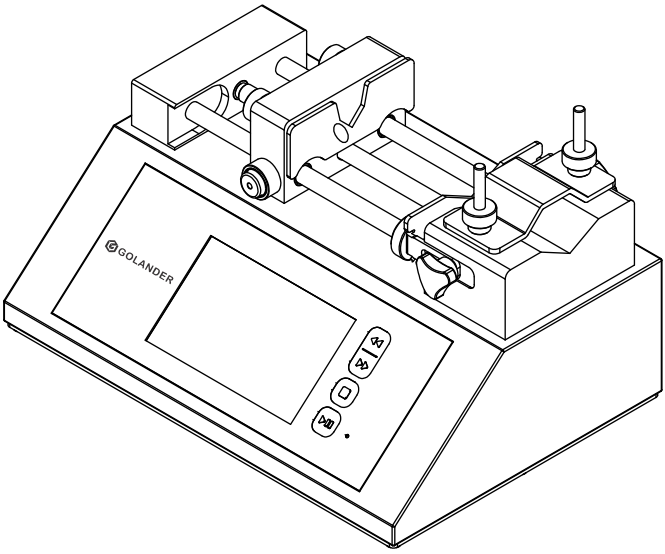
GOLANDER

LAB Series Syringe Pump

Operating Manual



Contents

Safety Precautions

Danger

- Use the correct voltage as indicated on the rating plate label of the pump to prevent damage.
- Unauthorized dismantling, changes, or modifications to the pump may result in malfunctions or potential accidents. Exercise caution when servicing internal components.
- The grounding plug must remain properly grounded at all times to prevent the risk of electric shock or electromagnetic interference.

Warning

- Maintain a safe distance from the lead screw during syringe pump operation to prevent fingers or loose clothing from getting caught in the drive.
- When installing a syringe, the limit block must be adjusted to the appropriate position to avoid accidental damage to the syringe. Our company is not liable for losses caused by syringe damage, including leakage of toxic, hazardous, or valuable liquids.
- Turn off the power before connecting or disconnecting external control devices or communication interfaces.
- This product is not intended for medical use.

1 Description

The LAB series syringe pumps support syringes of various sizes and offer five distinct operating modes: infuse, withdraw, infuse/withdraw, withdraw/infuse, and continuous cycle. A high-resolution color LCD touchscreen enhances user convenience for parameter configuration, with clear indicators displaying the pump's working status. The built-in options for syringes from various manufacturers and specifications allow for easy selection. Pre-stored data enable adaptability to diverse flow requirements. These syringe pumps provide high-precision control with integrated protection and alarm features. External signal controls allow seamless start and stop operations. The built-in RS485 communication interface, compatible with the MODBUS protocol, enables easy control of one or multiple pumps via external devices.

The LAB series includes the following models:
LAB-01: Single syringe, size 10 µl - 140 ml, linear velocity 1 µm/min - 150 mm/min.
LAB-02: Dual syringes, size 10 µl - 140 ml, linear velocity 1 µm/min - 150 mm/min.
LAB-04: Quadruple syringes, size 10 µl - 10 ml, linear velocity 1 µm/min - 150 mm/min.
LAB-10: Decuple syringes, size 10 µl - 10 ml, linear velocity 1 µm/min - 150 mm/min.

Applications

- Micro volume transfer
- Micro flow rate transfer
- No pulsation transfer
- High-precision transfer

2 Functions and Features

- Various operational modes
- 5-inch color LCD touch screen for ease of use
- Screen lock and key mute functions supported
- Clear operational status indication through indicator lights
- Compatibility with a variety of syringes, including standard and user-defined types
- Storage of multiple pre-set data configurations
- High-precision control capabilities
- Syringe protection and alarm features
- RS485 MODBUS communication support
- External control signal for start/stop and direction control
- A wide input voltage range AC 100-240V, 50Hz/60Hz
- Durable all-metal housing

3 Components and Connectors

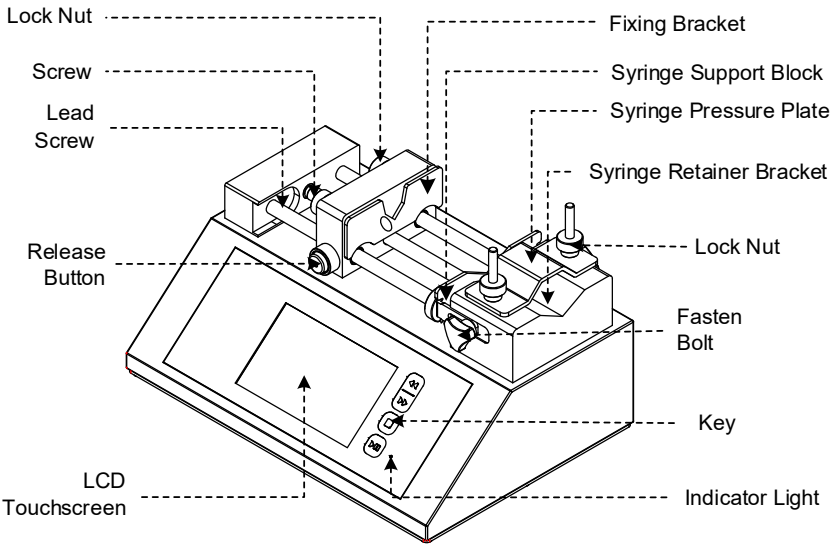


Figure 1 LAB-01 Components

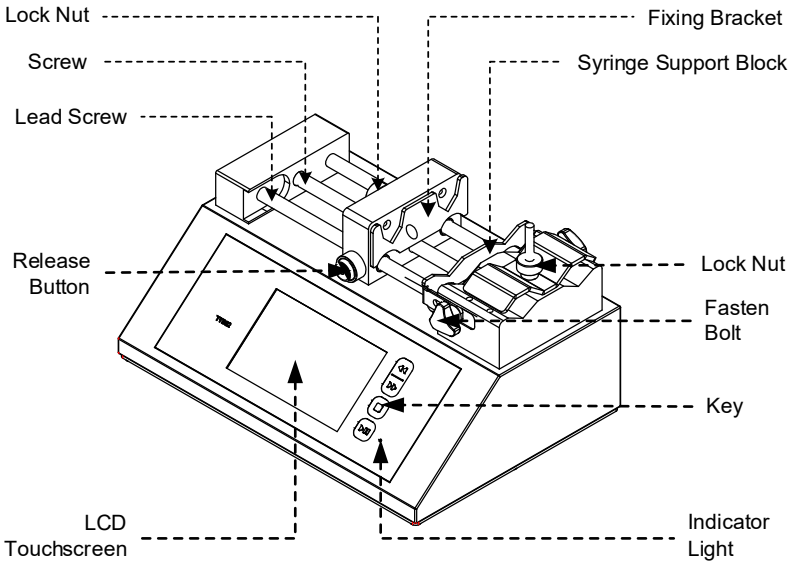


Figure 2 LAB-02 Components

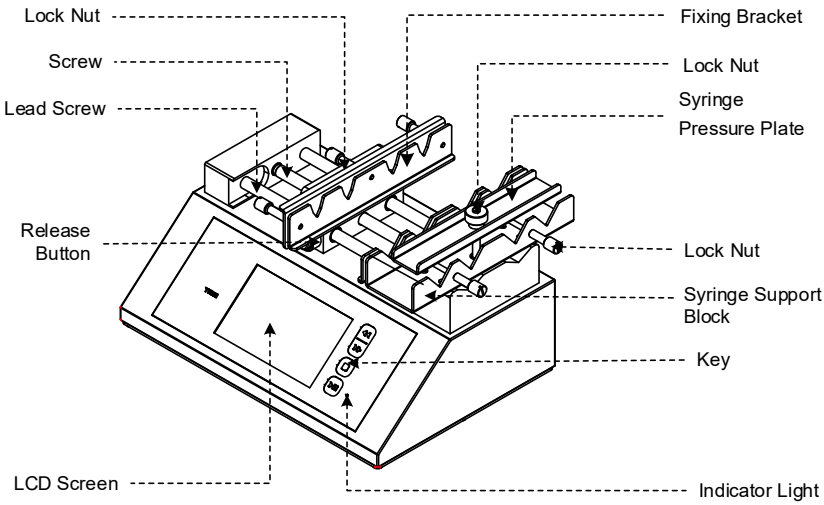


Figure 3 LAB-04 Components

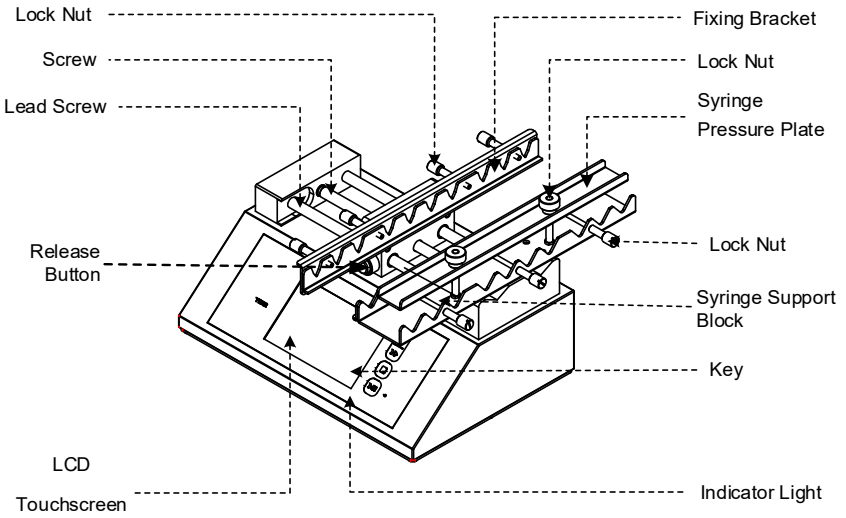


Figure 4 LAB-10 Components

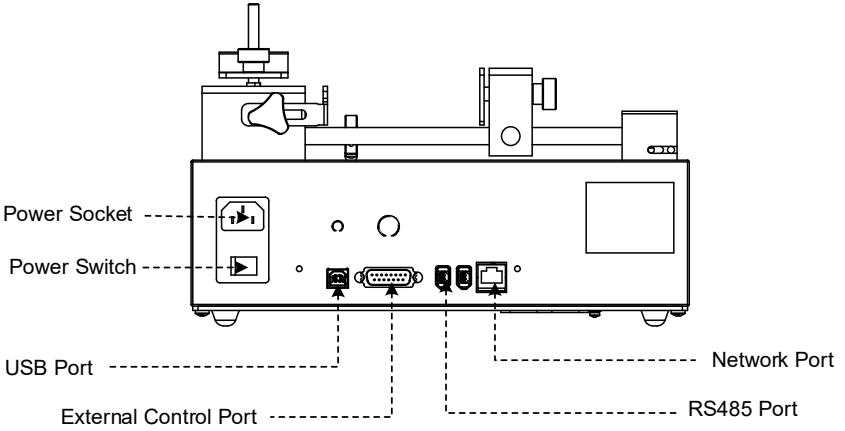


Figure 5 LAB Connectors

4 Display Panel and Operating Keypad

4.1 Keypad

Figure 6. Operating Keypad

START/PAUSE key. Press to start, pause or resume the defined operation.

STOP key. Stop or reset the operation.

FAST FORWARD key. When the drive stops, press and hold the key to advance at the maximum speed.

FAST BACKWARD key. When the drive stops, press and hold the key to reverse at the maximum speed.

Green Indicator Operation status indicator. It lights up when the drive starts. It blinks when the operation is paused.

Red Indicator Lights up when an operation is stopped or completed. It blinks when the motor stalls.

4.2 LCD Touch Screen Display

Icon	Indication	Icon	Indication
	Tone On		Tone Off
	Communication Connected		Communication Disconnected
	Infuse		Withdraw

	Screen Locked		Screen Unlocked
	Run		Pause
	Stop		Selected
	Not Selected		

Data entry: When the drive is not running, press the number to input the desired value in the pop-up window.

Figure 7. Flow input screen

Max: Maximum allowed value
Min: Minimum allowed value
⌫: Delete the last digit
X: Cancel the current entry data
Enter: Confirm the current entry data

4.3 Main Display

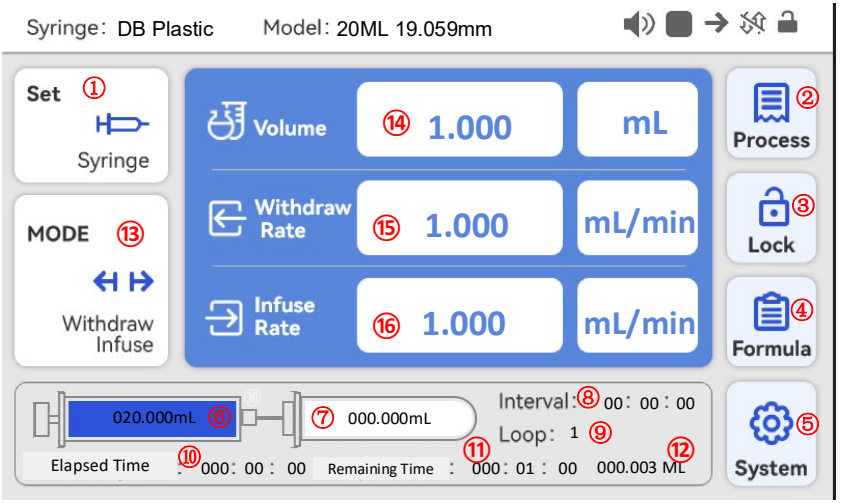


Figure 8. Main Interface Display

1. 

Press the icon to access the syringe manufacturer selection and then the syringe specification interface. Choose "Custom" if the syringe manufacturer is not specified (details see section 6.5.1).

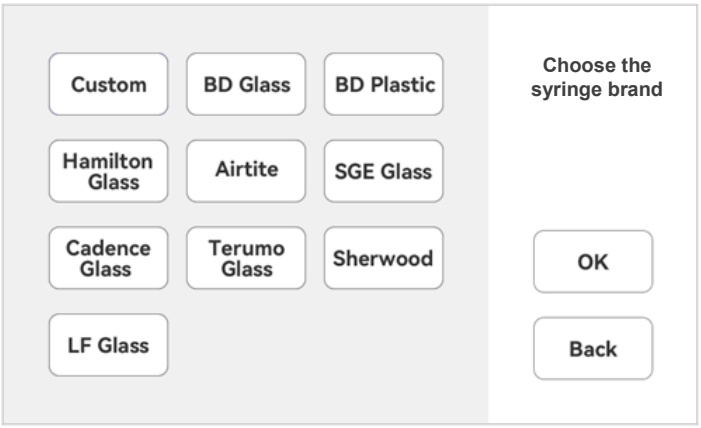


Figure 9. Syringe Manufacturers Interface

Figure 10. Syringe Specification Interface

2. 

Press this icon to access the process setup interface.

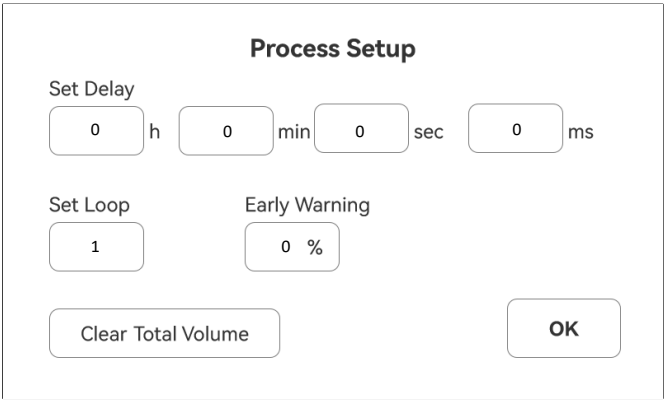


Figure 11. Process Setup

Set Delay: set the delay time in motion, first delay then operation.
Set Loop: set the number of loops for repetitive operation.
Early Warning: configure a reminder to alert before completing the operation, triggered when a preset percentage of the total transmission volume is reached.
Clear Total Volume：clear the accumulative volume.

3. 

Press this icon to lock the screen to prevent accidental modification of parameters. When the screen is locked, the icon will change to 

. Press 

and enter the password to unlock the screen. If there is no preset password, simply press “OK” to unlock the screen.

4. 

Press this icon to enter the quick setting interface for the selection of pre-entered three sets of data (see section 6.5.5 for details).

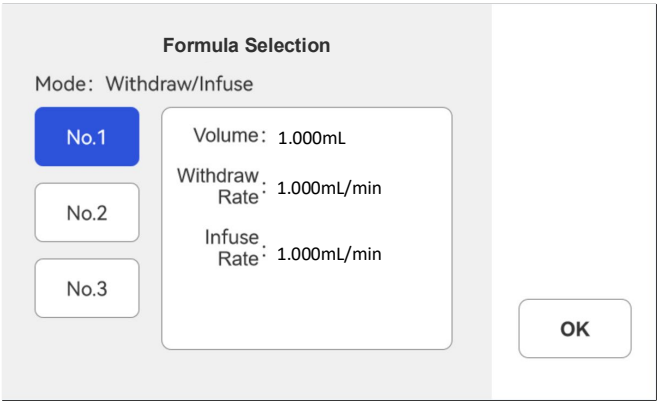


Figure 12. Quick Setting

5. 

Press the icon to access the system setting menu, and then select the corresponding menu to modify the parameters (see section 4.4 for details).

6. The current volume in a syringe is displayed, with the blue bar indicating progress with the current fluid volume.

7. The current volume in an external container, with the blue bar showing progress with the current fluid volume.

8. Display the current interval time.

9. Display the current number of repetitions.

10. Display the elapsed time of the current running process.
11. Display the remaining time of the current running process.
12. Display the current accumulated total liquid volume.
13. 

Press the icon to enter the operating mode selection interface (see section 6.5.2 for details).

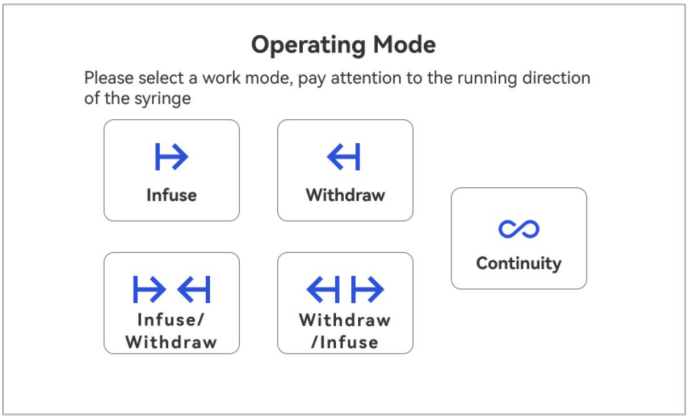


Figure 13. Operating Mode Selection Interface

14. Volume**:** Set the fluid volume to be withdrawn or infused. Tap the liquid volume value to input the desired value, and tap the liquid volume unit to switch between nL, uL, and mL.
15. Withdraw Rate**:** Set the withdrawal flow rate. Tap the flow rate value to input the desired value, and tap the flow rate unit to switch between nL/min, uL/min, and mL/min.
16. Infuse Rate: Set the infusion flow rate. Tap the flow rate value to input the desired value, and tap the flow rate unit to switch between nL/min, uL/min, and mL/min.

Attention: When “Overflow” or “Underflow” is shown, the value entered is out of range. Please re-enter the value or change the unit.

4.4 System Setting

When the drive is not running, press 

on the main screen to enter the system setting interface.

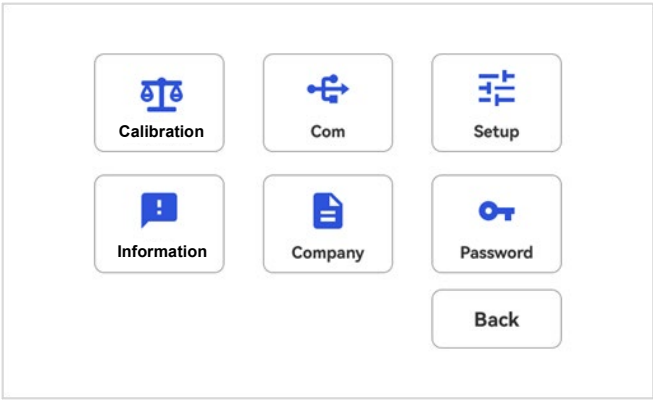


Figure 14. System Setting

Calibration - Calibrate the flow rate for a custom syringe by using the calibration wizard. Follow the provided instructions and measure the dispensed volume to accurately display the actual flow rate.

Com - This setting configures RS485 MODBUS communication parameters, such as baud rate, transmission mode, and pump address and Wi-Fi reset (Wi-Fi not available in European and American markets). To change the address, tap the address number displayed on the screen, then input the desired value in the pop-up window. Restart the drive to implement the changes.

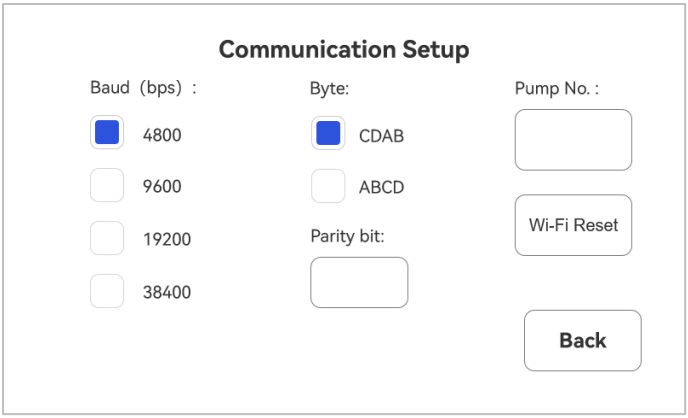


Figure 15. Communication Settings

Setup - Set general settings as shown below.

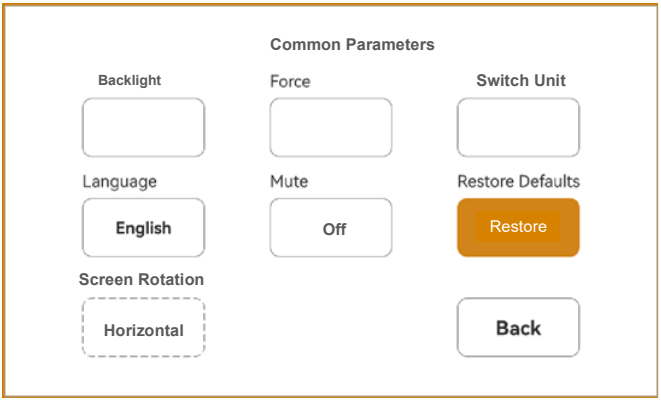


Figure 16. General Settings

- **Backlight**: Adjust the brightness of the backlight. Tap the number to modify the value.
- **Force**: Set the force according to the material of the syringe to prevent damage. Tap the number to adjust the value.
- **Switch Unit:** Switch between units.
- **Language**: System language, English or Chinese.
- **Mute :** Choose whether to enable or disable the sound.
- **Restore Defaults:** Reset all parameters to factory defaults. Restart to apply the settings.
- **Alarm:** Activate or deactivate the alarm function.
- **Screen Rotation:** Choose between a vertical or horizontal interface.

Information- This section displays the syringe pump's hardware version, software version, ambient temperature, and device serial number.

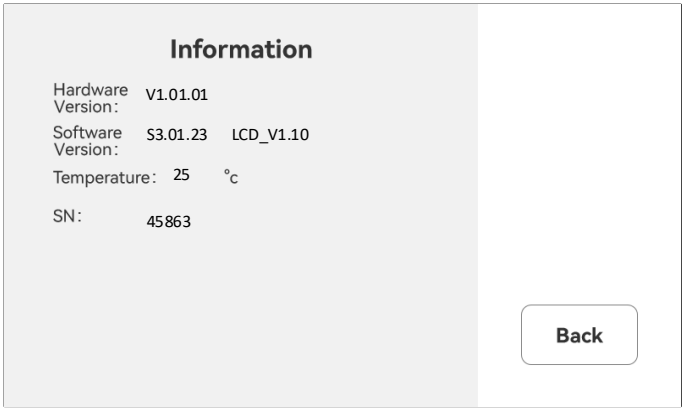


Figure 17. Information

Password – A password can be set to lock the screen and prevent accidental changes to parameters. The default password is 000000. To set a new password, enter the desired password and confirm by pressing “OK”.

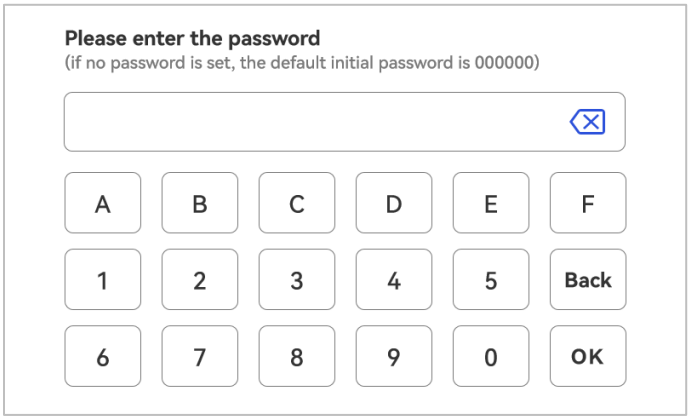
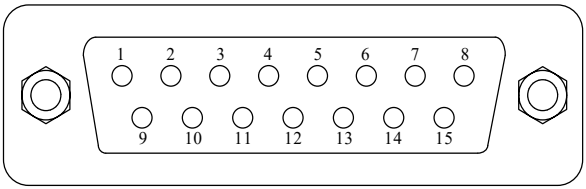


Figure 18. Password

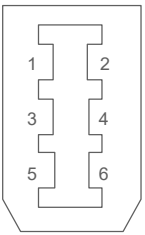
5 External Control Interface



- **DB15 Interface**

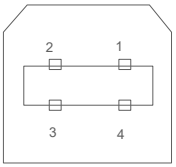
Pin	Mark	Note
1		
2	B	Communication interface, B pole of RS485
3	A	Communication interface, A pole of RS485
4	VCC_W	External DC power input
5		
6	CW_IN	External input signal to control direction
7		
8	COM	Ground of external power
9		
10	+24V	Positive of internal +24V power source
11	GND	Ground of Internal power source
12	CW	Direction signal output
13	RS_IN	External start/stop signal input
14		
15	RS	Start/stop signal output

- **RS485 Interface**



Pin	Mark	Note
1		
2		
3	B	Communication interface, B pole of RS485
4	A	Communication interface, A pole of RS485
5		
6		

- **USB Interface**



Pin	Mark	Note
1	+5V	+5V power source
2	DATA-	Data -
3	DATA+	Data +
4	GND	Power Ground

Caution: Ensure the correct signal is provided according to the legend pins. Do not exceed the specified signal range. When connecting to an external power supply, adhere to the specified voltage range to avoid permanent damage, which is not covered by warranty.

Caution: Low voltage signals must be isolated from the main power supply. Use an independent, shielded, and grounded input cable.

Caution: Multi-strand cable ends must be protected with qualified protective sleeves to prevent equipment damage.

6 Operating Instructions

6.1 Before Operation

1) Please check the packing slip to ensure all parts are included and undamaged. If any issues are detected, please contact the manufacturer or distributor.
2) Read the manual thoroughly**.**

3) Maintain a minimum distance of 200mm from the back of the pump while it is in operation.

6.2 Install a Syringe

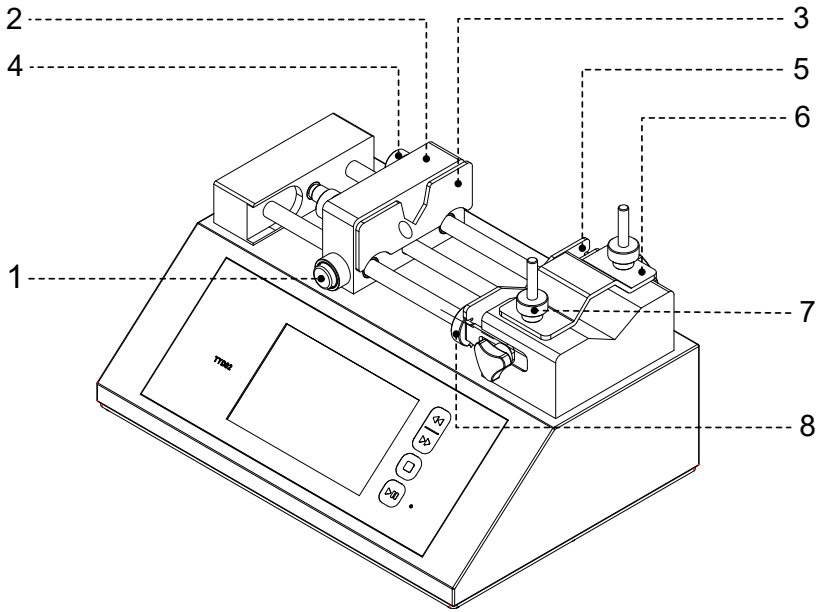


Figure 19. Install a Syringe

1) Press and hold the release button (1) and move the slider (2) to a position near the length of the syringe.
2) Loosen the locking nuts (4) and (7), and adjust the position of the fixed brackets (3) and 5).
3) Place the syringe into the right holder groove, securing the syringe plunger flange onto the fixing bracket (3) and the syringe barrel flange into the fixing bracket (5).
4) Tighten the lock nut (4) and (7).
5) Use an Allen Key to adjust the position of the stop block (8) to prevent over-pushing the syringe.

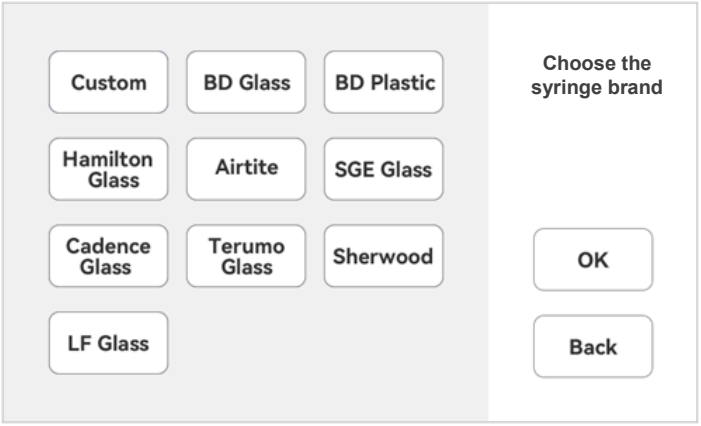
6.3 Power Connection

Ensure that the voltage of the power supply matches the rating indicated on the pump's rating plate label. Plug the power cord into

the power connector located at the rear of the drive, and then connect the opposite end of the power cord to an electrical outlet. Flip the power switch, also located at the rear of the drive, to turn it on.

6.4 First Run Wizard

When using the syringe pump for the first time or after a factory reset, the system will show a welcome message, followed by the selection of Syringe Manufacture-> Syringe Specification -> Work Mode. Users can customize parameters and operating modes to meet specific requirements, with the option to save settings for future use, eliminating the need to rerun the setup process.



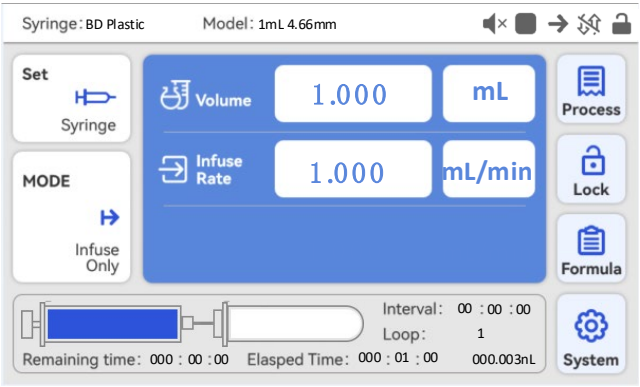


Figure 20. First Run Wizard

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

Table 1. Default Parameter Settings

Parameter	**Default Setting**
Mute	On
Baud Rate (bps)	9600
Parity bit	Even
Mode	Computer
Pump No	1
Force	100%
Backlight	100%
Unit change	Speed
Screen Orientation	Horizontal
Alarm	On
Set Delay	0 seconds
Set Loop	1
Early Warning	0% (Off)
Flow Rate Unit	(mL/min)
Syringe Manufacturers	BD GLASS

Syringe Inner Diameter	4.699 mm
Syringe Size	1 mL
Working Mode	Infuse only
Transfer volume	1mL
Infuse Flow Rate	2.601mL/min
Storage Data Group	Formula 1

6.5 Operation Flowchart

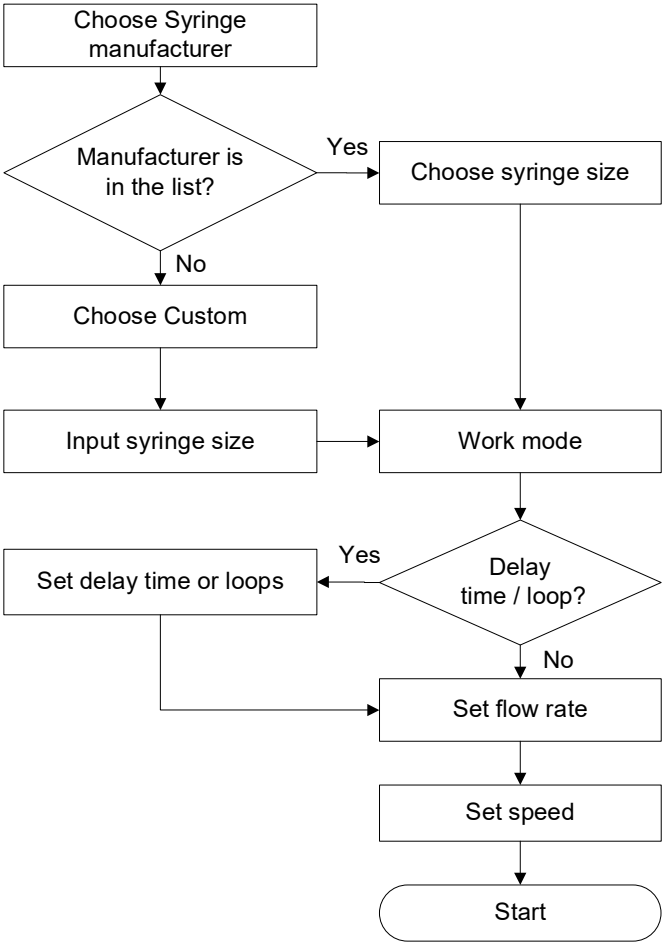


Figure 21. Operation Flowchart

6.5.1 Syringe

On the main screen, press 

to access the syringe manufacturer interface. Choose “Custom” if a manufacturer is not listed. Press “OK” to proceed to the syringe specification interface, and then press “Back” to return to the main screen.

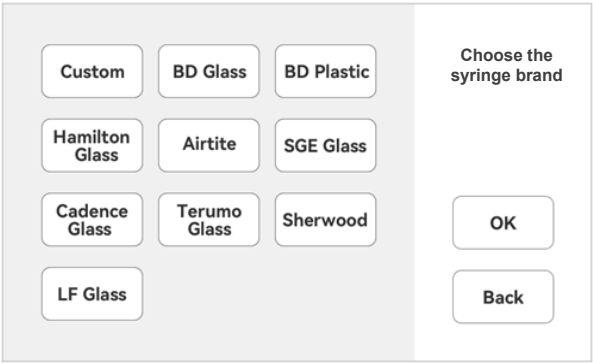


Figure 22. Select a Syringe Manufacturer

In the syringe specification interface, select the corresponding syringe. The left side of the screen shows the syringe volume capacity and barrel internal diameter, while the right side shows the maximum and minimum flow rates.

Figure 23. Select Syringe Model

If “Custom” is selected as the syringe manufacturer, it allows a user to input the specification of a syringe. Press the numbers to change the values for the ID and volume, and press the volume unit to

switch between mL and uL.

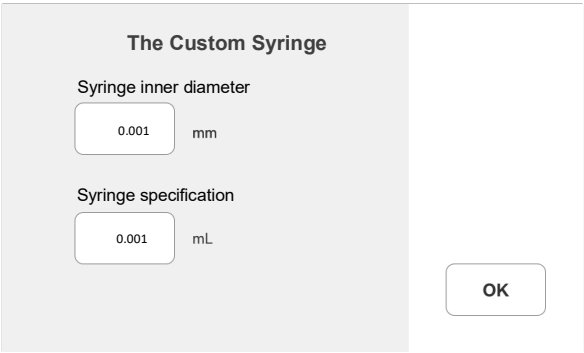


Figure 24. Custom Syringe

Note: Each syringe manufacturer is associated with a specific series of syringe models. Ensure the correct transmission combination is selected.

6.5.2 Operating Mode

Press “Mode” on the main screen to access the operating mode interface, then select the work mode.

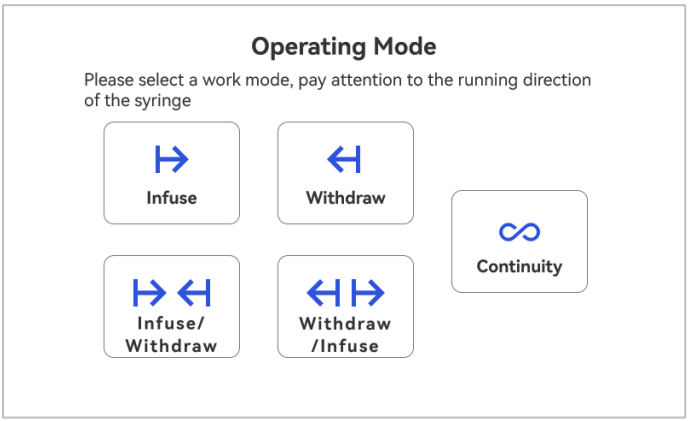


Figure 25. Operating Mode

Infuse Only: This mode permits single-direction infusion operations.

If replay loops are set, multiple infusions can be conducted.

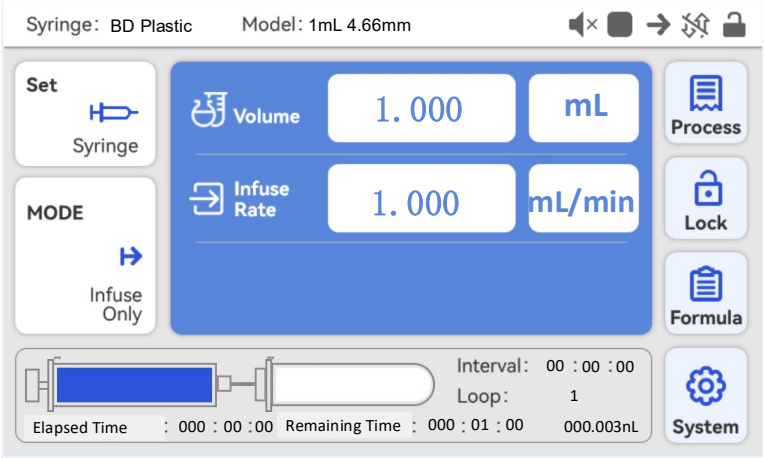


Figure 26. Infuse-only Display Interface

Withdraw only: This mode allows single-direction withdrawal operations. If replay loops are set, multiple withdrawals can be performed.

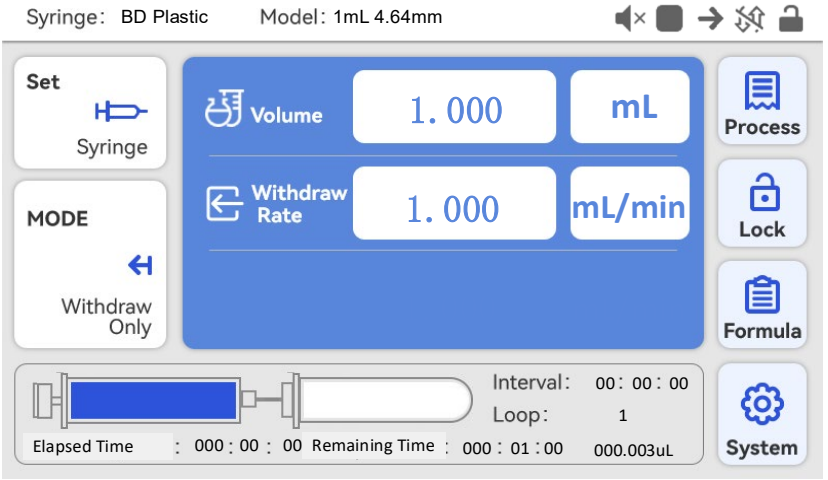


Figure 27. Withdraw-only Display Interface

Withdraw/infuse: This mode enables withdrawal first, followed by infusion. Multiple loops can be set for multiple operations.

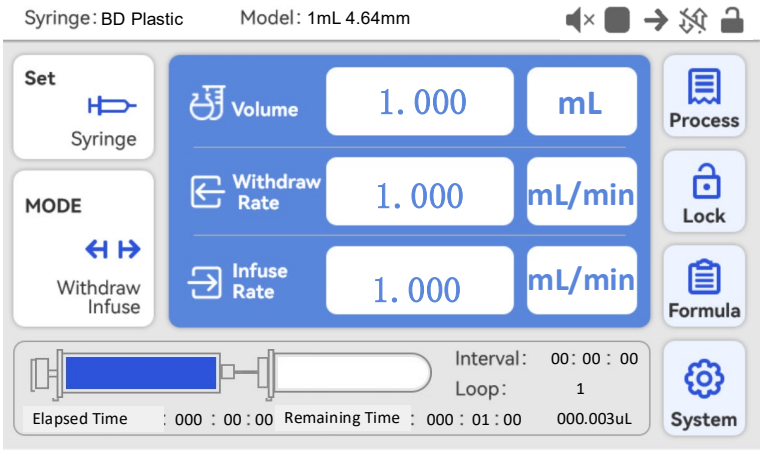


Figure 28. Withdraw/infuse Display Interface

Infuse/withdraw: This mode allows infusion first, followed by withdrawal. Multiple loops can be set for multiple operations.

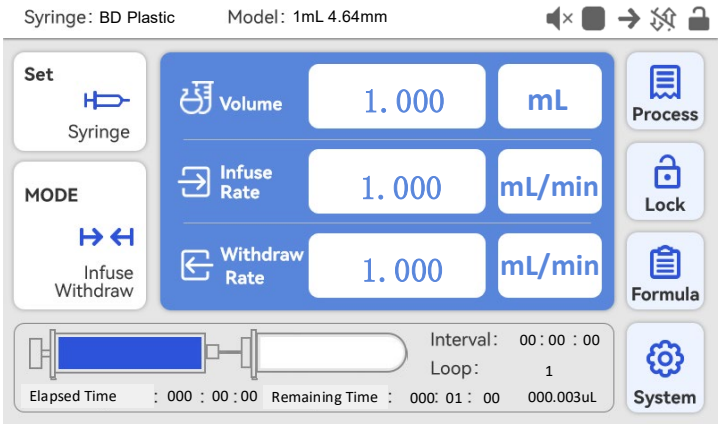


Figure 29. Infuse/Withdraw Display Interface

Continuity: Operations are conducted through external signals or communication. Pulse or level can be selected as the control mode.

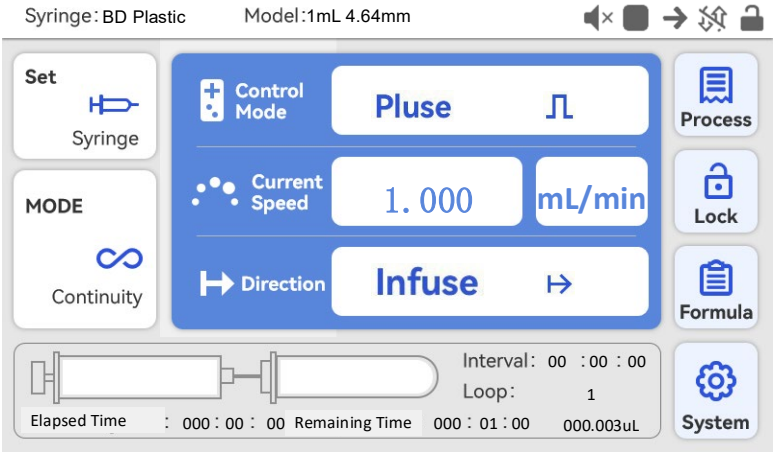


Figure 30. Continuity Display Interface

Press 

to set delay time and loop as shown below.

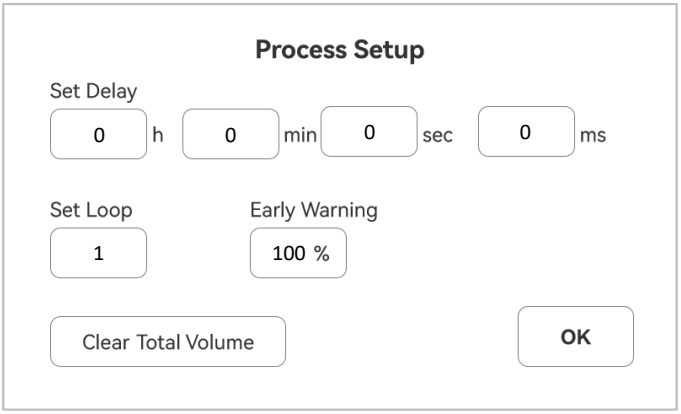


Figure 31. Process Setup

Please refer to the workflow chart below for details.

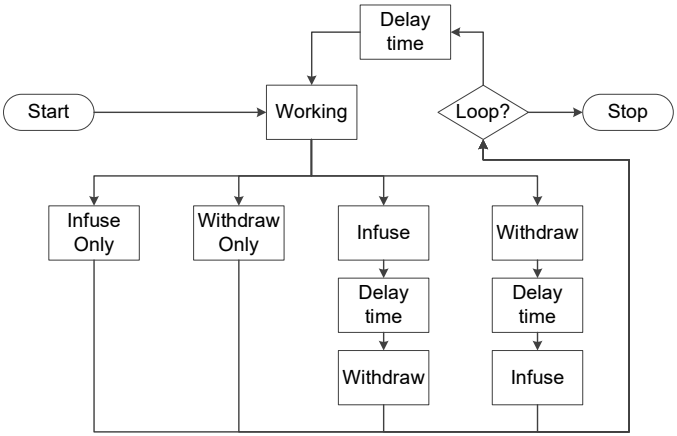


Figure 32. Workflow Chart

6.5.3 Volume and Flow Rate

To set the desired injection or withdrawal volume, press the volume value to change it. Press the volume unit to switch between nL/min, uL/min, or mL/min.

To set the desired inject or withdraw flow rate, press the flow rate value to change it. Press the flow rate unit to switch between nL/min, uL/min, or mL/min.

6.5.4 Start the process

Press the START/PAUSE key to start the running process, indicated by a green indicator light. Upon completion, the red indicator will be on. During the running process, pressing the START/PAUSE key will suspend the current operation, indicated by the green indicator blinking. Pressi the START/PAUSE key again to resume the paused process. To terminate the process entirely, press the STOP key, reset the process parameters, and the red indicator light turns on.

If the push block encounters the limit block or is obstructed by external force mid-process, the syringe pump will trigger an alarm, with the red light flashing. Press the START/PAUSE key to disarm

the alarm and resume the process, or press the STOP key to end it.

6.5.5 Save and Recall Settings

- Save settings

Set the work mode on the main screen, then press 

to proceed to the quick setting interface.

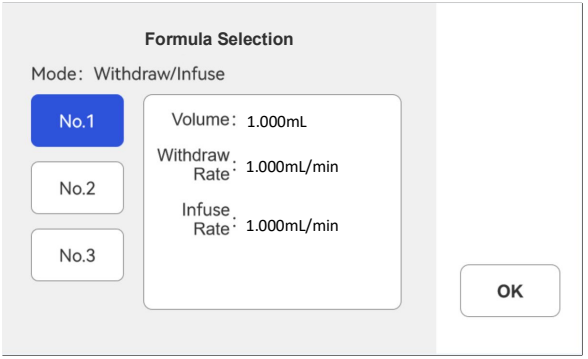


Figure 33. Quick Settings

Settings can be saved to one of the three slots, with the system initialized to the No. 1 by default. After choosing a slot, proceed to configure the settings for liquid volume and flow rate. Once the desired parameters are set, click OK to save this group of data. Repeat these steps for the second and third groups for convenient storage and retrieval of settings as needed.

- Recall settings

Press 

to access the Quick Settings interface to choose settings saved in a group slot, and then press “OK” to return to the main screen. The settings on the main screen will be updated accordingly.

6.6 Flow Rate Calibration

To calibrate the flow rate

1) Install a syringe and prepare a suitable balance or measuring cylinder and measuring cup.
2) On the main screen, select" Custom" syringe, and enter the Inner diameter and syringe volume capacity.
3) When the pump is not running, press the fast backward key to fill the syringe with fluid.
4) Press System to enter System Setting, and press "Calibration" to access the calibration wizard.

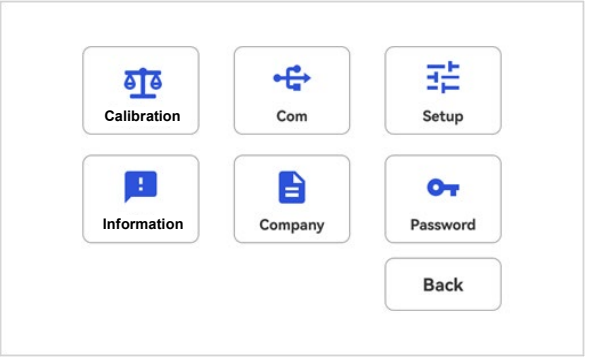


Figure 34. System Setting

5) Flow rate and volume are shown in the calibration wizard interface. Flow rate is the expected speed, and volume is the testing volume. Press the number to change the value if necessary. Press "Next" to enter the test window or press "Back" to return to the system setting window.

Note: To ensure test accuracy, the liquid volume value should not be less than the value recommended by the system.

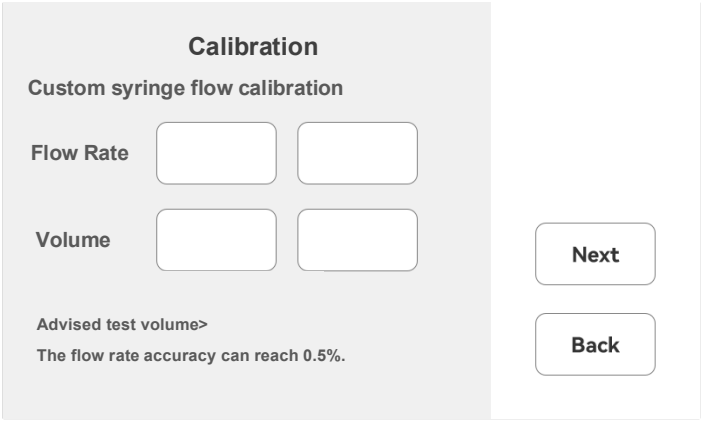


Figure 35. Flow Rate Calibration

6) The calibration test interface is shown below.

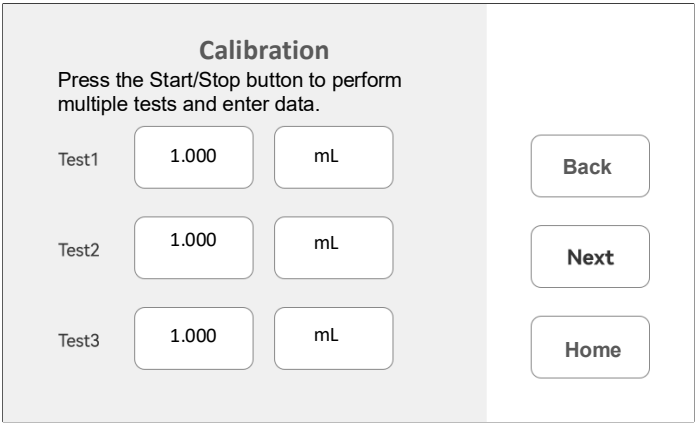


Figure 36. Calibration

Ensure the syringe is filled with liquid. Press the START/PAUSE key to begin fluid injection. Once the pump stops, measure the transferred fluid volume using a balance or a measuring cylinder. Enter this value as Test 1 on the screen. Optionally, repeat these steps for Test 2 and Test 3. Verify the unit is correct. Press 'Next' to access the 'Analyze and Calculate' interface.

To modify the desired flow rate and test volume, press “Back” to re-enter values, and input the results into the system. Press “Home” to

exit the calibration wizard and return to the system setting interface. Press the STOP key to stop a test at any time and press the START/PAUSE key to resume the test.

7) The system will automatically compute the average value, calculate the correction coefficient, and display the reference of the original coefficient. Press “OK” to save the data. Press “Back” to cancel the test and return to the system setting interface.

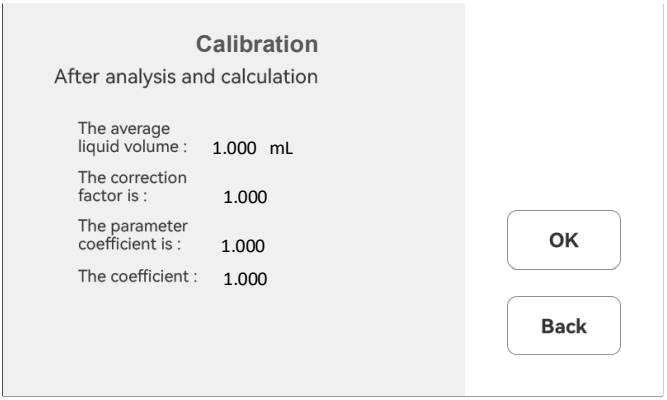


Figure 37. Analyze and calculate

If no result data is entered, the window below will appear. Press “Back” to redo the test.

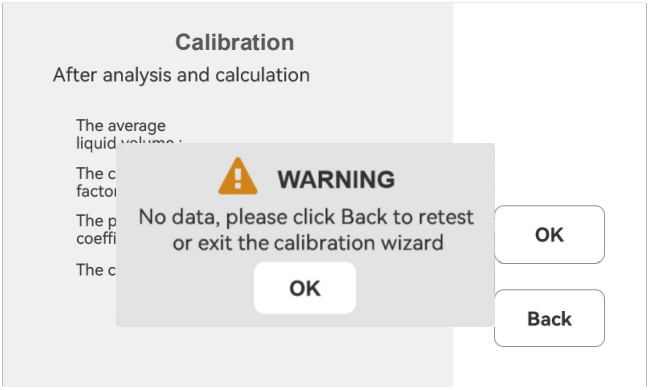


Figure 38. No data entered

6.7 External Control Mode

1) Switch the power off. Wire the DB15 connector as shown below and connect it to the DB15 port on the rear of the pump.

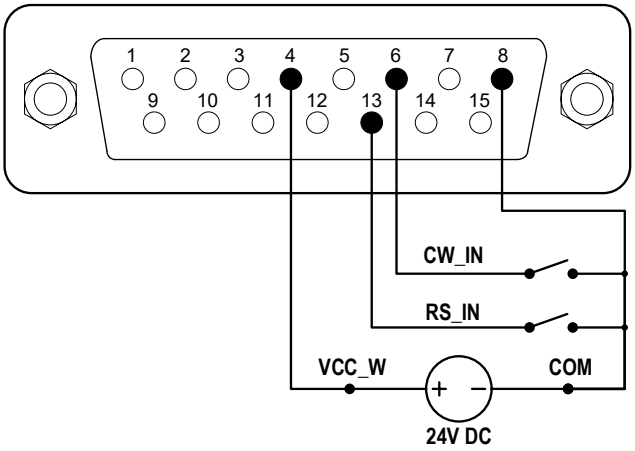


Figure 39. DB15 wiring with external 24VDC power source

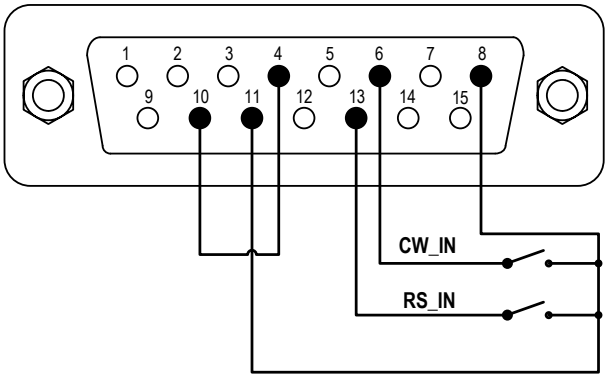


Figure 40. DB15 wiring with internal 24VDC power source

2) Power on to display the main screen.
3) When the work mode is Infuse Only, Withdraw Only, Withdraw/Infuse, or Infuse/Withdraw, close then open the external RS_IN switch, the pump will run. Repeat the process to stop the pump.

4) In Continuity work mode:
   - Pulse Signal Control: close and then open the external RS_IN switch to start the pump. Repeat the process to stop the pump.
   - Level Signal Control: close the external RS_IN switch to start the pump. Open the RS_W switch to stop the pump.
   - Open the external CW_IN switch for infusion. Close the external CW_IN switch for withdrawal.

6.8 Footswitch Mode

1) Switch off the power. Wire the DB15 connector as shown below and connect it to the DB15 port on the rear of the drive.

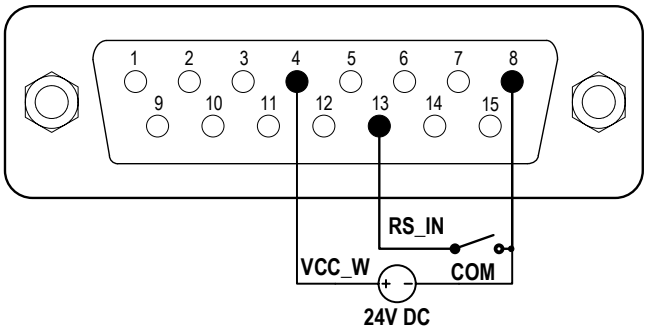


Figure 41. Control with external 24V DC power source

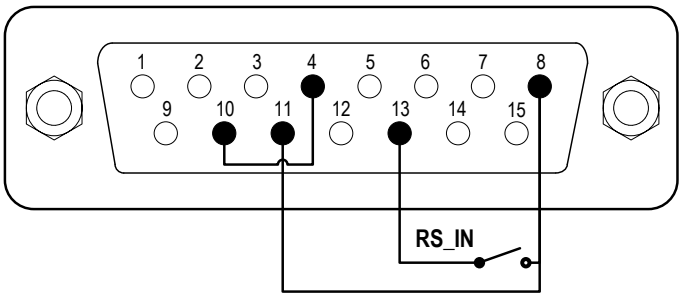


Figure 42. Control with internal 24V DC power source

2) Power on to display the main screen.
3) When the work mode is Infuse only, Withdraw only,

Withdraw/Infuse or Infuse/Withdraw, close and then open the external RS_IN switch to start the pump; close and then open the RS_IN switch again to stop the pump.

4) In Continuity work mode:
   - Pulse Signal Control: close and then open the external RS_IN switch to start the pump. Repeat the process to stop the pump.
   - Level Signal Control: close the external RS_IN switch to start the pump. Open the RS_W switch to stop the pump.
   - Open the external CW_IN switch for infusion. Close the external CW_IN switch for withdrawal.

6.9 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.

1) Switch off the power. Wire the DB15 connector as shown below and connect it to the DB15 port on the rear of the pump. An external DC power source is recommended to avoid electrical interference.

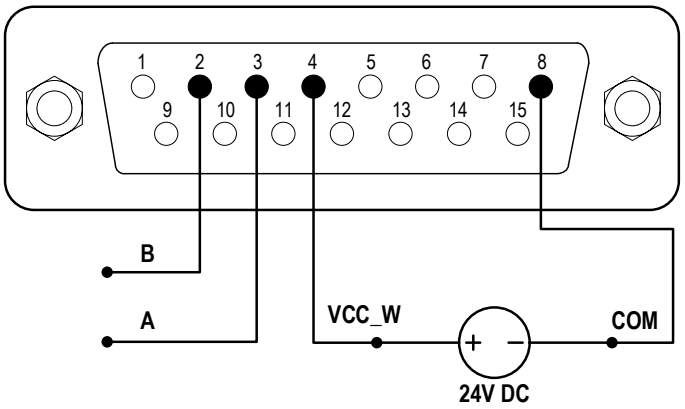


Figure 43. RS485 MODBUS wiring with external 24V DC Power Source

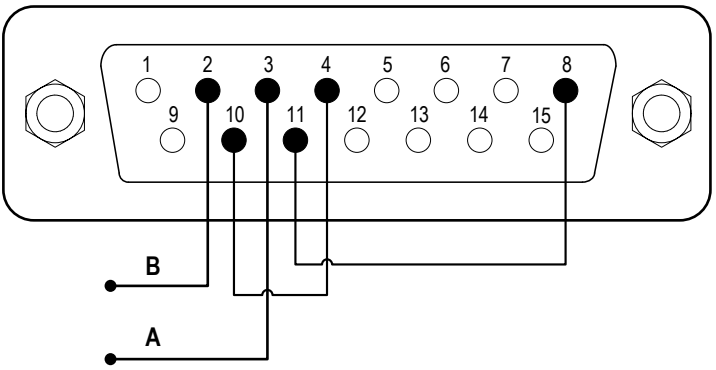


Figure 44. RS485 MODBUS wiring with internal 24V DC power source

2) Turn on the power to display the main screen.
3) When is displayed on the main screen, the communication is connected. The communication is disconnected when is displayed.
4) Control the pump with the communication interface.

7 Maintenance

7.1 Warranty

The product comes with a one-year labor and parts warranty. The limited warranty does not cover any damage that is caused by improper usage and handling.

7.2 Regular Maintenance

1) Check the push block and the lead screw regularly, and apply bearing grease when necessary.
2) Do not use water to wash the pump. Keep the pump dry.
3) Do not use chemical solvents to clean the case.

7.3 Malfunction Solutions

No.	Malfunction	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 drive. 4. Check the wire connection between the LCD and the main control board.
2	Hardware	Motor does not work	1. Check the wire connection between the motor and the drive board. 2. Check the power voltage for the drive.
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	Keypad does not work	1. Check the wire connection between the keypad and the main board. 2. Check if the key is damaged.
6	Hardware	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.
7	Hardware	RS485 com does not	1. Check the wiring of the connector.

		work	2. Check if the external control power voltage is provided. 3. Check the connections of the communication board.
8	Hardware	Noisy when running	Check the wire connection between the motor and the main board.
9	Software	Touch screen does not work	Press and hold the FAST FORWARD and FAST BACKWARD buttons at the same time, then power on the drive to calibrate the screen.
10	Software	Flow rate not accurate	Calibrate the flow rate
11	Software	RS485 does not work properly	1. Check if the display shows that the communication is ready. 2. Reset the address of the drive. 3. Check if two pumps on the bus utilizing the same address.

 If a problem cannot be solved, please contact the manufacturer or distributor.

8 Dimensions

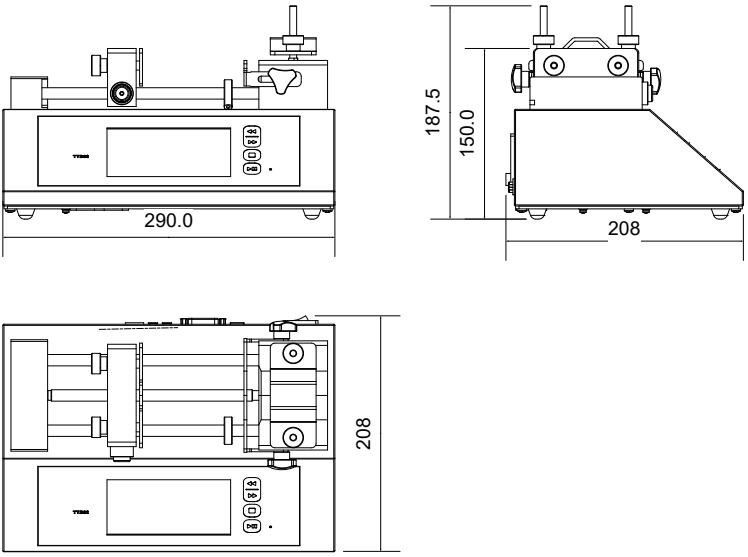


Figure 45. LAB-01 Dimensions (mm)

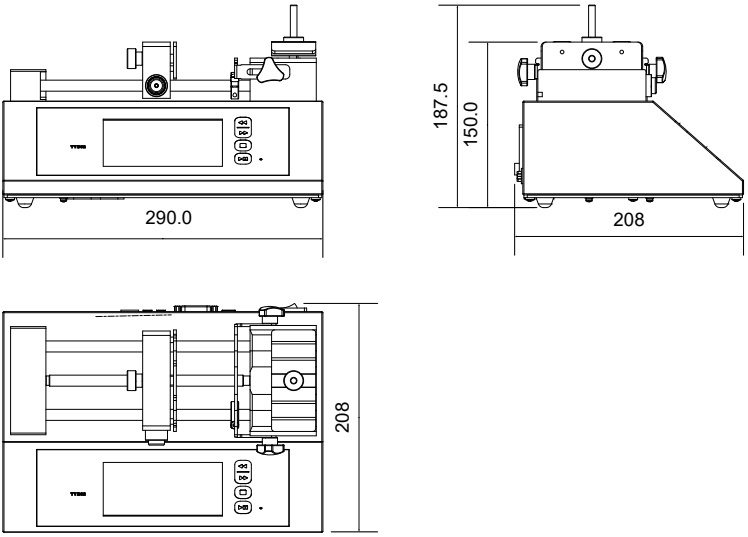


Figure 46. LAB-02 Dimensions (mm)

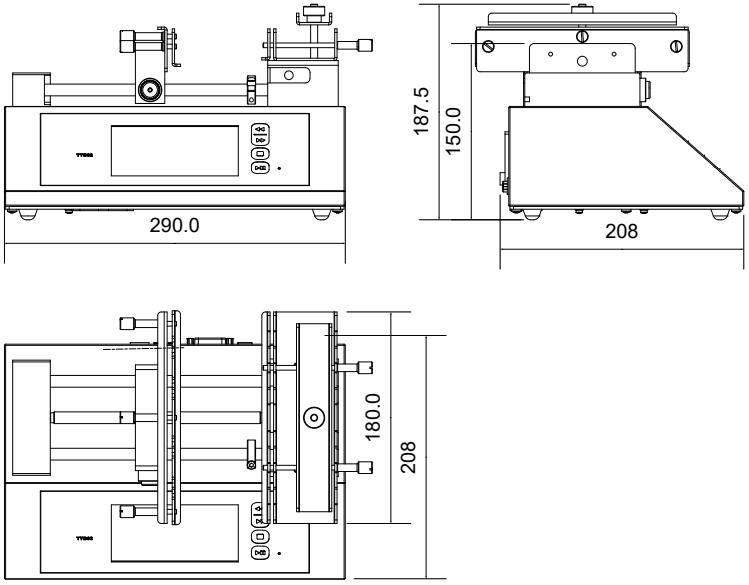


Figure 47. LAB-04 Dimensions (mm)

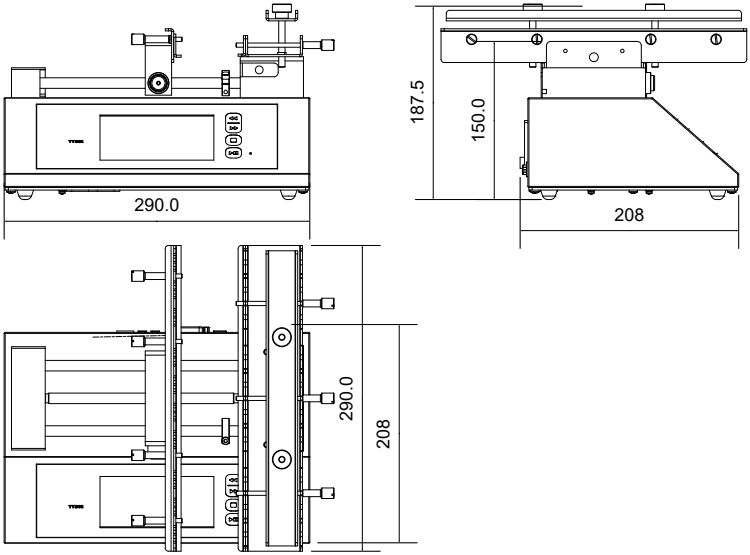


Figure 48. LAB-10 Dimensions (mm)

9 Naming Rule

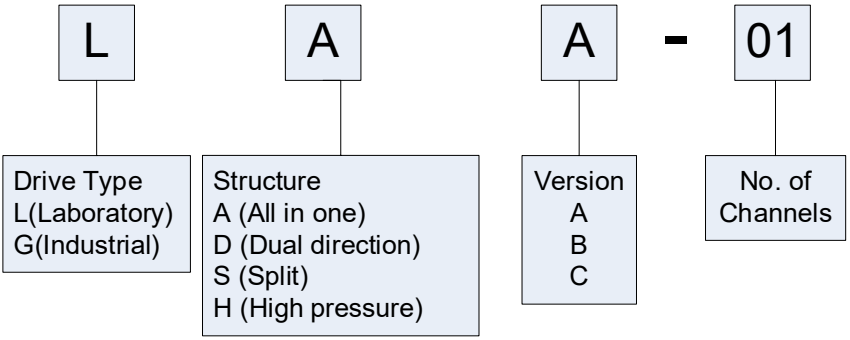


Figure 49. Naming Rule

10 Specifications

LAB-01: one syringe
LAB-02: one or two syringes

Syringe	10ul-140ml
Function	Infusion, withdraw, infusion/withdraw, withdraw /infusion, continuation mode. Built-in main brand syringes. Syringe protection and traffic jam alarm. Linear force adjustable.
Communication	RS485 Modbus
Display	Color LCD touch screen
External control	External signal control start-stop and direction. Direction status signal output.

Flow rate	0.185nl/min(10ul)-173.718ml/min(140ml)
Linear speed	1um/min - 150mm/min
Linear travel accuracy	± 0.5% (when >30% of full drive stroke)
Linear force	>20kgf, adjustable

Pusher advance per microstep	0.156um/ustep
Operation	touch screen + keypad
Display	65565 color LCD
Power supply	AC 100-240V, 50Hz/60Hz
Wattage	<50W
Working environment	Temperature 0-40°C Relative humidity <80%
Dimension	290x210x180mm
Weight	4.4kg

LAB-04: up to four syringes
LAB-10: up to ten syringes

Syringe	10ul-10ml
Function	Infusion, withdraw, infusion/withdraw, withdra w/infusion, continuation mode. Built-in main brand syringes. Syringe protection and traffic jam alarm. Linear force adjustable.
Communication	RS485 Modbus
Display	Color LCD touch screen
External control	External signal control start-stop and direction. Direction status signal output.

Flow rate	0.185nl/min(10ul) - 14.427ml/min(10ml)
Linear speed	1um/min - 150mm/min
Linear travel accuracy	± 0.5% (when >30% of full drive stroke)
Linear force	>20kgf, adjustable
Pusher advance per microstep	0.156um/ustep
Operation	touch screen + keypad
Display	65565 color LCD
Power supply	AC 100-240V, 50Hz/60Hz

Wattage	<50W
Working environment	Temperature 0-40°C Relative humidity <80%
Dimension	290x210x180mm
Weight	4.7kg

11 Reference Flow Rate

Size	ID	MIN flow rate	Unit	MAX flow rate	Unit
0.5 µl	0.103 mm	8.000	pl/min	1.249	µl/min
1 µl	0.146 mm	16.000	pl/min	2.511	µl/min
2 µl	0.206 mm	33.000	pl/min	4.999	µl/min
5 µl	0.343 mm	83.000	pl/min	12.497	µl/min
10 µl	0.485 mm	184.00	pl/min	27.711	µl/min
25 µl	0.729 mm	417.00	pl/min	62.608	µl/min
50 µl	1.03 mm	833.00	pl/min	124.984	µl/min
100 µl	1.457 mm	1.667	nl/min	250.092	µl/min
250 µl	2.304 mm	4.169	nl/min	625.383	µl/min
500 µl	3.256 mm	8.326	nl/min	1.248	ml/min
1000µl	4.608 mm	16.676	nl/min	2.501	ml/min
1 ml	4.699 mm	17.342	nl/min	2.601	ml/min
3 ml	8.585 mm	57.885	nl/min	8.682	ml/min
5 ml	11.989 mm	112.890	nl/min	16.933	ml/min
10 ml	14.427 mm	163.469	nl/min	24.520	ml/min
20 ml	19.05 mm	285.027	nl/min	42.754	ml/min
30 ml	21.59mm	366.090	nl/min	54.913	ml/min
50 ml	26.594 mm	555.459	nl/min	83.318	ml/min
100 ml	35.7 mm	1000.982	nl/min	150.147	ml/min
140 ml	38.4 mm	1158.117	nl/min	173.718	ml/min

The provided flow data, obtained under standard conditions with pure water, serves as a reference. Actual usage may vary based on specific factors like pressure and medium characteristics.

Golander LLC
4405 International Blvd
Ste B117, Norcross, GA 30093
USA
Tel: +1 678-587-8806
info@golanderpump.com
www.golanderpump.com

Golander GmbH
Dechant-Heimbach-Str. 29
53177 Bonn
Germany
Tel: +49 228 50446952
info@golander.de
www.golander.de