BP301 High Precision Filling Peristaltic Pump User Manual

Safety Precautions!

To prevent fire, electric shock or personal injury when using this product, please follow the following safety precautions:

1. Please turn off the driver power before installing (or removing) the pump head and tube, otherwise your fingers or clothes may be entangled in the driver;
2. Please turn off the power before connecting the external control device, otherwise the equipment may be damaged;
3. This product should be installed on a stable surface, otherwise the product will fall over due to vibration and be damaged;
4. This product should be installed in a protected place to prevent anyone from stepping on the connecting wires or tripping over the connecting wires, thereby damaging the connecting wires or injuring people;
5. Before cleaning this product, please unplug the power plug from the socket;
6. Do not disassemble, change or repair this product without permission. If necessary, please contact Duoning.

Cautions:

1. Before using this product, please read carefully and fully understand the contents of this manual;
2. Before using this product, please read and follow the instructions in the safety precautions carefully;
3. The tube are consumable materials. Long-term use may cause rupture due to fatigue, resulting in liquid leakage. Please check and replace the tube in time.
4. Please keep this manual well.

Warning!

- This product may be interfered by electromagnetic fields and cause malfunction in certain special industrial environments or near radio transmitting devices.
- Non-professionals are not allowed to open the casing of this product, otherwise they will not receive normal after-sales service.

Table of Contents

1. Overview

BP301 peristaltic pump is a high-precision filling device. This product features a large-screen LCD display that shows the working parameters and status of the equipment. The chassis is designed with a streamlined metal molded shell that has an IP54 protection rating. Additionally, the surface of the shell is treated with a baked varnish, making it elegant, easy to clean, and resistant to corrosion.

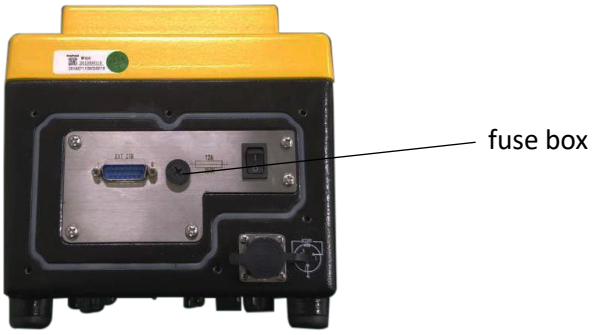
This series of peristaltic pumps utilizes a brushless DC motor for drive, offering low noise, minimal heat generation, maintenance-free operation, and stable, reliable performance with high filling accuracy and consistent pulsing. These pumps are highly suitable for fluid transfer and filling across various industries, including beverages, health products, pharmaceuticals, fine chemicals, and printing.

- **The product pictures are as follows:**

- **This series of products consists of two main parts:**
  - **Pump head:** For detailed introduction, please refer to the Pump Head Manual.
  - **Driver:** The main body of the peristaltic pump (power source).

- **Fuse**

This product contains a 2A standard fuse. If it must be replaced, please open the rear cover at the rear of the chassis. You can use a cross screwdriver to unscrew the fuse box and replace with another fuse of the same standard. **Note: Fuse specifications, rated 250V, 2A, size 5*20mm, slow blow.**



⚠ **Warning**

Please unplug the power plug before replacing the fuse!

2. Product Introduction

2.1. Product Functions

- The large LCD screen displays the working parameters and working status of the peristaltic pump, which is intuitive and clear.
- The operation interface is user-friendly and designed with simple prompts, which is easy to learn and understand.
- Two working modes available, which can be used for quantitative filling or for ordinary continuous working mode. It is flexible and suitable for use in different environments.
- There is a button tone and buzzer prompt tone when the button is pressed. The buzzer rings to indicate that the button is working. The sound can be turned on or off as needed.
- The speed, direction and start/stop of the pump can be controlled by external signals.
- The speed, direction and start/stop of the pump can be controlled by RS485 interface and Modbus RTU communication protocol.
- Brushless DC motor, servo drive, low noise, low heat generation and maintenance-free.
- Provides power-off memory function, and the startup display is the running screen before the last shutdown.
- Store 12 sets of set file parameters for quick call and improved work efficiency.

2.2. Product Technical Parameters

The detailed technical parameters of the product are shown in the following table:

Model	BP300
Drive	DC brushless motor, servo drive, low noise, low heat, maintenance-free
Speed range	0.1 ~ 600.0 rpm (maximum speed depends on pump head)
Speed resolution	0.1 rpm
Adjustment mode	Panel buttons adjust parameters, with buzzer sounds prompts
Display mode	Large LCD screen displays working parameters and status, with Chinese and English menus available
External control interface	Dry contact signal controls start, stop and direction; analog signal (current 4-20 mA, voltage 0-10 V) controls speed; RS485 interface, Modbus RTU communication protocol controls start, stop, direction and speed; state output function
Applicable power supply	220VAC (±10%), 50Hz/60Hz
Power consumption	≤70 W
Working environment	Temperature 0 ~ 40 ℃, relative humidity ≤80%
Applicable pump head	YZ15 (4 pump heads), KZ15 (4 pump heads), KZ25, YG15, etc.
Protection level	IP54
Flow range	See "Pump Head Manual" for details
Enclosure	Die-casting chassis with special spraying
Dimensions	390×200×196 (mm)

Note 1: The applicable pump heads in the above table can be interchanged on the same driver to meet the

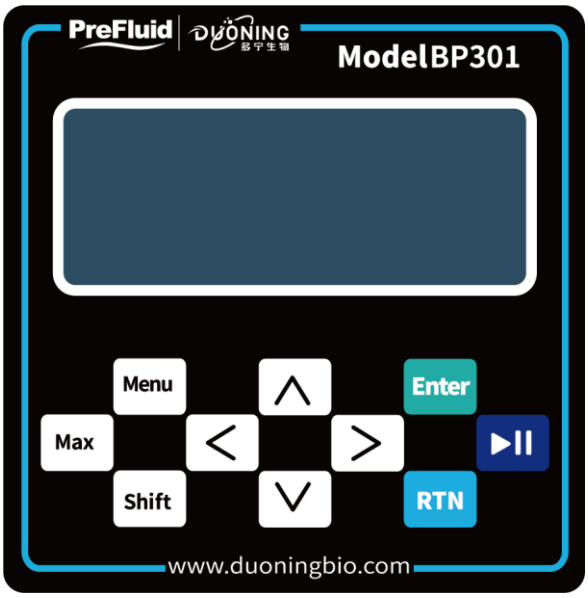
actual needs of different channels, flow rates and pressures.

Note 2: For the reference flow rate of the product, please refer to the "Pump Head Manual".

3. Control Panel and Rear Panel Description

3.1. Control Panel Description

The control panel consists of a large LCD displayscreen and ten membrane (or touch) buttons, as shown below:



Part description:

- **LCD display screen:** displays the working parameters and working status of the peristaltic pump.
- **The button functions are as follows:**

▶II: Start/Stop button: Control the start or stop of the pump

Enter: Enter button: Confirm the setting parameters

RTN: Return button: Return to the previous level and exit

∧ : Up button: For adjusting parameters

∨ : Down button: For adjusting parameters

< : Left button: For adjusting parameters

> : Right button: For adjusting parameters

Max : Drain button: Use with the direction setting to fill or drain the tube

Menu : Menu button: Switch between system setting screen and file setting screen

Shift : Function button: In a certain screen, combined with other keys:

① Shift + Max

In the “Quantitative filling” working screen, press this button combination to reset the “filling times”; in the “Continuous working” working screen, press this button combination to reset the “total amount”.

② Shift + Enter

In the "Quantitative filling" and "Continuous working" working screen, press this button combination to enter the calibration menu screen.

③ Shift + ∧

In both working screens, press this button combination to lock and release the control panel buttons. In the "System Settings" and "File Settings" screens, press this button combination to quickly turn pages upward.

④ Shift + ∨

In the "Continuous working" screen, press this button combination to switch the speed and flow position. The values displayed in bold can be modified. In the "System Settings" and "File Settings" screens, press this button combination to quickly turn pages downward.

⑤ Shift + < 、 Shift + >

Available in both working screens, press this button combination to set the rotation direction.

3.2. Chassis Rear Description

This pump comes with a chassis rear cover (the rear cover is detachable) to improve the waterproof level. Users who do not require high waterproof level can remove the pump rear cover before using it when using external control. The external control cable uses the standard DB15 external control cable and is connected to the external control interface. The rear panel (after the rear cover is removed) is as shown below.

- **Power switch:** Turn to "I" for ON, turn to "O" for OFF.

- **External control interface:** External control signal input interface. See "5. External control" for details. The standard DB15 external control cable can be used.
- **Fuse box:** Built-in fuse.

⚠ Note: Fuse specifications: 250V, 2A, 5mm*20mm, slow-blow fuse.

For users with higher waterproof requirements, please remove the chassis rear cover before using external control, pass one end of the standard 15-core external control cable (without crimping the terminal) through the cable connector of the chassis rear cover, and connect the end with DB15 and the shell to the corresponding interface as required. Check that the connection of each cable is correct and reliable, then cover the chassis rear cover and tighten the screws.

Cable connector Chassis rear cover

- **Rear cover:** better prevent the harm of dust, water and other debris, thereby improving the IP level of the whole machine.
- **Cable connector:** the functional lead on the external control can be connected through this port.

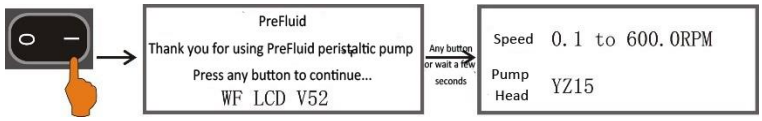
4. Operation Instruction

4.1. Installation of Pump Head and Tube

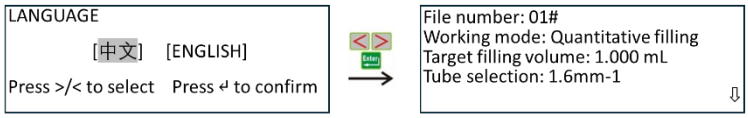
The pump head and tube must be installed before the following operations. For detailed installation methods, please refer to "Pump Head Manual".

4.2. Power on and Start up

Connect the power plug into the power socket and turn on the power switch. The first time (new machine) power on or after restoring the factory settings, the power on process is as follows:



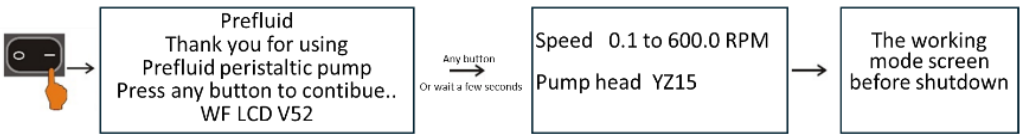
After selecting "Chinese" and pressing the confirmation button, you will enter the file setting interface, as below.



⚠ **Note: Make sure that the input power voltage is consistent with the power supply voltage required by the machine.**

- Turn the **power switch** to "I" for on, and to "0" for off.
- You need to select the operating language when you **turn on the machine for the first time** or after restoring the factory settings. This machine provides two operating languages, namely [Chinese] and [ENGLISH]. After turning on the machine, the welcome screen will be displayed first. You can press any button or wait for three seconds to enter the language selection screen. Here, our introduction will be based on the selection of Chinese. After selecting and confirming, enter the file setting interface.
- **Steps to enter the "File Settings" interface:**
  - Press the RTN button to enter in the working screen;
  - Press the Menu button to enter in the system settings screen.

The process for each subsequent startup is as follows:



That is, it starts from the welcome screen, then enters the speed and pump head prompt screen, and then enters the working screen before shutdown.

4.2.1. Introduction to File Numbers

File numbers are available from 00# to 12#, in three types: current file parameters, 00# file parameters, and 01#-12# file parameters.

- Current file parameters are the parameters that the pump is using after startup, which can be modified and saved. In the file setting screen, the file number displays 00#-12#.
- 00# file is the default parameter and cannot be modified. After reselecting (press ∧ , ∨ buttons to select, press Enter to confirm), the default parameter is displayed. When the parameters are modified, they are automatically saved as the current file parameters, and can also be saved as 01#-12 files.
- 01#-12 files, these 12 groups of parameters are previously stored file parameters, and can be used by reselecting (press ∧ , ∨ buttons to select, press Enter to confirm). When the parameters are modified, they are automatically saved as the current file parameters. If you want to call 01# file again, you need to press ∧ , ∨ buttons to reselect 01# file.

4.2.2. Introduction to Working Modes

- **Quantitative filling**, filling operation is performed according to the set target filling volume, filling time and running speed, etc., which is a common method.
- **Continuous working**, working according to the set speed and flow rate.

4.2.3. Introduction to Pump Status

▶II , the pump stops and waits for triggering (pressing the ▶I button on the panel or external signal triggering) to work.

▶▪▪ , the pump is running and waiting to be triggered (press the ▶I button on the panel or an external signal) to stop.

▶▪I , the pump is paused. After the interval time is over, the pump will automatically run again. Used in "quantitative filling".

▶▶ , the pump being emptied and filled, Press and hold the Max button to display.

PC▶II , the pump stops and waits for a trigger (communication to start the pump) to work.

PC▶▪▪ , the pump is running, waiting for a trigger (communication to stop the pump) to stop.

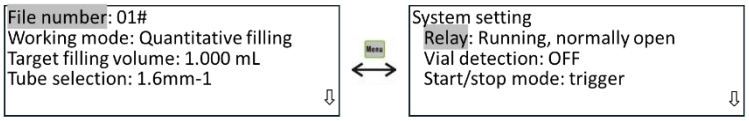
PC▶▪I , the pump is paused. After the interval time is over, the pump automatically runs again. The initial start and stop are triggered by communication. Used in "Quantitative filling".

RC▶II , the pump stops, and the 2nd and 11th pins of the external control interface are short-circuited, waiting for a trigger (external signal trigger) to work, and the analog signal controls the speed. Used in "continuous working" mode.

RC▶▪▪ , the pump is running, and the 2nd and 11th pins of the external control interface are short-circuited, waiting for a trigger (external signal trigger) to stop, and the analog signal controls the speed. Used in the "continuous working" mode.

4.3. System Settings

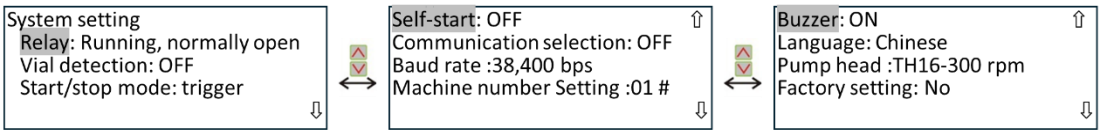
In the file setting screen, press the Menu button to enter the system setting screen. As shown below:



There are multiple operations in the system settings. Select the setting item by pressing the ∨ and ∧ button (display is highlighted), and then press the Enter button, the parameter items behind the item will be highlighted. General parameters can be set by pressing the ∨ , ∧ and Enter buttons. For multi-digit numerical parameters, you can use the < , > buttons to select the digit (a digit is highlighted), the ∧ , ∨ buttons to adjust the value, and the Enter button to confirm the setting. Press Shift + ∧ or Shift + ∨ to quickly turn pages up or down.

Note: When the system setting screen is on the first page, the "⇩" mark will be displayed on the right, the "⇧" mark will be displayed on the last page, and the "⇧" and "⇩" marks will be displayed on the middle page at the same time. It means "next page" or "previous page" exist or "both next and previous pages exist".

As shown in the following figure:



The parameters are described as follows:

Relay: "Run, normally open", "Run, normally closed" are optional. If "Run, normally open" is selected, when the pump is running, external control PIN13 and PIN14 are open, and when the pump stops, external control PIN13 and PIN14 are normally closed.

Bottle detection: ON and OFF are optional. When "ON", the pump operation is controlled by the bottle signal, that is, the pump operates when there is a bottle, and does not operate when there is no bottle; when "OFF", the pump operation is not controlled by the bottle signal, that is, the pump operates when it receives

the external control drive signal.

Note: This item is used in the "quantitative filling" working screen, and the pump is started by external control (see 5. External control "Wiring method 1" for details).

Start/stop method: trigger and switch are optional. When select "trigger", the pump will start when it receives a pulse signal; when select "level", the pump will start when it receives a high or low level.

Self-start: ON and OFF are optional. When "ON", the powered pump starts according to the parameters before shutdown (when it is not in communication or external control speed); when "OFF", the powered pump is in a stopped state.

Note: The above two items are used for the "continuous work" mode. ① The 2nd and 11th pins of the external control interface are open, the start and stop of the pump can be controlled by the 2nd and 12th pins, and the direction can be controlled by the 2nd and 3rd pins. For details, see **"Wiring method 2" in the 5. External control.** ② The 2nd and 11th pins of the external control interface are short-circuited, the start and stop of the pump can be controlled by the 2nd and 12th pins, the direction can be controlled by the 2nd and 3rd pins, and the speed can be controlled by the analog signal of the 5th or 15th pins. For details, see **"Wiring method 3 and 4" in 5. External control**.

Communication selection: ON and OFF are optional. When select "ON", the operation of the pump is controlled by communication; when select "OFF", the operation of the pump is controlled by the panel and external signals.

Baud rate: 9,600 bps, 19,200 bps and 38,400 bps are optional.

Machine number setting: 01#-16# can be set, the default is 01#

Note: The above three items are used for communication control. "Communication selection" = ON, the operation of the pump is mainly controlled by communication.

Buzzer: ON, OFF optional.

Language selection: Chinese, English optional.

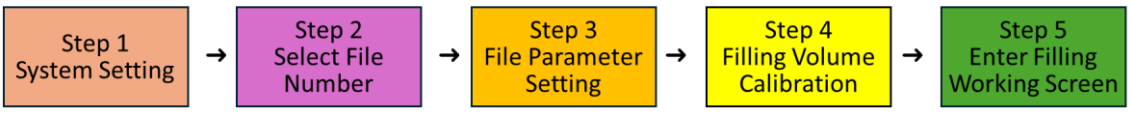
Pump head selection: YZ15, KZ15, KZ25, etc. optional. Press Shift + Enter buttons to select the pump head, the maximum speed is determined by the pump head.

Factory setting: select YES or NO. Note! Once "YES" is selected, all the parameters adjusted will be restored to the factory state. *Please use with caution!!!*

4.4. Quantitative Filling

4.4.1. Preparations for Filling

Flowchart as follows:



Step 1: System Settings

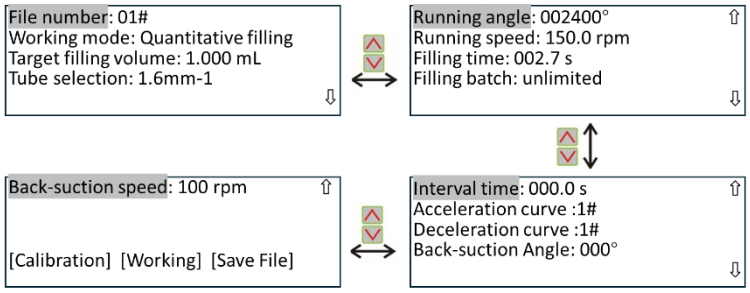
See **4.3 System Settings**, set "Communication Selection" to "OFF".

Step 2: Select File Number

Enter the file setting screen, select the file number to call the saved file parameters.

Step 3: File Settings

Set the file parameters according to the previous method, as shown in the figure below (example):



File number: 00#-12#, select 01#.

Working mode: quantitative filling and continuous working are available. Select "quantitative filling".

Target filling volume: 0.010 mL-9.900 L, set to 1.000 mL.

Tube selection: Tube inner diameter 0.8 mm, 1.6 mm, 3.2 mm, 4.8 mm, 6.4 mm, 8.0 mm, 9.6 mm, 12.7mm optional. -1, -2 represent 1-channel and 2-channel tubes. Set to 1.6 mm-1. When reselecting the tube, the parameters represented by the tube are the default parameters.

Running angle: 30°-999,999°, that is, the angle at which the pump head runs. Here, 002,400° is determined by the "target filling volume" and the tube and its number of channels, and cannot be changed here.

Running speed: 0.1-600.0 rpm, set to 150.0 rpm.

Filling time: 0.3-999.9 s, set to 2.7 s. "Running speed", "filling time" and "running angle" are related. If one of the speed and time changes, the other will change accordingly.

Filling batch: 0-999 can be set. When the set value is reached, the pump will stop filling and pop up a prompt screen. When set to 0, "unlimited" is displayed, indicating that the pump continues to fill according to the set parameters. The usage is related to the "interval time".

Interval time: 0-999.9 s. ① When "interval time" = 0s, the pump receives a trigger signal and dispense once. ② When "interval time" > 0s, the pump receives a start signal, dispenses once, stops once, and dispenses once again, and the cycle repeats.

Acceleration curve: 1-9#, the larger the value, the longer the acceleration time. Select according to the impact of the liquid on the bottom of the bottle during filling.

Deceleration curve: 1-9#, the larger the value, the longer the deceleration time. Select according to the splashing of the liquid on the bottom of the bottle at the end of filling.

Back-suction angle: 0-360°, the angle of reversal after each normal operation of the pump. Used for dispensing of liquids with high viscosity to prevent dripping.

Back-suction speed: 50-300 rpm.

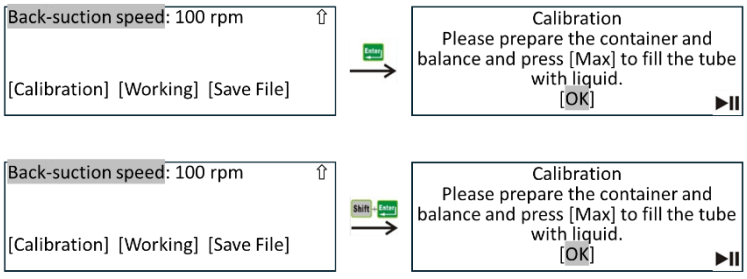
[Calibration]: When highlighted, press the Enter button to enter the calibration screen.

[Work]: When highlighted, press the Enter button, or press the ▶I button to enter the "quantitative filling" working screen.

[Save file]: When highlighted, press the Enter button to enter the file parameter saving interface.

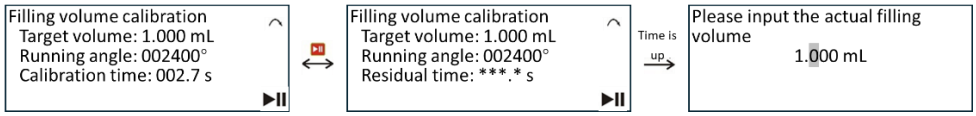
Step 4: Target filling volume calibration

In the file setting screen, press the ∧ , ∨ buttons to select [Calibration], and then press the Enter button to confirm and enter the quantitative filling calibration screen (or in the file setting screen, press Shift + Enter), as shown below:



Prepare a container that can hold the target amount and a balance that can weigh the target amount

according to the prompts. Press the Max button to fill the tube with liquid and make sure there are no bubbles in the tube. Then press the Enter button to enter the next menu. Press the ▶I button in the filling calibration screen. The pump is calibrated once as shown below. If the actual filling amount is already known, you can press the Enter button and directly enter the actual filling volume.



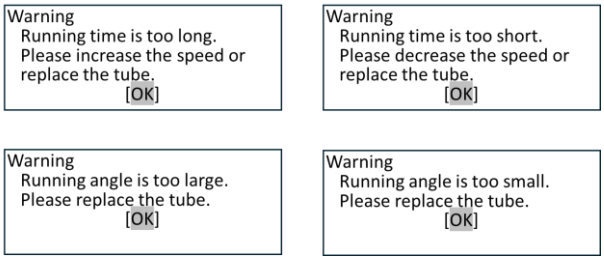
Target volume: 1.000 mL, the volume that needs to be dispensed and calibrated.

Running angle: 002400°, the angle at which the pump needs to run based on the set target volume and the number of tubes and channels.

Calibration time: 002.7 s, the time set for dispensing liquid, which is also the calibration time.

After the calibration time is over, the input screen for the actual volume will pop up. After entering the actual volume according to the weighing of the balance, press the Enter button to generate the running angle and time after this calibration. As shown below.

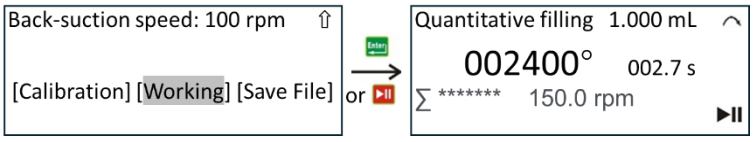
If the set dispensing amount is too different from the actual calibration value, a warning prompt may pop up: ① The running time is too long (> 999.9s). ② The running time is too short (< 0.1s). ③ The running angle is too large (> 999,999°). ④ The running angle is too small (< 180°). As shown in the figure below.



Please follow the warning prompts to do the next step. Under normal circumstances, after several checks, you can enter the work screen to work.

Step 5: Enter the quantitative filling interface

After calibration, return to the file setting screen, press the button or select the [Work] button to enter the quantitative filling work screen.



1.000 mL: Target volume, the volume that needs to be dispensed and verified.

002400°: The running angle of the pump calculated based on the target volume and the number of tubes and their channels. It can be fine-tuned. The method is shown below.

002.7 s: The set time for the pump to fill, which is displayed in countdown during operation.

∑*****:** The number of filling times, which is increased by 1 for each dispense, and the initial value is 0. If "∑***/***" is displayed, it means batch filling. The value before "/" indicates the number of times the filling has been done, and the value after "/" indicates the set filling batch. Each time the filling is done, the count is increased by 1 until the values before and after "/" are the same, and the filling completion prompt screen pops up. Press the Shift + Max key to clear the number of filling times.

: Indicates that the pump is running in the forward direction;

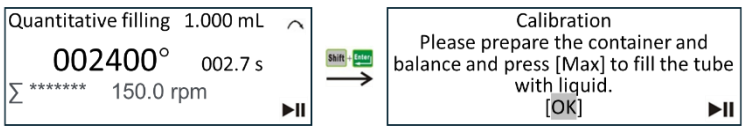
: Indicates that the pump is running in the reverse direction.

4.4.2. Combination buttons

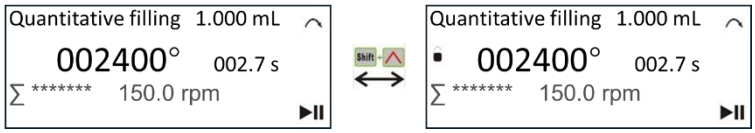
In working screen, use of combination keys.

(i) When the pump is stopped, press Shift + < or Shift + > buttons to change the pump's rotation direction.

(ii) When the pump is stopped, press Shift + Enter buttons to quickly enter the calibration screen. You can also select [Calibration] in the file setting screen and press Enter button to enter.



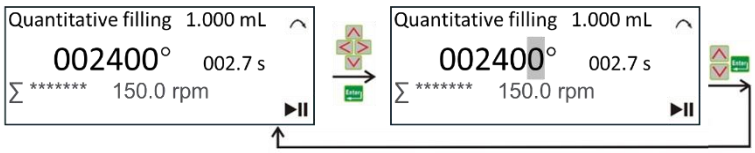
(iii) Press the Shift + ∧ buttons to lock or unlock the keyboard. This operation is available when the pump is running or stopped. When the keyboard is locked, only the stop function of the ▶I button is available.



(iv) When the pump stops, press the Shift + Max buttons to clear the number of fillings.

4.4.3. Fine-tuning of the Running Angle

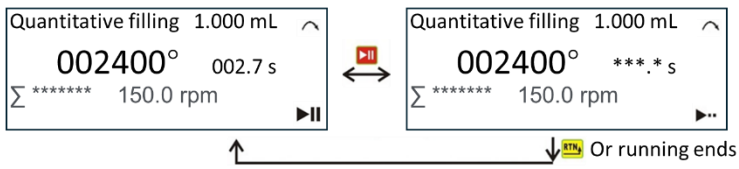
In the working screen, after the tube has been working for a period of time, the liquid dispensed may change slightly. At this time, the running angle can be fine-tuned to adjust the liquid dispensing amount without re-calibration. Press ∧, ∨, <, > or Enter buttons to highlight a certain angle value, indicating that the position can be modified. Press ∧, ∨ buttons to adjust the angle value, and press Enter button to confirm. This operation can be performed when the pump is working or stopped. As shown below.



4.4.4. Manual Filling

(i) When filling batch = "unlimited", interval time = 0.

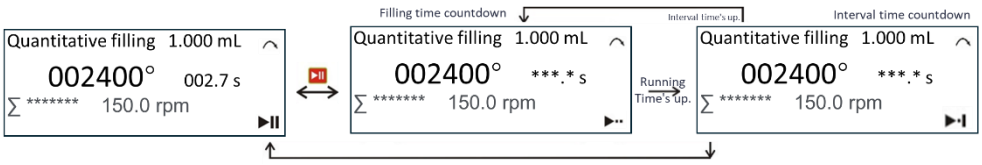
Press the ▶I button once, dispensing once, the count increases, and when the count reaches 10,000,000, it returns to zero ∑0, and the working screen is as follows.



(ii) When the filling batch = "unlimited" and the interval time = n (n>0).

Press the ▶I button once to dispense multiple times, the count increases, and when the count reaches 10,000,000, it returns to zero ∑0, and the working screen is as follows. Press the ▶I button again to stop

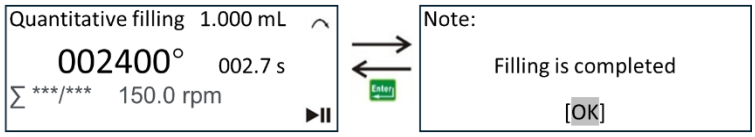
the pump.



(iii) When the batch size = N (N>0), the interval time = 0.

Press the ▶I button once, dispense once, the count increases, and the count is displayed as ∑***/***.

When the filling is completed, the prompt screen pops up.



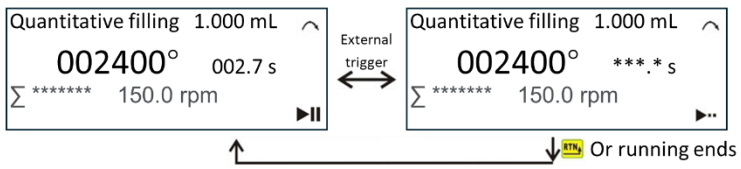
(iv) When the batch size = N (N>0), the interval time = n (n>0).

Press the ▶I button once, and dispense n times, and the count increases, and the count is ∑***/***.

4.4.5. External Control Filling

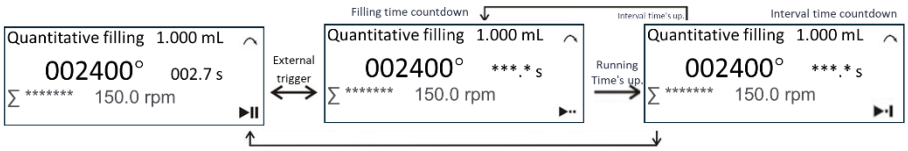
For external control filling, it is required that ① to set "bottle detection" in the 4.3 system setting section. Please set it to ON (the pump start is controlled by the bottle signal) or OFF (the pump start is not controlled by the bottle signal) as needed; the delay time is set to 0 or n (n > 0) as needed. ② to connect the external control signal, and connect the bottle control signal and the filling start signal according to "wiring method 1" (see 5. External control for details).

(i) When "filling batch" = "Unlimited" and the interval time = 0. The external control starts once, the filling is done once, and the count increases. When the count reaches 10,000,000, it returns to zero ∑0, and the working screen is as follows.



(ii) When “filling batch” = “Unlimited”, and the interval time = n (n>0), the external control starts once, and dispense multiple times, the count increases. When the count reaches 10,000,000, it returns to zero ∑0, and the working screen is as follows. Press the ▶I button again or the external control triggers the pump to

stop.



(iii) When "filling batch" = N (N>0), "Interval time" = 0, the external control starts once, and dispense once, the count increases, and ∑***/*** is displayed.

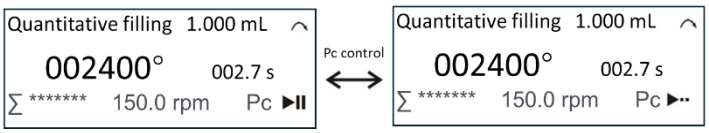
(iv) When "filling batch" = N (N>0), the interval time = n (n>0), the external control starts once, dispense N times, the count increases, and ∑***/*** is displayed.

Note: ① When "bottle detection" = "ON", the external control starts when there is a lack of bottles, and the screen prompts "bottle lack". ② When the delay time = n (n>0), the external control startup screen prompts "Delay". ③ Users generally use "filling batch" = "Unlimited", interval time = 0, bottle detection = "ON", and "Delay time" = 0. ④ After starting the pump in external control mode, press ▶I button on panel once to stop the pump urgently.

4.4.6. Communication Filling

For communication filling, it is required that ① In the **4.3 System Settings** section, set "Communication Selection" to ON; set the baud rate as needed; and set the machine number to any value between 01-16# as needed. ② If you need to access the communication control signal, press "**Wiring Mode 5**" to access the communication signal (see **5. External control** for details).

(i) When "filling batch" = "Unlimited" and "Interval Time" = 0. The pump receives a start signal from the PC once, dispenses once, and the count increases, as shown in the figure below.



(ii) When "filling batch" = "Unlimited" and "Interval time" = n (n>0). The pump receives a start signal from the PC once, and dispenses countless times, and the count increases.

(iii) When "filling batch" = N (N>0), "Interval time" = 0. The pump receives a start signal from the PC once, and dispenses once, and the count increases, and the count is displayed as Σ***/***.

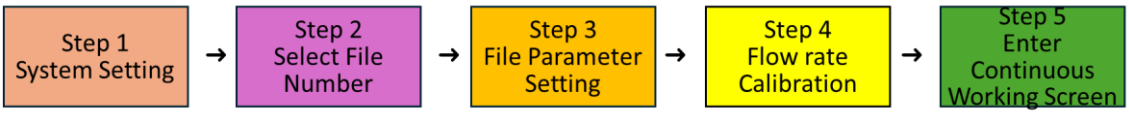
(iv) When "filling batch" = N (N>0), "Interval time" = n (n>0). The pump receives a start signal from the PC once, and it dispenses N times, and the count increases, and the count is displayed as Σ***/***.

Note: ① "PC" stands for "Personal Computer", which means it is controlled by a computer. ② After starting the pump by communication, press the ▶| button on panel once to stop the pump.

4.5. Continuous working

4.5.1. Preparation

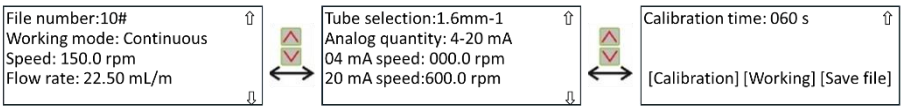
The flow chart is as follows:



Step 1: System Settings
See **4.3 System Settings**, set "Communication Selection" to OFF, and "Auto-Start" to OFF.

Step 2: Select Work Number
Enter the file setting screen, select the file number to call the saved file parameters.

Step 3: File Parameter Settings
Set the file parameters according to the previous method, as shown in the figure below (example):



File number: 00#-12#, the file number here is 10#.

Working mode: quantitative filling and continuous working are optional, select "continuous working".

Speed: 0.1-600.0 rpm, set to 150.0 rpm.

Flow: 0.001-2.200 L/m, set to 22.50 mL/m.

Tube selection: Tube inner diameter 0.8 mm, 1.6 mm, 3.2 mm, 4.8 mm, 6.4 mm, 8.0 mm, 9.6 mm, 12.7mm optional. -1 and -2 means 1 and 2 tubes respectively. Set to 1.6 mm-1. When the tube is set, the speed and flow are interrelated.

Analog quantity: 4-20 mA, 0-10 V optional.
When "4-20mA" is selected,
04 mA speed: 0.0-600.0 rpm, set to 0.0 rpm. It is the speed corresponding to the external analog quantity 4mA.
20 mA speed: 0.0-600.0 rpm, set to 600.0 rpm, which is the speed corresponding to the external analog 20

mA.

When "0-10 V" is selected,
0 V speed: 0.0-600.0 rpm, set to 0.0 rpm. It is the speed corresponding to the external analog 0 V.
10 V speed: 0.0-600.0 rpm, set to 600.0 rpm, which is the speed corresponding to the external analog 10 V.

Calibration time: 15 s, 30 s, 60 s, 90 s, 120 s, 150 s, 180 s, 240 s optional. Set to 60 s.

[Calibration]: When highlighted, press the Enter button to enter the calibration screen.

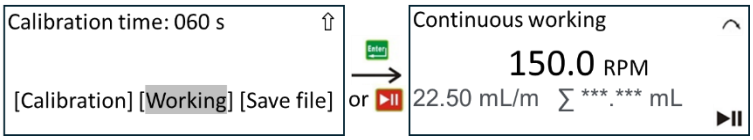
[Work]: When highlighted, press the Enter button, or press the ▶I button to enter the "Continuous Work" work interface.

[Save File]: When highlighted, press the Enter button to enter the file parameter saving interface.

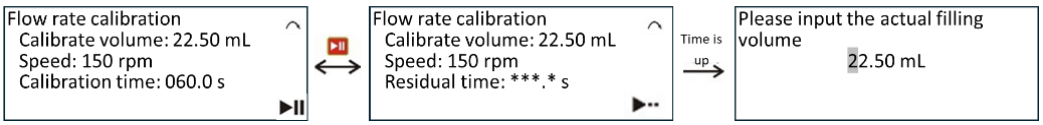
Note: When the analog quantity is set to any speed within the range of 0.0-600.0 rpm, the speed corresponding to other analog quantities is converted according to the ratio.

Step 4: Flow calibration

In the file setting screen, press the ∧ , ∨ buttons to select [Calibration], and then press the Enter button to confirm and enter the flow calibration screen (or in the working screen, press Shift + Enter), as shown below:

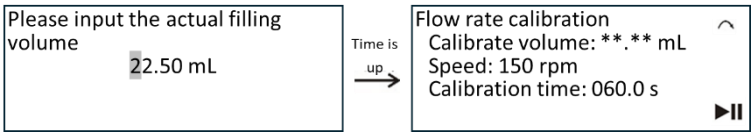


Prepare a container that can hold the target amount and a balance that can weigh the target amount according to the prompts. Press the Max button to fill the tube with liquid and make sure there are no bubbles in the tube. Then press the Enter button to enter the next menu. Press the ▶I button in the filling calibration screen. The pump is calibrated once as shown below. If the actual filling amount is already known, you can press the Enter button and directly enter the actual filling value.

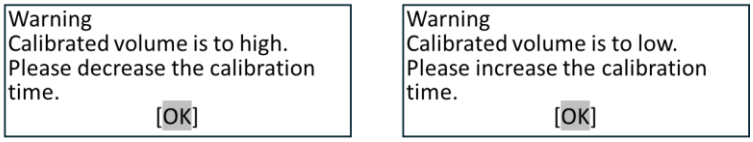


Calibration volume: 22.50 mL, the volume to be verified calculated based on the calibration time.
Speed: 150.0 rpm, the set speed.
Calibration time: 060.0 s, the set flow calibration time.

After the calibration time is over, the actual volume input screen pops up. After entering the actual volume according to the balance weighing, press the Enter button. As shown below.

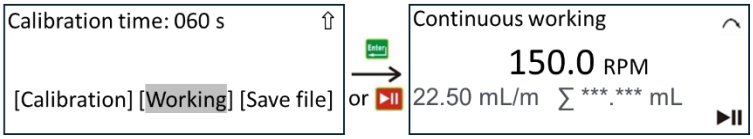


Note: If the calibration time is too long or too short, a warning may appear when entering the calibration screen. Please follow the prompts (as shown below).



Step 5: Enter the flow metering screen

After the test is completed, return to the file setting screen, press the button or select [Work] and press the Enter button to enter the continuous working screen.



150.0 RPM: The speed at which the pump needs to run, or the set speed, generated based on the set flow rate and the number of tube and tube channels.

25.50 mL: The corresponding flow rate generated by the set flow rate or the set speed, that is, the delivery volume of the tube per minute.

∑*.**mL:** The total amount of fluid (cumulative amount) output at the set speed/flow rate when the pump is working. The following units change automatically, including mL, L and kL. You can clear it to 0 by pressing the Shift + Max key, and the unit will automatically return to mL after clearing it to 0.

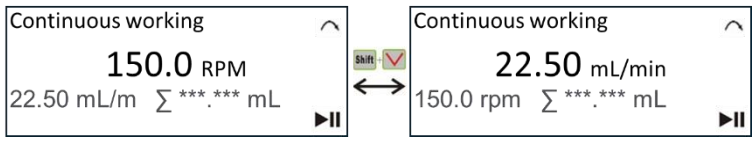
4.5.2. Combination Buttons

In working screen, use of combination buttons.

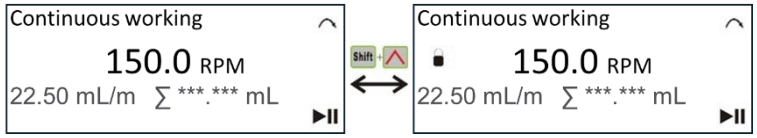
(i) When the pump is stopped, press Shift + < or Shift + > buttons to change the rotation direction of the pump. You can also change the rotation direction in the "System Settings" screen.

(ii) When the pump is stopped, press Shift + Enter key to quickly enter the calibration screen. You can also select [Calibration] in the file settings screen and press Enter button to enter.

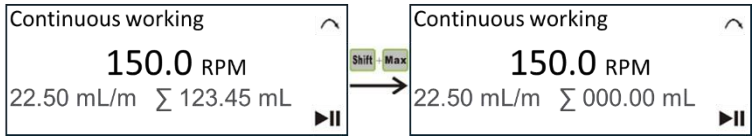
(iii) Press the Shift + V button to switch between adjustable speed and adjustable flow.



(iv) Press the Shift + ^ buttons to lock or unlock the keyboard. When the keyboard is locked, only the stop function of the ▶I button is available.



(v) When the pump stops, press the Shift + Max buttons to reset the total amount.

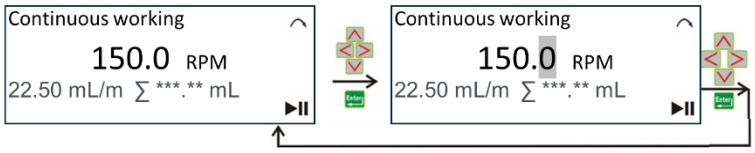


4.5.3. Fine-tuning of Speed and Flow rate

After the tube has been working for a period of time, the flow rate of the liquid squeezed out of the tube may change slightly. At this time, the speed can be fine-tuned to keep the actual flow rate consistent with the

set flow rate. Therefore, the flow rate display value remains unchanged when the speed is adjusted. If the set flow rate is adjusted, the speed will be adjusted with the flow rate according to the corresponding relationship between the flow rate and the tube.

Method: Press ∧ , ∨ , < , > or Enter buttons to highlight a certain position of the speed (flow rate) to indicate that the position can be modified, and press < , > to select the position to be adjusted, and ∧ , ∨ to adjust the position value, and press the Enter button to confirm (when the flow rate is adjustable, the method is the same). As shown in the figure below.



Note: ① If the flow range is determined, the speed calculated according to the tube specifications is also determined. It is possible that the adjustment is invalid during adjustment. ② Whether the pump is in operation or not, the "speed" and "flow" can be adjusted. ③ When the pump stops running, you can press the Max button to fill or drain the tube (with the direction).

4.5.4. Manual Operation

Press the ▶I button once, the pump will work, press it again, and the pump will stop working. As shown in the figure below.

When “Auto Start” is set to ON, the pump will start running as soon as it is turned on. Press the ▶I button once and the pump will stop working.

4.5.5. External Control Operation

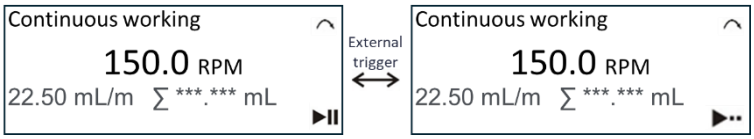
For working in external control mode, it is required that ① to set "Communication selection" to OFF in the

4.3 system setting section. ② Set "Start and stop mode" to "Trigger" or "Switch" as needed. ③ It is necessary to connect external control signals, connect direction signals and start and stop signals (pins 2, 3, and 12 of the external control interface) according to "**Wiring method 2**", or connect direction signals, analog input signals, analog control speed signals, and start and stop signals (pins 2, 3, 5/15, 11, and 12 of the external control interface) according to "**Wiring method 3**" (see 5. External control for details).

(i) There are two control modes for external control signals to control direction and start/stop. The external control interface is wired according to "**Wiring method 2**".

① When "Start/stop mode" = "Trigger", the pump receives a pulse signal to work, and then receives a pulse signal to stop working. When a low-level direction signal is received, the pump direction changes. If the pump is running in the current state, it needs to be started again to be effective. (See 5. External control for details)
② When "Start/Stop Mode" = "Switch", the pump starts working when it receives a low-level signal, and stops working when it receives a high-level signal. When a low-level direction signal is received, the pump direction changes. If the pump is running in the current state, it needs to be started again to be effective. (See 5. External control for details)

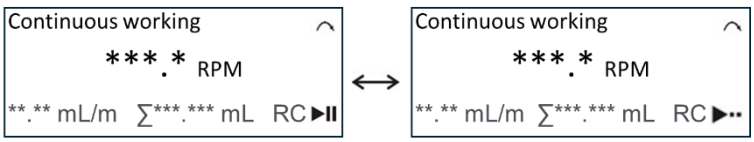
The working screen is as shown below.



(ii) External control signals control direction and start/stop, and analog signals control speed. There are two control modes as follows. The external control interface is wired according to "**wiring mode 3, 4**". First, short-circuit pins 2 and 11 of the external control interface.

① When "Start/stop mode" = "Trigger", the pump receives a pulse signal to work, and then receives a pulse signal to stop working. When a low-level direction signal is received, the pump direction is forward, and when a high level is received, it is reverse. The speed (flow) is calculated in inverse proportion to the analog quantity received (see 5. External control for details).
② When "Start/stop mode" = "Switch", the pump receives a low-level signal to work, and then receives a high-level signal to stop working. When a low-level direction signal is received, the pump direction is forward, and when a high level is received, it is reverse. The speed is calculated in inverse proportion to the analog quantity received (see 5. External control for details).

The working screen is as shown below.

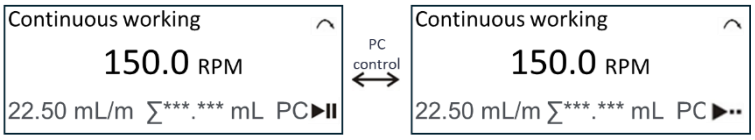


Note: After starting the pump in external control mode, press the ▶I button on the panel once to stop the pump in an emergency.

4.5.6. Operation by Communication

For working in communication mode, it is required that ① to set the "communication selection" to ON in the **4.3 system setting** section; set the baud rate as needed; and set the machine number to any value between 01-16# as needed. ② to connect the communication control signal, and connect the bottle control signal and the filling start signal according to "**wiring mode 5**" (see 5. External control for details).

When receiving the start and stop command, the working screen is as shown below.



4.6. File Save

Select [File Save] in the file setting screen and press the Enter button to confirm and enter the file save screen. As shown below.

4.7. Filling and Draining

Before the peristaltic pump is used, the tube must be filled with liquid. At this time, you can press Max and hold the button in any working mode until the tube is full of liquid.

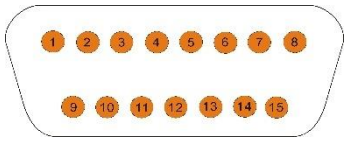
After the pump is finished working, the liquid in the tube must be drained. At this time, change the direction of the rotation first (opposite to when it is full), and then press and hold the Max button until the liquid in the tube is drained.

5. External control

This series of peristaltic pumps can be operated and controlled by the buttons on the panel, and the speed (flow) can be controlled by external current, and the direction, start and stop of the pump can be controlled by the level. In addition, all parameters of the pump can be controlled by communication. All external controls are connected through the external control port.

5.1. External Control Interface

The external control interface is on the rear panel, a DB15 socket, and its internal pin sequence is as follows:



The pins of the external control interface are defined as follows (with the colors of the external control cable):

Pins	Color	Definition
Pin 1	Brown	+5V, for external device use, current less than 100 mA.
Pin 2	Red	GND, common ground wire.
Pin 3	Orange	F/R, rotation direction control signal.
Pin 4	Yellow	+12V, for external device use, current less than 100mA.
Pin 5	Green	Iin, current input (4~20mA), control speed (flow).
Pin 6	Brown, dotted	A, RS485 communication A terminal.
Pin 7	Red, dotted	B, RS485 communication B terminal.
Pin 8	Orange, dotted	GND, RS485 communication ground
Pin 9	Blue	A, RS485 communication A terminal
Pin 10	Purple	B, RS485 communication B terminal. .
Pin 11	Gray	REM, analog enable port/bottle signal input port
Pin 12	White	S/S, trigger and switch control signal input port.
Pin 13	Black	COM, relay output common terminal
Pin 14	Yellow, dotted	NO, relay output normally open terminal.
Pin 15	Green, dotted	Vin, voltage input (0~10V), control speed.

Note: This machine is equipped with a DB15 external control cable as standard.

5.2. Wiring Method

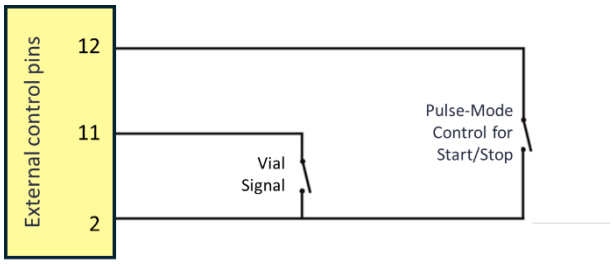
There are 6 wiring methods for external control and communication control of this series of peristaltic pumps. The requirements for the added control level and external current have been explained above.

The 6 wiring methods are explained as follows:

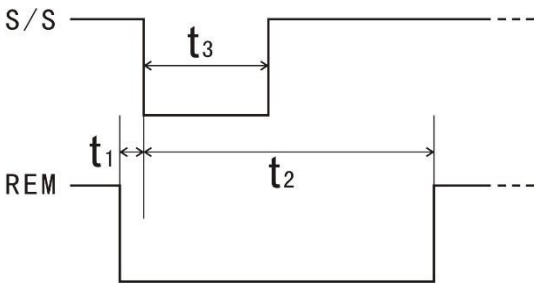
Wiring method 1: Connect pins 2, 11, and 12 of the external control interface to the external control device.

Wiring method 2: Connect pins 2, 3, and 12 of the external control interface to the external control device.
Wiring method 3: Connect pins 2, 3, 5, 11, and 12 of the external control interface to the external control device.
Wiring method 4: Connect pins 2, 3, 15, 11, and 12 of the external control interface to the external control device.
Wiring method 5: Connect pins 6 (9) and 7 (10) of the external control interface to the external control device.
Wiring method 6: Connect pins 13 and 14 of the external control interface to the external control device.

The typical application diagram is shown below:
Wiring method 1: Connect pins 2, 11, and 12 of the external control interface to the external control device.



Note:
① Short-circuiting pins 2 and 11 indicates that there are bottles, and opening pins indicates that there is no bottle. Short-circuiting pins 2 and 12 indicates that the start/stop signal has been received.
② The timing requirements of the "start signal" and "bottle signal" are shown in the figure below:

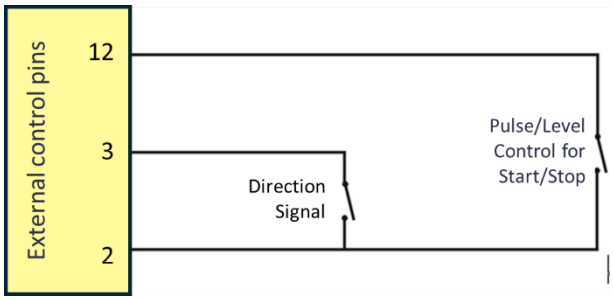


S/S—start signal; REM—bottle signal; t1—bottle signal advance placement time 3; t2—bottle signal holding time; t3—start signal holding time.

See the table below for requirements for each time period:

Time Period	Minimum (ms)	Recommendation (ms)	Maximum (ms)
t_1	0	10	100
t_2	150	200	Before next startup
t_3	100	150	Before next startup

Wiring method 2: Connect pins 2, 3, and 12 of the external control interface to the external control device.



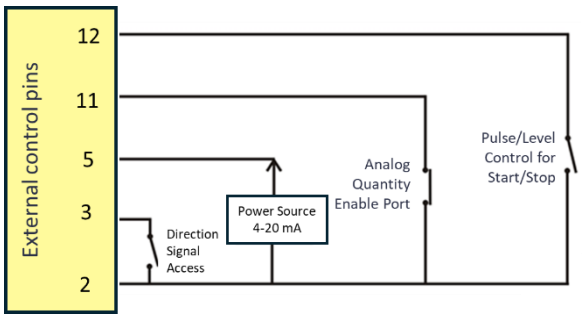
Note:

① When "Start/Stop Mode" = "Trigger", PIN12 works when it receives a pulse signal, and stops working when it receives another pulse signal.

② When "Start/Stop Mode" = "Switch", PIN12 works when it receives a low-level signal, and stops working when it receives a high-level signal.

③ When PIN3 receives a low-level direction signal, the pump direction changes.

Wiring method 3: Connect pins 2, 3, 5, 11, and 12 of the external control interface to the external control device.



Note: External control signals control direction and start/stop, and analog signals control speed. First, short-circuit pins 2 and 11 of the external control interface to select the speed to be controlled by external analog quantity.

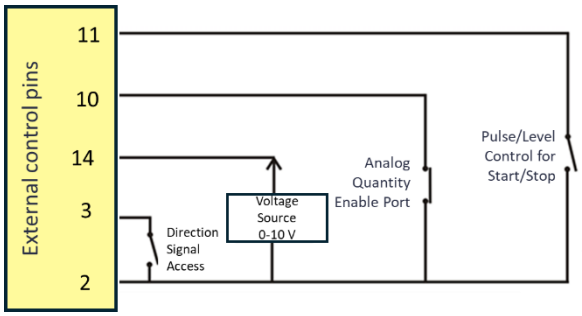
① When "Start/Stop Mode" = "Trigger", PIN12 receives a pulse signal to work, and then receives a pulse signal to stop working.

② When "Start/Stop Mode" = "Switch", PIN12 receives a low-level signal to work, and then receives a high-level signal to stop working.

③ When PIN3 receives a low-level direction signal, the pump direction is forward, and a high-level signal is reverse.

④ The speed (flow) is calculated according to the analog quantity received by PIN5 and the speed corresponding to the high and low values of the analog quantity (i.e. "4 mA speed", "20 mA speed").

Wiring method 4: Connect pins 2, 3, 15, 11, and 12 of the external control interface to the external control device.



Note: External control signal controls direction and start/stop, and analog signal controls speed. First, short-circuit pins 2 and 11 of the external control interface to select the speed to be controlled by external analog quantity.

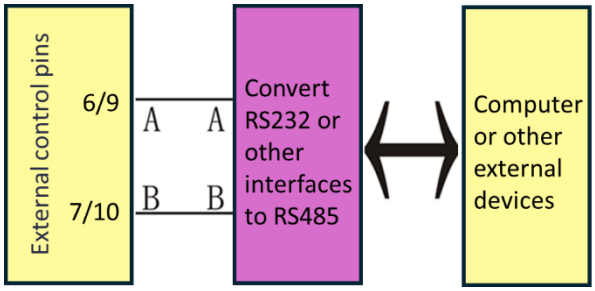
① When "Start/Stop Mode" = "Trigger", PIN12 receives a pulse signal to work, and then receives a pulse signal to stop working.

② When "Start/Stop Mode" = "Switch", PIN12 receives a low-level signal to work, and then receives a high-level signal to stop working.

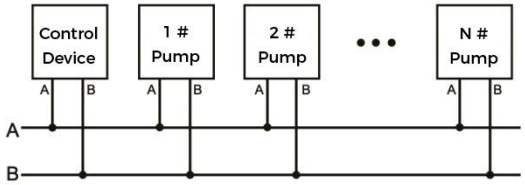
③ When PIN3 receives a low-level direction signal, the pump direction is forward, and high-level is reverse.

④ The speed (flow) is calculated according to the analog quantity received by PIN15 and the speed corresponding to the high and low values of the analog quantity (i.e. "0 V speed", "10 V speed").

Wiring method 5: Connect pins 6/9 and 7/10 of the external control interface to the external control device. Mainly used for communication control mode.



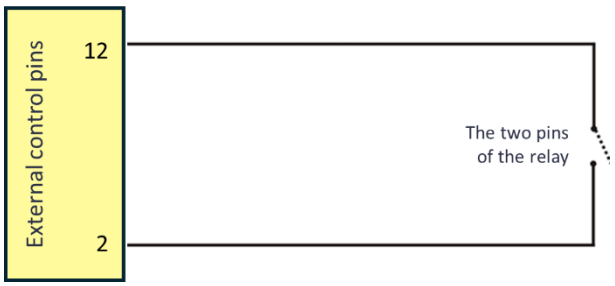
Some applications require remote communication control of multiple peristaltic pumps. According to the above "Wiring Method 4", the 6/9 pin (A) and 7/10 pin (B) of the external control interface can be connected to form a control system as shown in the following figure:



Note 1: 1≤N≤16.

Note 2: Before communication control, please refer to "System Settings" to set a machine number for each pump.

Wiring method 6: Connect pins 13 and 14 of the external control interface to the external control device. When the "Relay" is set to "Run, Normally Open"/"Run, Normally Closed", the two pins are normally open/normally closed when the pump is running, and the two pins are normally closed/normally open when the pump is stopped.



6. Maintenance and repair

6.1. Product Maintenance

- If the peristaltic pump will not be used for a long time, the tube should be removed.
- The product should be kept clean and can be wiped with a soft cloth and clean water.

Note: Do not use alcohol to clean the surface.

6.2. Product Repair

Be familiar with and master the correct operation of the product, external connection methods and various working conditions to eliminate faults caused by human factors. Common fault and troubleshooting methods are shown in the table below:

Fault description	Cause of fault	Troubleshooting	Note
After powering on, there is no display on the LCD screen.	Check if there is electricity in the power socket, if there is power plug loose, and if the fuse is loose or blown?	Re-plug the plug; reinstall or replace the fuse; note that the fuse must be selected according to the requirements in the specification sheet.	Be sure to check and determine what caused the fuse to blow.
After starting up, the LED screen displays correctly, but the pump roller does not rotate.	Check whether the pressure block on the pump head is pressed too tight so that the shaft is stuck; check whether the connecting wires of the motor are properly plugged in; whether the external control signal is connected and meets the requirements.	Reinstall the pressure block of the pump head as required; plug in the plug; connect the external control line and check whether the signal meets the requirements.	Otherwise there is a problem inside the pump and it is best to contact the supplier or company to resolve it.
The pump roller rotates but cannot deliver liquid (or gas)	Check whether the tube is crushed, whether the tube is broken or leaking	Adjust the tube clamps on both sides of the pump head; replace with new tube	
During operation, the tube slides to one side along with the roller.	Check whether the tube clamp is locked and whether it is locked properly	Adjust the tube clamp and lock it properly	

7. After-Sales Service

1 If this product does have quality problems within three months from the date of purchase, the supplier will be responsible for replacing it;
2 This product will be repaired free of charge within one year from the date of purchase;
3 After the warranty period, if the user cannot solve the fault by himself, please contact the distributor or Duoning/Prefluid to get preferential repair and service;
4 Failures caused by the following reasons are not covered by warranty services:
5 Any modification by end user, overload operation, improper maintenance, operating environment that does not meet product specifications, operation beyond the voltage range, and failure to wire correctly.

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