DIYONING

BP201 Flow Metering Peristaltic Pump User Manual

Safety Information!

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

1. Please turn off the power of the driver 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 may collapse and be damaged due to vibration;
4. This product should be installed in a protected place to prevent people from stepping on or tripping over the connecting wires, which may damage the connecting wires or cause personal injury.
5. Before cleaning this product, please unplug the power plug from the socket;
6. Do not disassemble, modify or repair this product without permission. If necessary, please contact Duoning/Prefluid Engineers.

Note:

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 information carefully;
3. The tube is a consumable. 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 in a safe place.

Warn!

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

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1. Overview

BP201 peristaltic pump is a high-precision flow metering pump. The product chassis adopts a streamlined metal molded shell with an IP54 high protection level. The surface of the shell is coated with a special coating, which is easy to clean and anti-corrosion.

This product uses a stepper motor as drive, which features good stability. Suitable for fluid transportation and filling in many fields such as beverages, health products, pharmaceuticals, fine chemicals and printing.

Product pictures as follows:

This series of products mainly consists of two parts:

- **Pump head:** For detailed introduction, please refer to the Pump Head Manual.
- **Drive:** The main body (power source) of the peristaltic pump.

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 friendly and has simple prompts, making it easy to learn and understand.
- Two working modes are optional. It can be used for quantitative work or ordinary continuous work. It is highly flexible and suitable for use in different occasions.
- There is a key tone and buzzer prompt sound when the key is pressed. The **buzzer sound** indicates that the key is effective. The sound can be turned on or off as needed.
- The pump can be started and stopped externally by applying an external level and trigger pulse.
- The pump speed, direction, start and stop can be controlled by RS485 interface and Modbus RTU communication protocol.
- It has a power-off memory function, and the startup display will be the working interface before the last shutdown.
- 16 groups of file parameters can be stored for quick recall and improved work efficiency.

2.2. Product Technical Specifications

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

Model	BP201
Drive	Stepper motor
Speed range	1 – 600 rpm
Speed resolution	0.1 rpm
Adjustment method	The panel buttons adjust the parameters, and the buzzer sounds a prompt

Model	BP201
Display mode	Large LCD screen displays working parameters and working status, with Chinese and English menus available
External control interface	Control start/stop, direction and speed (or flow); RS485 interface, Modbus RTU communication protocol control parameters and operation
Applicable power supply	220VAC (±10%), 50Hz/60Hz
Power consumption	≤50W
Work environment	Temperature 0 - 40℃, relative humidity ≤80%
Applicable pump head	YZ15, KZ15, YG15, etc.
Protection level	IP54
Flow range	For details, please refer to the Pump Head Manual.
Enclosure	Die-cast chassis with special spraying
Dimensions	250×150×160(mm)

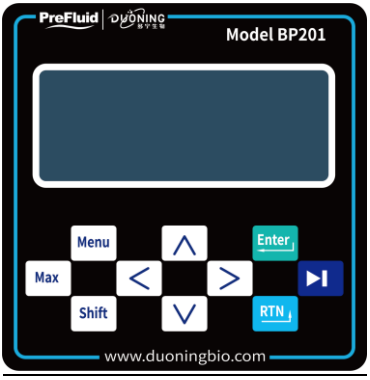
Note 1: The applicable pump heads in the above table can be interchanged on the same driver to meet the actual needs of different channels, flow rates and pressures.

Note 2: For the reference flow 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 display screen and ten touch buttons, as shown in the figure below.



Part Description:

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

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

Enter —— Enter button: Determination of setting parameters

RTN —— Return button: Go back one level and exit

∧ -- Up key: Adjust parameters

∨ -- Down key: Adjust parameters

< -- Left key: Adjust parameters

> —— Right key: Adjust parameters

Max —— Drain key: works with the running direction to fill or drain the tube

Menu —— Menu key: switch between system settings interface and file settings interface

Shift —— Function key: for key combination use, in a certain interface:

① Shift + Menu

In the “Continuous Work” working interface, press this key combination to reset the “Total Amount” to zero.

② Shift + Enter

In the "Quantitative Work" and "Continuous Work" working interfaces, press this key combination to enter the calibration menu interface.

③ Shift + ∧

In two working interfaces, press this key combination to lock and release the control panel buttons. In the "System Settings" and "File Settings" interfaces, press this key combination to quickly turn pages upward.

④ Shift + ∨

In the "Quantitative Work" and "Continuous Work" interfaces, press this key combination to switch the speed and flow position. The values displayed in bold can be modified. In the "System Settings" and "File Settings" interfaces, press this key combination to quickly turn pages downward.

⑤ Shift + < , Shift + >

Available in both working interfaces. Press this key combination to set the rotation direction.

3.2. Rear Panel Description

The rear panel consists of an external control interface, a power switch, a fuse box and a power socket, as shown in the figure below.

- **External Control Interface:** External control signal input interface. For details, see "V. External Control Instructions".
- **Fuse Box:** Built-in fuse.
- **Power Outlet:** 220V AC power input socket.
- **Power Switch:** Turn to "I" for ON, turn to "O" for OFF.

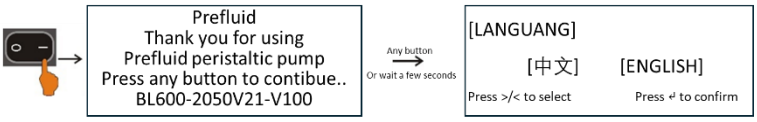
4. Operation Introduction

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 the relevant "Pump Head Manual".

4.2. Power-on Introduction

Insert the power plug into the power socket and turn on the power switch. The process of starting up the machine for the first time (new machine) or after restoring the factory settings is as follows:



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

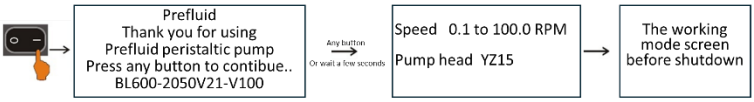
Note: Make sure that the input power voltage is consistent with the power supply voltage required by the machine.

- **Power switch** Turn to "I" for on, turn to "0" for off.
- **First time power on** or after restoring the factory settings, you need to select the operating language when you turn on the machine. This machine provides two operating languages, namely [Chinese] and [ENGLISH]. After turning on the machine, the welcome interface will be displayed first. You can press any key or wait for three seconds to

enter the language selection interface. Here we will introduce the selection of Chinese. After selecting and confirming, enter the file setting interface.

- **Method to enter the "File Settings" interface:**
  - Press the RTN Key to enter;
  - In the system settings interface, press Menu key to enter.

The following is the process for each subsequent startup:



That is, enter the working interface before shutdown from the welcome interface, speed and pump head prompt interface.

4.2.1. Introduction to File Numbers

Document No. There are 00#-16# options, three types: current file parameters, 00# file parameters, 01#-16# file parameters.

- The current file parameters are the parameters that the pump is using after starting up, which can be modified and saved. The file number is displayed in the file setting interface from 00# to 16#.
- 00# file is the default parameter and cannot be modified. After reselecting (press ∧ , ∨ to select, and press Enter to confirm), the parameters are modified, they are automatically saved as the current file parameters and can also be saved as 01#-16 files.
- 01#-16 files, these 16 groups of parameters are the file parameters that have been stored before, reselect (press ∧ , ∨ to select, and press Enter to confirm) is available. After the parameters are modified,

they are automatically saved as the current file parameters. If you want to call the 01# file again, you need to press ∧ , ∨ key to reselect file 01#.

4.2.2. Introduction to Working Mode

Quantitative work, it is a common method to work once according to the set target loading volume, running time and speed, etc.

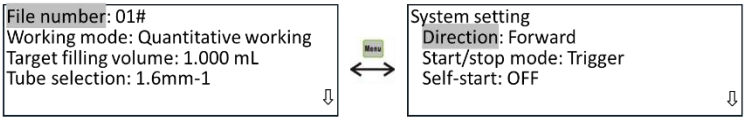
Continuous work, work according to the set speed and flow rate.

4.2.3. Introduction to Pump Status

- ▶II, The pump stops and waits for a trigger (press the ▶I key or external signal trigger) to work.
- ▶▪▪, The pump is running and waiting for a trigger (press the ▶I key or external signal trigger) to stop.
- II, The pump is paused. Press ▶I again, the pump starts running again.
- ▶▶, While the pump is emptying, press and hold Max key display.
- PC ▶II, The pump stops and waits for a trigger (communication to start the pump).
- PC ▶▪▪, The pump is running, waiting for a trigger (communication to stop the pump) to stop.
- RC▶II, The pump stops, and the 2 and 8 pins of the external control interface are short-circuited, waiting for the trigger (external signal trigger) to work, and the analog signal controls the speed. The "continuous work" mode is used.
- RC▶▪▪, The pump is running, and the 2 and 8 pins of the external control interface are short-circuited, waiting for the trigger (external signal trigger) to stop, and the analog signal controls the speed. The "continuous work" mode is used.

4.3. System Settings

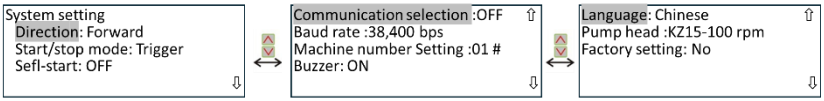
In the file settings interface, press Menu key to enter the system settings interface. As shown below:



The system has multiple settings. Press ∨ key and ∧ key to select the setting item (displayed in reverse), and then press Enter, the following parameters will be highlighted. Regular parameters can be set by ∨ , ∧ and Enter. For multi-digit numerical parameters, you can use < , > keys to select bit (the bit is highlighted), use ∧ , ∨ key to adjust the value. Press Enter to confirm the setting. Press Shift + ∧ or Shift + ∨ to quickly scroll up or down.

Note: When the system setting interface is on the first page, a "⇩" mark will be displayed on the right, a "⇩" mark will be displayed on the last page, and both "⇩" and "⇩" marks will be displayed on the middle page. This means "next page presents" or "previous page presents" or "both previous and next pages present".

As shown in the following figure:



The parameters are described as follows:

Running direction: Forward and reverse are optional. In addition, the running direction can also be changed by pressing the Shift + < or Shift +

> key.

Start-stop mode: There are two optional modes: trigger and switch. When "trigger", the pump will work when it receives a pulse signal; when "level", the pump will work when it receives a high or low level.

Self-start: ON and OFF are optional. When "ON", the powered pump works according to the parameters before shutdown (when there is no communication or external speed control, if the pump is running or stopped before shutdown, it will run or stop after startup); when "OFF", the powered pump is in a stopped state.

Note: The above two items are used in the "Continuous Work" interface. ① The 2 and 8 pins of the external control interface are open, the start and stop of the pump can be controlled by the 2 and 9 pins, and the direction can be controlled by the 2 and 3 pins. For details, see V. External Control Instructions "Wiring Method 2".② Short-circuit pins 2 and 8 of the external control interface, the start and stop of the pump can be controlled by pins 2 and 9, the direction can be controlled by pins 2 and 3, and the speed can be controlled by the analog signal of pin 5. For details, see V. External Control Instructions "Wiring Method 3".

Communication options: ON and OFF are optional. When “ON”, the operation of the pump is controlled by communication; when “OFF”, the operation of the pump is controlled by the panel and external signals.

Baud rate: The available options are 9600bps, 19200bps, and 38400bps. The default is 38400bps.

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 or OFF is optional.

Language selection: Chinese and English are available.

Pump head selection: Use Shift + Enter keys to select the pump head. The maximum speed is determined by the pump head.

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

4.4. Quantitative Work

4.4.1. Quantitative Work Preparation

The flow chart is as follows:

Step 1: System setup

See 4-3 System Settings, set “Communication Selection” to “OFF”.

Step 2: Select the file number

Enter the file setting interface and 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 following figure (example):

Document No.：00#-16# optional.

Working Mode: There are two working modes to choose from: quantitative work and continuous work. Select "quantitative work".

Target loading: Set according to actual needs.

Tube selection: Select a tube with the same inner diameter as the actual tube used. If the tube used is not in the options, select "oth". -1 and -2 indicate the number of channels.

Speed: Set a suitable speed. The speed will affect the running time. When the running time is sufficient, try not to set the speed too high.

Flow: Set the target flow rate. If the target flow rate cannot be set, replace the tube and reselect the tube before setting it again.

Run time: The time format is (hours: minutes: seconds)

Note: "Speed", "Flow" and "Running Time" are related. If one of them is changed, the other two will change accordingly.

Calibration time: The running time of the test can be selected from 15s, 30s, 60s, 90s, 120s, 150s, 180s, and 240s. Generally, the longer the test time, the higher the test accuracy.

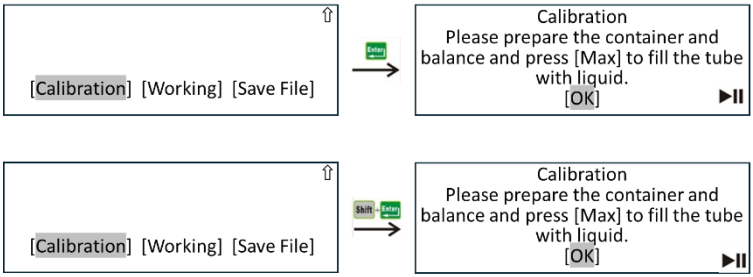
[Calibration]: When highlighting, press Enter key to enter the calibration interface.

[Work]: When highlighting, press Enter key, or press ▶I key to enter the “Quantitative Work” interface.

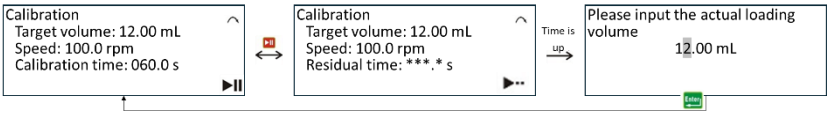
[Save File]: When highlighting, press Enter key to enter the file parameter saving interface.

Step 4: Flow calibration

In the file settings interface, press ∧ , ∨ to select [Calibration] and press Enter to confirm and enter the quantitative work calibration interface (or in the file setting interface, press Shift + Enter), as shown below:



Follow the prompts to prepare a container that can hold the test load and a balance that can weigh the test load. Press Max to fill the tube with liquid and make sure there are no bubbles in the tube. Then press Enter to enter the next menu. In the calibration interface, press ▶II. The pump will be calibrated once as shown below. If the actual loading volume is known, press Enter key and directly input the actual loading value.

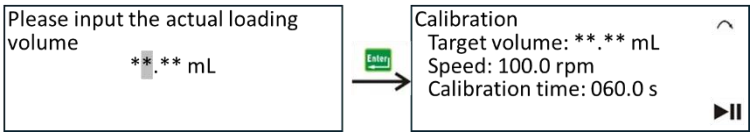


Calibration load: The load calculated based on the calibration time.

Speed: Set the running speed.

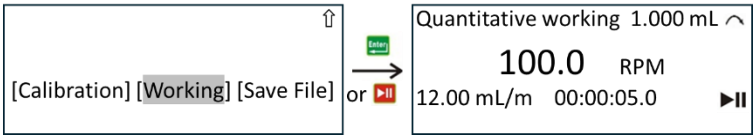
Calibration time: The set calibration time, which can be set in the file settings.

After the calibration time is over, the actual loading input interface pops up. After entering the actual loading according to the weighing of the balance, press Enter key, as follows.



Step 5: Enter the quantitative work interface

After the calibration is completed, return to the file setting interface and press ▶| or select [Work] and press Enter key to enter the quantitative work interface.



1.000mL: Target loading quantity, output loading quantity, countdown display during operation.

12.00mL/m: The set flow rate, can be fine-tuned.

100.0rpm: The set running speed, can be fine-tuned.

5.0s: The set pump running time, will be displayed as a countdown while it is working.

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

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

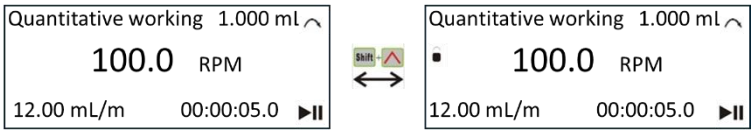
4.4.2. Key Combination

In working interface, key combination is available.

(i) When the pump is stopped, press Shift + < or Shift + > keys, you can change the pump running direction. You can also change the direction in the "System Settings" interface.

(ii) When the pump stops, press Shift + Enter, you can enter calibration interface, or you can also select [Calibration] in the file setting interface and press Enter key to enter.

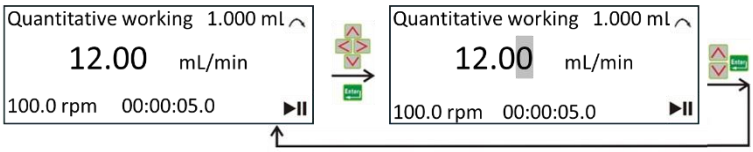
(iii) Press Shift + ∧ keys, the keyboard can be locked and unlocked. It can be operated when the pump is running or stopped. When the keyboard is locked, only ▶I key is available.



(iv) Press Shift + ∧ key, the speed and flow rate can be set.

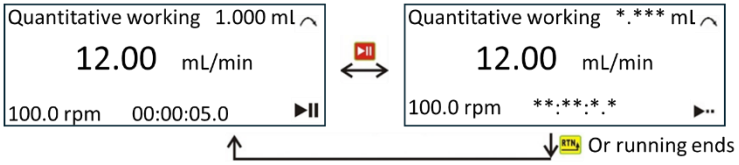
4.4.3. Fine-tuning of Flow Rate

In the working interface, if the current flow rate is too high (time is too short) or too low (time is too long), you can fine-tune the flow rate (speed and time will change accordingly) to adjust the liquid delivery time. Press ∧ , ∨ , < , > or Enter, the highlighted digit on the key indicates that the digit can be modified. Press ∧ , ∨ key to adjust, press Enter to confirm, When the pump is stopped, all 4 digits of the flow rate can be adjusted. When the pump is working, only the last 2 digits can be adjusted (when the speed is adjustable, the adjustment is the same). See the figure below.



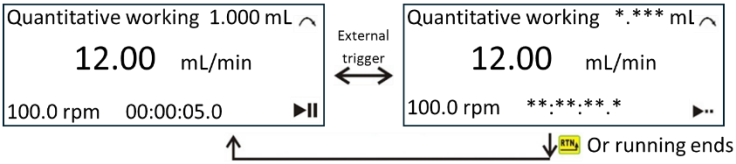
4.4.4. Manual Work

Press ▶I key once, and the machine will work once. The target loading volume will decrease, and the remaining volume will be displayed. The running time will decrease, and the remaining time will be displayed. The working interface is as follows.



4.4.5. External Control Work

External control requires access to external control signals, and the start signal is connected according to "Wiring method 1" (see V. External control instructions for details). The working interface is as follows.

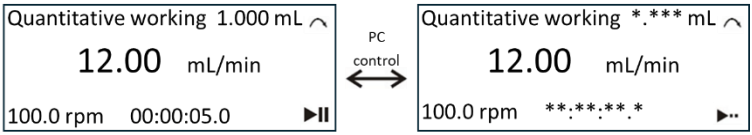


Note: After starting the pump in external control mode, press ▶I on the panel once to stop the pump urgently.

4.4.6. Communication Work

For communication work ① You need to set "Communication Selection" to ON in the **4.3 System Settings** section; set the baud rate as needed; and set the machine number to any value between 01-16# as needed. ② need to access the communication control signal, follow "**Wiring Method 4**" to access the communication signal (see **V. External Control Instructions** for details).

The pump works once it receives a start signal from the PC. The working interface is as follows.



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

4.5. Continuous work

4.5.1. Work Preparation

The flow chart is as follows:

Step 1: System setup

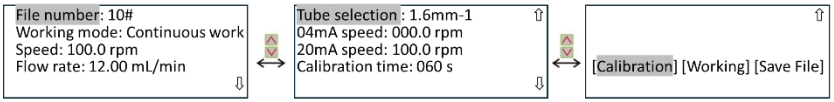
See **4.3 System Settings**, set “Communication Selection” to OFF, and “Auto Start” to OFF.

Step 2: Select a file number

Enter the file setting interface and 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 following figure (example):



File No.： 00#-16# optional

Working Mode: There are two working modes to choose from: quantitative working and continuous working. Select "continuous working".

Speed： Set the appropriate speed

Flow: Set the target flow rate. If the target flow rate cannot be set, replace the tube and reselect the tube before setting it again.

Tube selection: Select the tube inner diameter that is consistent with the actual tube used. If the tube used is not in the optional list, select "oth". -

1, -2 indicates the number of channels. When the tube is determined, the speed and flow rate are interrelated.

04mA speed: The speed corresponding to the external analog 4mA.

20mA speed: The speed corresponding to the external analog quantity 20mA.

Calibration time: 15s, 30s, 60s, 90s, 120s, 150s, 180s, 240s are optional. Set to 60s. Generally, the longer the test time, the higher the test accuracy.

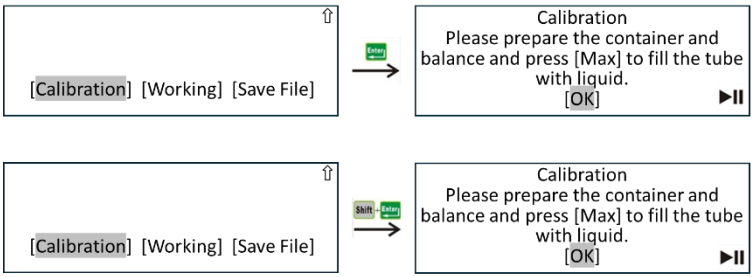
[Calibration]: When highlighting, press Enter key to enter the calibration interface.

[Work]: When highlighting, press Enter key, or press ▶| key to enter the "Continuous Work" interface.

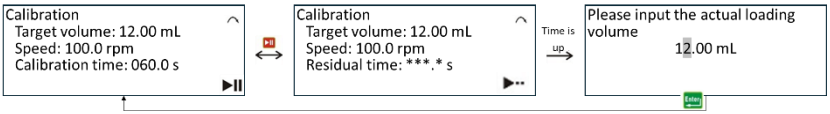
[Save File]: When highlighting, press Enter key to enter the file parameter saving interface.

Step 4: Flow calibration

In the file settings interface, press ∧ , ∨ to select [Calibration] and press Enter to confirm and enter the quantitative work calibration interface (or in the file setting interface, press Shift + Enter), as shown below:



Follow the prompts to prepare a container that can hold the calibration load and a balance that can weigh the calibration load. Press Max to fill the tube with liquid and make sure there are no bubbles in the tube. Then press Enter to enter the next menu. Press ▶I in calibration interface, the pump will calibrate once. If the actual filling volume is known, press Enter key, and directly input the actual loading value. As shown below:



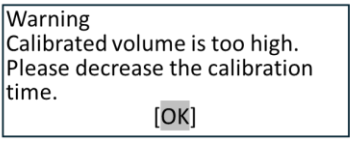
Calibration loading quantity: 12.00mL, the volume to be calibrated based on the calibration time.

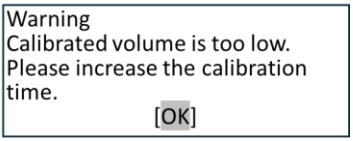
Speed:100.0rpm, set speed.

Calibration time: 060.0s, the set flow calibration time.

After the calibration time is over, the actual loading input interface pops up. After entering the actual loading according to the weighing of the balance, press Enter key. As follows.

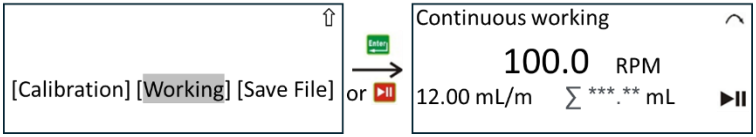
Note: If the calibration time is too long or too short, a warning may appear when entering the calibration interface. Please handle it according to the prompts (as shown below).





Step 5: Enter the flow metering interface

After the test is completed, return to the file setting interface, reset the required flow rate to 12.00mL, and press ▶II key or select [Work], press Enter key to enter the continuous working interface.



12.00mL: The set flow rate or the corresponding flow rate generated according to the set speed, that is, the delivery volume of the tube per minute.

100.0RPM: The speed at which the pump needs to run, or the set speed, is generated based on the set flow rate and the number of tubes and tube channels.

Σ*.**mL**: The total amount (accumulated amount) of fluid output at the set speed/flow rate when the pump is working. The following units automatically change to mL, L, and kL. You can press Shift + Max to zero, after zeroing to 0, the unit will automatically return to mL.

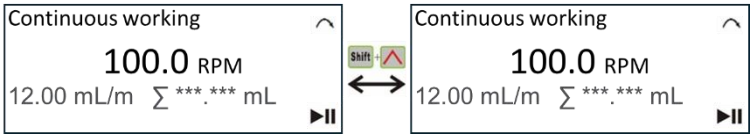
4.5.2. Key Combinations

In working interface, key combinations are available.

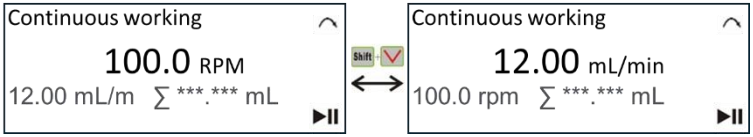
(i) When the pump is stopped, press Shift + < or Shift + > , the direction of rotation of the pump can be changed. The direction of rotation can also be changed in the "System Settings" interface.

(ii) When the pump stops, press Shift + Enter to enter calibration interface, you can also select [Calibration] in the file setting interface and press Enter key to enter.

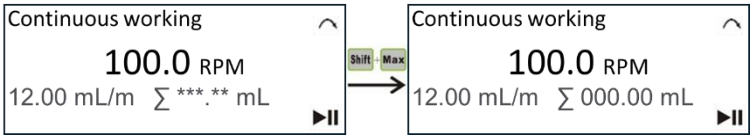
(iii) Press Shift + ∧ keys to lock and unlock the keyboard. When the keyboard is locked, only ▶I key is available.



(iv) Press Shift + ∨ keys to switch the display mode (speed display or flow display).

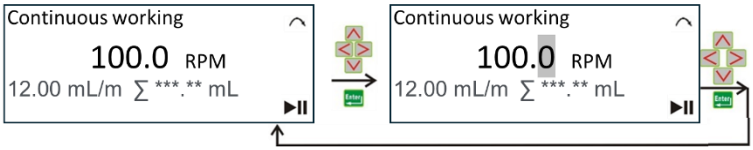


(v) When the pump stops, press Shift + Max to reset total amount to zero.



4.5.3. Fine-tuning of Speed and Flow Rate

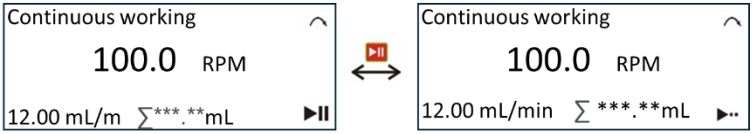
After the tube has been working for a period of time, the flow rate of the liquid squeezed out of the tube may change slightly. At this time, the flow rate can be fine-tuned to keep the actual flow rate consistent with the set flow rate. According to the corresponding relationship between the flow rate and the tube, the speed will change with the adjustment of the flow rate. Method: Press ∧ , ∨ , < , > or Enter, when a flow (speed) digit is highlighted, it means that the digit can be modified. Use < , > to select the digit to be adjusted. Use ∧ , ∨ to adjust the bit value, press Enter key to confirm (when the speed is adjustable, the method is the same). See the figure below.



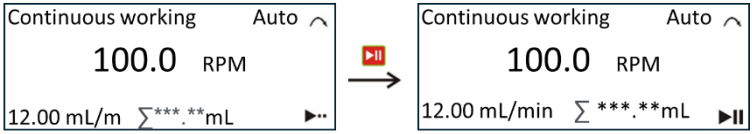
Note:①If the flow range is determined, the speed calculated according to the tube specifications is also determined. It is possible that the adjustment is invalid during adjustment. ②The "flow rate" and "speed" can be adjusted regardless of whether the pump is in operation or not. ③When the machine stops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

4.5.4. Manual Work

Press ▶I once to start the pump working, and press it again to stop the pump working. See the figure below.



When "Auto Start" is set to ON, if the pump is running or stopped before shutting down, the pump will run or stop after starting up.



4.5.5. External Control Work

When working in external control mode ① It is necessary to set "Communication Selection" in the **4.3 System Settings** section to OFF. ②Set “Start/Stop Mode” to “Trigger” or “Switch” as required. ③If you need to connect external control signals, follow "**Wiring Method 2**" to connect the direction signal and start/stop signal (pins 2, 3, and 9 of the external control interface), or follow "**Wiring Method 3**" to connect the direction signal, analog input signal, analog control speed signal, and start/stop signal (pins 2, 3, 5, 8, and 9 of the external control interface) (see **V. External Control Instructions** for details).

(i) External control signal controls direction and start/stop. There are two control modes as follows. The external control interface is wired according to "**Wiring Mode 2**".

①When "Start/Stop Mode" = "Trigger", the pump starts working after receiving a pulse signal and stops working after receiving another pulse 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 **V. External Control Instructions** for details)

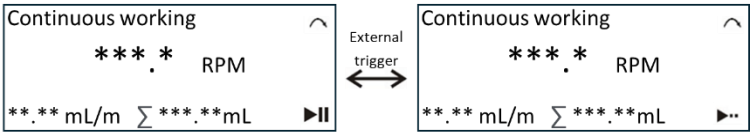
②When "Start/Stop Mode" = "Switch", the pump starts working when it receives a low-level signal and stops working when it receives a high-level signal. When a low-level direction signal is received, the pump direction changes. If the pump is running in the current state, it needs to be started again to be effective. (See **V. External Control Instructions** for details)

(ii) External control signals control direction, start and stop, and analog signals control speed. There are two control methods as follows. The external control interface is wired according to "**Wiring Method 3**". First, short-circuit pins 2 and 8 of the external control interface.

①When "Start/Stop Mode" = "Trigger", the pump starts working when it receives a pulse signal and stops working when it receives another pulse signal. When a low-level direction signal is received, the pump direction is forward, and when a high level is received, the pump direction is reverse. The flow rate (speed) is calculated in inverse proportion to the received analog value (see **V. External Control Instructions** for details).

②When "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 is forward, and a high-level direction is reverse. The flow rate (speed) is calculated in inverse proportion to the received analog value (see V. External Control Instructions for details).

The working interface is as shown below.

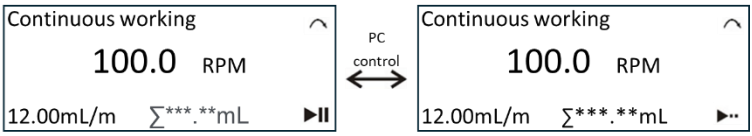


Note: After starting the pump in external control mode, press ▶I on the panel once to stop the pump urgently.

4.5.6. Communication Work

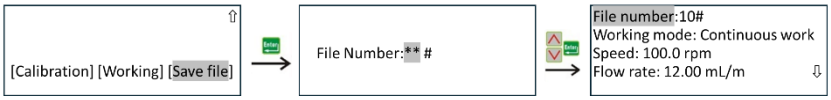
Working in communication mode ① You need to set "Communication Selection" to ON in the **4.3 System Settings** section; set the baud rate as needed; and set the machine number to any value between 01-16# as needed. ②If you need to access the communication control signal, follow "Wiring Method 4" to access the start signal (see V. External Control Instructions for details).

When the start/stop command is received, the working interface is as shown below.



4.6. File Saving

In the file setting interface, select [Save File] and press Enter to confirm and enter the file saving interface, as shown below.



4.7. Filling and Draining

Before the peristaltic pump is used, the tube must be filled with liquid. Press and hold the Max key until the tube is filled with liquid.

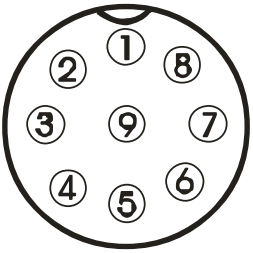
After the pump is finished working, the liquid in the tube must be drained. At this time, first change the direction of the pump (opposite to when it is filled), then press and hold the Max key until the liquid in the tube is drained.

5. External Control Description

This series of peristaltic pumps can be operated and controlled by the keys on the panel and can also be controlled by external current to control the speed (flow) and level to start and stop the pump. In addition, all pump parameters 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 nine-core aviation socket, and its internal pin sequence is as follows:



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

Pins	Color	Definition
1-pin	**Brown**	**+5V,** for use by external control, the current is less than 100mA.
2-pin	**Red**	**GND,** common ground wire.
3-pin	**Orange/Pink**	**F/R**, rotation direction control signal.
4-pin	**Yellow/Milky White**	**+12V,** for use by external control, the current is less than 100mA.
5-pin	**Green**	**Iin,** current input (4-20mA), control speed (flow).
6-pin	**Blue**	**A,** RS485 communication terminal A.
7-pin	**Purple**	**B,** RS485 communication terminal B.
8-pin	**Gray/Black**	**REM,** analog signal enable port.

Pins	Color	Definition
9-pin	**White**	**S/S,** trigger and switch control signal input port.

5.2. Wiring Method

There are 4 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 four wiring methods are described as follows:

Wiring method 1: Connect pins 2 and 9 of the external control interface to the external control device.

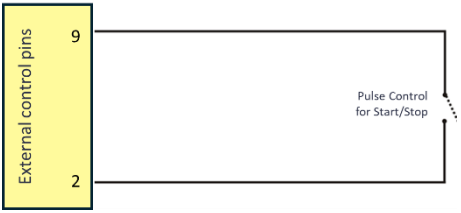
Wiring method 2: Connect pins 2, 3, and 9 of the external control interface to the external control device.

Wiring method 3: Connect pins 2, 3, 5, 8, and 9 of the external control interface to the external control device.

Wiring method 4: Connect pins 6 and 7 of the external control interface to the external control device.

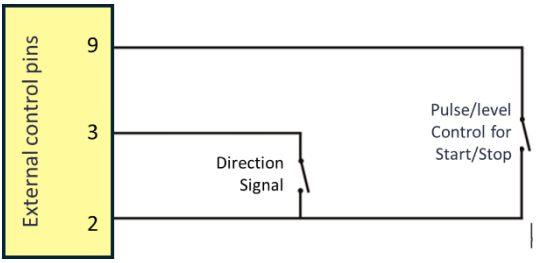
The typical application diagram is shown below:

Wiring method 1: Connect pins 2 and 9 of the external control interface to the external control device.



Description: pin 2, 9 short-circuited to indicate receiving the start-stop signal.

Wiring method 2: Connect pins 2, 3, and 9 of the external control interface to the external control device.



Description:

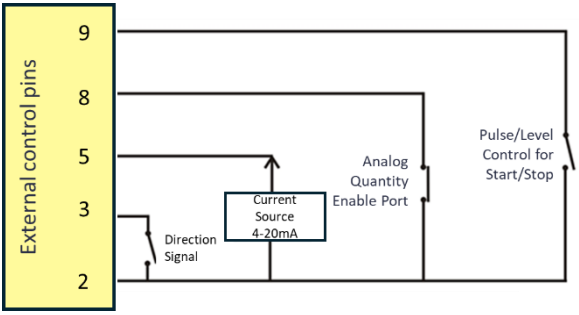
①When "Start-Stop Mode" = "Trigger", PIN9 starts working when it receives a pulse signal, and stops working when it receives another pulse signal.

②When "Start/Stop Mode" = "Switch", PIN9 works when it receives a low-level signal and stops working when it receives a high-level signal.

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

Wiring method 3: Connect pins 2, 3, 5, 8, and 9 of the external control

interface to the external control device.



Description: External control signal controls direction, start and stop, analog signal controls speed. First, short-circuit pins 2 and 8 of the external control interface, then the speed (flow) is controlled by the external analog quantity.

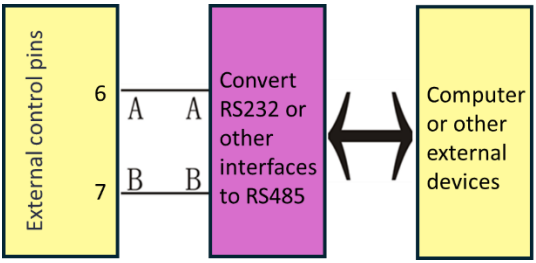
①When "Start-Stop Mode" = "Trigger", PIN9 starts working when it receives a pulse signal, and stops working when it receives another pulse signal.

②When "Start/Stop Mode" = "Switch", PIN9 receives a low-level signal to start working, and receives a high-level signal to stop working.

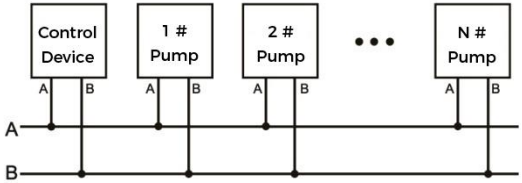
③When PIN3 receives a low-level direction signal, the pump direction is forward, and a high level is reverse.

④The speed (flow rate) is calculated from the analog value received by PIN5 and the "4mA speed" and "20mA speed".

Wiring method 4: Connect pins 6 and 7 of the external control interface to the external control device. Mainly used for communication control.



Some applications require remote communication control of multiple peristaltic pumps. According to the above "Wiring Method 4", the 6th pin (A) and 7th 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 performing communication control, please refer to "System Settings" to set a machine number for each pump.

6. Maintenance and Repair

6.1. Product Maintenance

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

Note: Please do not use alcohol to clean the mask.

6.2. Product Maintenance

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 phenomena and troubleshooting methods are shown in the table below:

Fault	Cause	Troubleshooting	Note
After powering on, there is no display on the LCD screen.	Check if there is electricity in the power socket, and if the power plug is loose, or 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 powering on, the LCD screen displays correctly, but the pump roller does not rotate.	Check whether the lock 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 lock 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 to resolve it.
The pump roller rotates but no fluid is pumped.	Check whether the tube is pressed into place; check whether the tube is damaged or leaking.	Adjust the tube clamps on both sides of the pump head; replace with new tubes.	

Fault	Cause	Troubleshooting	Note
During operation, the tube slides to one side along with the roller.	Check whether the tube clamp is locked and secure.	Adjust the tube clamp and fasten it.	

7. After-sales service

1. If the product has quality problems within three months from the date of purchase, the supplier will be responsible for replacement;
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 handle the fault by himself, please contact the dealer or Duoning/Prefluid to get preferential repair and service;
4. Failures caused by the following reasons are not covered by warranty service: modification by end-users, overload operation, improper maintenance, operating environment not meeting product specifications, operation beyond the voltage range, and failure to properly connect the wires, etc.

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