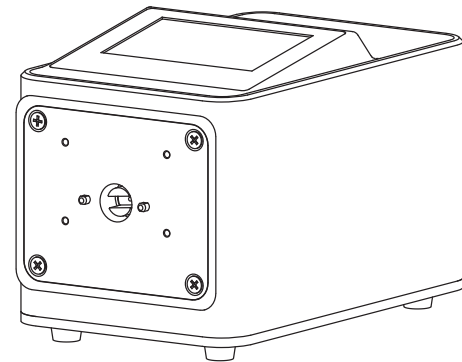




Manual No.

MF103

High-Protection Peristaltic Pump



Website: www.ussolid.com
Customer Support: service@ussolid.com

Safety Precautions



Important information:

Be sure to read the manual carefully before operation!

	This icon warns: Keep fingers away from moving parts.
	This icon warns: Be careful.
	This icon warns: Be careful, the surface is hot.
	This icon warns: Be careful, electric shock hazard.
	This icon warns: To recycle this product.
	This icon warns: Personal protective equipment (PPE) must be worn.

Danger:

	Please use the same power supply as that on the nameplate of the machine, otherwise the equipment will be damaged!
	Please do not disassemble the shell or modify the interior of the equipment by yourself, otherwise it may cause malfunctions or even electric shock accidents!
	When installing and disassembling the pump tube, please turn off the power first and do not approach the rotating roller to prevent fingers and clothing from getting entangled in the mechanical mechanism!
	When installing and disassembling external control devices, please turn off the power first to prevent electric shock accidents or damage to the equipment!



Please connect the protective area of the machine to the ground, otherwise there is a risk of electric shock, electromagnetic interference, or induced static electricity!



If it is used to transport dangerous liquids, special operating procedures must be developed for this liquid, and personnel must also be prevented from being injured during use.



This product is not suitable for explosion-proof environment, and it should not be used in explosive environment.

Warning:



Before using, please confirm that the transmitted liquid will not react chemically with the tube or pump head, otherwise it will damage the tube or pump head. If unsure, please consult our engineers.



The tube is a vulnerable part, please check it regularly. Our company is not responsible for the loss caused by tube damage, especially the leakage of toxic, harmful and valuable liquids!



Due to the fact that the actual working environment conditions (including temperature, humidity, acid, alkali, organic solvent and other corrosive environment, dust environment, power supply voltage, etc.) exceed our technical specifications and the machine is damaged, our company is responsible for the paid warranty, which is not within the scope of normal warranty.



The primary protection for the operator against injury from the moving parts of the pump is provided by the pump head safety device. Please note that safety devices vary from product to product, depending on the model of pump head. See pump head section in manual.



If the pump was running before the power failure, the pump will automatically start when the power is turned back on.

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Peristaltic Pump Introduction

Peristaltic pump is a safe and reliable fluid transmission equipment, the fluid only contacts with the inner wall of the tube line, through squeeze the tube to realize the fluid transmission. Its unique design, which integrates tube lines without valves or seals, ensures fluid cleanliness, reduces the risk of leakage, and provides a more reliable, safe, and clean method of transmission.

Working Principle

The tube fits between the roller and the pressure block, forming a seal at the point of contact when squeezed. As the roller rotates and advances along the tube, the sealing contact advances with it. As the rollers pass, the tube returns to its original shape, creating a vacuum that draws in liquid. Before the roller reaches the end of the pressure block, a second roller starts compressing the tube at the beginning of the pressure block, isolating the fluid between the two compression points. As the first roller clears the pressure block, the second roller continues to expel the liquid through the discharge port of the tube.

At the same time, a new partial vacuum is created behind the second roller, sucking in more liquid from the inlet. There is no back flow and siphoning, and the pump effectively seals the tube when not in use, so there is no need for a separate valve.

Introduction

This series of peristaltic pumps adopts color LCD touch screen, and the operation interface is simple, intuitive and clear. This series of peristaltic pumps are mainly suitable for quantitative distribution of various complex liquids, and can also be used for flow transmission control. This product features a three-level access control system to ensure data security. Integrated with digital interfaces including RS485 bus interface, Ethernet interface, and RS232 serial interface. Utilizes the MODBUS communication protocol for easier connectivity with other control devices such as computers, human-machine interfaces (HMI), and PLCs. This series of high-protection peristaltic pumps offers a stricter IP rating than previous models, ensuring stable operation in harsh environments such as humidity, weak acid-base salt spray, and dust. Suitable for applications in food hygiene, biological preparations, laboratories, and other related fields.

Application

- The pump body does not touch the liquid.
- No valve blockage.
- The inner surface is smooth and easy to clean.
- Maximum head: up to 8 meters of water column.
- Low shear force, suitable for transferring emulsions or liquids containing foam, cells, etc.
- Suitable for transporting liquids containing gases, magnetic beads, or suspensions containing small particles.
- It is suitable for accurate metering and quantitative feeding, and high filling accuracy can be obtained by choosing suitable tube diameter and filling efficiency.
- Suitable for transferring liquids with a certain degree of viscosity;
- The liquid only comes into contact with the tube.
- If use food and medical grade tube, this pump can be used for food and medical transmission and filling.
- Replacement tube of special material to transfer abrasive liquids.

Function and Features

- Features a color LCD screen with a wide viewing angle for clear status display.
- Includes forward/reverse, start/stop, and full-speed functions.
- The speed resolution is 0.1 rpm, and the speed accuracy error is less than $\pm 0.2\%$.
- Flow rate display and flow rate adjustment.
- Flow calibration function
- Equipped with five operating modes: flow mode, volume dispensing mode, time dispensing mode, programming mode, and external control mode.
- Five groups of dispensing parameters can be pre-stored in volume dispensing mode and time dispensing mode.
- External analog speed adjustment, with high/low level control for start/stop and forward/reverse operation.
- Three-level access control ensures parameter security.
- RS485 bus interface, supporting MODBUS-RTU protocol, facilitates

MF103 High-Protection Peristaltic Pump

connection with various control devices for remote automated monitoring and control.

- RS232 serial interface, supporting MODBUS-RTU protocol, enables easy connection with personal computers and industrial computers for automated monitoring and control.
- Ethernet interface, supporting MODBUS-TCP protocol, allows remote monitoring and control via network, enabling complex automation applications.
- The circuit board is sprayed with conformal coating to achieve the effect of dustproof and moistureproof.
- Exceptional anti-interference characteristics and wide voltage design, suitable for complex power supply environments.
- Aluminum alloy housing, easy to clean, effectively resists corrosion from various acids, alkalis, salts, and organic solvents.

Components and Interfaces

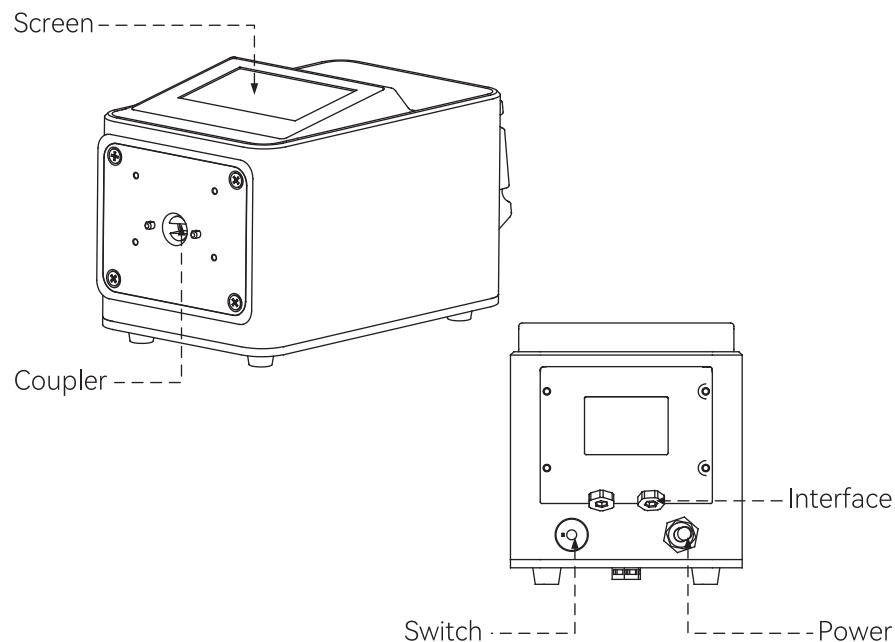


Figure 1 Components and Interfaces

Basic User Operations and Display Instructions

◆ Panel and Key Description

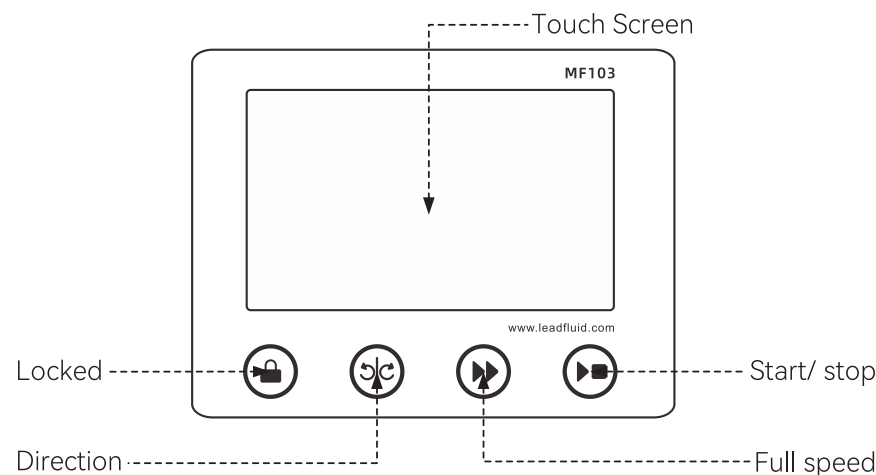


Figure 2 Display Panel

The device supports touch screen operation, utilizing a resistive touch screen for safe and reliable performance suitable for industrial environments.

The device features commonly used functions designed as physical buttons for quick operation. The functions of the keys are as follows:

[Lock]: Used to lock and unlock the touch screen. When the touch screen is locked, relevant parameters cannot be modified, preventing accidental operation during use.

[Direction]: Controls the rotation direction of the drive.

[Full Speed]: Controls the drive to operate at full speed.

[Start/Stop]: Controls the start and stop of the drive.

◆ Parameter Setting Interface

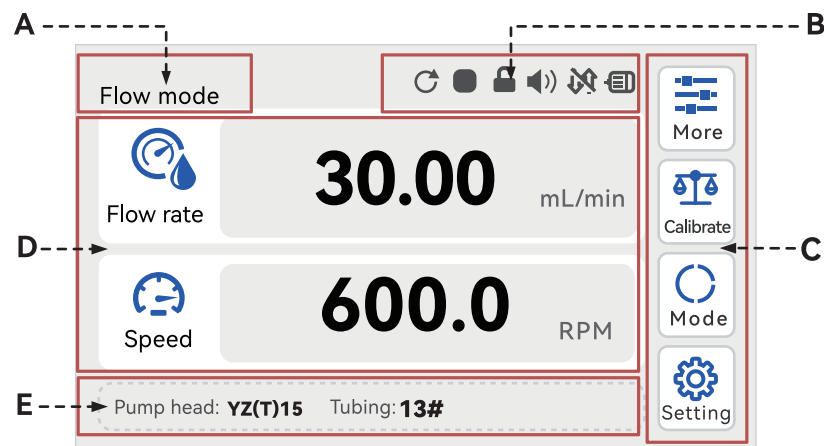


Figure 3 Parameters Setting Interface

Users can set work-related parameters in the parameter settings interface. The specific parameters vary slightly depending on the operating mode. The diagram shows the parameter settings interface in flow rate mode, which is divided into five main operational display areas based on functionality, as follows:

Area A: Mode Display – shows the current operating mode (Flow Mode, Volume Mode, Time Mode, Program Mode, External Control Mode).

Area B: Status Indicator – uses icons to represent the current device status. For specific icons and their corresponding statuses, refer to the Icons and Status Description section.

Area C: Function Keys – This area contains four function buttons. Clicking on them will navigate to the relevant parameter settings or function options.

Area D: Parameter Settings – This is the working parameter configuration area. Different parameters can be set based on the selected operating mode.

Area E: Information Prompt – This area displays information such as the pump head, tube, and formula set by the user. Used for customers to monitor and confirm relevant parameter settings.

◆ Parameter Input Interface



Figure 4 Parameter Input Settings Interface

Users can click on the display area of parameters that need to be set (such as flow rate, liquid volume, etc.) in the mode parameter settings interface. Enter the parameter settings interface to configure the relevant parameter values and units. The setup interface varies slightly depending on the input parameters. The diagram shows the flow rate input interface, which is divided into four main operational display areas based on functionality, as follows:

Area A: Displays the maximum and minimum values that can be entered.

Area B: Displays the currently entered value and its unit.

Area C: Unit input key area. Click to select the desired unit.

Area D: Numeric input key area. Click to enter the desired value.

◆ Operating Status Interface

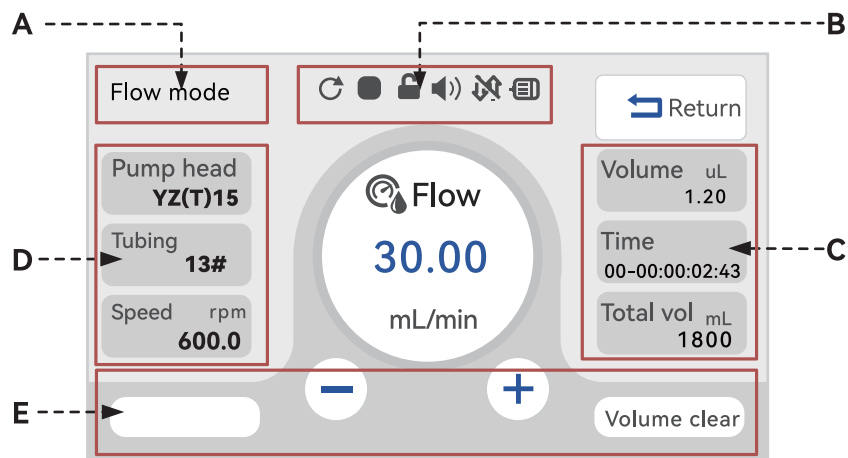


Figure 5 Operating Status Interface

Users can monitor and control the operating status of the drive on the mode operation status interface. The specific status display varies slightly depending on the operating mode. The diagram shows the operation status display interface in flow rate mode, which is divided into five main functional display areas as follows:

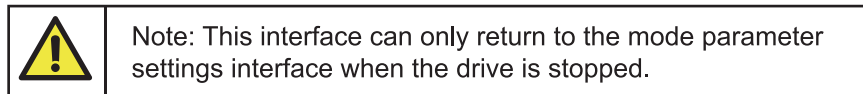
Area A: Mode Display – shows the current operating mode (Flow Mode, Volume Dispensing Mode, Time Dispensing Mode, Programming Mode, External Control Mode).

Area B: Status Indicator – uses icons to represent the current device status. For specific icons and their corresponding statuses, refer to the Icons and Status Description section.

Area C: Status Display – shows information such as the current liquid volume transferred by the drive, operating time, and cumulative liquid volume.

Area D: Status Display – displays details including the pump head and tube currently in use, as well as the current rotation speed.

Area E: User Operations – allows users to perform fine-tuning, cumulative reset, and other operations.



◆ Full Speed Status Interface

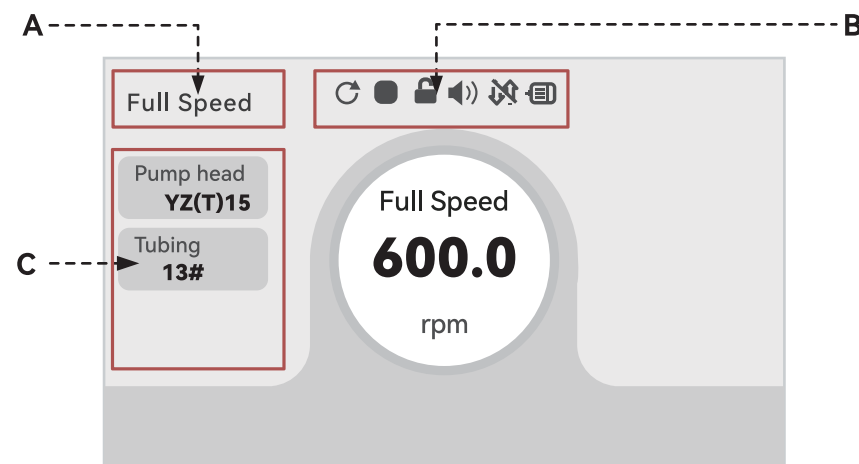


Figure 6 Full Speed Operation Status Interface

Users can enter full-speed operation by clicking the [Full Speed] key. In this state, the drive operates at its set maximum speed, typically used for tasks such as cleaning and filling. This interface is divided into three main operational display areas based on functionality, as follows:

Area A: Mode Display – shows the current operating mode, Full Speed Mode.

Area B: Status Indicator – uses icons to represent the current device status. For specific icons and their corresponding statuses, refer to the Icons and Status Description section.

Area C: Displays the pump head and tube in use.

◆ More Setting Interface

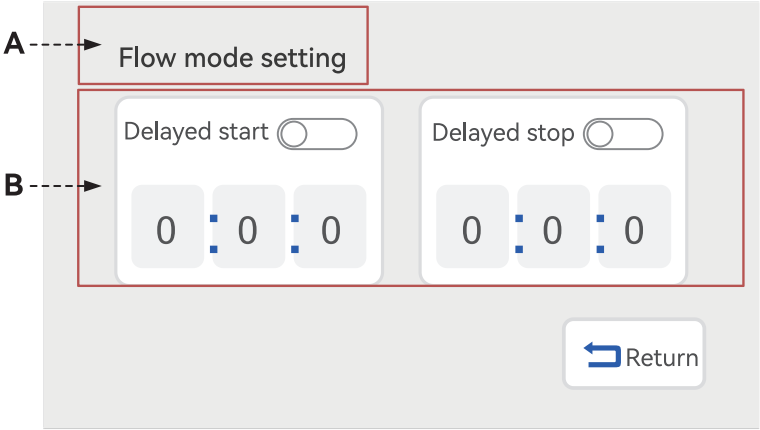


Figure 7 More Setting Interface

Users can configure auxiliary parameters for the current mode in the mode's additional settings interface. The specific auxiliary parameters vary slightly depending on the operating mode. The diagram shows the additional parameters interface for flow rate mode, which is divided into two main operational display areas based on functionality, as follows:

- Area A:** The title displays the operating mode being set.
- Area B:** Parameter Settings. In flow mode, you can set the timing for activation, deactivation, and enable/disable functions.

◆ Icon and States Description

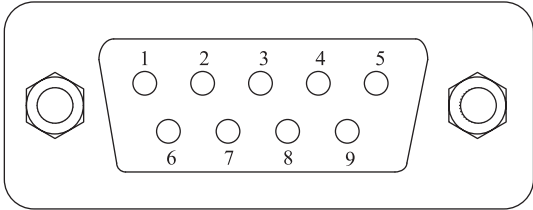
The device uses icons as states display, which is simple and intuitive. The icons and their corresponding states are as follows:

ICON	DESCRIPTION	REMARKS
	Current setting or running direction of the drive, clockwise	
	Current setting or running direction of the driver, counterclockwise	
	Driver current working state, stop	
	Driver current working state, running	Working operation status includes non-motor operation status such as cycle interval, delayed start, etc
	Driver locking state, unlock	
	Driver locked state, lock	
	Motor working state, normal	
	Motor working state, abnormal	
	Driver Modbus connection state, disconnected	
	Driver Modbus connection state, connected	
	Driver buzzer state, mute	
	Driver buzzer state, beep	

Table 1 Description of Icon Function

Drive Interface Pin Definitions

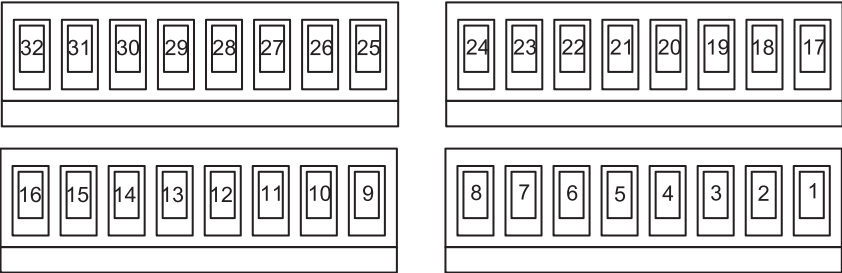
◆DB9 Female Connector Pin Definitions



DB9 Pin	English Notes	Description
1		
2	RXD	RS232 accepts data
3	TXD	RS232 sending data
4		
5	GND	Signal ground line
6		
7		
8		
9		

Table 2 DB9 Female Connector Pin Definitions

◆Plug-in Terminal Block Interface Definition (MF103)



No.	English Notes	Description
1	COM	Ground of external power
2	IN0	Signal Input 0 (Start/Stop)
3	IN1	Input Signal 1 (Direction)
4	IN2	Signal Input 2 (Pulse)
5	COM	External commons.
6	OUT0	Signal Output 0
7	OUT1	Signal Output 1
8	OUT2	Signal Output 2
9	COM	External commons.
10	VCC	External DC power input
11	0V	Internal power ground
12	12V	Internal +12V power supply output
13、14、15、16	NC	Reserve
17	B-	Communication interface, RS485 bus terminal B
18	A+	Communication interface, RS485 bus terminal A
19	B-	Communication interface, RS485 bus terminal B
20	A+	Communication interface, RS485 bus terminal A
21	CANL	Communication interface, CAN bus L terminal
22	CANH	Communication interface, CAN bus H terminal
23	CANL	Communication interface, CAN bus L terminal
24	CANH	Communication interface, CAN bus H terminal
25	DAC	Analog voltage signal output
26	AGND	Negative input of external analog signal
27	ADC	The positive input of external analog signal
28	AGND	Negative input of external analog signal
29、30、31、32	NC	Reserve

Table 3 Definition of Plug-in Terminal Interface

Operation Instructions

◆Preparation

- Please compare the packing list to check whether all accessories are wrong or damaged when you open the outer package of the pump. Please contact us in time, if you find any problems.
- Read the operation manual carefully, and keep it at hand, or keep it in a fixed

MF103 High-Protection Peristaltic Pump

place for reference at any time.

- Place the pump on a level table with the rear at least 200 mm away from obstacles.

◆ Install Pump Head and Tube

For detailed installation steps, please refer to the operation manual of the corresponding pump head!

The device is compatible with YZ(T)15, YZ(T)25, DS, DT10, DT15, and DMD15 pump heads.

- Align the flat side of the pump head shaft with the groove of the drive coupler (ensure the spindle sleeve is installed), then push it in. Rotate the pump head until the positioning hole at the rear aligns with the positioning pin on the drive pump head bracket. Fit the pump head snugly against the bracket, then insert the two fixing screws through the mounting holes of the pump head and tighten them.
- Pull the pump head lever to open the pump head, put the tube into the pump head smoothly and straighten it, pull the lever in the opposite direction to the horizontal position, and the tube is installed.

Note: Before installing the pump, the positioning pin on the pump head bracket must be installed, as indicated by the arrow in the figure below.

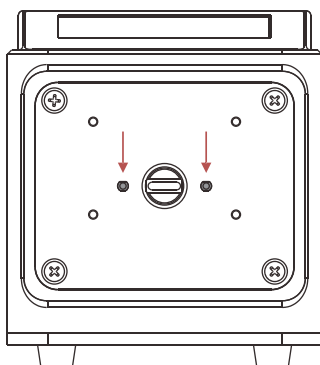


Figure 8 Pump Head Installation Instructions

◆ Power Connection

- The power supply should match the power supply used as indicated by the nameplate on the rear of the case.

- Plug the supplied power cord into the power socket on the rear of the drive.

◆ First Power on Wizard

When customers use the device for the first time, they need to set relevant parameters according to the wizard prompts. To ensure the reliable operation of the equipment. The setting process is as follows:

Step 1: Start the machine to display the boot screen, and automatically enter the next step after 3 seconds

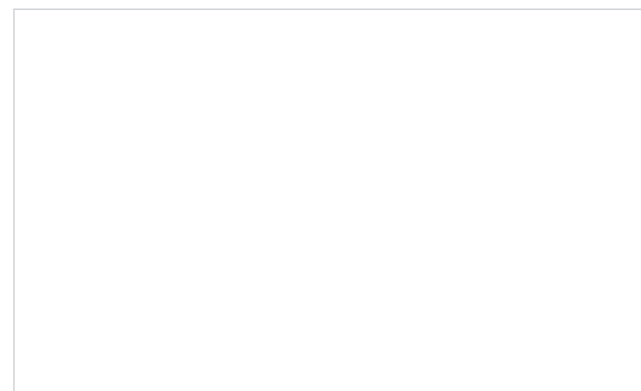


Figure 9 Startup Interface

Step 2: Select the desired language to use.

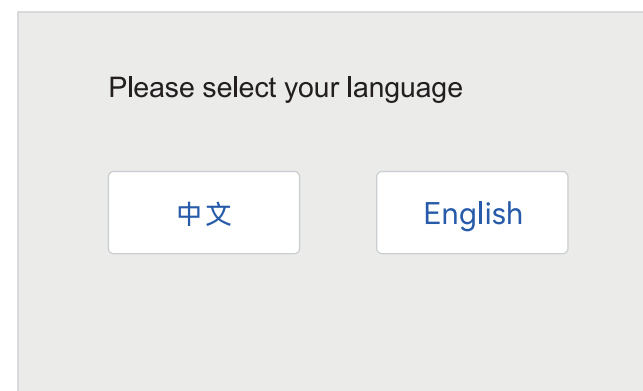


Figure 10 Language Selection Interface

MF103 High-Protection Peristaltic Pump

Step 3: Select the model of the pump head being used.

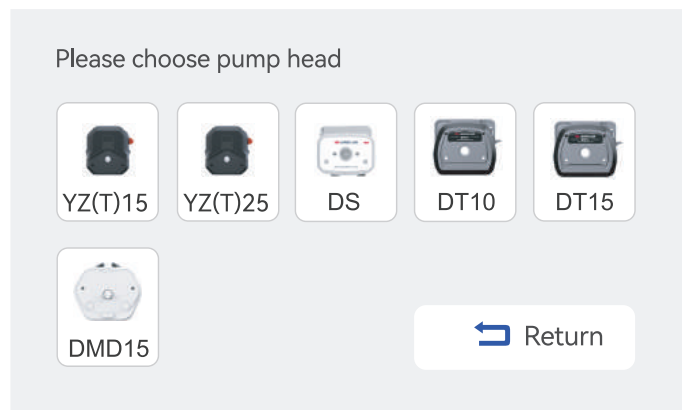


Figure 11 Pump Head Selection Interface

Step 4: Select the tubing model to be used, or choose an appropriate tubing model based on the flow rate range.

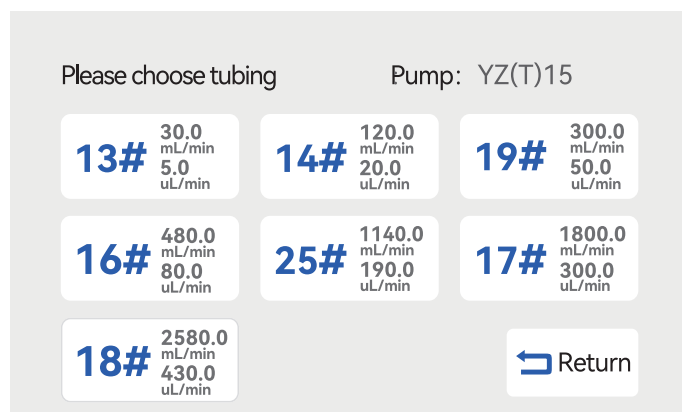


Figure 12 Tube Selection Interface

Step 5: Select the desired operating mode.

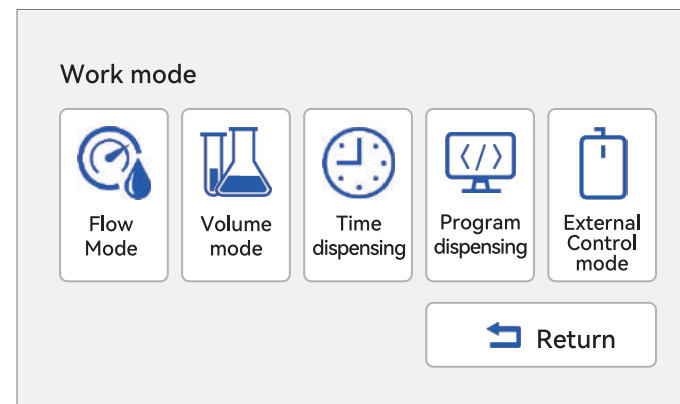


Figure 13 Working Mode Interface

Step 6: The system setup is complete, and normal operation can begin.

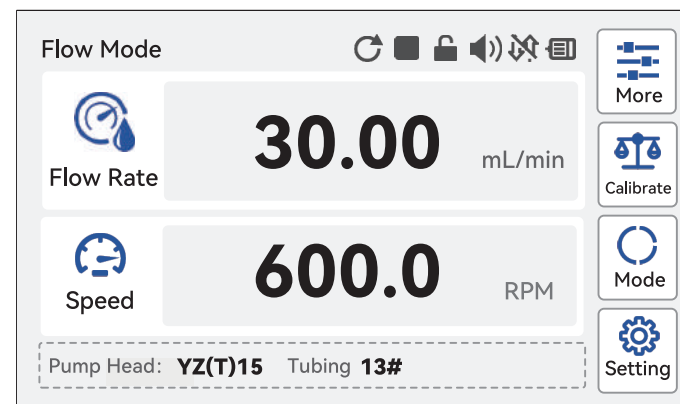


Figure 14 Flow Mode Operation Interface

◆ User Permissions and Screen Lock

The drive features a four-level user permission system to ensure the reliability of parameter settings and operational processes, preventing economic losses caused by accidental misuse during operation. The permissions, listed from highest to lowest, are: Administrator, Technician, Operator, and Guest (locked state). Corresponding permissions can be obtained by entering passwords to perform relevant operations. The drive defaults to Operator permissions upon startup, allowing parameter configuration, flow calibration, and other operations. By clicking the [Lock] button, the drive enters screen lock mode, and the permission level is reduced to Guest. In the locked state, clicking the [Lock] button again or tapping any valid on-screen control will bring up the permission password entry interface. Entering the corresponding permission password will grant the respective access level.

The operational functions available at each permission level are as follows:

Functions	Visitor	Operator	Technician	Administrators
Stop Task	X	X	X	X
Start Task	-	X	X	X
Full Speed Task	-	X	X	X
Direction Switch	-	X	X	X
Parameters Setting	-	-	X	X
Additional Parameter Settings	-	-	X	X
Calibration	-	-	X	X
Mode Switch	-	-	X	X
System Parameters	-	-	-	X
Permission Password Management	-	-	-	X

X: Allowed - : Prohibited

Table 4 User Permission

The system defaults to "0000" as the password for all permission levels upon factory shipment. When the password is set to "0000", users do not need to enter a password to unlock permissions and will directly obtain the highest

permission level associated with "0000". In other words, if no permission password has been set, clicking the [Lock] button will grant Administrator privileges directly.

• Password setting

Settings (Administrator Permission) – Password Setup, enter the password setup interface. In this interface, users can set passwords for non-guest permission levels respectively.

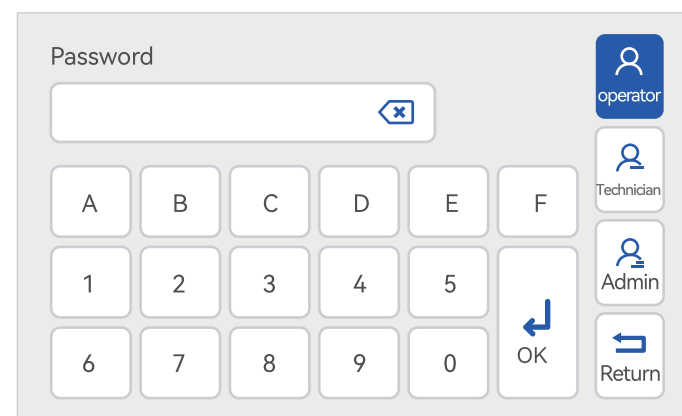


Figure 15 Password Setting Interface

Password setup procedure:

- Click [Operator], [Technician], or [Administrator] to confirm the permission level.
- Enter a 4-digit password, which can consist of numbers 0-9 and characters A-F. Only when the password is set to "0000" will this permission level be disabled, and no password will be required for unlocking.
- Click [Confirm] to complete the password setup, or click [Back] to cancel the operation and exit.

• Insufficient Permissions Prompt

When the user's permissions are insufficient, the system automatically displays an "Insufficient Permissions" prompt window, as shown in the figure below:

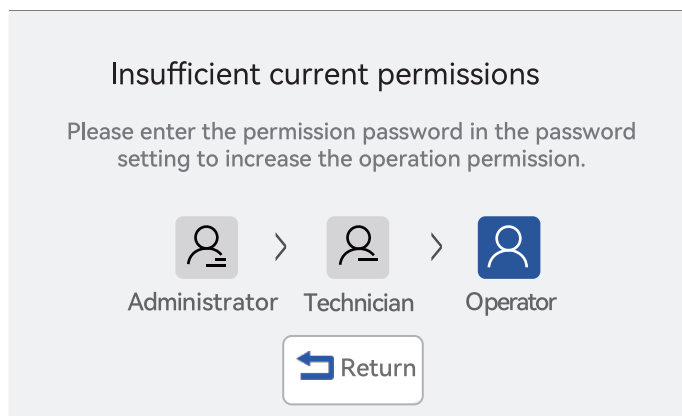


Figure 16 Permission Selection Interface

On this interface, the current user permission level is displayed in reverse video. The user can click on any user permission icon to enter the password.

◆Flow Calibration and Fine-Tuning

The product's transfer accuracy can be improved through calibration during use. Utilizing our patented algorithm, customers can quickly complete the calibration process. Due to the characteristics of peristaltic pumps, it is generally recommended to perform a valid calibration under the following circumstances:

- After replacing hardware such as tube or pump heads;
- When the drive has not been used for an extended period and is being used again;
- After adjusting the tube position, inspecting tube usage, or performing operations that require opening or closing the pump head;
- When there is a noticeable change in flow rate after continuous operation for 4 hours;
- After significantly adjusting flow parameter settings or changing the fluid being transferred.

The drive offers two calibration methods. One is standard calibration, where the system guides the user through the calibration process via a wizard. The other is online fine-tuning, which allows users to manually adjust parameters during operation in certain modes to compensate for flow rate deviations. Fine-tuning

is typically used to compensate for flow attenuation during continuous operation.

Standard Calibration and Wizard Workflow

1. Preparation: Before performing standard calibration, the user needs to prepare standard measuring tools such as a balance and a measuring cylinder to measure the actual total volume of fluid transferred for input during the calibration process. It is also recommended to use a fluid with viscosity close to or the same as the actual fluid being transferred, and to perform the calibration at the flow rate used in practice.
2. Prime the tube: Click the [Full Speed] key to rapidly fill the tube with fluid and remove air bubbles or other impurities that may affect measurement accuracy.
3. Select calibration mode: Click the [Calibration] button in the functional area to enter the calibration mode selection interface.

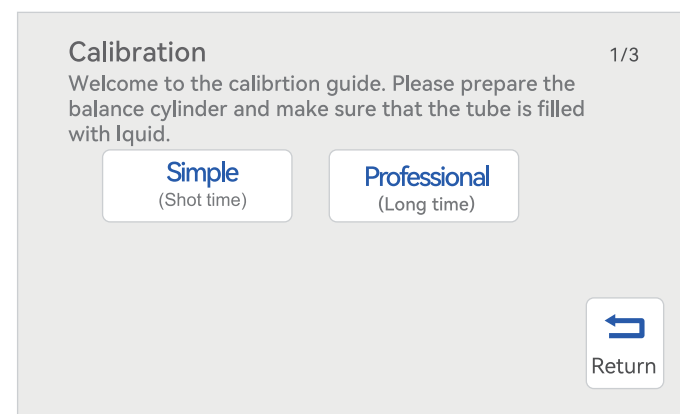


Figure 17 Flow Calibration Wizard Interface

This interface offers two calibration modes: [Simple] and [Professional].

- Simple: The simple mode takes less time and is suitable for applications where high precision is not critical.
- Professional: The professional mode takes relatively longer but delivers higher accuracy. Users can select the calibration mode based on their application requirements.

4. Start actual dispensing and measurement input:

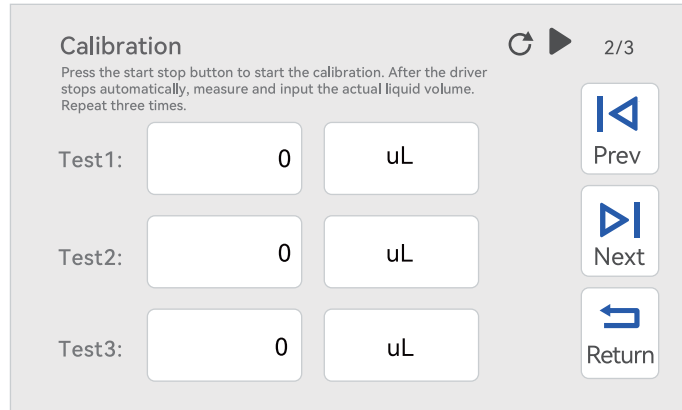


Figure 18 Calibration Test Quantity Input

On the measurement input interface, the user needs to manually click the [Start/Stop] button to trigger a calibration dispensing cycle. At this point, the drive begins fluid transfer. Depending on the selected calibration mode and the set flow parameters, the drive will automatically operate for a period of time before stopping.

The user then needs to weigh the obtained liquid volume, convert it into the volume unit displayed on the current page, and input the actual volume. To improve calibration accuracy and reduce human error, it is recommended to repeat the dispensing and measurement process three times and input the results of the three measurements sequentially.

Click [Next] to complete the calibration measurement input.

Calibration completed and confirmed.

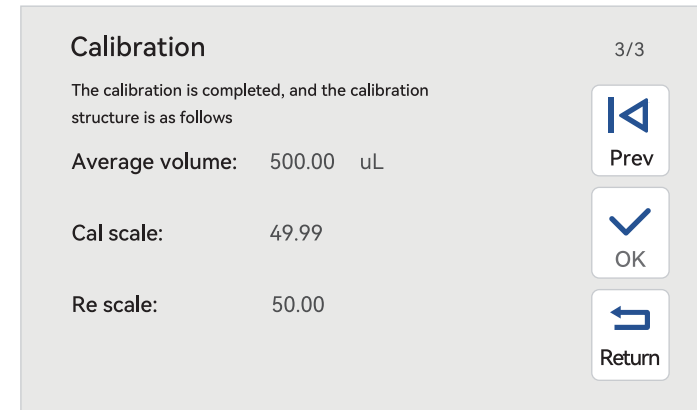


Figure 19 Calibration Completion Interface

After completing the measurement input, the drive automatically calculates the average liquid volume and the calibration coefficient. Based on the reference coefficient displayed on this interface, the customer can make a preliminary judgment on whether there are any obvious abnormalities in the calibration results.

If there are no objections to the calibration results, click [Finish] to complete the calibration.

If there are doubts about the calibration results, click the [Prev] key to return to the previous step and restart the calibration. If doubts about the results persist after multiple quick calibrations, it is recommended to use professional calibration.

◆ Communication Interfaces and Protocols

The drive supports various communication interfaces, including RS232, RS485, and Ethernet ports. Communication parameters are configurable.

Customers can remotely monitor and control the operation of the drive through the selected communication interface. Users can modify the parameters of each communication interface in the Settings → System Settings interface to meet different system integration requirements.

Parameter Setting

Figure 20 RS232 Parameter Settings Interface

RS232 Parameters:

Baud Rate: 9600 (factory default);

Start Bit: 1;

Data Bits: 8;

Parity: Even (factory default);

Stop Bits: 1;

Note: After changing the address, a restart is required for the changes to take effect.

Figure 21 RS485 Parameter Settings Interface

RS485 Parameters:

Baud Rate: 9600 (factory default);

Start Bit: 1;

Data Bits: 8;

Parity: Even (factory default);

Stop Bits: 1;

Note: After changing the address, a restart is required for the changes to take effect.

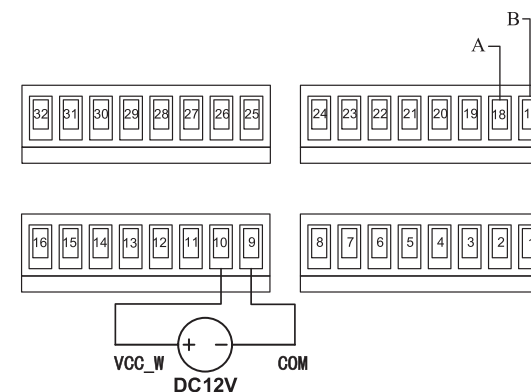


Figure 22 Communication external 12V power supply wiring diagram

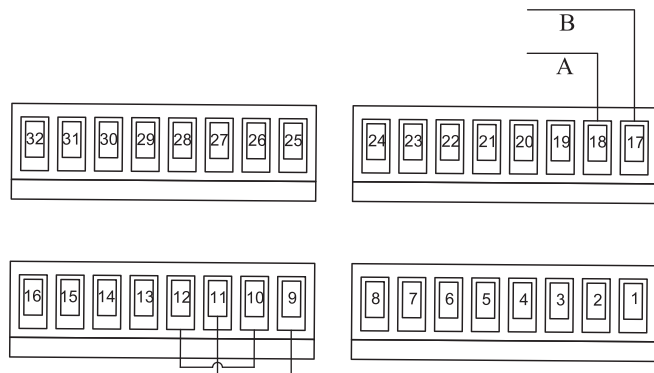


Figure 23 Communication Internal 12V Power Supply Wiring Diagram

Ethernet Port Parameters:

Network Interface Parameters

IP

1921680240

Gateway

19216801

Server Port

8234

Return

Figure 24 Network Port Parameter Settings

IP Address: 192.168.0.240 (factory default);
Gateway Address: 192.168.0.1 (factory default);
Subnet Mask Length: 24 (factory default);
Protocol: TCP/IP;
Note: After changing the address, a restart is required for the changes to take effect.

◆MODBUS Protocol

The communication of the drive is based on the MODBUS protocol, where the serial ports (RS232, RS485) use the MODBUS-RTU protocol stack, and the Ethernet port uses the MODBUS-TCP protocol stack. Through memory mapping technology, users can access the drive via different physical interfaces.

This protocol enables easy integration with diverse industrial equipment for centralized monitoring and distributed control. It supports various industrial controllers, such as human-machine interfaces, industrial PCs, regular computers, and PLCs. The program utilizes a modular design, ensuring stability and reliability.

The function codes supported by the protocol are shown in the table below:

Function Code	Name	Function
0x03	Read Holding Register	Get the current binary value in one or more holding registers
0x04	Read input register	Get the current binary value in one or more input registers
0x06	Write a single register	Load the specific binary value into a holding register
0x10	Write multiple registers	Load specific binary values into a series of continuous holding registers

Table 5: Communication Protocol Function Codes

Register addresses and functions refer to the "High-Protection Peristaltic Pump Communication Address Manual".

◆ Flow Mode Parameter Settings

Flow mode can be used for continuous fluid transfer. By setting parameters such as timed start and timed shutdown, functions like delayed start and delayed shutdown can be achieved.

The parameter settings interface is as follows:

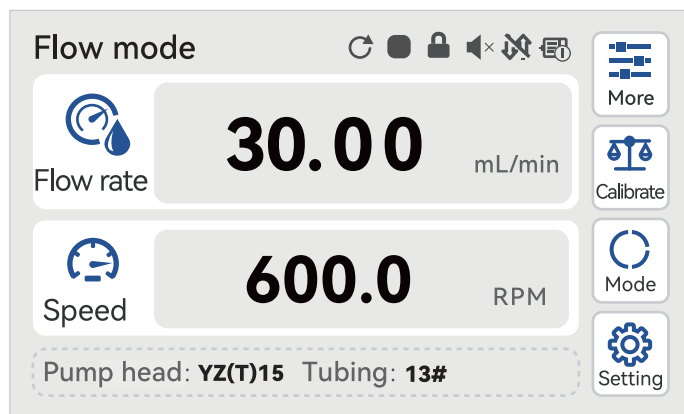


Figure 25 Flow Mode

[Flow Rate] area displays the current flow rate. Click to set the flow rate and unit. After the settings are completed, the rotation speed will change accordingly.

[Speed] area displays the current rotation speed;

[More] key, click to enter the quick parameter settings interface;

[Calibration] key, click to enter the flow calibration interface;

[Mode] key, click to enter the mode settings interface;

[Settings] key, click to enter the system settings interface.

Quick Parameter Settings Interface:

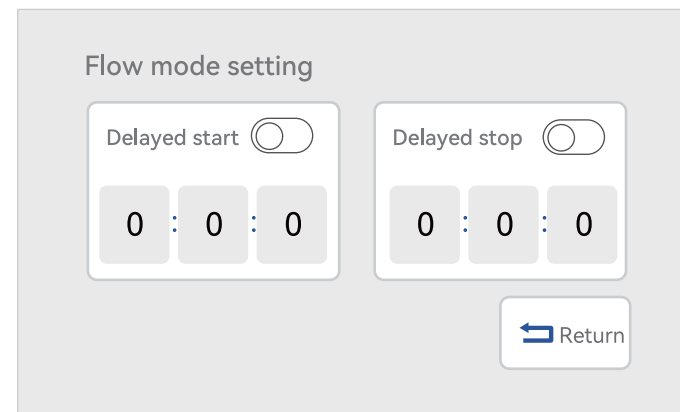


Figure 26 Quick Setup for Flow Mode

The **[Delayed Start]** area displays the scheduled start time, which can be set by configuring the hours, minutes, and seconds separately. The enable button in the upper right corner allows you to enable or disable this function. The set time will only take effect when the function is enabled.

The **[Delayed Stop]** area displays the scheduled shutdown time, which can be set by configuring hours, minutes, and seconds separately. The enable button in the upper right corner allows you to enable or disable this function. The set time will only take effect when the function is enabled.

◆ Volume Dispensing Mode Parameter Setting

Volume Dispensing Mode can be used for quantitative fluid transfer. The drive has built-in storage for 5 sets of formulas. Users can select and configure parameters for different formulas based on their needs and recall them as required. In Volume Dispensing Mode, the transfer rate can be determined either by a Volume-Flow Rate combination or a Volume-Time combination. The mode also supports settings for loops and interval times.

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The parameter settings interface is as follows:

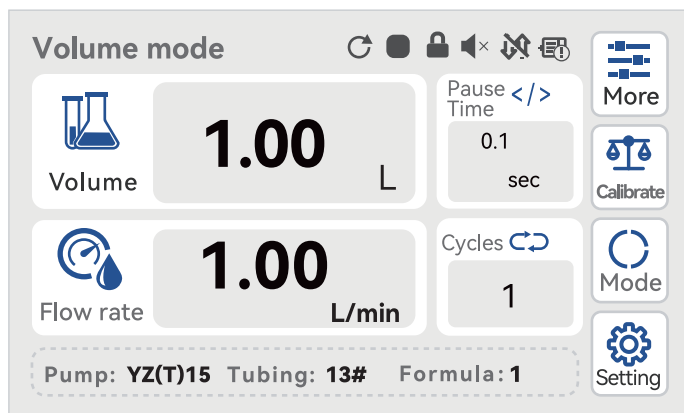


Figure 27 Liquid Volume Dispensing -the Flow Rate Interface

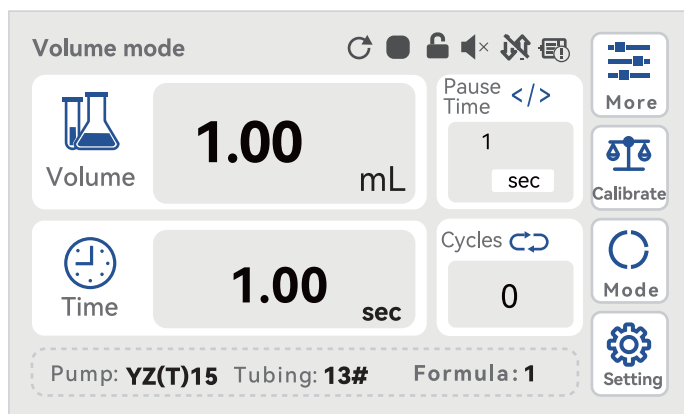


Figure 28 Liquid Volume Dispensing -Time Interface

[Volume] area displays the current liquid volume; click to set the volume and unit.

[Flow Rate] area displays the current flow rate; click to set the dispensing flow rate and unit. Available when [Flow Rate] is selected as the transfer rate unit.

[Time] area displays the current time; click to set the dispensing time and unit.

Available when **[Time]** is selected as the transfer rate unit. When using Volume-Time mode, users must independently verify the validity of the set time. If the set time is shorter than the minimum dispensing time required for the current volume at the maximum speed, the drive will operate at its maximum speed to ensure reliable volume delivery. In this case, the actual dispensing time may exceed the set time.

[Interval] area displays the loop interval time when the Loop function is applied (when the **[Loop]** setting is not 1). Click to set the interval time and unit.

[Loop] area displays the number of cycles. 0 indicates infinite looping, with a factory default of 1.

[More] button: Click to enter the quick parameter settings interface.

[Calibration] button: Click to enter the flow calibration interface.

[Mode] button: Click to enter the mode settings interface.

[Settings] button: Click to enter the system settings interface.

Quick Parameter Settings Interface:

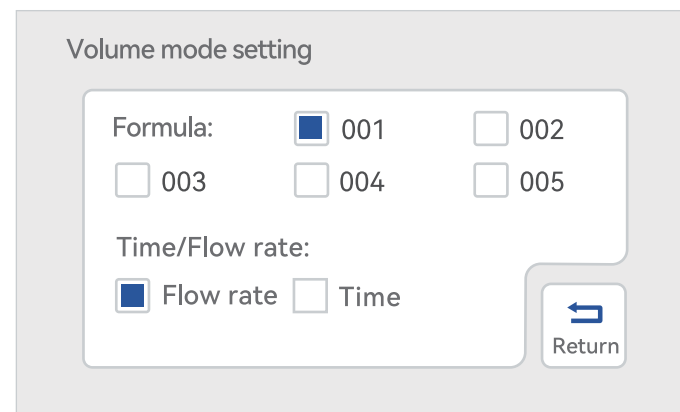


Figure 29 Volume Dispensing Mode Quick Setup Interface

[Formula Selection] This mode supports storage for 5 formula sets. Users can switch operating parameters by selecting different formulas. Any modifications to the current formula's parameters will be saved in real time

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to that formula. Formulas only store the set parameters. It is recommended to check dispensing accuracy after switching formulas and perform calibration promptly if needed.

[Transfer Rate Unit Switch] This mode supports two methods for setting the transfer rate (flow rate). By selecting different units, you can switch between volume-flow rate and volume-time combinations.

◆ Time Dispensing Mode Parameter Setting

Time Dispensing Mode can be used for timed fluid transfer. The drive has built-in storage for 5 formula sets. Customers can select, store parameters for, and recall different formulas based on their needs. Supports loop and interval time settings.

The parameter settings interface is as follows:

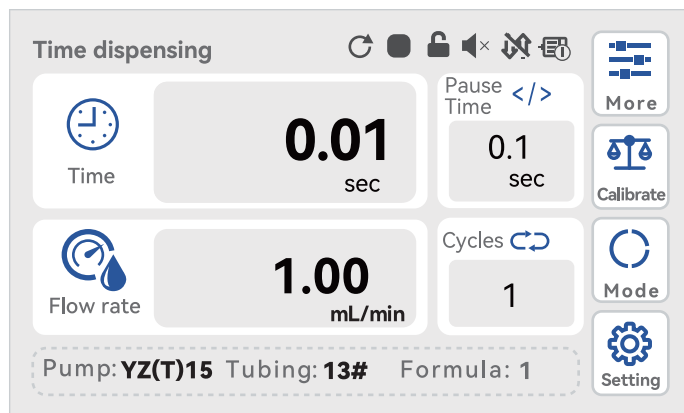


Figure 30 Time Dispensing Interface

[Time] area displays the current time; click to set the dispensing time and unit.

[Flow Rate] area displays the current flow rate; click to set the dispensing flow rate and unit.

[Interval] area displays the loop interval time when the Loop function is applied (when the **[Loop]** setting is not 1). Click to set the interval time and unit.

[Cycle] area displays the number of cycles. 0 indicates infinite looping, with a factory default of 1.

[More] button: Click to enter the quick parameter settings interface.

[Calibration] button: Click to enter the flow calibration interface.

[Mode] button: Click to enter the mode settings interface.

[Settings] button: Click to enter the system settings interface.

Quick Parameter Settings Interface:

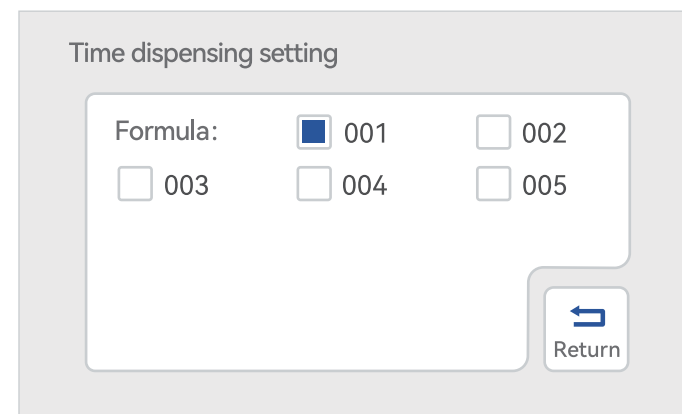


Figure 31 Time Dispensing Mode Quick Setup Interface

[Formula Selection] This mode supports storage for 5 formula sets. Users can switch operating parameters by selecting different formulas.

Any modifications to the current formula's parameters will be saved in real time to that formula. Formulas only store the set parameters. It is recommended to check dispensing accuracy after switching formulas and perform calibration promptly if needed.

◆ Programming Mode Parameter Settings

Programming Mode can be used for programmable fluid transfer. The drive has built-in storage for 30 programming steps. Users can select programming sequences of varying lengths based on their needs, and each step can be individually enabled or disabled. Every programming step supports loop and interval time settings.

The parameter settings interface is as follows:

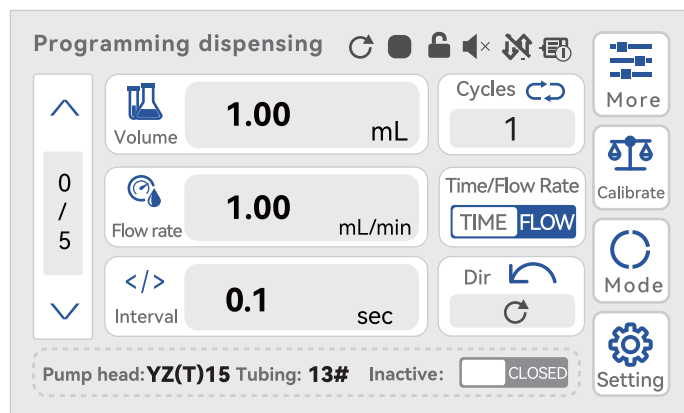


Figure 32 Programming Mode (Flow) Interface

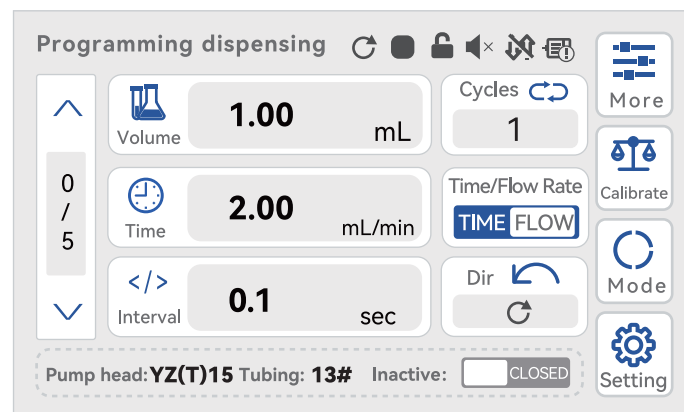


Figure 33 Programming Mode (Time) Interface

[Volume] area displays the current liquid volume; click to set the volume and unit.

[Flow Rate] area displays the current flow rate; click to set the dispensing flow rate and unit. Available when [Mode] is turned off.

[Time] area displays the current time; click to set the dispensing time and unit. Available when [Mode] is turned on.

[Interval] area displays the loop interval time when the Loop function is applied (when the [Loop] setting is not 1). Click to set the interval time and unit.

[Mode] can be used to enable or disable the Volume-Time function.

[Loop] area displays the number of cycles. 0 indicates infinite looping, with a factory default of 1.

[Dir] indicates the rotation direction for the current step.

[Inactive] When step inactive is activated, the current step participates in the programming sequence. When inactive is deactivated, the programming sequence skips the current step.

[More] button: Click to enter the quick parameter settings interface.

[Calibration] button: Click to enter the flow calibration interface.

[Mode] button: Click to enter the mode settings interface.

[Settings] button: Click to enter the system settings interface.

Quick Parameter Settings Interface:

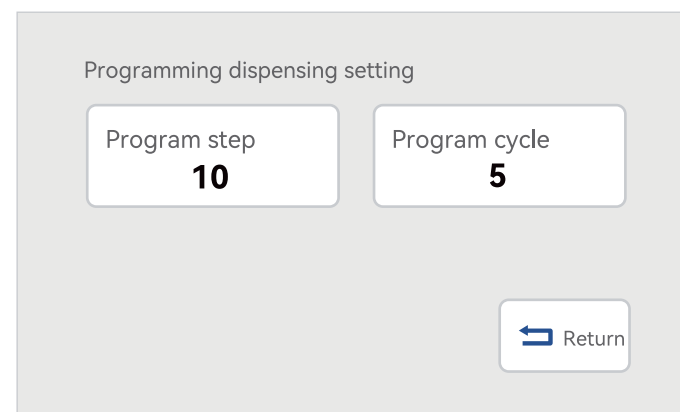


Figure 34 Programming Dispensing Mode Quick Setup Interface

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[Program Step] This mode supports a maximum of 30 steps.

[Program Cycle] Programming loop count. 0 indicates infinite looping, with a factory default of 1.

◆ External Control Mode Parameter Settings

External Control Mode can be used to operate the drive via analog or digital external signals. Through external signals, the drive can be integrated with other systems for automation. The parameter settings interface is as follows:

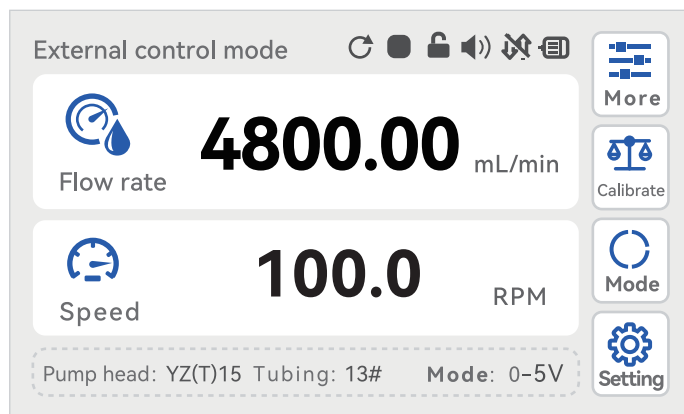


Figure 35 External Control Mode Parameter Settings Interface

[Flow Rate] area displays the current flow rate. When **[Control Mode]** is set to foot switch, click to set the flow rate and unit. After setting, the speed will change accordingly. When **[Control Mode]** is set to 0-5V, 0-10V, or 4-20mA, the flow rate varies with the external analog signal input and cannot be manually set.

[Speed] area displays the current rotational speed.

[More] button: Click to enter the quick parameter settings interface.

[Calibrate] button: Click to enter the flow calibration interface.

[Mode] button: Click to enter the mode settings interface.

[Setting] button: Click to enter the system settings interface.

Quick Parameter Settings Interface:

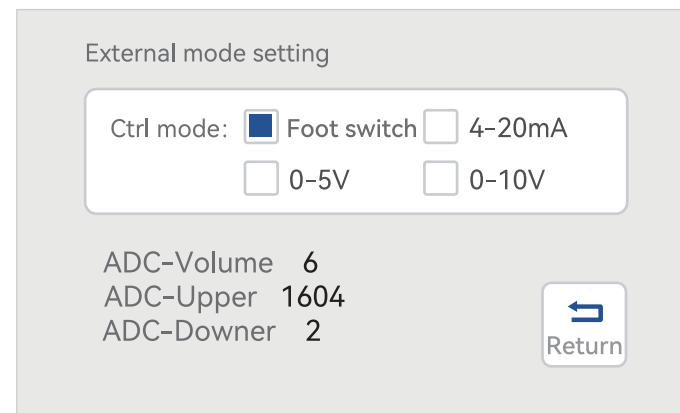


Figure 36 External Control Mode Quick Setup Interface

[Ctrl Mode] Users can select different flow control mode.

[ADC Current Value] area displays the current digital conversion value of the analog signal.

[ADC Upper Limit] area displays the upper digital limit value of the analog signal. The upper and lower limit values work together to achieve analog speed control. Click to set.

[ADC Lower Limit] area displays the lower digital limit value of the analog signal. The upper and lower limit values work together to achieve analog speed control. Click to set.

Analog speed control algorithm:

$$\text{Speed} = (\text{Current Value} - \text{Lower Limit}) / (\text{Upper Limit} - \text{Lower Limit}) * \text{Maximum Speed}.$$

Analog Calibration Method:

Analog signals require adjustment of the ADC upper and lower limit values to adapt to different analog signal inputs.

1. Adjust the analog signal input to the maximum value required by the system, read the data of the current ADC value, and write it into the ADC upper limit value.

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2. Adjust the analog signal input to the minimum value required by the system, read the data of the current ADC value, and write it into the ADC lower limit value.
3. Test the analog signal by gradually changing it from the minimum to the maximum value, and observe whether the rotational speed follows accordingly.

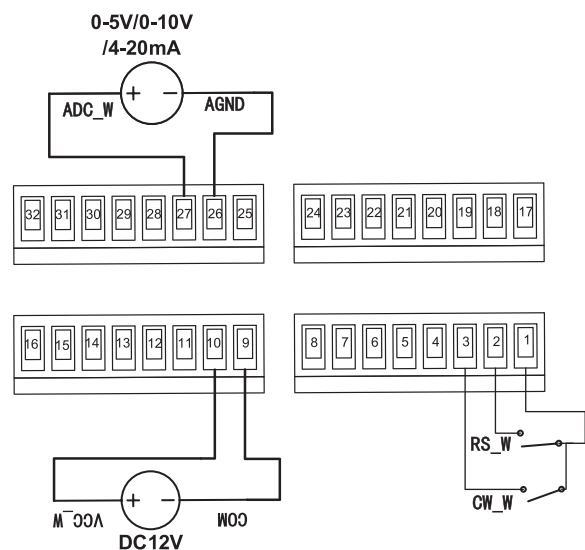


Figure 37 Wiring Diagram for External Control Analog Mode – Connecting to an External DC12V Power Supply

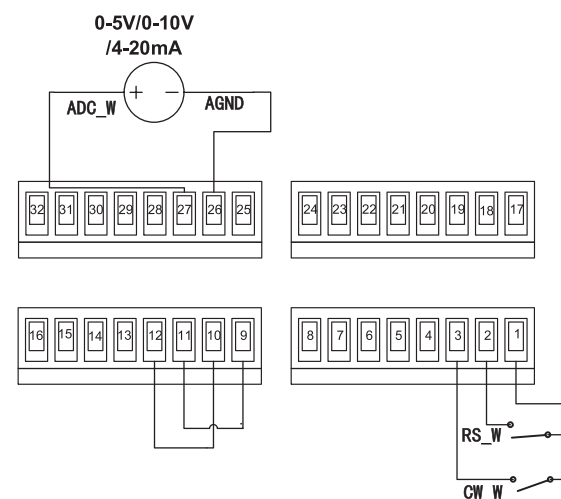


Figure 38 Wiring Diagram for External Control Analog Mode – Connecting to the Internal DC12V Power Supply

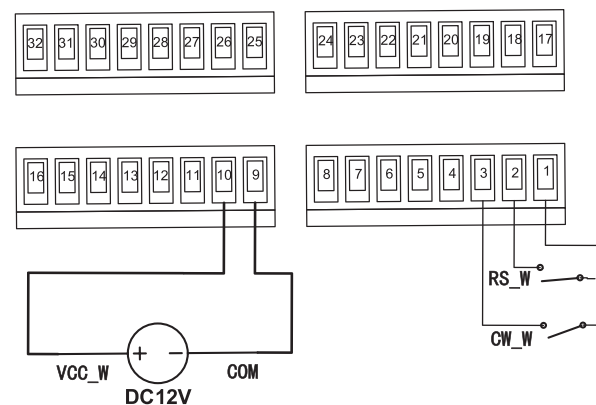


Figure 39 Wiring Diagram for Foot Pedal Control – External 12V Power Supply

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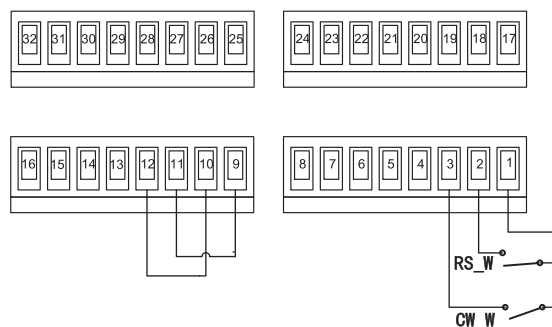


Figure 40 Wiring Diagram for Foot Pedal Control –
Internal 12V Power Supply

Malfunction and Maintenance

◆ Daily Maintenance

- Peristaltic pump routine maintenance can refer to the following table.
- There is a cooling fan behind the peristaltic pump, please do not cover it to avoid affecting heat dissipation.
- Peristaltic pumps can not be flushed with water, if the pump tube rupture during operation, the liquid in the pump head should be dried or dried in time.
- Do not use chemical solvents to clean the peristaltic pump and pump head .

◆ Malfunction Solutions

1	Hardware	No display	1. Check whether the power cord is connected properly. 2. Check whether the fuse is blown. If it is blown, please contact the manufacturer for replacement.
2	Hardware	Motor does not rotate	1. Check whether the flow or speed is set too small, such as 0.1rpm.
3	Hardware	Motor is trembling	1. Check that the pump head screws and plate rod are tightened.
4	Hardware	The motor rotates in only one direction.	1. Check that the direction keys are working normally. 2. Check whether the external control direction signal is normal.
5	Hardware	The key does not work	1. Whether or not it is locked
6	Hardware	Noisy when the pump is running	1. Check that the pump head screws and plate rod are tightened.
7	Hardware/ Software	Communication does not work	First check the software: 1. Whether the mode is Flow Mode 2. Reset the machine address. 3. Check if there are two machines on the bus it with the same address If the problem is not resolved, continue to check the hardware: 4. Check if the connection is correct 5. Check whether the external control power supply is energized.
8	Hardware/ Software	External control does not work	First check the software: 1. Whether the mode is external control. If the problem is not resolved, continue to check the hardware: 2. Check if the connection is correct 3. Check whether the external control power supply is energized.
9	Software	Inaccurate flow rate display	1. Calibrate the flow rate.

Table 8 Malfunction Solutions

MF103 High-Protection Peristaltic Pump



Note: This product is not medically certified. When used as a component in a medical device, the medical device itself must have medical certification.



Note: There are no parts in the pump that can be repaired by the user. If the user repairs by himself, the warranty of the pump will be invalid. If there is a fault that cannot be solved after checking the software and connecting the external hardware, please contact us, and do not repair by yourself.

Dimensions

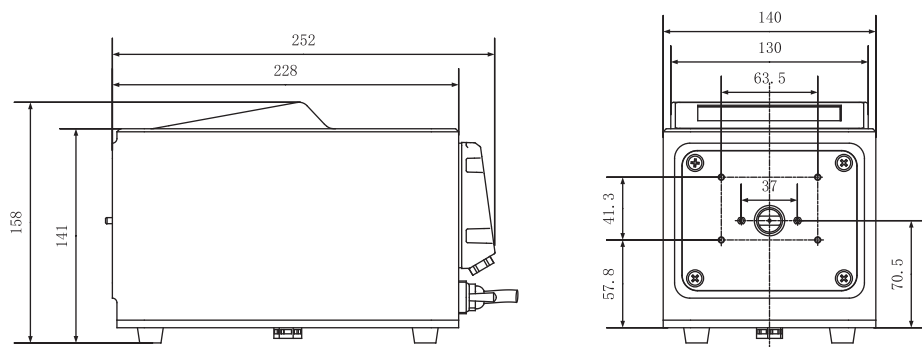
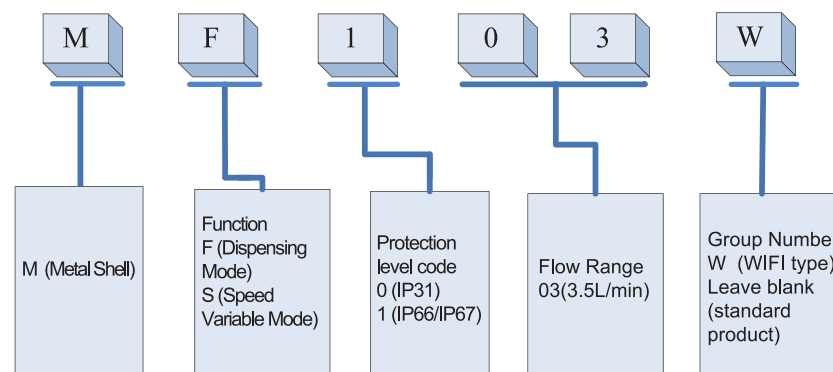


Figure 41 Dimensions of MF103(mm)

Naming Rules



Technical Parameters

MF103 Technical Parameters

Functions

Suitable pump heads	YZ(T)15, YZ(T)25, DS, DT10, DT15, DMD15
Functions	Key control for start/stop, direction, full speed, and status memory (power-off memory); Foot switch control, external start/stop, external direction control, with physical isolation, optional 5V/12V/24V level input; Optional speed adjustment via 0-5V/0-10V/4-20mA; Flow mode, volume dispensing mode, time dispensing mode.
Communication Function	RS485, RS232, and Ethernet support Modbus communication protocol.
Display Functions	Color LCD touch screen
Direction Control	Forward and reverse reversibility

Performance

Flow range	0.0006-3000mL/min
Speed range	0.1-600 rpm
Speed Resolution	0.1 rpm, accuracy error less 0.2%
Delayed start time	1 second to 999 hours.
Scheduled operation time	1 second to 999 hours.
The time of dispensing	0.1 seconds to 99.9 seconds.
Loop Count	1-9999 times, 0 indicates infinite looping.
Pause Time	0.1-999 seconds/minutes/hours.
Reverse Angle	0-720 degrees
Adjustment Method	Mask touch screen operation
Display	4.3-inch IPS color LCD.
Applicable Power Supply	AC 100-240V 50Hz- 60Hz
Wattage	<60W
Working environment	Temperature 0- 40°C Relative humidity<80%
Dimensions	252x140x158mm
Drive Weight	5.15kg

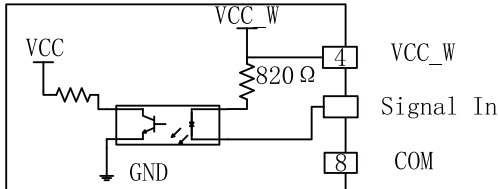
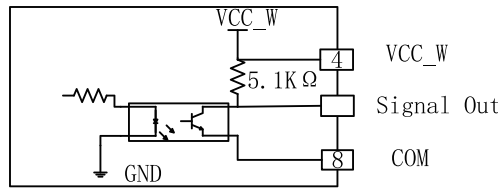
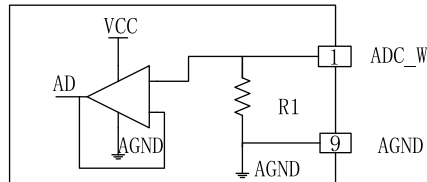
◆Flow Rate Chart of the Pump

Driver Model	Suitable Pump Head	Channel Number	Suitable Tube	Flow Rate (mL/min)
MF103	DMD15	1	13#14#16#19#25#	0.01 ~ 2100
	DT15	2	19#16#25#17#	0.067 ~ 2220
	DT10	1	13#14# ¹ , Wall thickness 0.8 ~ 1, ID ≤3.17	0.00023 ~ 82
	YZ15	1	13#14#16#19#25#17#18#	0.005 ~ 2580
	YZ25	1	15#24#	0.18 ~ 1860
	YT15	1	13#14#16#19#25#17#18#	0.005 ~ 2580
	YT25	1	15#24#35#36#	0.18 ~ 3000
	DS	1、2、4	Wall thickness 0.8 ~ 1, ID ≤3.17	0.0006 ~ 51.3



Note: The above applicable pump head, the number of suitable channels and the flow rate of a single channel are all obtained from the test of purified water with a common tube under normal temperature and pressure conditions in the laboratory. This data is for reference only, due to pressure in actual use, temperature, medium characteristics, tube material and other specific factors, the specific situation needs to consult our engineers.

External Control Input and Output Performance

Input Switch Value or OC Gate Specification		
Project	Parameter	
Input Interface Principle		
Single Signal Input ON Current	$5.5\text{mA} < I_{on} < 15\text{mA}$	
Single Signal Input OFF Current	$I_{off} < 1.5\text{mA}$	
Signal Input Method	switch (closed, open) or NPN transistor OC gate	
External Control Input Voltage	5V	Input loop requires no series resistors
	12V	
	24V	1.5KΩ resistor in series with the input circuit
Isolation Method	Optoelectronic isolation	
Output Specification		
Project	Parameter	
Principle of Output Interface		
Output Method	NPN transistor OC gate with internal pull-up	
Isolation Method	Optoelectronic isolation	
Input Analog Specifications		
Project	Parameter	
Interface Principle		

Input Impedance (<100HZ)	0-5V	R1=4KΩ
	0 -10V	R1=4KΩ
	4-20mA	R1=248Ω
Allowable Error	0-5V, 0-10V, 4-20mA	±1%
Resolution	0-5V	5mV
	0-10V	10mV
	4-20mA	16uA
Internal Output Power Specifications		
Project	Parameter	
The Output Voltage	DC12V±1V	
Allowable Output Current	< 130mA	
External input Power Specification		
Project	Parameter	
Allowable Input Voltage	DC5-25V	
Allowable Input Current	> 350mA	