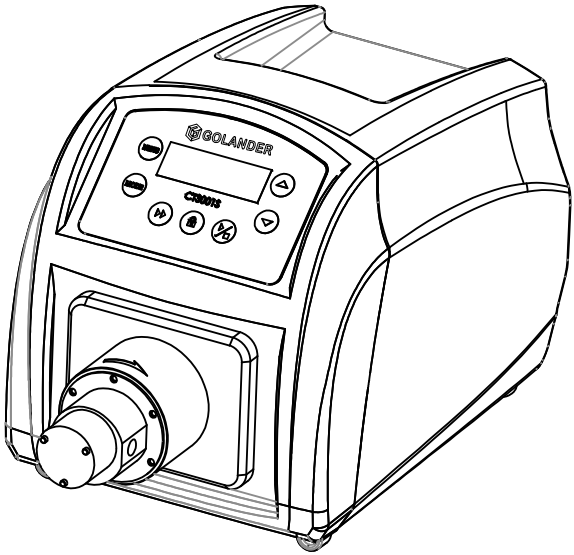
GOLANDER

CT3001S Variable-Speed Gear Pump

Operating Manual



Contents

Safety Precautions

Danger

- Please use the correct AC power voltage source shown on the nameplate attached to the equipment to avoid any damage.
- Please do not open the case. It may cause a malfunction or an electric shock. For maintenance, please contact the manufacturer or distributor directly.
- To install or remove the pump head, please first turn off the power supply. Handle the flange of the pump head carefully and refrain from using pliers to clamp it, as this may cause inner core displacement or even permanent damage to the pump.
- This product is unsuitable for explosion-proof environments and must not be operated in explosive atmospheres.

Warning

- Connect the machine’s protective ground properly. The pump is equipped with a grounded plug, which must remain well-grounded at all times to prevent electric shock or electromagnetic interference.
- This product is not designed for or intended for patient-connected applications, including medical or dental use.
- Always remove power from the pump before performing maintenance, cleaning, or connecting or disconnecting external control devices or communication interfaces.
- Tubing breakage may result in fluid being sprayed from the pump. Take appropriate safety measures to protect the operator and the surrounding equipment.
- Only remove the two protective covers on the pump head immediately before installing connectors or tubing to prevent foreign objects from entering and damaging internal components.

- Take care when sealing tubing to prevent leaks. Avoid any foreign substances, such as sealant or Teflon tape, from entering the pump.
- Ensure that the inner diameter of the tubing, especially at the inlet, matches the pump's capacity to avoid cavitation and abnormal wear. The combined pressure between the inlet and outlet must not exceed 20 bar (290 psi).
- It is strongly recommended to install a filter at the inlet to remove particles larger than 10 μm. Ensure the filter has sufficient surface area to avoid pressure loss. Regularly inspect the filter. If a vacuum gauge is installed after the filter and the vacuum exceeds 0.1 bar, the filter element should be cleaned or replaced.
- The gear pump can only transport liquid in one direction, so make sure the inlet and outlet are correctly connected.

1 Introduction

The CT3001S is a high-performance, low-noise micro gear pump equipped with a brushless motor and a magnetically driven pump head, delivering low-pulsation, constant-flow fluid control. It features an LCD display and intuitive key-based operation for easy parameter setting. With real-time RPM monitoring and timed dispensing functions, the pump is well-suited for a wide range of applications. It offers multiple external control and standard MODBUS RS485 interfaces for seamless integration with external devices. The CT3001S operates at speeds ranging from 50 to 3000 rpm, with a speed resolution of 1 rpm.

2 Functions and Features

- 128x32 dot matrix LCD with simple parameter setting and intuitive status display.

- Multiple working modes, including internal control, external control, timed dispensing, and level mode.
- Functions include start/stop, full-speed operation, speed regulation, and power-off memory (state memory).
- Supports wide external control signal voltage input from 5 to 24 V.
- Speed regulation and start/stop control via external analog signals with photoelectric isolation.
- External speed regulation signal type (voltage or current) can be switched on the control panel.
- RS-485 communication supporting MODBUS protocol with configurable communication parameters for easy integration.
- Multiple control parameters can be customized, suitable for OEM applications.
- Circuit board coated with conformal coating for dust-proof and moisture-proof protection.
- Strong anti-interference capabilities and wide voltage design suitable for complex power supply environments.
- Stainless steel shell that is easy to clean and resists corrosion from acids, alkalis, salts, and organic solvents.
- Streamlined plastic casing for additional durability.

3 Components and Connectors

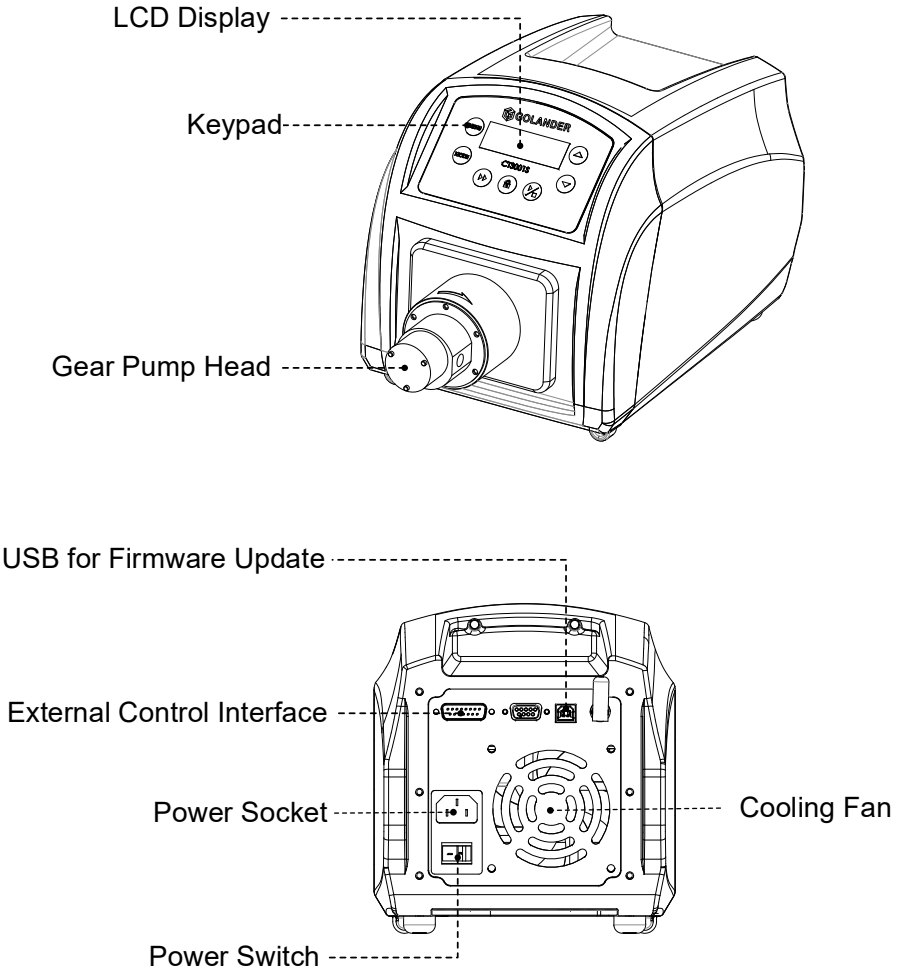


Figure 1. Components and Connectors

4 Display Panel and Operating Keypads

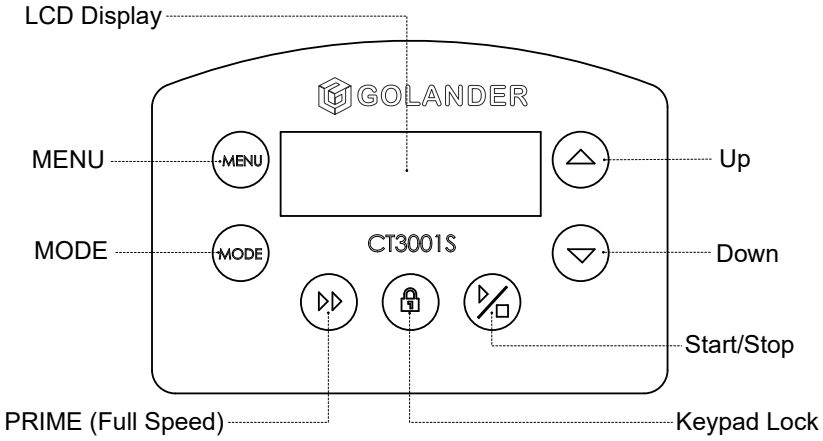


Figure 2. Display Panel

4.1 Keypad

UP key: To increase speed. Press briefly to increase the last digit by 1. Hold the key to increase speed quickly.

DOWN Key: To decrease speed. Press briefly to decrease the last digit by 1. Hold the key to decrease speed quickly.

MENU Key: From the main interface, press this key to enter the menu interface. In the menu interface, press this key to return to the main interface. It is disabled during pump operation.

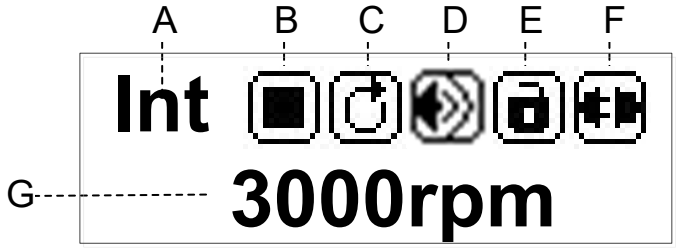
MODE Key: Switch between control modes: internal control, external control, timing, and level 1 mode. This key is disabled during pump operation.

PRIME (Full Speed) Key: Press this key to toggle between the highest speed and the current speed setting.

Lock Key: Press this key to toggle the lock or unlock state of the pump.

Start/Stop Key: Use this key to start or stop the pump. In menu mode, press it to enter the sub-menu.

4.2 LCD Display



A. Control Mode

It displays the current control mode. Press the MODE key to switch between the following control modes:

- Internal Control Mode (Int): Use the keypad to operate the pump. Use an optional external pulse signal to control the start and stop.
- External Control Mode (Ext): Use an external analog signal to control rotation speed. Use an external logic level signal to control direction, start and stop. The keypad is disabled.
- Time Dispense Mode (Disp): Dispense fluid automatically by setting the duration for each dose, pause time between doses, and the number of cycles.
- Logic Level 1 Control Mode (footswitch) (Lev1): Use an external logic-level signal to control the start and stop. Use the keypad to control direction and speed.

B. Running State

Stop Running Pause

C. Direction

Clockwise Counterclockwise

D. Key Tone

Tone on

Tone off

E. Keypad Lock

Keypad unlocked

Keypad locked

When the keypad is locked, only the START/STOP key will work. In the main screen, press and hold the DIRECTION key to lock the keypad; press and hold the START/STOP key to unlock the keypad.

F. Communication

Communication disconnected

#1

Connected, the pump number is set to 1

G. Rotating Speed

The current rotating speed, i.e., revolutions per minute, is displayed. When the pump is running at full speed, the display will be >>>>>>>.

5 Parameter Settings

On the main screen, press the MENU key to access the settings menu. Press the UP or DOWN key to choose the parameter you wish to adjust. Press the START/STOP key to display the current value of the

parameter, and use the UP or DOWN key to modify the value. Press the START/STOP key to confirm the changes, and then press the MENU key to return to the main screen.

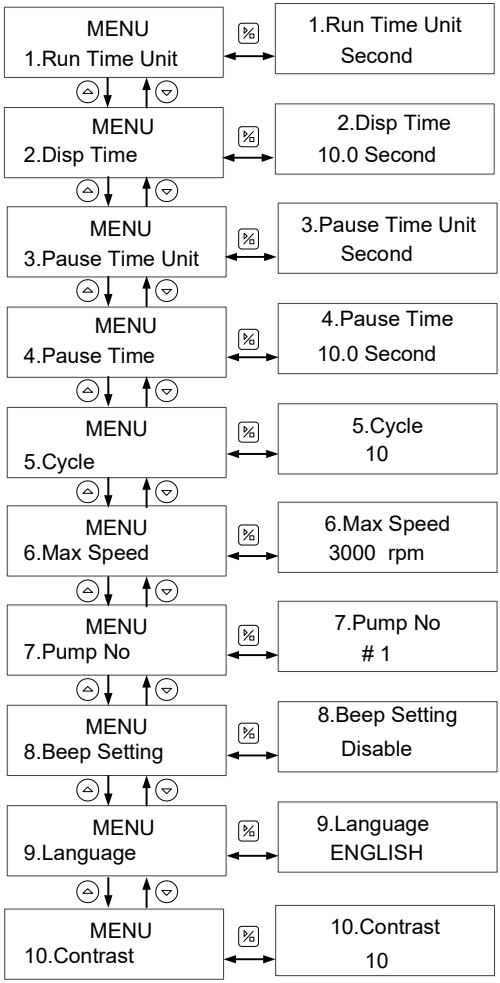


Figure 3. Parameter Setting Flow Chart

1) Run Time Unit: Time unit for the dispense duration in Time Dispense mode, configurable in seconds, minutes, hours, and days.
2) Dispense Time: It is the dispense duration for each dose in Time Dispense mode, adjustable within the range of 0.1 to 999 seconds/minutes/hours/days.

3) Pause Time Unit: Time unit for the interval time in Time Dispense mode, selectable in seconds, minutes, hours, and days.
4) Pause Time: Pause time between doses in Time Dispense mode. It is the lag time between successive doses when the number of cycles is set to more than 1, with a range of 0.1 to 999 seconds/minutes/hours/ days.
5) Cycle: Number of cycles in Time Dispense mode, ranging from 0 to 999 cycles. When set to 0, dispensing continues until manually stopped; when set to any other value, the pump stops after the specified number of cycles (*Figure 12*).
6) Max Speed: Maximum speed for External Control Mode. It is the maximum speed that the external analog signal can control.
7) Pump No: It is the pump's communication address for the communication mode. Restart the pump to take effect.
8) Beep Setting: Set the key tone on or off.
9) Language: System language setting, English or Chinese.
10) Contrast: LCD backlight contrast setting.

6 Advanced System Parameter Settings

In the main interface, press the MENU and UP keys to enter the advanced system parameter setting interface. In this interface, press the UP and DOWN keys for advanced parameter selection, press the START/STOP key to enter the submenu, and press the UP or DOWN key to adjust the parameters. To return to the previous menu, press the START/STOP key. To return to the main interface, press the MENU key.

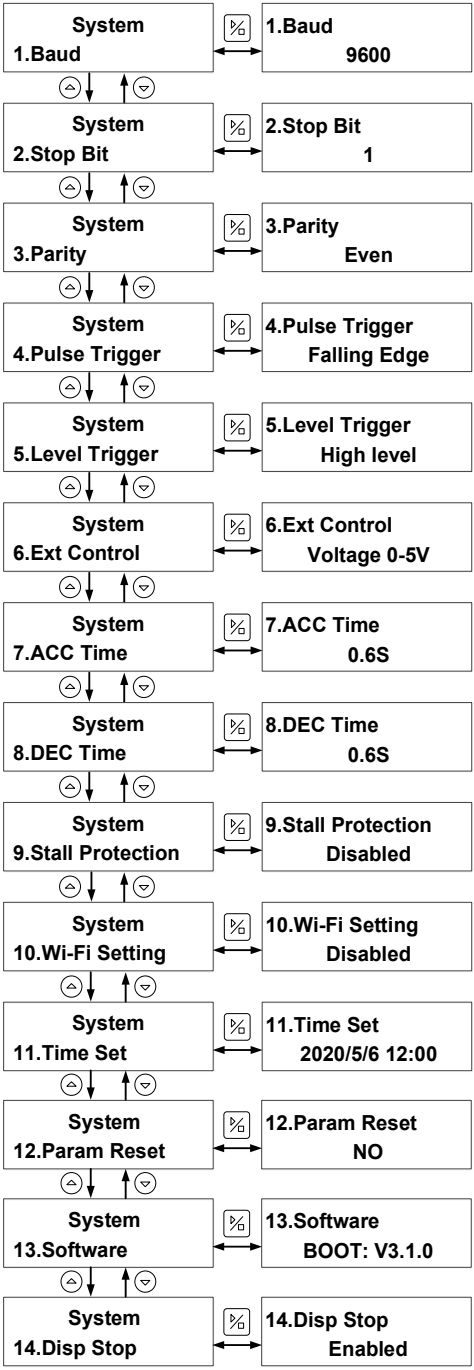
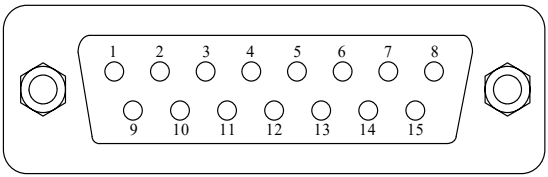


Figure 4 System advanced parameter setting flow chart

1. Baud: In communication mode, set the baud rate to 4800, 9600, 19200, 38400 (default is 9600).
2. Stop Bit: In communication mode, specify the stop bit size, options are 1 or 2 (default is 1).
3. Parity: In communication mode, set the parity type to odd parity, even parity, or none parity (default is even parity).
4. Pulse Trigger: In Internal Control or Time Dispense mode, set the pulse trigger type of external control start/stop signal of the drive, and choose between the rising edge trigger and falling edge trigger (default is falling edge trigger).
5. Level Trigger: In External Control or Level mode, set the level trigger type when the drive is controlled externally, options include high-level trigger and low-level trigger (default is the high-level trigger).
6. Ext Control (External Control): In External Control mode, the parameter type of analog signal to control the drive speed can be set to voltage mode 0-5V, voltage mode 0-10V, and current mode 4-20mA (drive speed changes linearly with the change of external control analog signal).
7. ACC Time (Acceleration Time): Set the acceleration time when the drive is started and running. The unit is in seconds (the default value is 0.5 seconds).
8. DEC Time (Deceleration Time): Set the deceleration time when the drive stops running. The unit is in seconds (the default value is 0.5 seconds).
9. Stall Protect: The setting of stall protection is off by default (the WIFI version has this function).
10. Wi-Fi Setting: The Wi-Fi is off by default (the WIFI version has this function).
11. Time Set: Set the current date and time. Press the PRIME key to change the set parameters, press the UP or DOWN key to adjust the time, and press the START/STOP key to save and exit.
12. Param Reset: Restores parameters to their original factory settings. Restart the pump to apply the change**.**
13. Software: Information on the current software used.

14. Disp Stop: In dispensing mode, enabling the function ensures that the dispensing process remains unaffected by other external control signals (noises).

7 External Control Interface



DB15 Pin	Mark	Note
1	ADC_W	Positive of external analog input
2	B	Communication interface, B pole of RS485
3	A	Communication interface, A pole of RS485
4	VCC_W	External DC power input
5		
6		
7		
8	COM	Ground of external power
9	AGND	Negative of the analog signal input
10	+12V	Positive of internal +12V power source
11	GND	Ground of the Internal power source
12		
13	RS_W	Start/stop signal input
14		
15	RS	Start/stop signal output

Attention:

- Follow the pin legend to provide the correct signals. Do not exceed the specified signal value range. Ensure the external power supply voltage is within the specified limits to avoid permanent damage, which is not covered by the warranty.
- Low-voltage signals must be electrically isolated from mains power. Use a separate shielded ground wire for input.
- Use a proper protective wire sleeve at the end of multi-strand cables to prevent equipment damage.

8 Operation Instructions

8.1 Before Operation

1) Please check the packing slip to confirm that all items are intact and undamaged. If you encounter any issues, contact the manufacturer or distributor for assistance.
2) Carefully read the provided instructions to familiarize yourself with the setup and operation procedures.
3) Ensure there is at least 200 mm of space behind the pump during operation to allow proper ventilation.

8.2 Power Connection

The voltage of the power supply is indicated on the nameplate of the pump drive. Please ensure to use the correct power source for the pump. Plug the power cord into the power connector on the rear of the pump and plug the opposite end of the power cord into an electrical outlet. Flip the power switch located on the rear of the pump to turn it on.

8.3 Install pump head and tubing

Install pump head

1) Put the pump head into the pump head holder, ensuring the entrance is horizontal.

2) Align the pump head with the bracket mounting holes, then secure it using the provided M3x8 mm stainless steel screws and nuts.

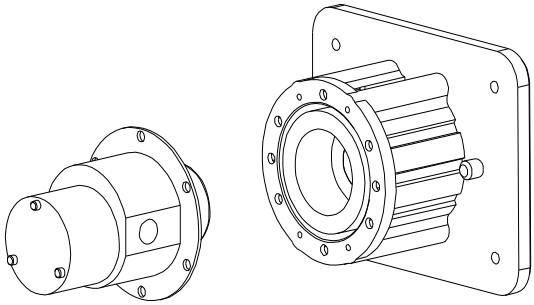
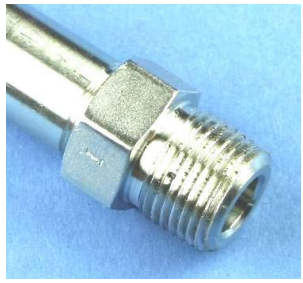


Figure 5. Install Pump Head

Install tubing

1) Screw the 1/8NPT threaded stainless steel or plastic joints onto the pump head. Ensure that both the internal and external threads are in good condition and free of any residue.

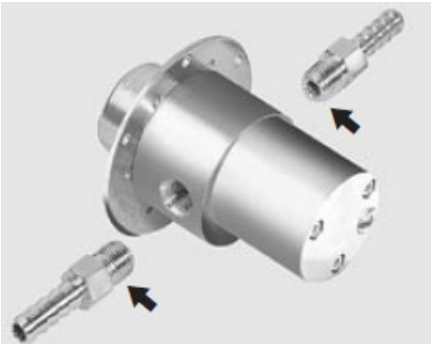
Good



Defective

2) Wrap two layers of Teflon tape clockwise around the threads. Ensure that no tape enters the inner part of the pump.

3) Tighten the nut on the pump with a torque wrench. **Avoid applying excessive force to prevent thread damage.**



8.4 Working Mode

Turn on the power. The display will show a welcome message then the main screen. Press the MODE key to change the working mode.

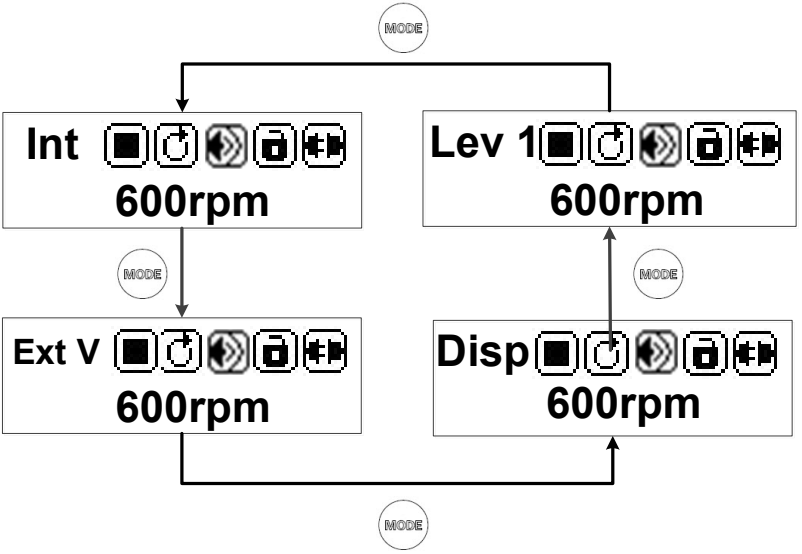


Figure 6. Change Working Mode

8.5 Internal Control Mode

In this mode, the pump is operated using the keypad on its front panel.

- Turn on the power switch. The LCD screen will display a welcome message and then show the main interface.
- Press the **Mode** key to switch to internal control mode, as shown in the figure below:

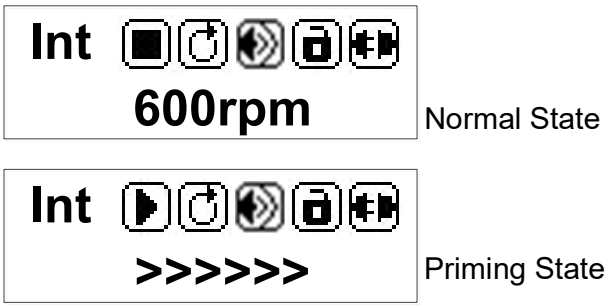


Figure 7. Internal Control Mode

- Use the **Up** and **Down** keys to adjust the desired speed.
- Press the **Lock** key to lock or unlock the device.
- Press the **Start/Stop** key to start or stop the pump.
- Press the Prime (**Full Speed)** key to run the pump at maximum speed.

8.6 External Control Mode

In this mode, use a logic level signal to control start and stop, and use an external analog signal to control rotation speed. The keypad is disabled.

To control the pump with external signal

1) Switch the power off. Wire the DB15 connector as shown in *Figure 8* or *Figure 9*, and connect it to the DB15 port on the rear of the

pump.

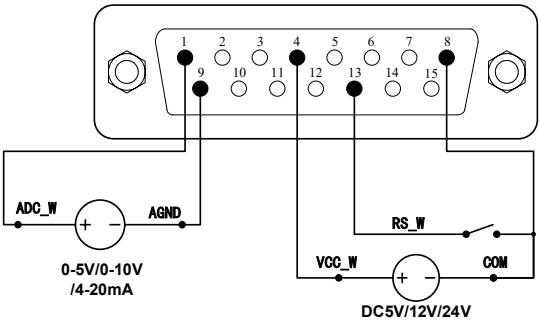


Figure 8. DB15 Wiring with External Power Source

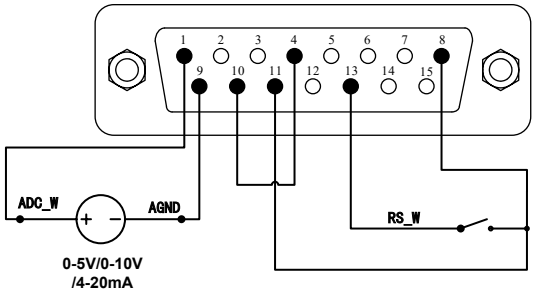


Figure 9. DB15 Wiring with Internal Power Source

2) Turn on the power switch. The LCD screen will display a welcome message and then enter the main interface.
3) Press the **Mode** key to switch to external control mode, as shown in the figure below:

For External Voltage Signal
0-5V/0-10V

For External Current Signal
4-20mA

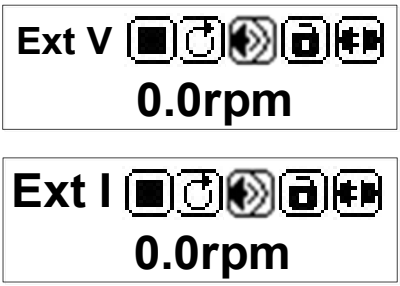


Figure 10. External Control Mode

4) Close the external RS_W switch and turn on the analog power supply. The pump speed will vary according to the analog input value. When the external RS_W switch is opened (disconnected), the pump will stop running.

8.7 Time Dispense Mode

The pump will dispense fluid automatically by setting the duration for each dose, the pause time between doses, and the number of cycles. When dispensing, the display will show the dispensing time or pause time (1.2s in *Figure 11*), and the total cycles that have been dispensed (4 in *Figure 11*).

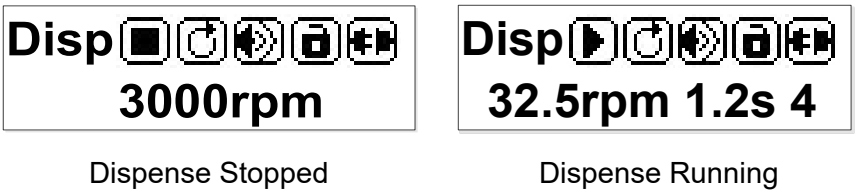


Figure 11. Time Dispense Mode

To set the Time Dispense Mode

1) Turn on the power. The pump will display the main screen.
2) Press the MODE key to change the mode to Time Dispense mode (“Disp” shown on the screen).
3) Press the MENU key to enter the settings menu.
4) Set duration for each dose, pause time between doses, and

number of cycles.

5) Return to the main screen.

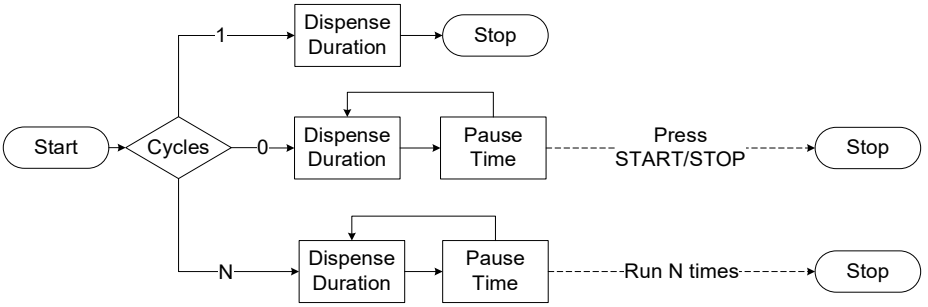


Figure 12. Dispense Cycle Setting

To run the Time Dispense mode

1) Press the DIRECTION key to change the running direction, clockwise or counterclockwise.
2) Press the START/STOP key to start dispensing.
3) When the pump is running, press the START/STOP key to stop it at any time.
4) A footswitch can be used to start/stop the pump.

8.8 Logic Level 1 Control Mode (footswitch)

Use an external logic-level signal to control the start and stop. Use the keypad to control direction and speed.

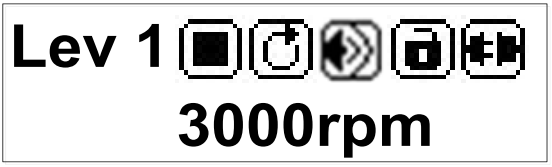


Figure 13. Logic Level 1 Control Mode

1) Turn off the power. Wire the DB15 connector as shown in *Figure 14* or *Figure 15*, and connect it to the DB15 port on the rear of the pump.

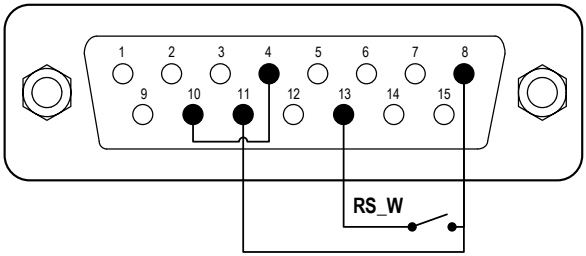


Figure 14. Logic Level 1 Control with Internal Power Source

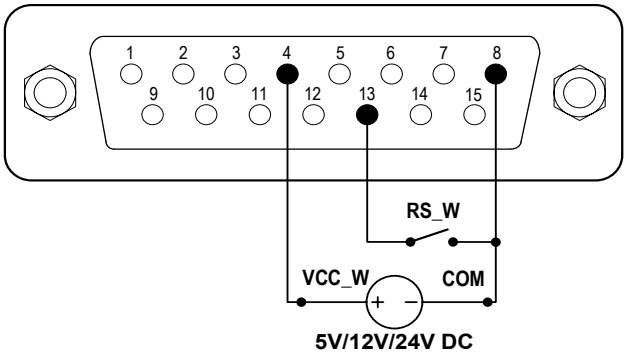


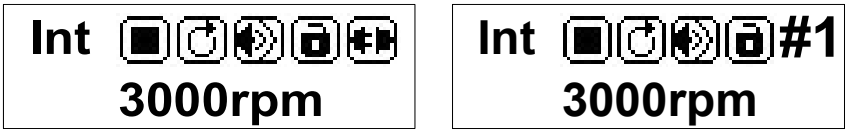
Figure 15. Logic Level 1 Control with External Power Source

2) Turn on the power. The pump will display the main screen.
3) Press the MODE key to change the mode to Logic Level 1 control mode ("Lev1" shown on the screen).
4) Press the UP or DOWN key to adjust the speed.
5) Press the DIRECTION key to change the rotating direction.
6) When the switch is closed, the drive will start running; when the switch is opened, the drive will stop.

Note: Use this mode to work with a TIME CONTROLLER.

8.9 Communication Mode

The RS485 interface supports the standard MODBUS protocol. The pump can communicate with external devices via the communication port. Please refer to the Communication Instruction manual for the parameters and supported commands.



Communication Disconnected

Communication Connected
The pump number is set to 1.

Figure 16. Communication Mode

1) When the power is off, wire the DB15 connector as shown in ***Figure 18*** and connect it to the DB15 port on the rear of the pump. An external DC power source is recommended to avoid electrical interference.

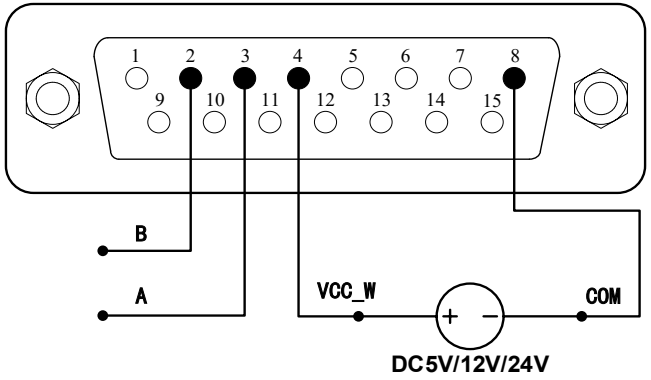


Figure 17. Communication Mode with External Power Source

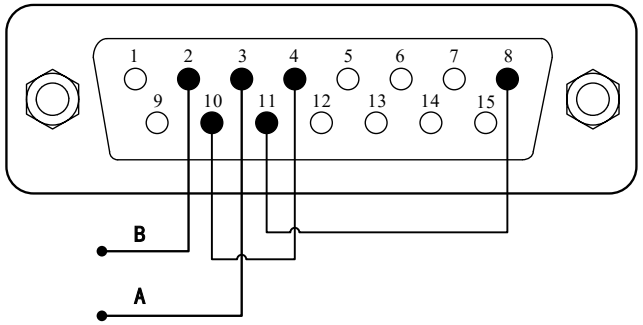


Figure 18. Communication Mode with Internal Power Source

2) Turn on the power switch. The pump will display the main screen.
3) Press the MODE key to change the mode to Internal Control mode or Time Dispense mode.
4) Control the pump with the communication interface.
5) Press the START/STOP key to stop the pump at any time.

9 Maintenance

9.1 Warranty

The product is covered with a one-year warranty starting from the customer's date of purchase:

1. The warranty covers the pump drive only, while the pump head, tubing, and consumable parts are excluded.
2. The warranty period begins on the purchase date shown on the invoice.
3. If a quality issue arises within the warranty period, we will provide free repair or replacement.
4. For problems caused by human factors such as water damage, impact, or improper use, we will waive labor fees but charge for material costs.

9.2 Regular Maintenance

1) Regularly inspect the tubing and connections for any signs of leakage.
2) Avoid blocking the fan located at the rear of the pump.
3) Keep the pump head dry at all times.
4) If a filter is used, check and replace it regularly.
5) Refrain from using chemical solvents to clean the pump or pump head.

9.3 Malfunction Solutions

No.	Mal-function	Description	Solution
1	Hardware	No display	1. Check the power cord 2. Check the fuse. If it was blown, replace it with a 1A slow-blow fuse 3. Check the internal power cord connection inside the pump.
2	Hardware	The motor does not work	1. Check the indicator of the drive board. 2. Check the wire connection between the motor and the drive board. 3. Check the wire connection between the drive and the mainboard. 4. Check the power voltage for the pump.
3	Hardware	Motor vibrates	1. Check the wire connection between the motor and the drive board. 2. The motor is overloaded. Check the mechanical connection.
4	Hardware	Motor only runs in one direction	Check the connection between the drive board and the main control board.
5	Hardware	The keypad does not work	1. Check the wire connection between the keypad and the mainboard. 2. Check if the key is broken.
6	Hardware	Noisy when running	1. When the pump operates between 70 and 120 revolutions per minute, noise may occur due to the motor's resonance frequency. This is considered normal. 2. Check the screws and levers on the pump head to make sure they are secure.
7	Hardware/ software	External control does not work	1. Check the wiring of the connector. 2. Check if the external control power voltage is provided.

			3. Check the connections of the external control board. 4. Check if the pump is on External Control Mode.
8	Hardware/ Software	RS485 com does not work	1. Check the wiring of the connector. 2. Check if the external control power voltage is provided. 3. Check the connections of the communication board. 4. Check if the display shows that the communication is ready. 5. Reset the address of the pump. 6. Check whether on the bus there are two pumps using the same address

If an issue persists, please contact the manufacturer or distributor for assistance.

10 Dimensions

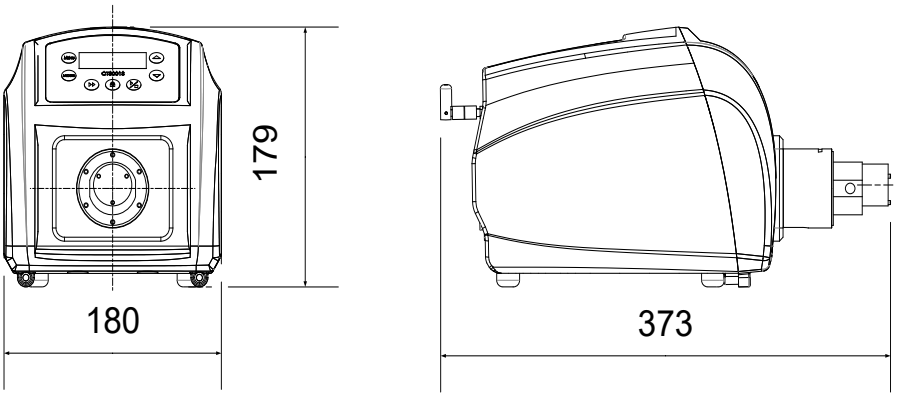
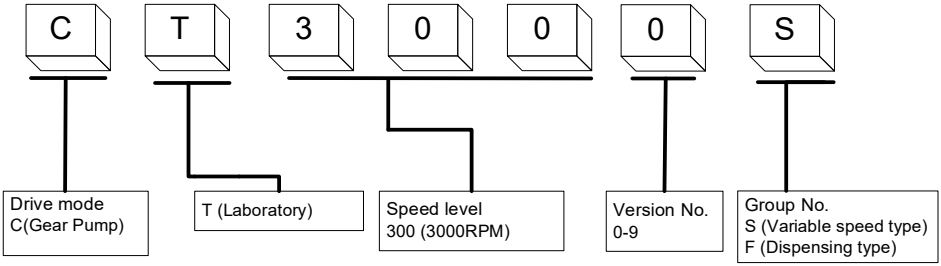


Figure 19. Dimensions (mm)

11 Naming Rule



12 Specifications

Suitable Pump Heads	MG204, MG209, MG213
External Control Functions	Key start/stop, full speed, state memory (power-off memory), foot switch control, and external start/stop with photoelectric isolation. Level signal input: 5V/12V/24V (optional). Speed adjustment: 0–5V/0–10V/4–20mA (optional). Timed dispensing is supported.
Communication Functions	RS-485 interface, MODBUS protocol supported
Display Functions	Displays real-time speed and control mode
Flow Range	15-900, 30-1800, 45-2700mL/min
Speed Range	50-3000 rpm
Speed Resolution	1 rpm
Adjustment Method	Keypad control
Display Method	128x32 LCD screen
Power Supply	AC 100-240V, 50-60Hz
Power Consumption	< 50 W
Operating Environment	Temperature: 5-40°C Relative humidity: < 80%

Dimensions (L × W × H)	373 x 180 x 179 mm
Drive Weight	3.8 kg
Protection Rating	IP31

13 Suitable Pump Heads

Pump Head Model	Gear Material	Outlet Pressure Water (MPa)	Flow Range (mL/min)	Liquid Temperature °C
MG204	PEEK	0.8	15-900	-45-120
MG209	PEEK	0.8	30-1800	-45-120
MG213	PEEK	0.3	45-2700	-45-120

The flow range data listed above were obtained using pure water (normal temperature and pressure) and are for reference only. In actual use, factors such as pressure, temperature, and fluid properties may lead to deviations. For precise performance details under specific conditions, please contact us.

14 Appendix

14.1 Schematic Diagram of Gear Pump Assembly

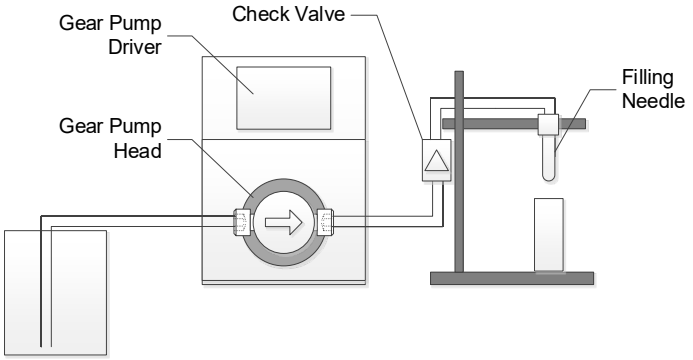
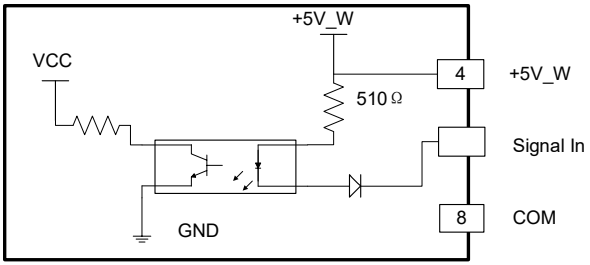
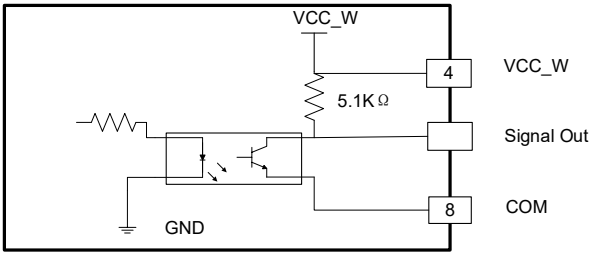


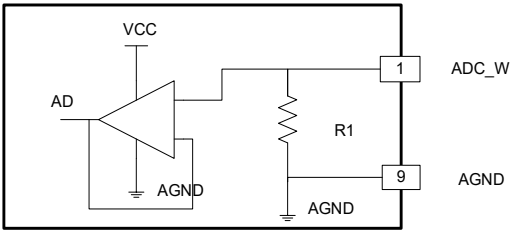
Figure 20. Schematic Diagram of Gear Pump Dispensing

1. The check valve must be installed vertically in the direction of flow. Ensure the arrow on the valve points upward.
2. The liquid level in the inlet container must be below the check valve. Ideally, the suction tubing should be laid horizontally or slightly inclined upward from the pump head.
3. Movement of the tubing can introduce tension, affecting the volume and repeatability of liquid transfer. It is recommended to fix the tubing and check valve to an outlet bracket.
4. To prevent dripping, it is advisable to attach a filling needle to the outlet tubing.

14.2 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	I_{off}＜1.5mA
Signal Input Method	Switch (closed, open) or NPN transistor OC gate
External Control Input Voltage	5-24V
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

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