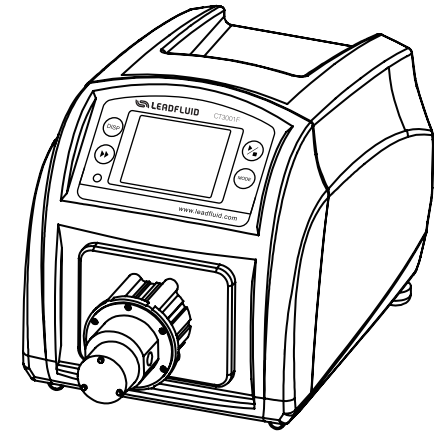
U.S. SOLID®

Manual No.

CT3001F
Dispensing Gear Pump
Operation Manual



CE

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! Please contact the dealer or our company directly regarding product repair matters.
	This product is not suitable for explosion-proof environment, and it should not be used in explosive environment.
	When installing and removing the pump head, please turn off the power. The flange of the pump head must be handled carefully and cannot be clamped with pliers, which may cause the misalignment of the inner core magnetic core or even cause permanent damage to the pump.

Warning:

	When connecting the external control or communication interface, please cut off the power inlet and the filter is large enough to avoid pressure loss in the circuit.
	The pump tube may be damaged and cause liquid spillage, please take necessary protective measures and check the pump tube regularly! When installing and removing external control devices, please be sure to turn off the power to prevent damage to the equipment!
	Please connect the protective ground of the machine to the ground, otherwise, there will be danger of electric shock or electromagnetic interference!
	This product is not intended for medical use.
	It is recommended to remove the two protective covers of the inlet and outlet of the pump only before installing the pipe joints and pipelines, so as to avoid any accidental foreign solid foreign matter entering the pump and damaging the internal components of the pump
	Special care must be taken when connecting the pump to the tubing to avoid leaks. If sealant or Teflon tape is used at the interface, it must be avoided to enter the pump.
	It is strongly recommended, especially for the inlet, that the inside diameter of the pipe should correspond to the capacity of the pump, so that insufficient liquid supply causes cavitation instead of normal wear. In any case the sum of inlet and outlet pressure shall not exceed 20bar/290PSI.
	It is strongly recommended to add a filter to the pump to filter out impurities with particles larger than 10um, so as not to accelerate the abnormal wear of internal components. The filter element needs to be checked regularly to make the filter effective. It is best to install a vacuum gauge at the rear end of the filter. When the vacuum increases over 0.1bar, the filter element should be cleaned or replaced.
	The gear pump can only transmit liquid in one direction, so pay attention to the position of the inlet and outlet when connecting the tube.
	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.

Contents

Gear Pump Introduction ---- 1
Description ---- 1
Functions and Features ---- 1
Components and Interfaces ---- 2
Display Panel and Operating Keypad ---- 3
Keypad ---- 3
Icon Description ---- 4
Touch Screen ---- 5
External Control Interface Description ---- 9
Installation Instruction ---- 11
Before Operation ---- 11
Install Pump Head and Tube Line ---- 11
Power Connection ---- 12
Operation Instructions ---- 13
First Run Wizard ---- 13
System Parameter Setting ---- 14
Flow Calibration ---- 21
Working Mode ---- 24
External Control Mode ---- 27
Communication Mode ---- 30
Foot Switch Mode ---- 31
Malfunction and Maintenance ---- 33
Drive Spare Parts ---- 33
Daily Maintenance ---- 34
Maintenance Worksheet ---- 34
Malfunction Solutions ---- 35
Dimensions ---- 36
Ordering Information ---- 36
Optional Accessories Table ---- 36
Naming Rules ---- 36
Technical Parameters ---- 37
Flow Rate Chart of the Pump ---- 38
Appendix ---- 38
Touch Screen Calibration Wizard ---- 39
External Control Input and Output Performance ---- 40

Gear Pump Introduction

Gear pump is a positive displacement (PD) pump. Gear pumps use the action of rotating gears and gears to move fluid. The rotating gear forms a liquid seal with the pump casing and creates a vacuum at the pump inlet, fluid that is sucked into the pump is enclosed in the cavity of the rotating gear and transferred to the discharge port. Gear pumps provide smooth, low-pulse flow proportional to the rotational speed of their gears.

Description

CT3001F is a high-performance, low-noise micro-gear pump, which uses a servo brushless motor and a magnetically driven pump head to achieve fluid control with low pulsation and constant flow. The driver uses a stainless steel shell, LCD screen display, and key operation, which can easily set parameters. The LCD screen displays the rotational speed, and the indicator light displays the status, which is suitable for various experimental fields. With a variety of external control methods, it is convenient to cooperate with other equipment, and it also has MODBUS protocol communication, which simplifies the difficulty of system development.

CT3000F speed range: 50-3000 rpm, flow range: 15-2700mL/min.

Functions and Features

- Suitable for various kinds of pump head.
- Suitable for transmitting viscous. high-pressure liquids.
- No pulse transmission, running quietly.
- Magnetic coupling design for easy maintenance.
- Servo brushless motor drive for high efficiency.
- Color LCD display flow, speed and other information, touch screenoperation control parameters.
- It has multiple working modes such as internal control, external control, liquid volume dispensing, time dispensing and copy dispensing.
- Flow calibration wizard to ensure the accuracy of liquid volume.
- Intelligent temperature control function.
- External signal control, physical isolation, analog speed control.
- RS485 communication, support MODBUS protocol, a variety of communication parameters can be set, easy to connect with various control equipment.
- Streamlined plastic shell.
- 5-24V wide voltage input, can be adapted to different environments.

Components and Interfaces

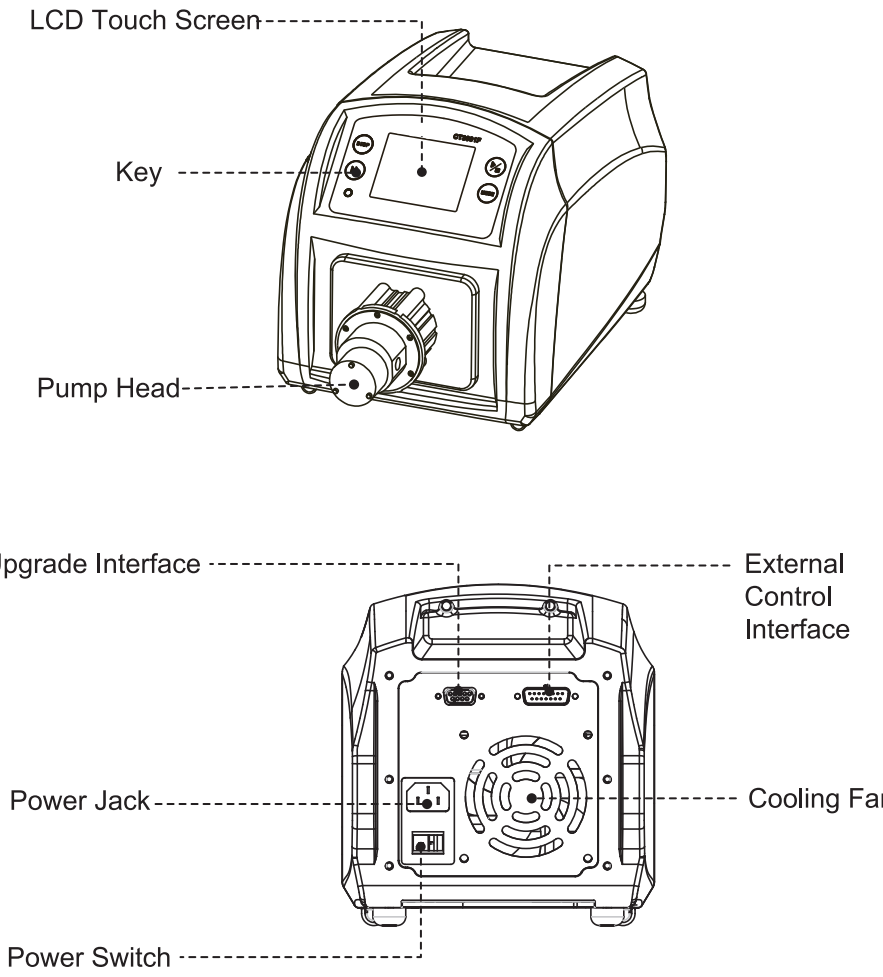


Figure 1 Components and Interfaces

Display Panel and Operating Keypad

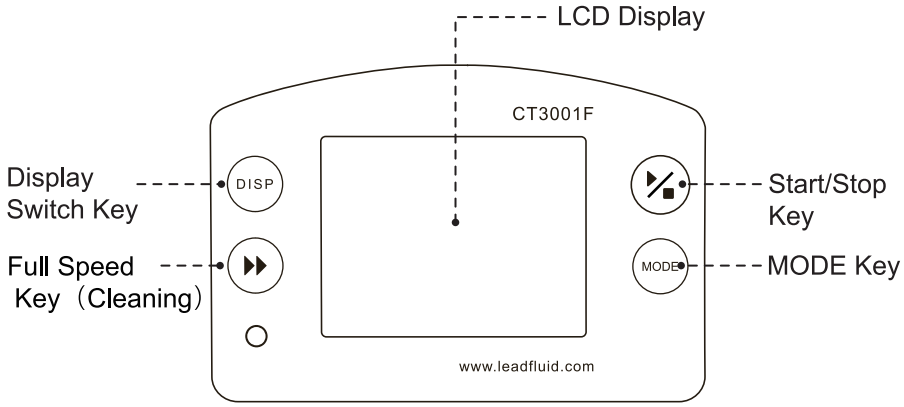


Figure 2 Display Panel and Operation Keys

◆Keypad

: Start/Stop Key. Control the start and stop of the pump.

DISP : Display Switch Key. Press the key to switch the display state.

: Full speed key. The pump runs at maximum speed and is used for filling or emptying liquid.

MODE : MODE key. In the stop state, switch between different working

Icon Description

Icon	Function	Icon	Function
	Keypad unlocked		Keypad locked
	Tone on		Tone off
	Internal control mode		Foot switch mode
	Current mode		Voltage mode
	Quick setting		System Setup.
	Increase key		Decrease key
	Communication (RS485) is connected		Communication (RS485) has been disconnected
	Stop State		Running State
	General parameters		Calibration wizard
	Password		Information
	Operation instructions		Back to main control interface

Table 1 Description of Display Icons

◆Touch Screen

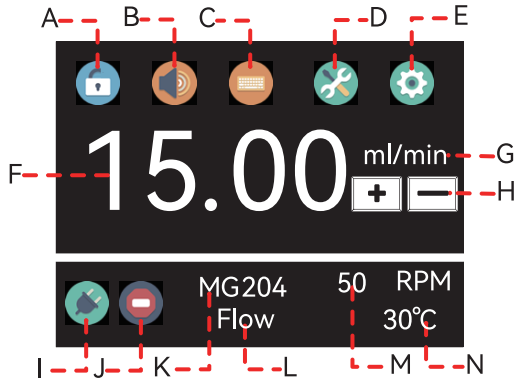
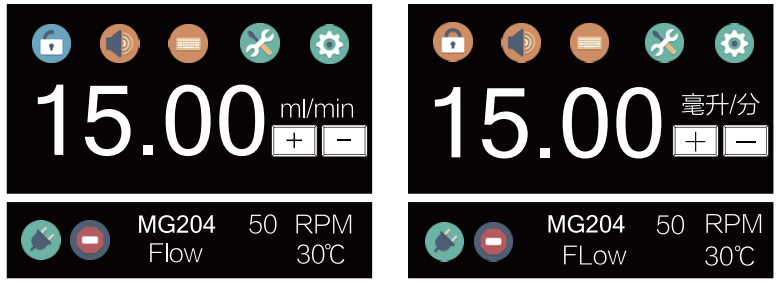


Figure 3 LCD Display

A: **Lock Key.** When the keypad is locked, the control mode and system parameters cannot be modified. Click the icon to switch between lock and unlock, as shown in the following figure:



Unlocked State Locked State

Figure 4 Lock Key

B: **Tone Key.** Control touch tone and key tone on or off. The icons are as follows:


Tone on


Tone off

Figure 5 Tone Icon

C: **Control Mode.** Click the icon to enter the control mode selection interface, there are four modes.

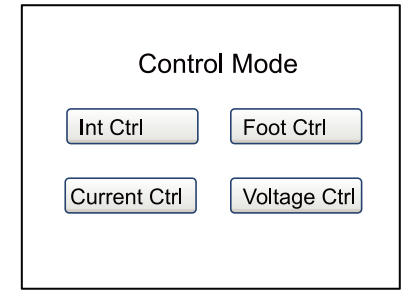


Figure 6 Control Mode Menu

- Internal Control Mode: The operation of the pump is controlled by keys and touch screen.
- Foot Switch Control Mode: The start and stop of the pump is controlled by the foot switch, and other parameters are controlled by keys and touch screen.
- Current Control Mode: The flow of the pump is controlled by an external analog 4-20mA, the start and stop are controlled by an external signal, and the key does not work. This function is optional, unavailable in standard version.
- Voltage Control Mode: The flow of the pump is controlled by an external analog 0-5V or 0-10V, the start/stop are controlled by an external signal, and the key does not work. Standard is 0-5V, 0-10V is optional.


Internal Control Mode


Foot Switch Control Mode

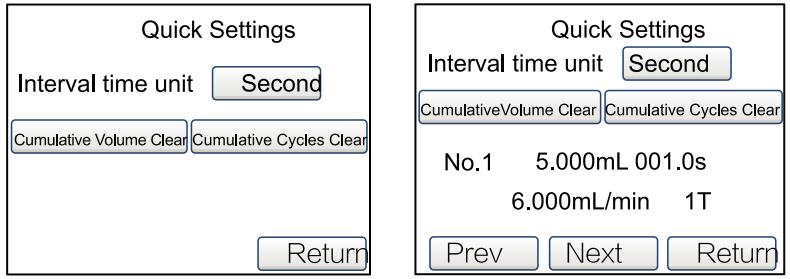

Current Control Mode


Voltage Control Mode

Figure 7 Control Mode Icon

D: Quick Settings. Click the icon to enter the quick setting interface, the be set interval time unit can as: seconds, minutes and hours, and the accumulated liquid volume and accumulated times can be cleared. There are five groups of pre-stored data in the liquid dispensing mode,time dispensing mode, and copy dispensing mode, which are viewed by the "Previous" or "Next" keys, and the data on the main control screen will change accordingly.


Figure 8 Quick Settings Icon



Flow Mode Not Flow Mode

Figure 9 Quick Setting Interface

E: System Setup. Click the icon to enter the system setup menu, you can then select the corresponding menu to modify the parameters. The icons are as follows:



Figure 10 System Setup Icon

F: Flow Setting. Displays the current flow rate. In the stopped state, you can click the numerical value, and directly input the numerical value to be modified in the pop-up dialog box, pay attention to the numerical range and unit on the dialog box.

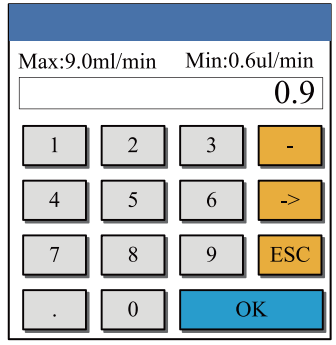


Figure 11 Flow Input Window

⚠	Note: If the flow rate needs to be displayed accurately, flow must be calibrated.

G: Flow units. Display the current flow unit, the flow unit is mL/min.

H: Fine-tuning Key. Adjust the flow rate in real time by clicking on the plus icon to increase the flow rate by one minimum unit, or clicking on the minus icon to decrease the flow rate by one minimum unit. Press and hold the increase icon or decrease icon for 1 second, and continue to press the key, and the flow rate will increase or decrease rapidly. The icons are as follows:

 Increase Key  Decrease Key

Figure 12 Fine-tuning Key

I: Communication State. Display（RS485）whether the current communication is connected, as shown in the figure below:

 Communication Connected  Communication Disconnected

Figure 13 Communication State Icon

J: Running State. Displays the current direction the pump is running. The icon is displayed in the stop state as shown below:



Figure 14 Stop State Icon

In the running state, current running direction is displayed in animation.



Figure 15 Running Status Indication

K: Pump Head Model. Display the model of using pump head. The specific display meaning is as follows:

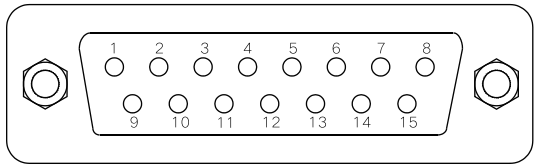
- MG204 indicates MG204 pump head.

L: Working Mode. Displays the current working mode, such as flow mode, volume dispensing mode, time dispensing mode, copy dispensing mode.

M: The Speed or the Accumulated Times. Displays the current RPM or all completed dispense counts, toggled by the "DISP" key. If the speed is greater than the maximum speed, overflow will be displayed. If the speed is lower than the minimum speed, underflow will be displayed. Accumulated counts can be cleared to zero in the quick setup interface.

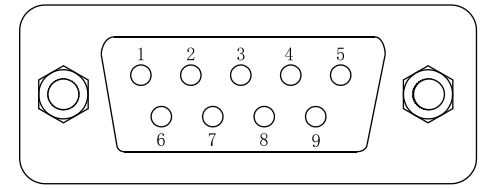
N: Temperature or the Accumulated Volume. Displays the temperature inside the drive or the total amount of fluid transferred during operation. Accumulated liquid volume can be cleared to zero at the quick setup interface.

External Control Interface Description



DB15 Pins	English Notes	Description
1	ADC_W	The positive input of external analog signal
2	B	Communication interface, B pole of RS485
3	A	Communication interface, A pole of RS485
4	+12V_W	External DC power +12V input
5	DAC	Analog voltage signal output
6		
7		
8	COM	External commons.
9	AGND	Negative input of external analog signal
10	+12V	Internal +12V power supply output
11	GND	Internal power ground
12		
13	RS_W	External input signal to control start/stop
14		
15	RS	Internal start/stop signal output.

Table 2 Definition of External Control Pins



DB9 Pins	English Notes	Description
1		
2	RXD	Receive data
3	TXD	Send data
4		
5	GND	Signal ground line
6		
7		
8		
9		

Table 3 Definition of RS232 Pins

Note: Follow the legend pins to provide the correct signal. Do not exceed the specified range of the signal value. Please pay attention to the specified voltage range when connecting to an external power supply, otherwise it may cause permanent damage and will not be covered by the warranty.

Note: Low voltage signals must be isolated from mains power. Use a separate shielded ground input wire.

Note: Use a qualified protective wire sleeve at the end of the multi-strand cable, otherwise there will be a risk of damage to the equipment.

Installation Instruction

◆Before Operation

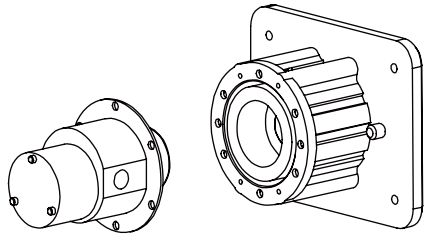
- Please compare the packing list to check whether all accessories are wrong or damaged when you open the outer package of the pump. Please contact us in time, if you find any problems.
- Read the operation manual carefully, and keep it at hand, or keep it in a fixed place for reference at any time.
- Place the pump on a level table with the rear at least 20 cm away from obstacles.

◆Install Pump Head and Tube Line

Install Pump Head

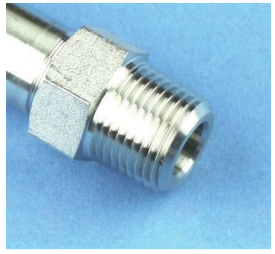
- Push the pump head into the pump head bracket, keeping the inlet and outlet level.

Align the pump head with the mounting holes of the pump head bracket, and fix the pump head on the bracket with M3*8mm stainless steel screws and nuts.

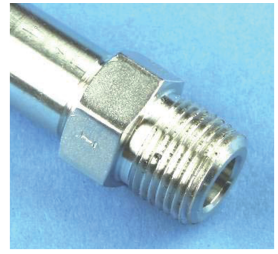


Tube Line Connection

- Choose 1/8 NPT stainless steel or plastic fittings, take care to clean the internal and external threads without leaving residue, and ensure that the internal and external threads are not weakened or deformed.



Qualified



Disqualified

- Use Teflon tape to wrap the thread clockwise from the second pitch, wrap it tightly twice, and finally cut it short and stick it on the thread.

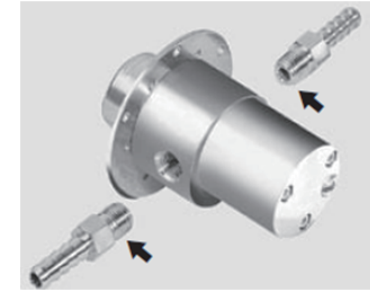


This one is qualified.



This is disqualified, the tape is wrapped too close to the edge, which may cause the tape to enter the interior of the Internal

- Screw the joint into the threaded hole of the inlet and outlet of the pump head, and tighten it with a wrench.



⚠	Note: Do not tighten too much, otherwise parts may be damaged!

◆Power Connection

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

⚠	Note: Make sure all power supply wires are rated for equipment wattage.
⚠	Note: The pump must be located so that it can be easily disconnected from the power source when the equipment is in use.
⚠	Note: Please use the same power supply as that on the nameplate of the machine, otherwise the equipment will be damaged!

Operation Instructions

◆First Run Wizard

The pump has preset default operating parameters, as shown in the table below:

Parameter	Default Setting
Password	Blank
Key Prompt Tone	Enable
Control Mode	Mode Switch
Pause Time Unit	Second
Infrared Setting	Enable
External Control Method	Pulse
Communication Baud	9600
Parity Check Mode	Even Parity
Endianness	CDAB
Communication address	1
ADD Time	0.5 seconds
Analog Proportional	100%

Table 4 List of Device Default Parameters

When starting up for the first time or after restoring the default value, the system first enters the language selection interface. Users should set parameters about pump head, work mode, working mode and calibration successively after selecting the language in the welcome interface.

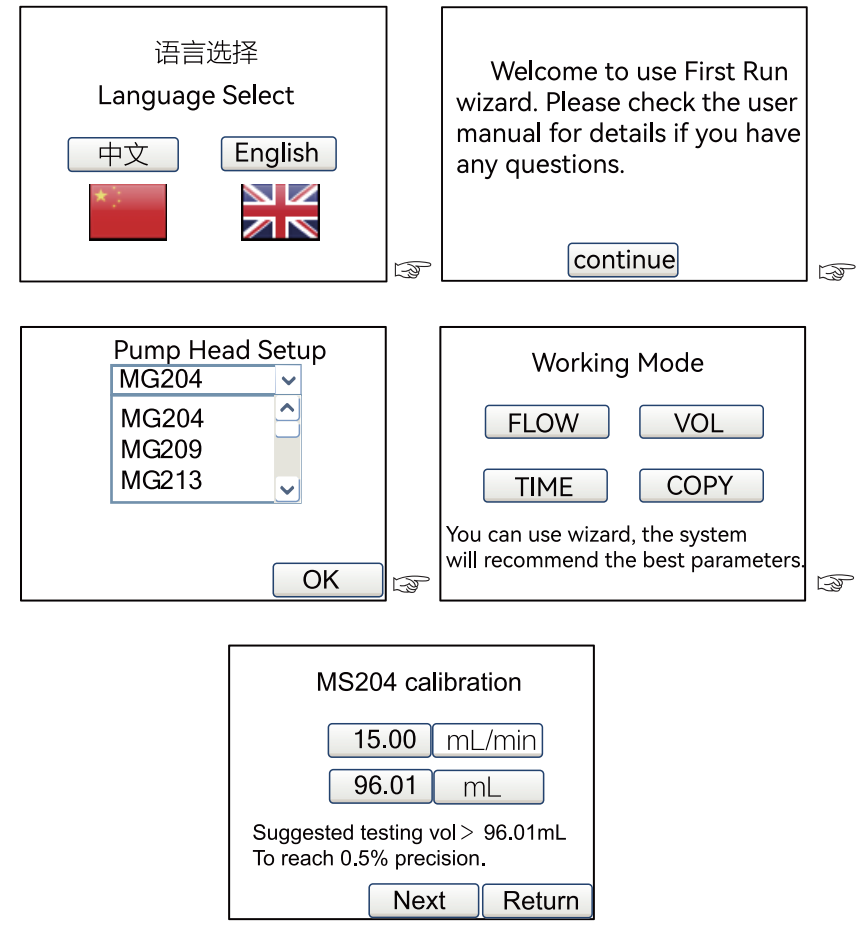


Figure 16 First Run Wizard Interface

◆System Parameter Setting

In the stop state, press the system menu icon  to enter the main control interface, the interface is as follows:



Figure 17 System Parameter Interface

General Settings: Set the common parameters of the peristaltic pump, and view the menu by sliding up and down on the touch screen, as shown in the figure below:

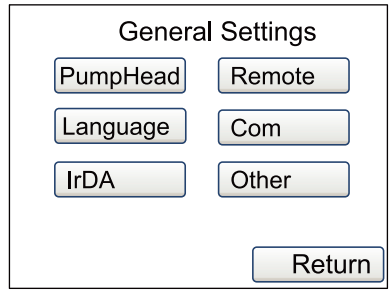


Figure 18 System Parameter Interface

- **Pump Head Setup:** According to the actual situation, choose the appropriate pump head model.

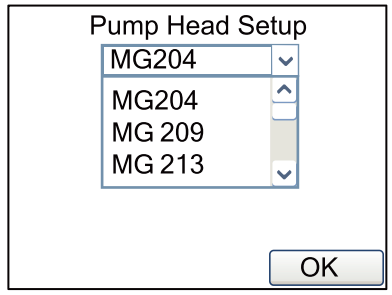


Figure 19 Pump Head Setup Interface

- **IrDA Setup:** Turn on or off the infrared remote control function.

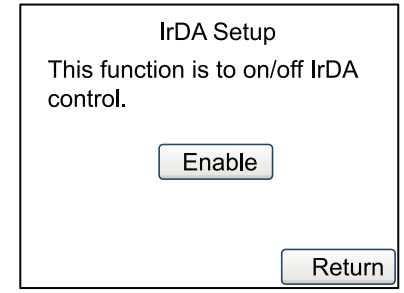


Figure 20 Infrared Remote Setting Interface

- **Language:** Select the language used, Chinese or English.

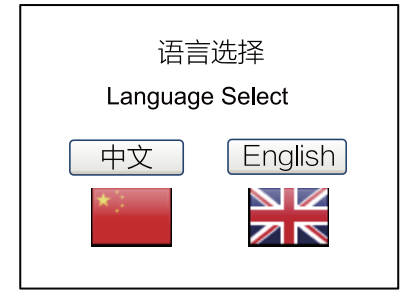


Figure 21 Language Setting Interface

- **Electric Select:** Choose whether the external control rotation direction signal is level mode or pulse mode. The level mode means that the external control signal controls the start/stop of the pump by maintaining the high and low level signals. The pulse mode means that the external control signal controls the operation of the pump by detecting the rising edge/falling edge generated when switching between high and low levels direction for example controlled by a unlock key (effective in external control mode).

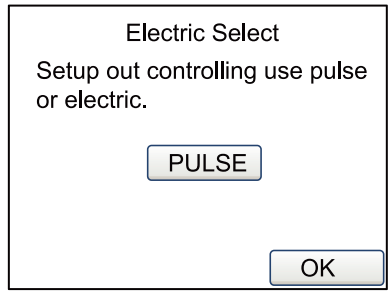


Figure 22 External Control Mode Interface

- **Communication Settings:** Set the communication rate, parity check mode, endianness or change the communication address. The communication rate can be set to 4800, 9600, 19200 and 38400; the parity check mode can be set to odd parity, even parity and no parity. The endianness can be set to ABCD or CDAB, and the communication address can be set to any one of the integer values from 1 to 247, which will come into effect after power off and restarting after modification of the settings.

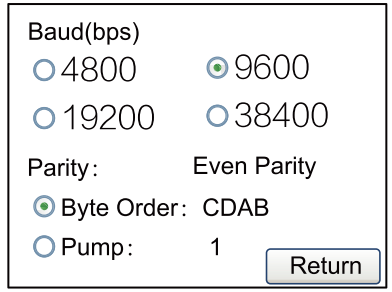


Figure 23 Communication Setting Interface

- **Other setup:** Acceleration Time: Sets the time required for the pump to go from startup to full speed. Analog Proportional: set the upper limit of the speed when the pump is controlled by an external analog.

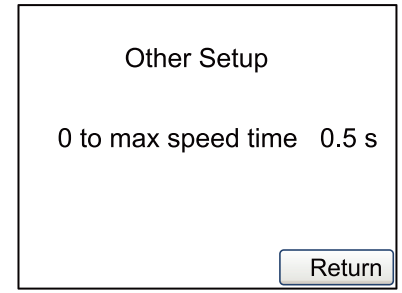


Figure 24 Other Setup Interface

Calibration Wizard: In order to improve the flow accuracy of the conveyed liquid, the flow needs to be calibrated. According to the prompt of the wizard, use the balance or graduated cylinder to weigh the transmission liquid, so that the displayed value corresponds to the actual flow rate Value accurately.

⚠	Note: If the flow rate needs to be displayed accurately, flow must be calibrated.

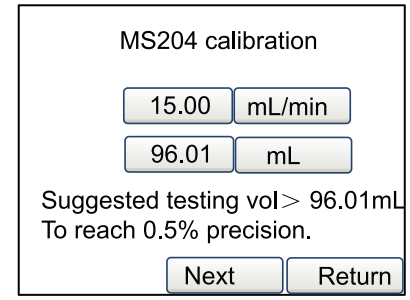


Figure 25 Calibration Wizard

- **Password:** Encrypt the drive. The initial password is blank by default, and the user can change the password after entering the default password. Before the password is entered, the password interface is displayed as shown in the figure below.

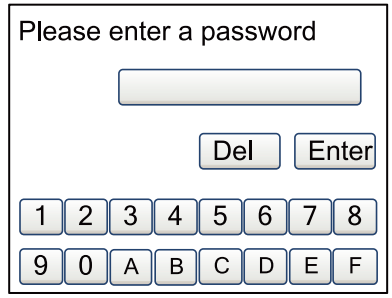


Figure 26 Enter Password Interface

After entering the password, open the password interface again, and the following figure will be displayed, and the user can enter a new password and press "Change Password".

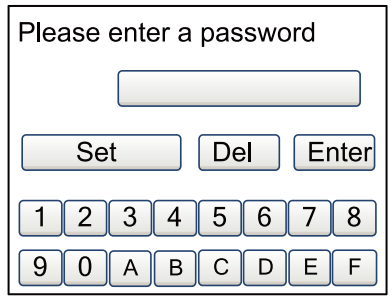


Figure 27 Change Password Interface

If you forget the password, you need to contact Lead Fluid to reset or retrieve it.

- **Information:** For the usage information of the this pump.

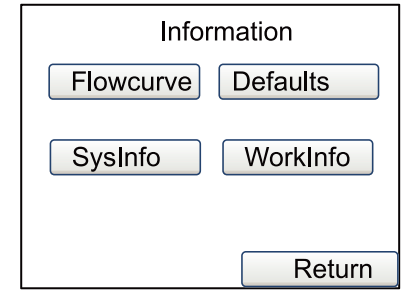


Figure 28 Information

- **System Information:** Display software version, memory capacity, operating temperature, etc.

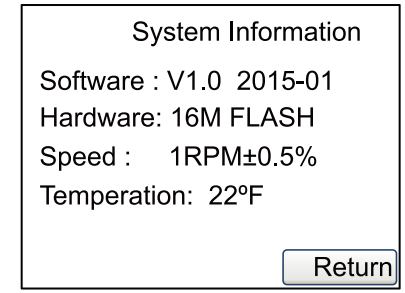


Figure 29 System Information Interface

- **Work Information:** Display the device startup time, running time and startup times.

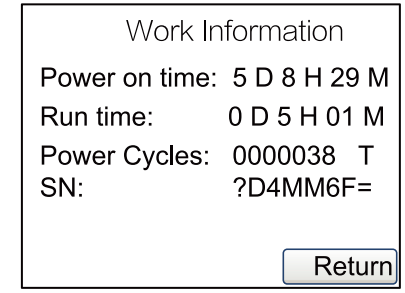


Figure 30 Work Information Interface

- **Factory Reset:** Restore all parameters to factory default value, need to restart the drive to take effect.

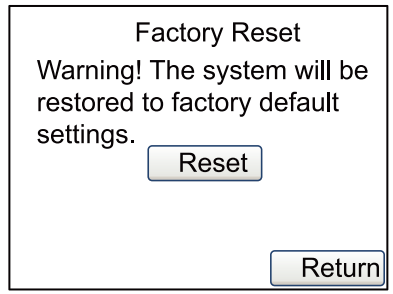


Figure 31 Factory Reset Interface

Operating Instructions: The company's contact information and brief introduction.
Return to Main Control: Return to the main control interface.

◆Flow Calibration

Weigh the actual transported liquid with a balance or graduated cylinder to calibrate the flow of pump. Calibration must be performed in the following cases.

- First run wizard
- Replace pump head
- Replace the tube line
- Reinstall the tube line
- Continuous working time is longer

The specific operation is as follows:

1) Install the pump head and tube, and prepare a suitable balance, or measuring cylinder and measuring cup.
2) Set the pump head in the Common Parameter Pump Head Selection to the pump head actually used (refer to the Common Parameter Introduction for details).
3) In flow interface, press the full speed key ⏩ to fill the tube with fluid.

4) In the stop state, click the system menu parameter setting icon ⚙ to enter the system parameter setting interface, and click the calibration wizard icon.



5) Enter the calibration wizard interface, the system displays the tube model, current flow and liquid volume to be calibrated, where the flow rate refers to the speed of the transmission liquid, and the liquid volume refers to the volume of the transmission liquid.

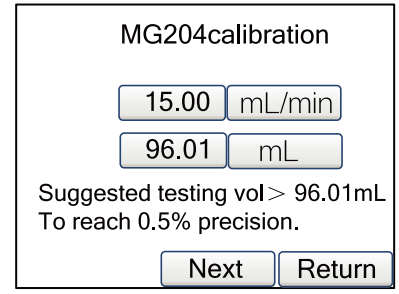


Figure 32 Calibration Wizard Setting Interface

As shown in the figure above, 15.00mL/min is the flow rate to be tested, and 96.01mL is the liquid volume to be tested. The value and unit can be directly clicked to modify. After the modification is completed, click the next button to enter the test interface; and click The exit key will directly exit the calibration wizard and return to the parameter setting interface.

⚠	Note: In order to ensure the test accuracy, it is recommended that the liquid volume value should not be less than the value recommended by the system during flow transmission. The liquid volume should be set to the actual volume that will be dispensed.

6) The test interface is as follows:

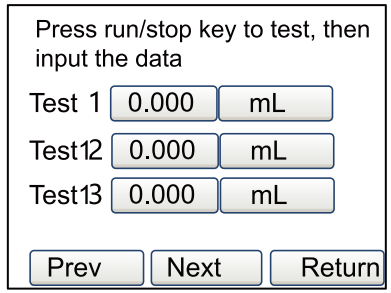


Figure 33 Calibration Wizard Actual Measurement Interface

Prepare the measuring cylinder or beaker, make sure the tube is full of liquid, press start and stop key, the gear pump starts to transfer the liquid, observe the progress bar at the bottom, wait for the peristaltic pump to stop automatically after the transfer is completed, weigh the liquid with a balance or a measuring cylinder, and record measured value.The above process can be repeated to weigh the liquids that have been transferred multiple times, and fill into the values in edit box of Test 1, Test 2, and Test 3, pay attention to choose the correct unit, and then click to enter the calibration calculation interface.If you want to re-modify the test of flow and liquid volume, you can click to re-enter the value. click key to exit the calibration wizard and return to the system parameter Setting interface.

⚠	Note: During the test, if there is an accident, you can press the start-stop key to stop the test, and press the start-stop key again to start the test again.

The test value can choose to input one or more sets of data, and the system will automatically calculate the average value.

7) The system automatically calculates the correction coefficient and displays the reference of the original coefficient. If the deviation is more than double, please pay attention to whether the following aspects are wrong:

- There is an error in the measurement
- The unit of the test value is wrong
- The pump head model is set incorrectly.
- Excessive level drop

If there are no problems, press Finish and the system will automatically save the new coefficients. Press previous step to re-test, press exit to return to the system parameter setting interface without saving the new coefficient.

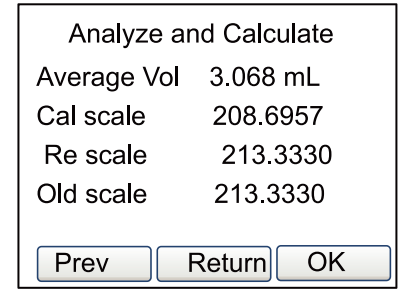


Figure 34 Calculation Result Interface of Calibration Wizard

If no data is entered, it will display as shown in the figure below, please click to retest.

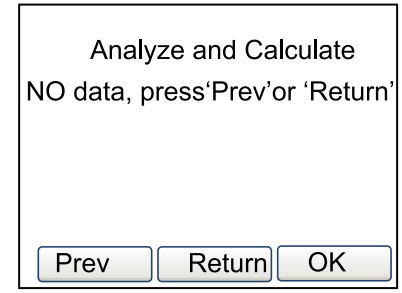


Figure 35 No Data Interface of Calibration Wizard

◆Working Mode

In stop state, press MODE to enter the working mode interface, as shown in the figure below:

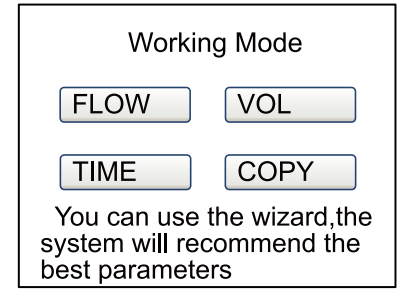


Figure 36 Working Mode Interface

- **Flow Mode**: The pump runs continuously according to the set flow rate and records the accumulated liquid volume.

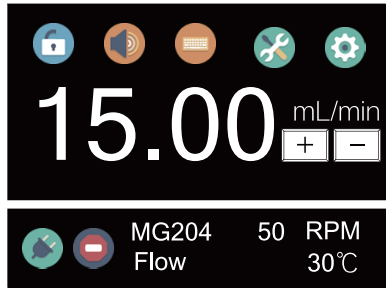


Figure 37 Flow Mode Interface

- **Volume Dispensing Mode**: By setting the liquid volume and flow rate, the pump automatically calculates the dispensing time for dispensing.

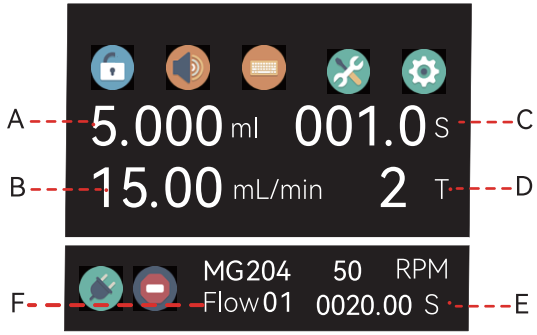


Figure 38 Liquid Volume Dispensing Interface

A: Liquid volume: Volume of liquid to be dispensed, uL, mL or L
B: Flow rate during dispensing (uL/min or mL/min).
C: Interval time. The time between multiple dispensing, hour, minute or second.
D: Number of dispensing When the number of dispensing is 0, the pump will run cyclically and will not stop until the start/stop key is pressed. When the number of dispensing is 1, the pump will run only once, and the interval time will be invalid. When the number of dispensing is greater than 1, the pump will run to the number of times it is set to run, and it will stop automatically.

E: The time of dispensing. Calculate the transfer time for a single dispense based on liquid volume and flow rate.
F: Displays the group number of the pre-stored parameter in the current working mode.

- **Time Dispensing Mode:**By setting the running time and flow rate, the pump into automatically calculates the liquid volume for dispensing.

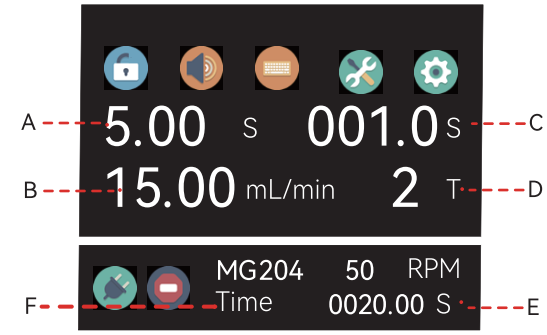


Figure 39 Time Dispensing Interface

A: The time of dispensing.
B: Flow rate during dispensing (uL/min or mL/min).
C: Interval time. The of time between multiple dispensing, hour, minute or second.
D: Number of dispensing When the number of dispensing is 0, the pump will run cyclically and will not stop until the start/stop key is pressed. When the number of dispensing is 1, the pump will run only once, and the interval time will be invalid. When the number of dispensing is greater than 1, the pump will run to the number of times it is set to run, and it will stop into automatically.
E: Volume to be dispensed. Estimate transfered volume based on flow rate and time.
F: Displays the group number of the pre-stored parameter in the current working mode.

- **Copy Mode**: By setting the liquid volume and flow rate, the pump automatically calculates the dispensing time for dispensing.

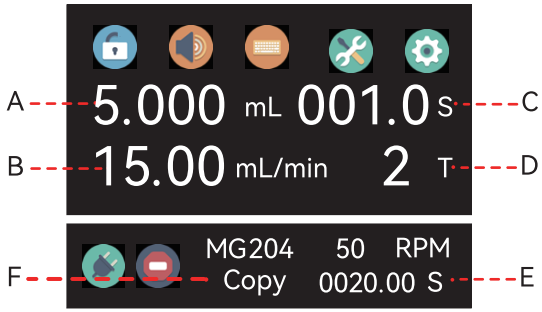


Figure 40 Copy Dispensing Interface

A: Volume of liquid to be dispensed(uL, mL or L).
B: Flow rate during dispensing (uL/min or mL/min).
C: Interval time. The of time between multiple dispensing, hour, minute or second.
D: Number of dispensing
E: Volume to be dispensed. Estimate overall elapsed time based on fluid volume and interval time.
F: Displays the group number of the pre-stored parameter in the current working mode.

◆External Control Mode

The speed is controlled by the external input mode analog quantity, the start and stop are controlled by the external signal. Front panel keys do not work. Default standard support 0-5V analog control, the 0-10V and 4-20mA analog control is optional.

- With the power cut off, connect the circuit according to the wiring diagram below, and connect the DB15 interface to the back interface of the pump.

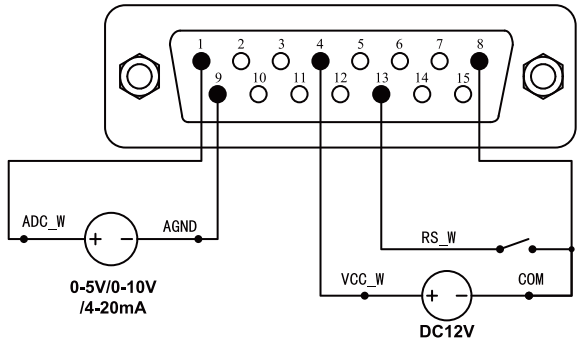


Figure 41 Wiring Diagram for Connecting External Power Supply in External Control Mode

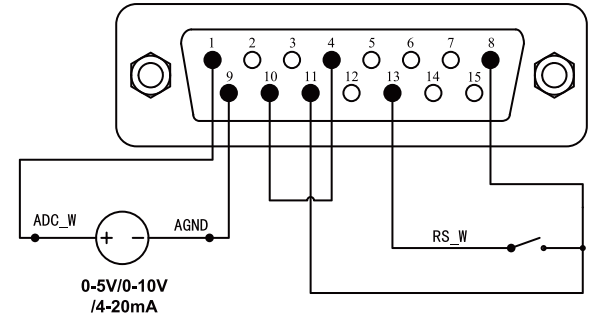


Figure 42 Wiring Diagram for Connecting Internal DC12V Power Supply in External Control Mode

- Turn on the power switch and the screen display the main control interface.
- Switch the control mode to select voltage mode or current mode .
- When the external control mode in common parameter is level mode, connect the switch of external RS_W, turn on the analog power supply, and the pump will change its speed with the change of analog quantity. Disconnect the external RS_W, and the pump will stop running.
- When the external control mode in common parameter is level mode, connect and then disconnect the switch of external RS_W, turn on the analog power supply, and the pump will change its speed with the change of analog quantity. Connect and then disconnect the switch of RS_W, and the pump will stop running.



Current Mode Voltage Mode

Figure 43 Analog Control Interface

Note: If you want to use an external 24V DC power supply to control the start, stop of the pump, you need to use a 1/4W 1.5K resistor in series with RS_W and CW_W, otherwise it will cause damage to the internal circuit of the pump.

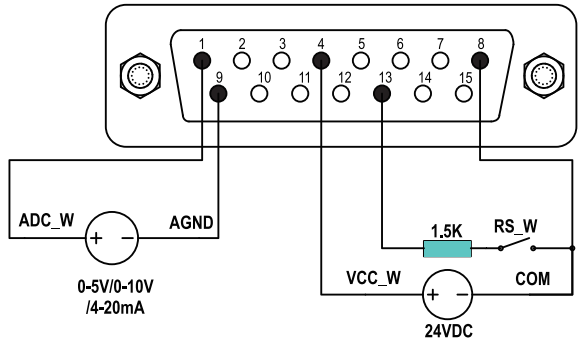


Figure 44 Wiring Diagram for Connecting External DC24V Power Supply in External Control Mode

Note: Follow the legend pins to provide the correct signal. Do not exceed the specified range of the signal value. Please pay attention to the specified voltage range when connecting to an external power supply, otherwise it may cause permanent damage and will not be covered by the warranty.

Note: Low voltage signals must be isolated from mains power. Use a separate shielded ground input wire.

Note: Use a qualified protective wire sleeve at the end of the multi-strand cable, otherwise there will be a risk of damage to the equipment.

◆Communication Mode

- RS485 communication supports MODBUS protocol, which can control various functions of the pump. For specific parameter addresses and support instructions, refer to the technical standard of Raffle Communication.
- Switch the power off, connect the circuit according to the wiring diagram below, and connect the DB15 interface to the back interface of the pump.

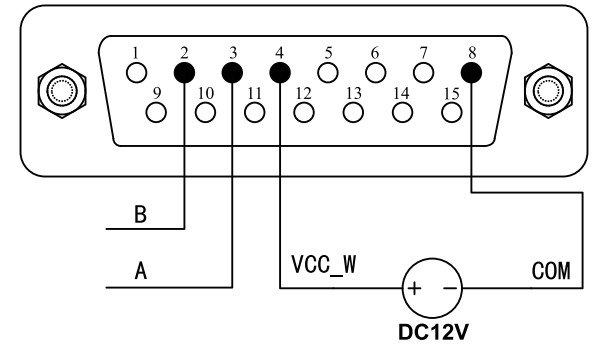


Figure 45 Communication External 12V Power Supply Wiring Diagram

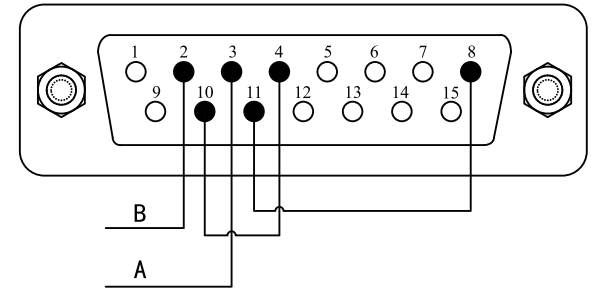


Figure 46 Communication Internal 12V Power Supply Wiring Diagram

- Turn on the power switch and the screen display the main control interface.
- In internal control mode, if the communication icon is closed, the communication connected, otherwise, the communication disconnected.
- Control the functions of the pump through communication.

⚠	Note: Follow the legend pins to provide the correct signal. Do not exceed the specified range of the signal value. Please pay attention to the specified voltage range when connecting to an external power supply, otherwise it may cause permanent damage and will not be covered by the warranty.
⚠	Note: Low voltage signals must be isolated from mains power. Use a separate shielded ground input wire.
⚠	Note: Use a qualified protective wire sleeve at the end of the multi-strand cable, otherwise there will be a risk of damage to the equipment.

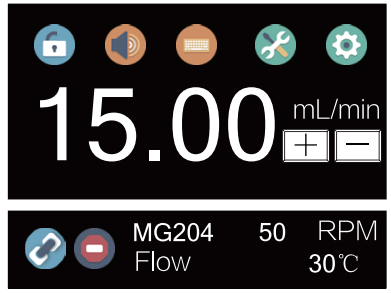


Figure 47 Communication Connected Interface

◆Foot Switch Mode

- Switch the power off, connect the circuit according to the wiring diagram below, and connect the DB15 interface to the back interface of the pump.

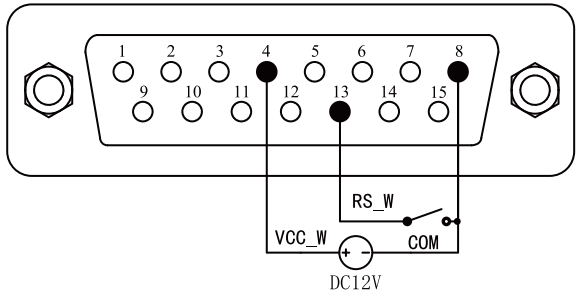


Figure 48 Foot Switch External 12V Power Supply Wiring Diagram

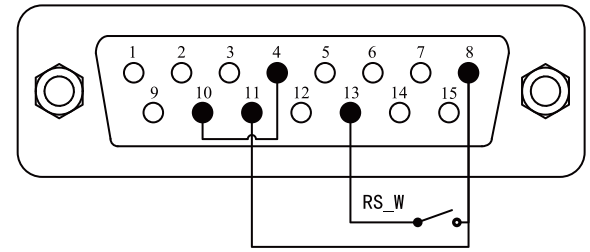


Figure 49 Foot Switch Internal 12V Power Supply Wiring Diagram

⚠	Note: Follow the legend pins to provide the correct signal. Do not exceed the specified range of the signal value. Please pay attention to the specified voltage range when connecting to an external power supply, otherwise it may cause permanent damage and will not be covered by the warranty.
⚠	Note: Low voltage signals must be isolated from mains power. Use a separate shielded ground input wire.
⚠	Note: Use a qualified protective wire sleeve at the end of the multi-strand cable, otherwise there will be a risk of damage to the equipment.

- Turn on the power switch and the screen display the main control interface.
- In internal control mode, liquid volume dispensing mode, time dispensing mode, and copy mode. Connect and then disconnect the switch of foot switch, the pump will begin to dispense.
- In foot switch mode, the external control mode is level. Connect the switch of the foot switch, the pump will run. Disconnect it, the pump will stop.
- In the foot switch mode, the external control mode is pulse. Connect and then disconnect the switch of foot switch, the pump will run, and do that again, the pump will stop.

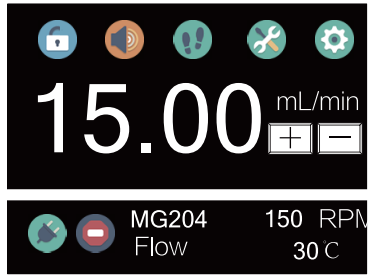


Figure 50 Foot Switch Interface

Malfunction and Maintenance

◆Drive Spare Parts

Spare Parts	Model	Spare Part Number
Blown fuses	1A	3020200100004
Power cable	250V 10A	3022300200016

Table 5 Drive Spare Parts

◆Daily Maintenance

- Regularly check the seal of the pipeline for leakage.
- Regularly check whether the filter needs to be replaced.
- When the tube line is not in use or not in use, please seal the inlet and outlet of the pump head with a sealing plug.

⚠	Note: Always disconnect the pump from the mains power before opening the pump head cover to change tubes, or performing any assembly, disassembly or maintenance activities.

◆Maintenance Worksheet

Carrying out regular maintenance on the pump according to the maintenance worksheet will help reduce the damage to the components of the pump, thereby ensuring the safety of people and property.

Maintenance Tasks	Frequency	Actions After Exception
Check if the pump leaks and damage.	1. Check before starting each time. 2. Daily visual inspection. 3. Periodic inspection during pump operation.	1. Before operating the pump, repair leaks and damage. 2. Replace parts when necessary. 3. Clean up all spilled liquid.
Check for abnormal temperature or noise during pump operation	1. Daily visual inspection. 2. Periodic inspection during pump operation.	1. Check and replace worn parts.
Do you need to replace the filter	1. Check flow rate at most every three days.	Please replace the filter in the following situations: 1. When the flow rate is lower than 75% of the original value. 2. Whether the filter is blocked.

Table 6 Maintenance Work List

◆Malfunction Solutions

NO.	Malfunction Type	Malfunction Description	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	Key does not work	1. Whether it is locked.
3	Hardware/ software	Communication does not work	**First check the software:** 1. Whether the mode is communication mode. 2. Reset the machine address. 3. Check if there are two machines on the bus using 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 supplies power.
4	Hardware/ software	External control does not work	**First check the software:** 1. Whether the mode is external control mode. **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 supplies power.

Table 7 Malfunction Solutions Reference Table

⚠	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

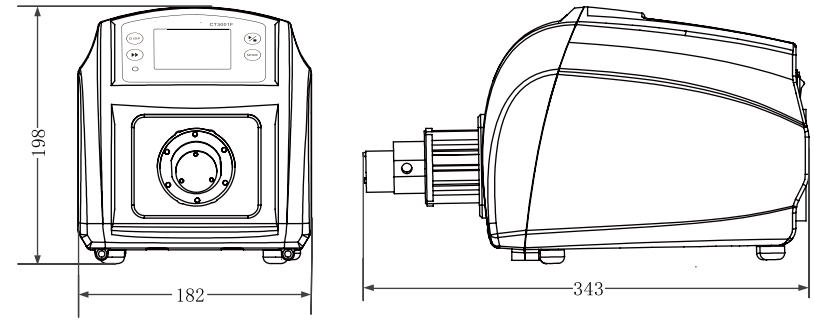


Figure 51 Dimensions(mm)

Ordering Information

Product Model	Description	Order Number
CT3001F		

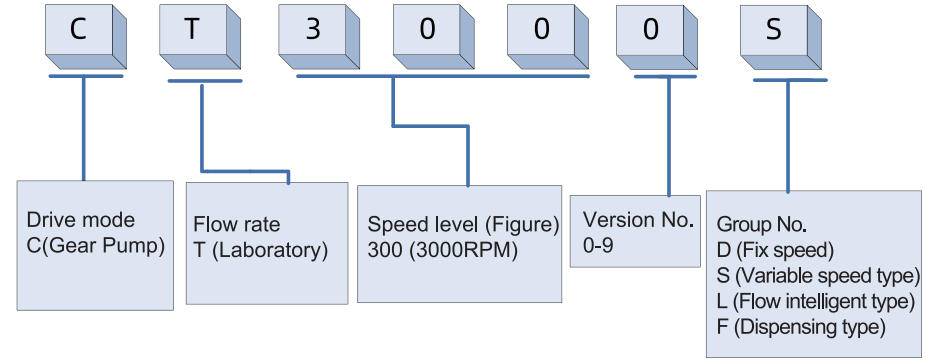
Table 8 Ordering information

Optional Accessories Table

Accessories list	Description	Order Number
Foot switch		1060200100017

Table 9 Table of Optional Accessories

Naming Rules



Technical Parameters

CT3001F Technical Parameters

Functions

Suitable Pump Heads	MG204, MG209, MG213
Main Functions	Key control start and stop, direction, full speed, state memory (power-off memory). Foot switch control, external control start/stop and direction, with optoelectronic isolator, 5V/12V/ 24V range level input optional, 0-5V/ 0-10V/4-20mA adjustable speed optional, flow mode, volume dispensing mode, time dispensing mode, and copy mode.
Communication Function	RS485, MODBUS remote control
Display Function	Color LCD touch screen
Direction Control	Uni-directional

Performance

Flow Range	15-2700 mL/min
Speed Range	50-3000 rpm/min
Speed Resolution	1 rpm, accuracy error less than ±0.5%
The time of Dispensing.	0.1~ 99.99 Second
Pause Time	0.1~ 999.9 Second
Number of Dispensing	0-999
Adjustment Method	Mask key+ touch screen operation
Display Method	65565 LCD
Applicable Power Supply	AC 100-240V 50Hz/ 60Hz
Wattage	<50W
Working Environment	Ambient temperature 5~40°C Relative humidity<80%
Dimensions	342X182X198mm
Driver Weight	3.5kg
Degree of Protection	IP31
Degree of Pollution	2

◆Flow Rate Chart of the Pump

Pump Head Model	Gear Material	Outlet Pressure Water (MPa)	Flow Range (mL/min)	Liquid Temperature °C
MG204XD0PT00000	PEEK	0.8	15-900	-45～120
MG209XD0PT00000	PEEK	0.8	30-1800	-45～120
MG213XD0PT00000	PEEK	0.3	45-2700	-45～120

Note: The above flow rate is 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 please to consult us.

◆Appendix

Schematic diagram of gear pump assembly

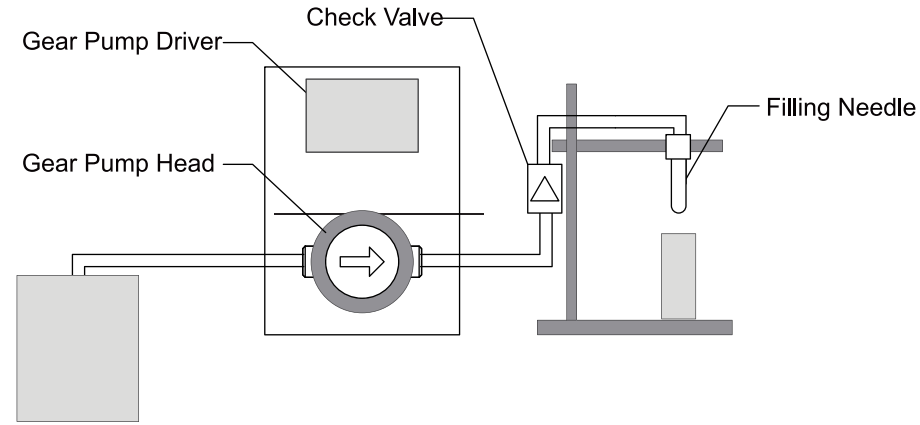


Figure 52 Schematic Diagram of Gear Pump Dispensing

1. The check valve must be installed in the vertical direction of the flow direction, and there is an arrow on the check valve, and the arrow must be upward.
2. The liquid level in the container on the inlet side of the pump must be below the check valve. Ideally, the suction line is placed horizontally or slightly upwards from the pump head.

3. Moving the tube will generate tension, which will affect the amount of liquid transferred and have a negative impact on the repeatability of liquid transfer. So we recommend fixing the tube and check valve at the output end on the outlet bracket.
4. In order to prevent the liquid from dripping, we further recommend installing a filling needle on the tube.

◆Touch Screen Calibration Wizard

During the use of the peristaltic pump, if you find that the touch is not accurate or the touch does not respond, you can follow the steps below to calibrate the screen.

1. Turn off the power of the peristaltic pump, press and hold the start-stop key and the mode key (MODE) at the same time, turn on the power switch, and release the key after seeing the interface shown in the figure below.
2. The interface shown in the figure below appears on the screen. Touch the dot at the bottom left of the screen with your finger or the tip of a pen, and the screen will display "OK" to enter the next step. Click the dot at the upper right corner of the screen again, as shown in the figure below. The screen displays "OK", go to the next step.

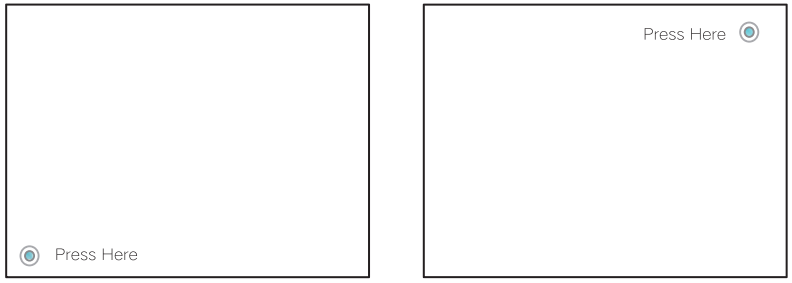


Figure 53Touch Screen Test Point Calibration Interface

3. The screen displays the coordinates of the touch point, touch any position on the screen again to complete the touch screen calibration.

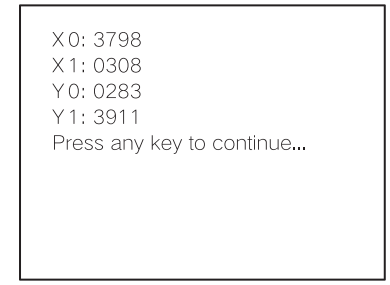
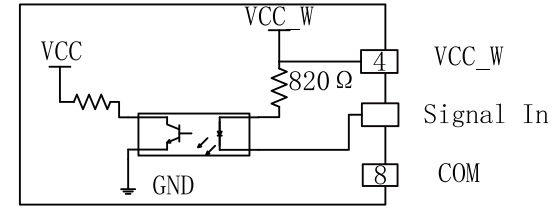
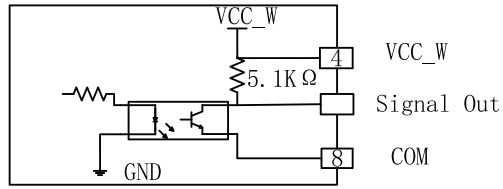
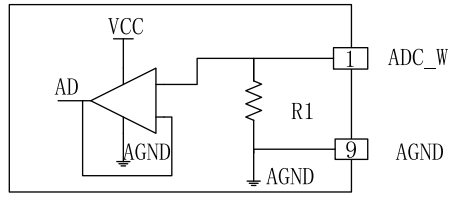


Figure 54 Touch Screen Calibration Interface

4. The screen displays the coordinates of the touch point, touch any position on the screen again to complete the touch screen calibration.

External Control Input and Output Performance

Input Switch Value or OC Gate Specification		
Project	Parameter	
Input Interface Principle		
Single Signal Input ON Current	5.5mA < Ion < 15mA	
Single Signal Input OFF current	Ioff < 1.5mA	
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	