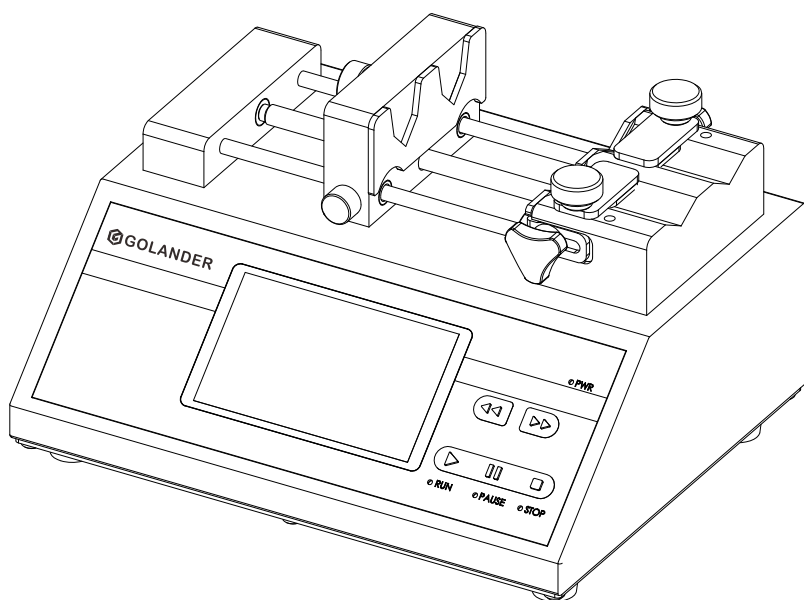




Syringe Pump LAA series

Operating Manual



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Safety Precautions



Danger

- To avoid damage, use the correct voltage indicated on the rating plate label of the pump.
- Make no unauthorized dismantling, changes or modifications to the pump. This may result in malfunctions or potential accidents. Take special care when servicing internal components.
- Keep a distance from the lead screw when the syringe pump is in operation. Fingers or loose clothing may get caught in the drive.



Warning

- When installing a syringe, the limit block must be adjusted to the appropriate position to avoid accidental damage to the syringe. Our company cannot be held liable for loss caused by damage to the syringe, including leakage of toxic, hazardous or valuable liquids.
- Turn off the power before connecting or disconnecting external control devices or communication interfaces.
- The pump is equipped with a grounding plug. It must be well grounded at all times.
- This product is not intended for medical use.

1 Description

LAA series syringe pumps work with various sizes of syringes and with five working modes: infuse, withdraw, infuse/ withdraw, withdraw/infuse and continuous cycle. Its high-resolution color LCD touch screen is convenient for parameter setting. Multiple indicators clearly indicate the working status. A variety of built-in syringe manufacturers and specifications for easy selection. Pre-stored data can adapt to different flow requirements. High-precision control with protection and alarm mechanisms. External signal controls start and stop. The built-in RS-485 communication interface which supports the MODBUS protocol allows one or multiple pumps to be easily controlled by external devices.

LAA-01, single syringe, size 10uL-60mL, linear velocity from 1um/min to 150mm/min

LAA-02, dual syringes, size 10uL-60mL, linear velocity from 1um/min to 150mm/min.

Applications

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

2 Functions and Features

- Multiple work modes
- Color LCD touch screen for ease of use
- Support screen lock, key mute operation.
- Indicators for clear indication of operation status
- Support a variety of syringes, both standard and self-defined
- Multiple pre-stored data

- High precision control
- RS485 MODBUS communication
- External control signal to control start/stop and direction
- Wide range of power input
- All-metal housing

3 Components and Connectors

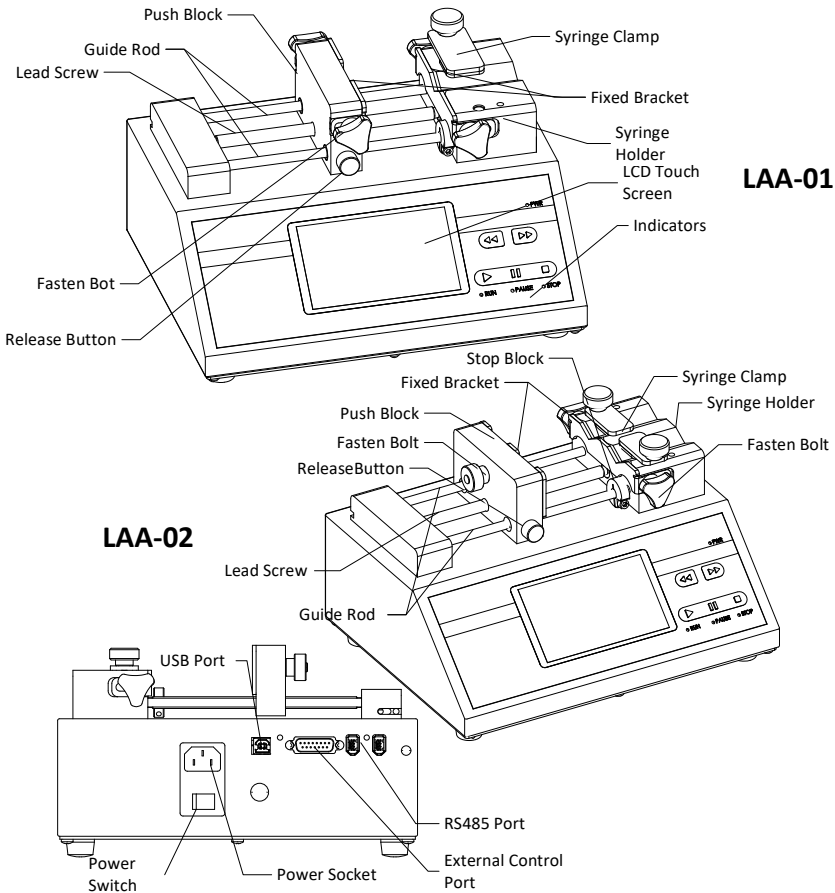


Figure 1. Components and Connectors

4 Display Panel and Operating Keypad

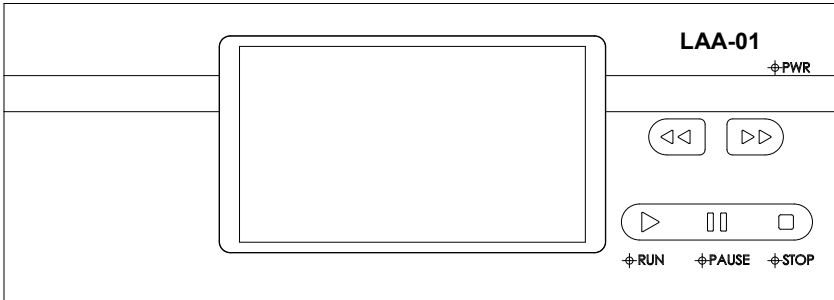


Figure 2. Display Panel

4.1 Keypad

- ▶ START key. Press to start or resume the defined operation.
- || PAUSE key.
- STOP key. Stop or reset the operation
- ▶▶ FAST FORWARD key. When the drive stopped, press and hold the key to push at the maximum speed.
- ◀◀ FAST BACKWARD key. When the drive stopped, press and hold the key to retreat at the maximum speed

Blue indicator: power indicator.

Green indicator: operation indicator. When the drive starts, this indicator turns on.

Yellow indicator: pause indicator. When the drive pauses, this indicator turns on.

Red indicator: this indicator turns on when an operation is stopped or completed. The light blinks when the motor losses speed.

4.2 LCD Touch Screen Display

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

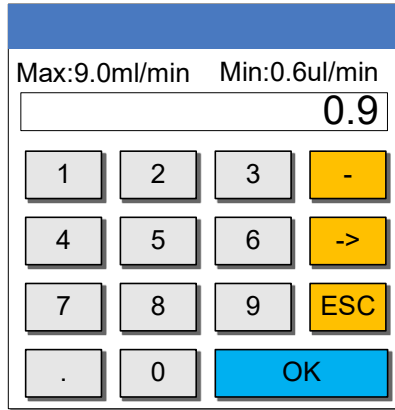


Figure 3. Flow input screen

Max: Maximum input value

Min: Minimum input value

->: Delete the last digit

ESC: Cancel the current entry data

OK: Confirm the current entry data

4.3 Keys



Return key: Return to the previous operation screen



Confirm key: Confirm the current entry data and save



Cancel key: Cancel current changes. Do not save.



Next key: Go to the next page



Return key: Return to the previous page

4.4 Main Display

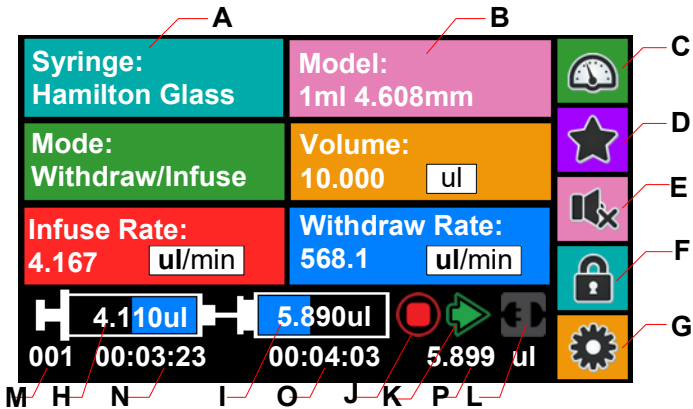


Figure 4. Main Interface Display

A - **Syringe:
Hamilton Glass**

Selection of syringe manufacturers. “Custom “is for self-defined syringes.

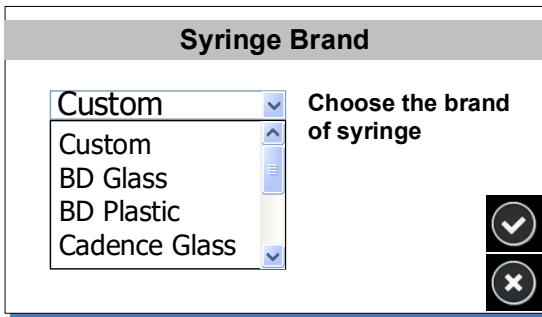


Figure 5. Syringe manufacturers

B - **Model:
1ml 4.608mm**

Syringe specifications, including the inner diameter of a syringe and the volume of a syringe. Press to enter the syringe selection interface.

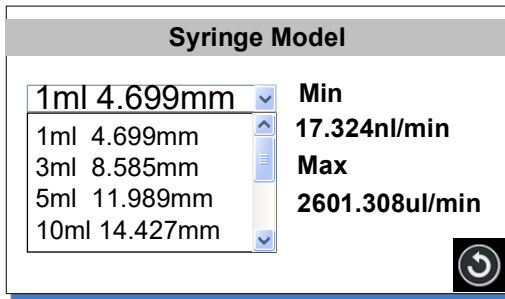


Figure 6. Syringe model selection

When “Custom” is selected as the syringe manufacturer, the ID and volume can be self-defined on the custom syringe setting page.

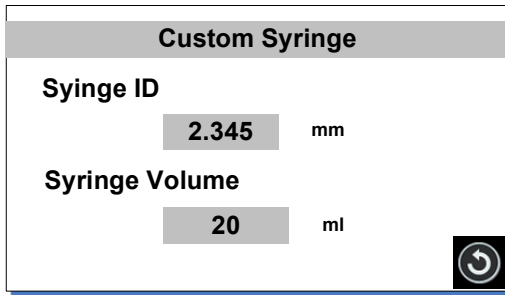



Figure 7. Custom Syringe

- C -  Press this icon to enter the process setup interface.

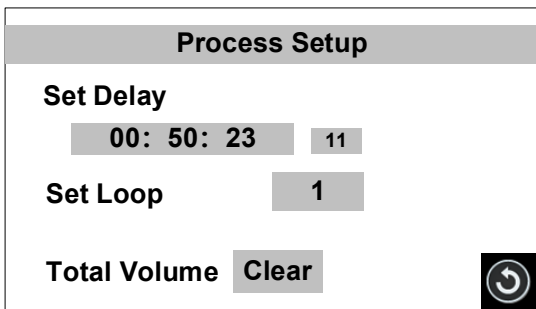


Figure 8. Process Setup

Set Delay:set the delay time in motion, first delay then

operation.

Set Loop: Set the number of loops for repetitive operation.

- Total volume: clear accumulative volume.

D -



Quick Settings: Press this icon to enter the quick setting interface for the selection of pre-entered three sets of data.

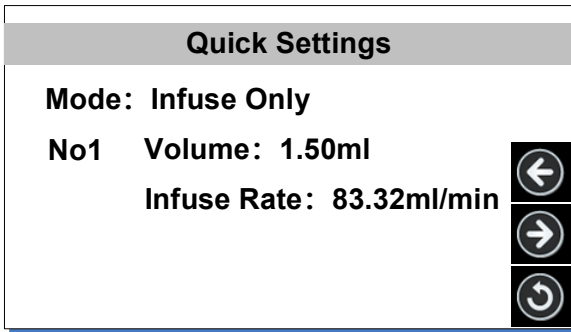
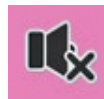


Figure 9. Quick Settings

E - Key Tone. To mute/unmute the key tone.



Tone on



Tone off

Figure 10. Key Tone

F - Lock. To lock the screen. It prevents setting modification.



unlocked



Locked

Figure 11. Screen Lock



System setting. Click the icon to enter the system setting interface to change the settings.



The current volume in a syringe is displayed. The blue bar shows progress with the current fluid volume.



Current fluid volume in an external container. The blue bar shows progress with the current fluid volume.

J - Operation status.



Motor in operation



Motor off



Motor loss speed



Fast forward



Fast backward

Figure 12. Operation status

K - Direction



Inject



Withdraw

Figure 13. Direction

L - Communication status



Communication
disconnected



Communication
connected

Figure 14. Communication status

M - Operation loops remained for the current operation.

N - Time elapsed for the current operation.

O - Remaining time for the current operation.

P - Accumulated volume.

Q - **Mode:**
Withdraw/Infuse

Work Mode: Press here to enter the work mode selection interface.

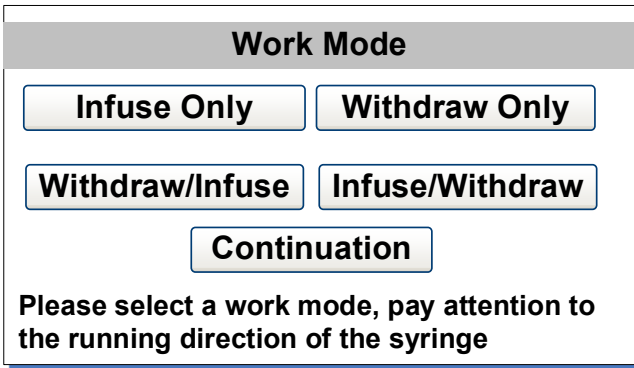


Figure 15. Work Mode interface

Infuse Only: Only allow single-direction operation of infusion. If replay loops are set, multiple infusions can be conducted.

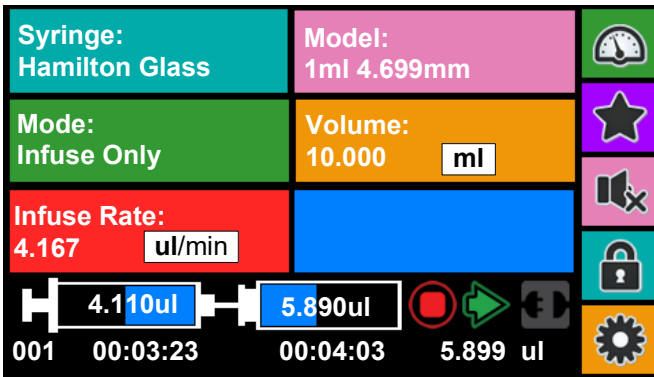


Figure 16. Infuse only display Interface

Withdraw only: Only allow single direction operation of withdrawing. If replay loops are set, multiple withdrawals can be done.

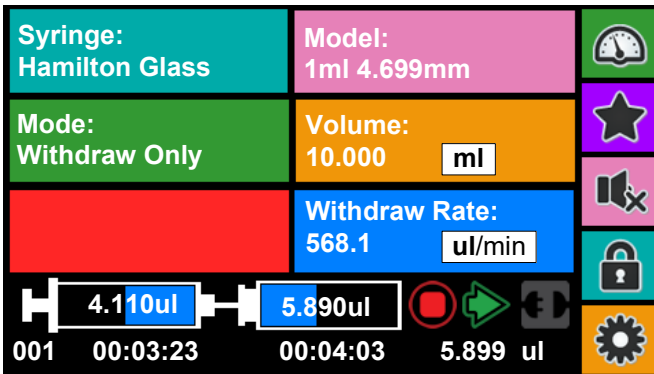


Figure 17. Withdraw only display interface

Withdraw/infuse: It allows withdrawal first then infusion. Multiple loops can be set for multiple operations.

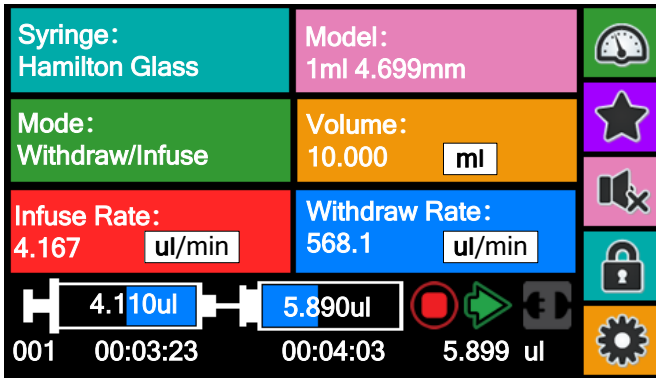


Figure 18. Withdraw/infuse display interface

Infuse/withdraw: It allows infusion first then withdrawal. Multiple loops can be set for multiple operations.

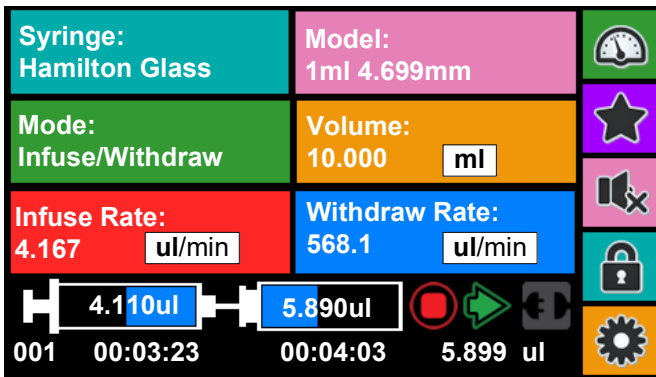


Figure 19. Infuse/Withdraw display interface

Continuation: Operation conducted through external signals or communication. Pulse or Elec can be selected as the control mode.

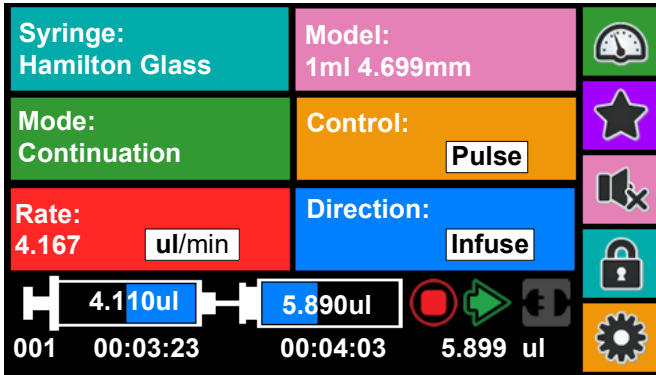


Figure 20. Continuation display interface




Volume: Set the required volume to withdraw or infuse. Press the volume value to change it. Press the volume unit to switch between ul and ml.



Infuse Rate/ Withdraw Rate: Set infuse flow rate and withdraw flow rate. Press the flow rate value to modify. Press flow rate unit to switch among 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.

4.5 System Setting

When the drive is not running, press  on the main screen to enter the system setting interface.

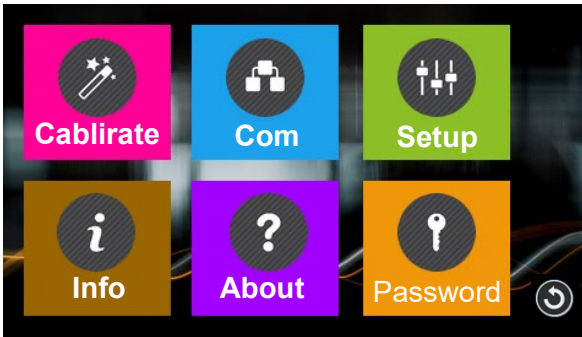


Figure 21. System Setting

Calibration - Calibrate the flow rate for a custom syringe by following the instruction of the calibration wizard and measuring the volume dispensed to make display the actual flow rate.

Com - It is the setting for RS485 MODBUS communication, including baud rate, transmission mode and pump address. To change the address, click the address number on the screen, then input the value in the pop-up window. Restart the drive to apply the settings.

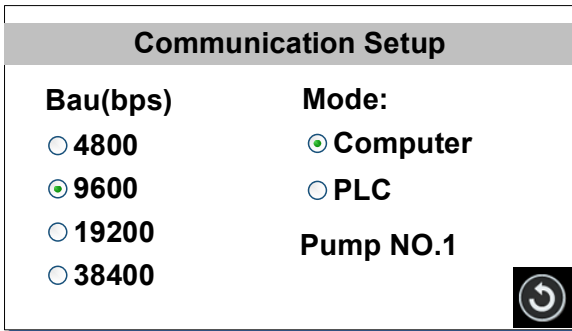


Figure 22. Communication Settings

Setup - Set up general settings as shown below.

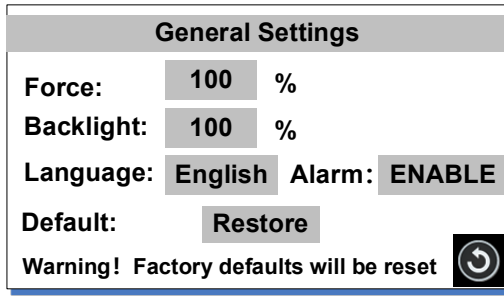


Figure 23. General Settings

- **Force:** The force is set according to the material of a syringe to prevent damage. Press the number to change the value.
- **Backlight:** Brightness of the backlight. Press the number to change the value.
- **Language:** System language, English or Chinese.
- **Alarm:** Enabled or disable the alarm when jammed.
- **Default:** Reset the drive to factory settings. Restart the drive to apply the setting.

Info - It shows the hardware version, software version, drive temperature, total power-on time, total run time, power-on cycles and serial number.

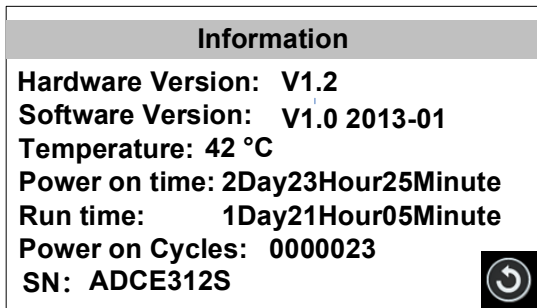


Figure 24. Information

About - It shows the functions and features of the pump.

Password - A password can be set to lock the screen and prevent

a user from changing parameters accidentally. The default password is empty.

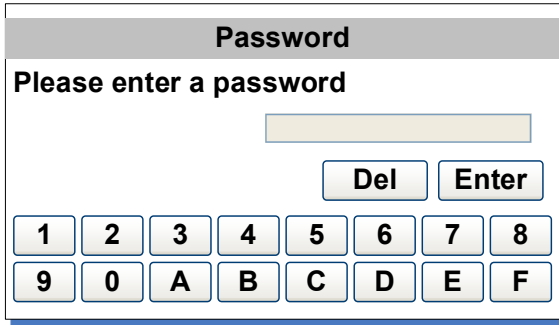
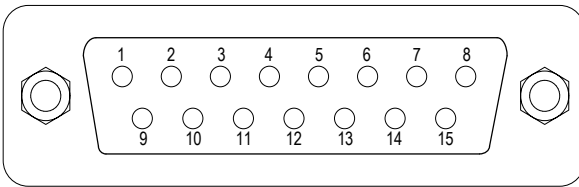


Figure 25. Password

5 External Control Interface



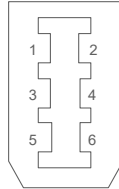
- **DB15 Interface**

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

LAA Series Syringe Pump

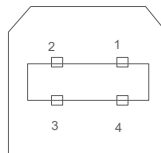
11	GND	Ground of Internal power source
12	CW	Direction signal output
13	RS_IN	External start/stop signal input
14		
15	RS	Start/stop signal output

- 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

6 Operation Instructions

6.1 Before Operating

- 1) Please check the packing slip to ensure all parts are included and intact. If there is a problem, please contact the manufacturer or distributor.
- 2) Read the instructions.
- 3) At least 200mm space from the back of the pump should be maintained when in operation.

6.2 Install Syringe

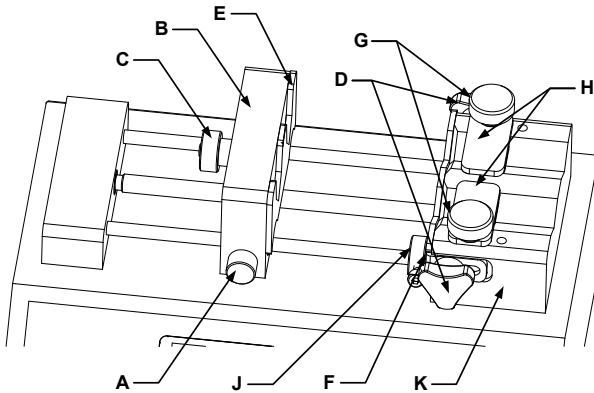


Figure 26. Install Syringe

- 1) Press release button A, and move block B to the position for the length of the syringe.
- 2) Loosen the fasten bolts C and D and adjust the position of the fixed brackets E and F.
- 3) Lift the screw G and rotate the syringe clamp 180 degrees.
- 4) Place the syringe in the groove of the syringe holder K, fix the plunger flange of the syringe on the fixed bracket E, and fix the barrel flange on the fixed bracket F.
- 5) Lift the screw G and rotate the syringe clamp 180 degrees to hold the syringe in position.
- 6) Tighten the fastening bolts C and D.

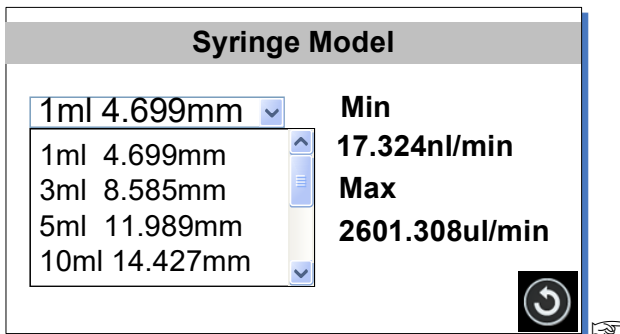
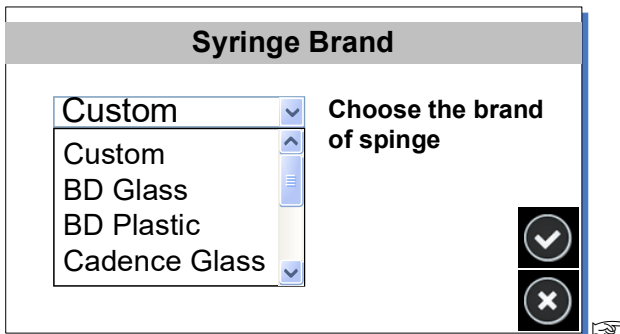
- 7) Use Allen Key to adjust the position of stop block J to prevent over-pushing the syringe.

6.3 Power Connection

The voltage of the power supply should match what is indicated on the rating plate label of the pump. Please plug the power cord into the power connector on the rear of the drive and plug the opposite end of the power cord into an electrical outlet. Flip the power switch located on the rear of the drive.

6.4 First Run Wizard

When using the drive for the first time or after a factory reset, the system will show a welcome message, then the selection of syringe brand -> syringe model -> Work Mode. A user can set the parameters and operation mode according to the requirement. The drive will save the information. One only needs to run the wizard once.



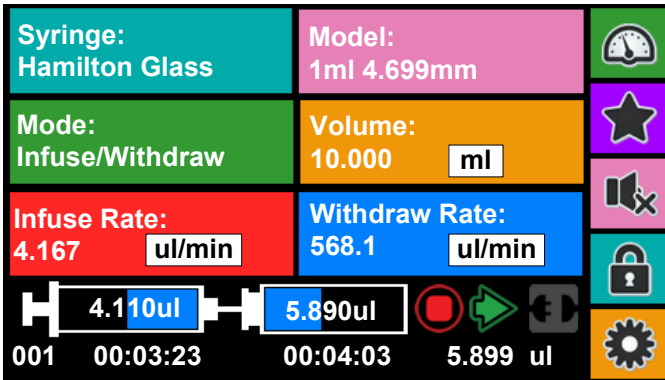
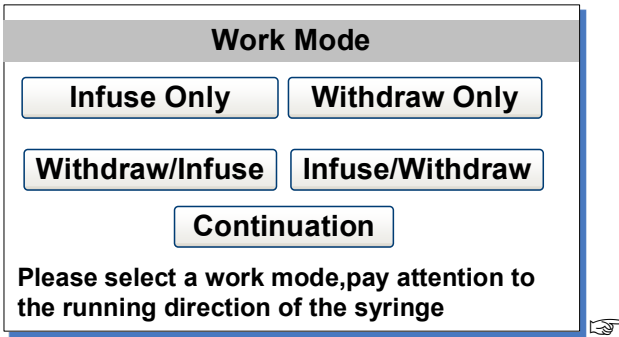


Figure 27. First Run Wizard

6.5 Operation Flowchart

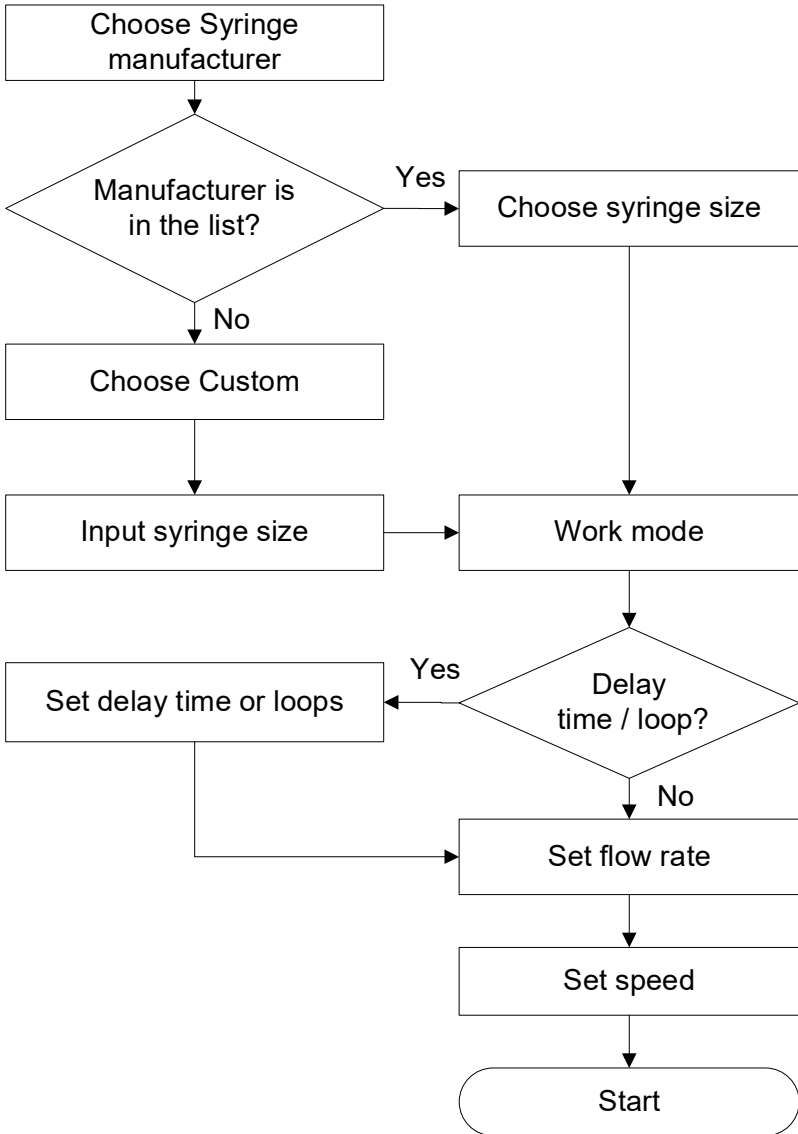



Figure 28. Operation Flowchart

6.5.1 Syringe

On the main screen, press

**Syringe:
Hamilton Glass**

Select the syringe manufacturer in the Syringe Brand window. Choose “Custom” if a manufacturer is not on the list. Press  to return to the main screen.

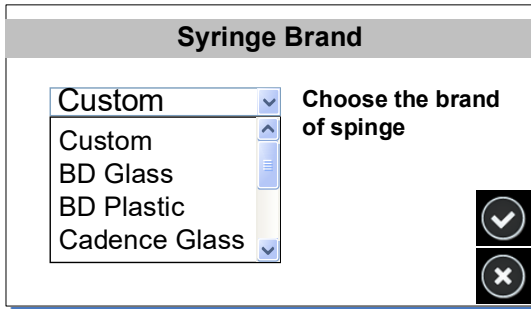


Figure 29. Choose syringe manufacturer

Press

**Model:
1ml 4.608mm**

Select the syringe size in the Syringe Model window. The left side shows the volume capacity and barrel internal diameter. The right side shows the maximum and minimum flow rates.

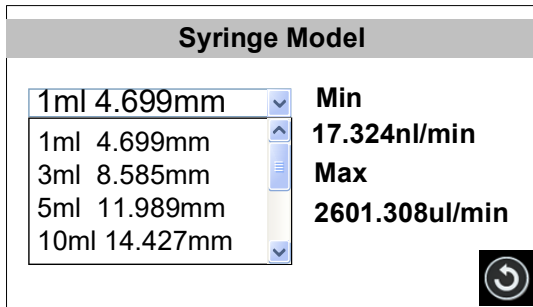


Figure 30. Choose syringe model

If “custom” is selected as the syringe manufacturer, it allows a user to input the specification of a syringe.

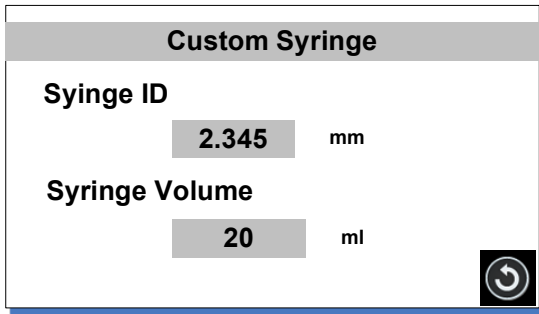



Figure 31. Custom Syringe

Press the numbers to change the values for the ID and volume. Please press the unit of volume to switch between ml and ul.

6.5.2 Work Mode

On the main screen, press  Mode:
Withdraw/Infuse

Select the work mode in the Work Mode window.

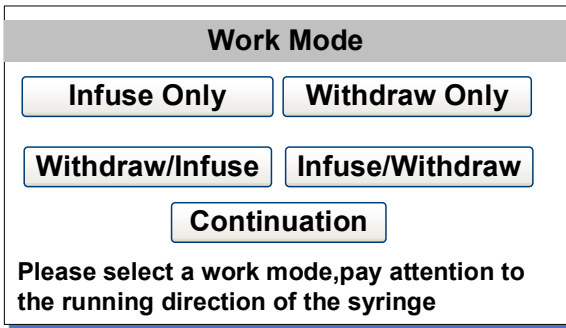



Figure 32. Work Mode

Press  to set delay time and loop as shown below.

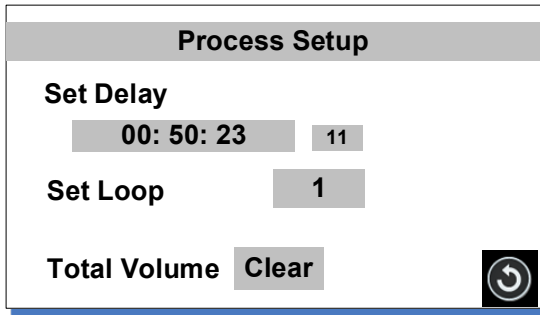


Figure 33. Process Setup

Below is the workflow chart.

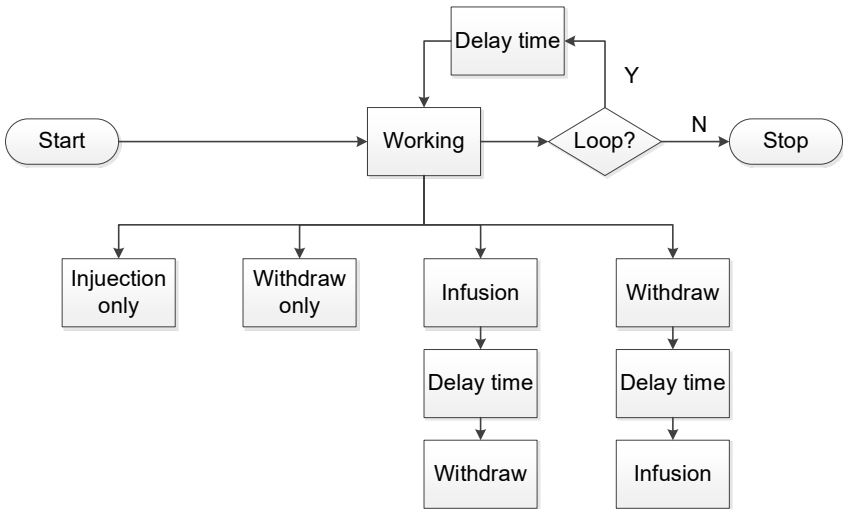


Figure 34. Workflow chart

6.5.3 Volume and Flow rate

To set the desired injection volume, please press the volume value to change it. Press the volume unit to switch between ul and ml.



To set the desired inject/withdraw flow rate, please press the flow rate value to change it. Press the flow rate unit to change the unit to nl/min, ul/min or ml/min.

Infuse Rate:

4.167





ul/min




Withdraw Rate:

568.1

ul/min

6.5.4 Start the process

Press the start button  to start the running process and the green indicator will be on. When completed, the red indicator will be on. When the process is running, press the pause button  to pause the process and the yellow indicator will be on. Press the start button  again to continue the process. Press the stop button  anytime to stop the process, the red indicator will be on, and the process will be reset.

In the middle of a process, the alarm will be triggered if the Push Block reaches the Stop block or it is stopped by something unexpected. The main screen will display , the buzzer will beep intermittently and the red indicator will be blinking. Press the stop button  to dismiss the alarm. Press the start button  to resume the process.

6.5.5 Save and recall Settings

- Save settings

Set the work mode on the main screen, then press



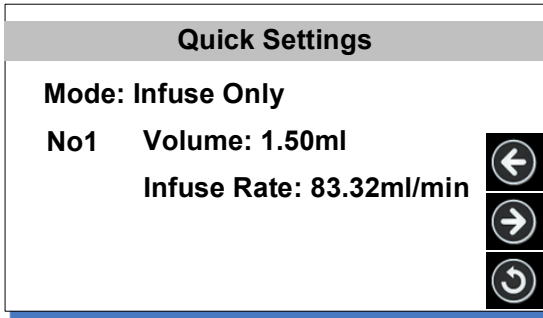









Figure 35. Quick settings

Press  or  to choose the group slot to save the settings. When initiated, the default group slot is No. 1. Press  to return to the main screen, set the volume and flow rate, and the current settings will be saved to the selected group slot.

Repeat the steps above, you can save the settings to the other group slots.


- Recall the settings

Press , press  or  in the Quick Settings window to choose settings saved in a group slot, and then press  to return to the main screen. The settings on the main screen will be updated.

6.6 Flow Rate Calibration

To calibrate the flow rate:

- 1) Attach a syringe to the drive.
- 2) On the main screen, choose Custom syringe, enter the Inner diameter and syringe volume capacity.

- 3) When the drive is not running, press the ◀◀ to fill fluid in the syringe.
- 4) Press  to enter System Setting, press calibration.

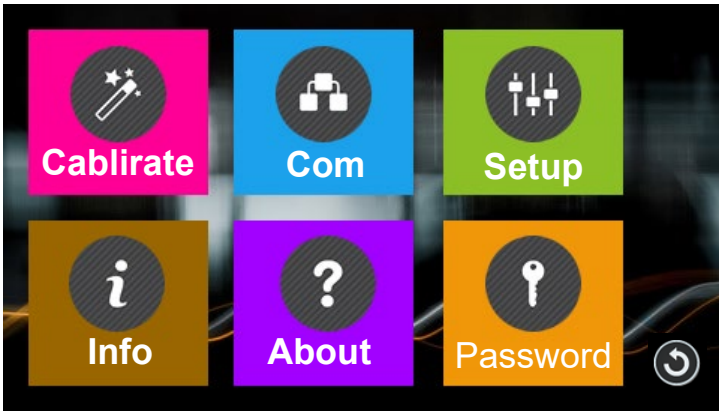


Figure 36. System setting

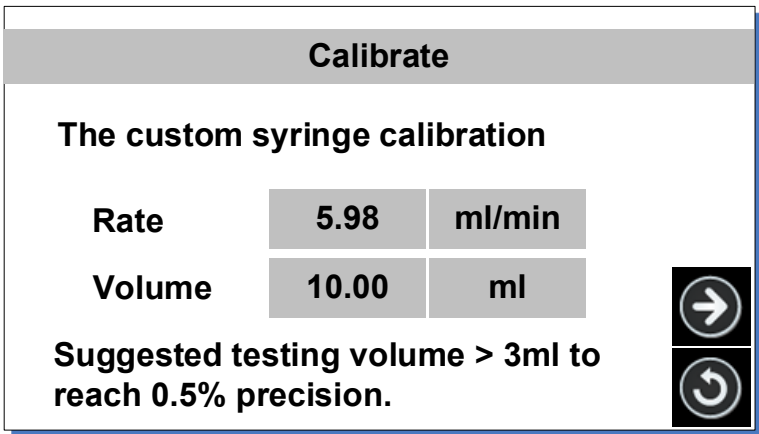




Figure 37. Flow rate calibration

Flow rate and volume are shown in the Calibration window. Flow rate is the expected value when calibrating, and volume is the testing volume. Press the number to change the value if

necessary, press  to enter the test window or press  to return to the system setting window.

Note: The fluid volume should not be less than the suggested value.

5) The calibration window is shown below.











Calibrate			
Press start/stop key to test, then input the data			
Test1	0.000	ml	
Test2	0.000	ml	
Test3	0.000	ml	

Figure 38. Calibration

First, make sure the syringe is filled with fluid. Press  , the syringe will start injecting fluid. Wait for the drive to stop, measure the volume of the transferred fluid, and enter the result value for Test1 on the screen. Repeat the above steps two more times (optional), and enter the result value for Test2 and Test3. Make sure the unit is correct. Press  to enter the "Analyse and calculate" window.

To modify the desired flow rate and test volume, press  to re-enter values, and input the results into the system. The system will ignore the result of 0 and will only use the results entered to calculate the actual flow rate.

Note: Please press  to stop the test anytime during the test, and press  to resume the test.

6) The corrected testing scale will be calculated and the old scale is also displayed for reference only. Press  to redo the test, or press  to cancel the test and return to the System setting window.

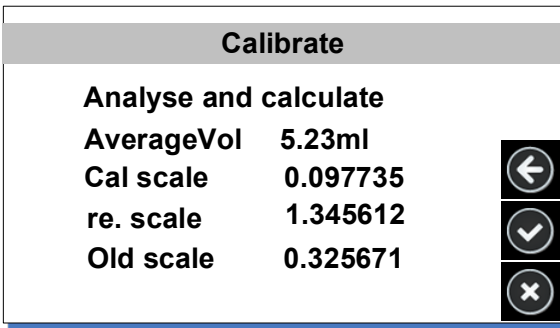



Figure 39. Analyze and calculate

If no result data is entered, the window below will appear. Please press  to redo the test.

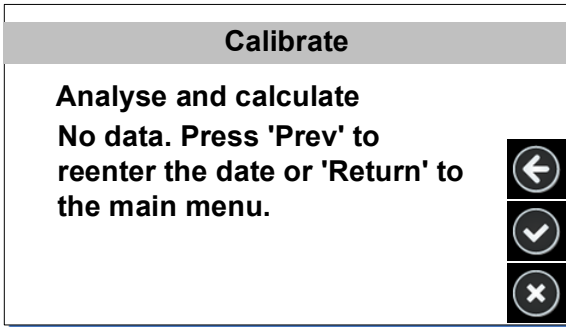



Figure 40. No date entered

6.7 Password

A password will prevent a user from changing parameters accidentally. The default password is empty.

How to set or change the password:

On the main screen, press  and then press Password. In the Password window, enter a new password.

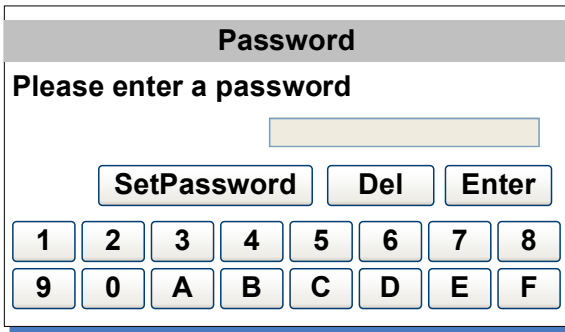





Figure 41. Set password

On the main screen, press  to lock the screen. The icon will change to . Press  and enter the password to unlock the screen. If there is no preset password, simply press Enter to unlock the screen.

6.8 External Control Mode

To control the pump by an external signal

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

LAA Series Syringe Pump

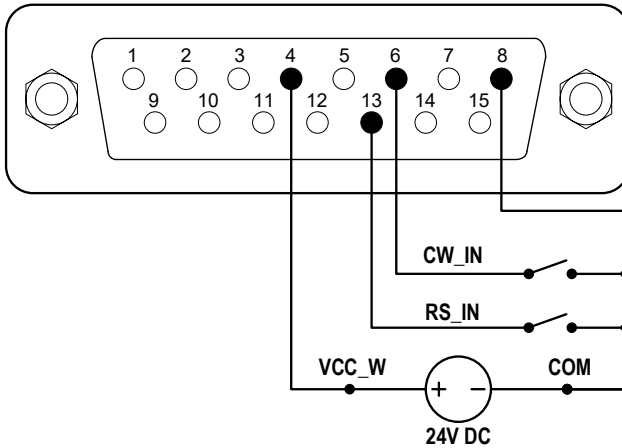


Figure 42. DB15 wiring with external 24VDC power source

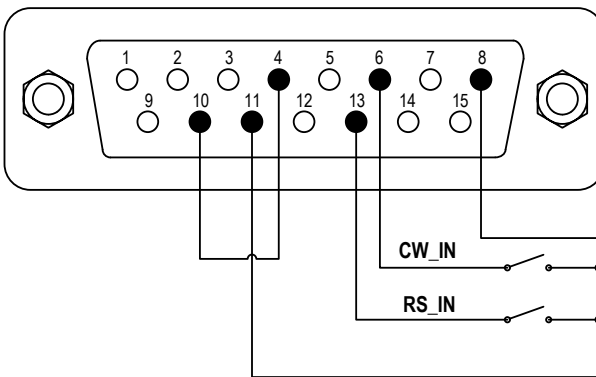


Figure 43. DB15 wiring with internal 24VDC power source

- 2) Turn on the power switch. The display will show the main screen.
- 3) Close then open the external RS_IN switch when the work mode is Infuse Only, Withdraw Only, Withdraw/Infuse or Infuse/Withdraw, the drive will run. Close and open the RS_IN switch again to stop the drive.
- 4) When the work mode is set to Continuation, the control mode is set to Pulse, close then open the external RS_IN switch, the drive will run. Close and open the RS_IN switch again to stop

the drive.

When the control mode is set to Elec, close the external RS_IN switch, and the drive will run. Open the RS_W switch to stop the drive.

When opening the external CW_IN switch, the drive will run in the injection direction; when closing the CW_IN switch, the drive will run in the withdrawal direction.

6.9 Footswitch

To use a footswitch to control the drive

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

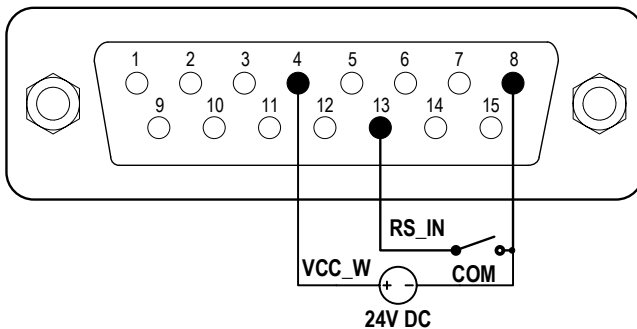


Figure 44. Control with external 24V DC power source

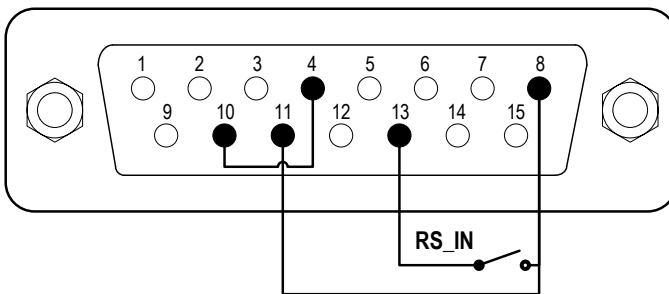


Figure 45. Control with internal 24V DC power source

- 2) Turn on the power switch. The display will show 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 drive will run; close and open the RS_IN switch again to stop the drive.
- 4) When the work mode is set to Continuation, the control mode is set to Pulse, close then open the external RS_IN switch, the drive will run; close and open the RS_IN switch again to stop the drive.

When the control mode is set to Elec, close the external RS_IN switch, the drive will run; open the RS_W switch to stop the drive.

6.10 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.

To work with communication mode

- 1) Turn the power off. 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.

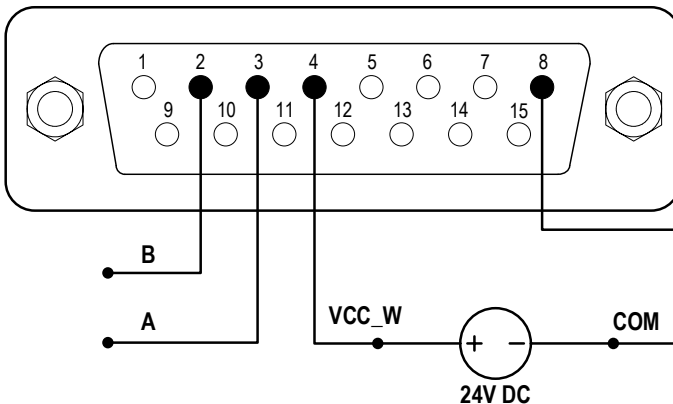


Figure 46. RS485 MODBUS wiring with external 24V DC Power Source

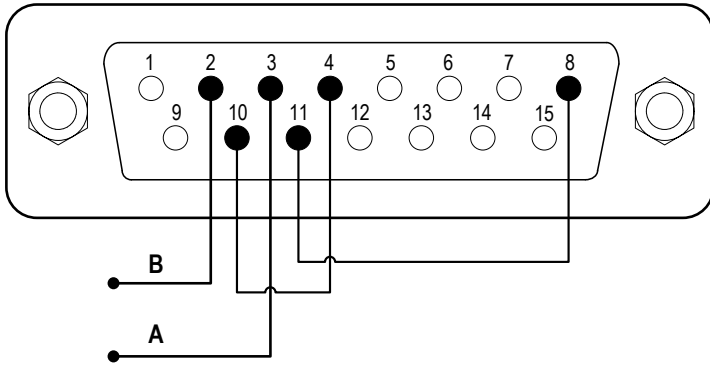




Figure 47. RS485 MODBUS wiring with internal 24V DC power source

- 2) Turn on the power switch. The display will show the main screen.
- 3) When the main screen shows , the communication is connected. If it shows , the communication is disconnected.
- 4) Control the pump with the communication interface.

7 Maintenance

7.1 Warranty

The product comes with 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 drive. Keep the drive dry.
- 3) Do not use chemical solvents to clean the case

7.3 Malfunction Solutions

No.	Malfunction	Description	Solution
1	Hardware	No display	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. Check the wire connection between the motor and the driver board. 2. Check the power voltage for the drive.
3	Hardware	Motor is trembling	<ol style="list-style-type: none"> 1. Check the wire connection between the motor and the driver board. 2. The motor is overloaded. Check the mechanical connection.
4	Hardware	Motor only runs in one direction	Check the connection between the driver board and the main control board.
5	Hardware	Keypad does not work	<ol style="list-style-type: none"> 1. Check the wire connection between the keypad and the main board. 2. Check if the key is broken.
6	Hardware	External control does not work	<ol style="list-style-type: none"> 1. Check the wiring of the connector. 2. Check if the external control power voltage is provided. 3. Check the connections of the

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			external control board.
7	Hardware	RS485 com does not work	<ol style="list-style-type: none"> 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.
8	Hardware	Noisy when running	Check the wire connection between the motor and the mail 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 right	<ol style="list-style-type: none"> 1. Check if the display shows the communication is ready. 2. Reset the address of the drive. 3. Check whether on the bus there are two pumps using the same address



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

8 Dimensions

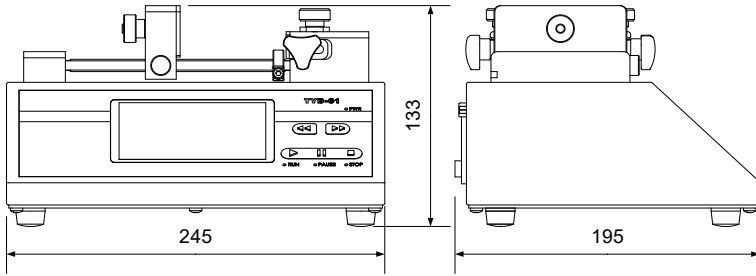


Figure 48. Dimensions (mm)

9 Naming Rule

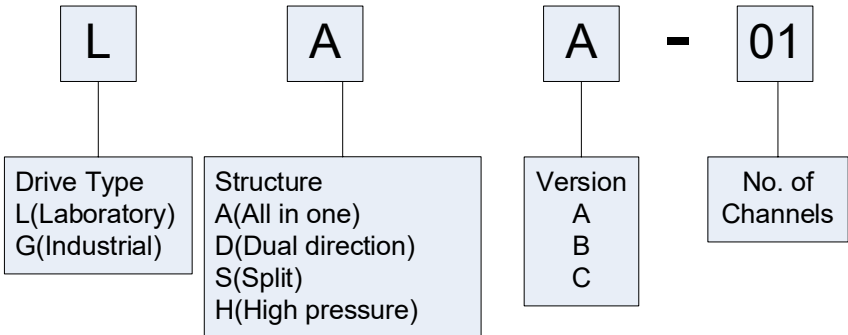


Figure 49. Naming Rule

10 Specifications

LAA-01: for one syringe

LAA-02: for one or two syringes

Syringe	10ul-60ml
Function	Infusion, withdraw, infusion/withdraw, withdra w/infusion, continuation mode. Built-in main brand syringes. Syringe protection and traffic jam alarm. Thrust 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) - 83.320ml/min(60ml)
Linear speed	1um/min - 150mm/min
Linear travel accuracy	± 0.5% (when >30% of drive stroke)
Linear force	>16kgf, adjustable
Pusher advance per microstep	0.156um/ustep
Operation	touch screen + button;
Display	65565 color LCD
Power supply	AC 90-264V 50Hz/60Hz
Wattage	<50W
Working environment	Temperature 4-40°C, Relative humidity <80%
Dimension	245x195x133mm
Weight	3.2kg

11 Flow rate table

Size	ID	Min flow rate	Unit	Max flow rate	unit
0.5ul	0.103mm	8.000	pl/min	1.249	ul/min
1ul	0.146mm	16.000	pl/min	2.511	ul/min
2ul	0.206mm	33.000	pl/min	4.999	ul/min
5ul	0.343mm	83.000	pl/min	12.497	ul/min
10ul	0.485mm	184.00	pl/min	27.711	ul/min
25ul	0.729mm	417.00	pl/min	62.608	ul/min
50ul	1.03mm	833.00	pl/min	124.984	ul/min
100ul	1.457mm	1.667	nl/min	250.092	ul/min
250ul	2.304mm	4.169	nl/min	625.383	ul/min
500ul	3.256mm	8.326	nl/min	1.248	ml/min
1000ul	4.608mm	16.676	nl/min	2.501	ml/min
1ml	4.699mm	17.342	nl/min	2.601	ml/min
3ml	8.585mm	57.885	nl/min	8.682	ml/min
5ml	11.989mm	112.890	nl/min	16.933	ml/min
10ml	14.427mm	163.469	nl/min	24.520	ml/min
20ml	19.05mm	285.027	nl/min	42.754	ml/min
30ml	21.59mm	366.090	nl/min	54.913	ml/min
50ml	26.594mm	555.459	nl/min	83.318	ml/min
60ml	26.594mm	555.459	nl/min	83.318	ml/min

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