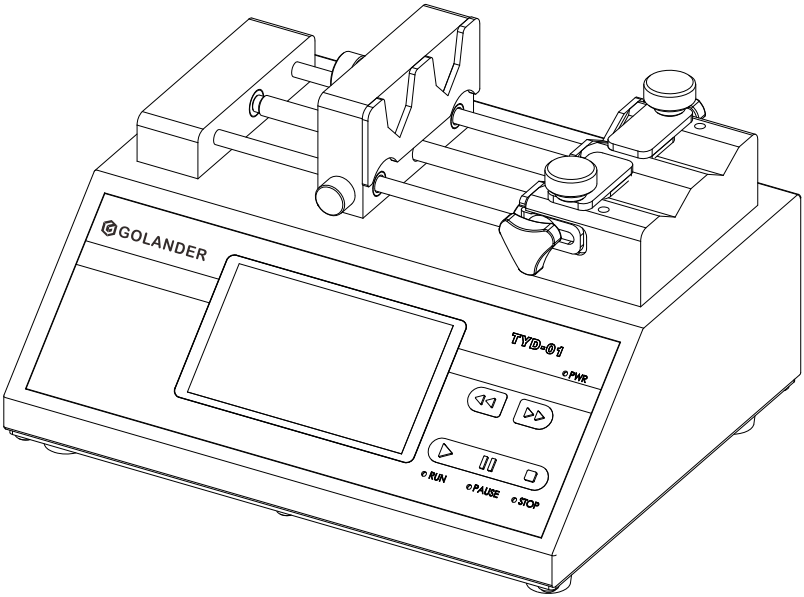
GOLANDER PUMP

Syringe Pump TYD01 Manual



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Contents

Safety Cautions

Danger: Please use correct AC power voltage source shown on the sticker on the equipment to avoid any damage.

Please do not open the case. High voltages exist and are accessible. Use extreme caution when servicing internal components.

For maintenance, please contact the manufacturer or distributor directly.

Danger: Maintain distance from the lead screw when a syringe pump is in operation. Fingers or loose clothing could get caught in drive mechanism.

Warning: When install a syringe, the limit block must be adjusted to the appropriate place to avoid unexpected damage to a syringe. Our company will not be held liable from loss result from damage to a syringe, including the leaking of toxic, damaging or valuable fluid.

Warning: Remove power from pump before connecting or disconnecting the external control device or communication interface.

Warning: Pump is provided with a grounded plug. It must be well grounded at all times.

Warning: This product is not intended for medical use.

1 Description

TYD01 series syringe pump can work with a variable size of the syringes, with different work modes according to the requirement. There are five working modes available: infusion, withdrawal, infusion then withdrawal, withdrawal then infusion and continuous cycle. It has split structure. Complete flexibility is offered with the user able to use many manufacturer's syringes with sizes ranging from 10uL to 60mL microliter syringe. The high precision control is suitable for all kinds of biological experiments. High-resolution color LCD touch screen is convenient to set parameters. Multiple indicators show the working status. The pump is versatile and can be interconnected through the RS485 interface. This interface is easy to use and each pump is assigned its own unique pump address, so multiple pumps can be linked together to be controlled by a PC, PLC or other control devices.

TYD01-01 is suitable for single syringe, size 10uL-60mL, and linear velocity from 1um/min to 150mm/min.
TYD01-02 is suitable for dual syringes, size 10uL-60mL, and 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 working modes
- Color LCD touch screen, physical function keys
- Screen lock, key mute operation.
- Indicators for clear indication of operation status

- A variety of standard syringes support, non-standard syringe support
- Multiple group data save
- High precision control
- RS485 MODBUS communication
- External control signal to control start/stop and direction
- Switching power supply to work with AC86-265V
- Metal case

3 Components and Connectors

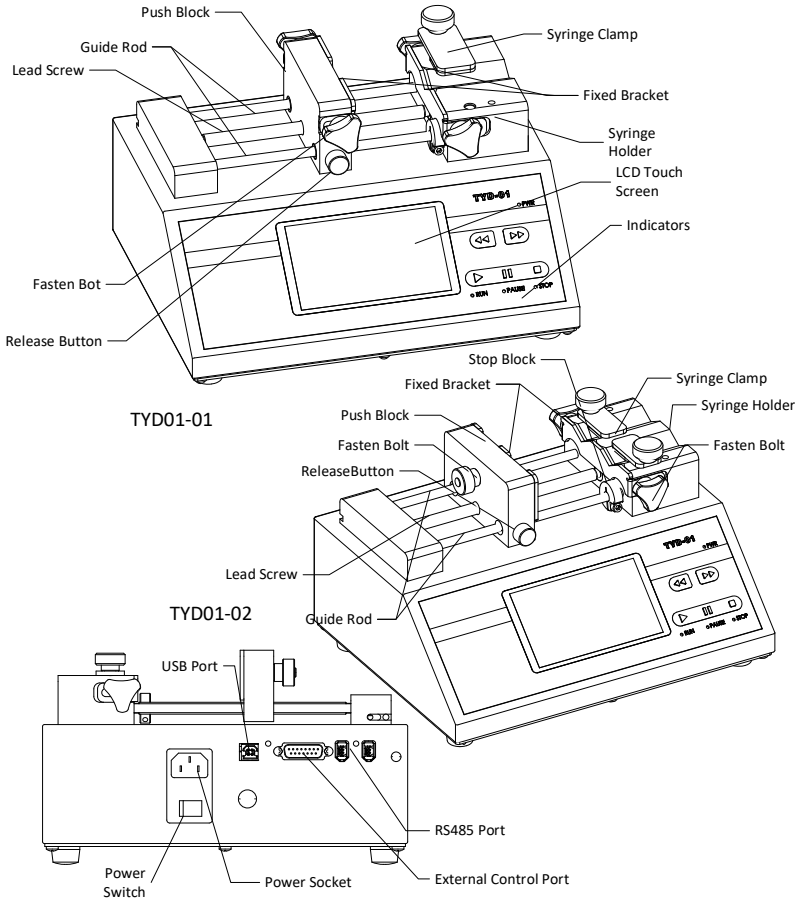


Figure 1. Components and Connectors

4 Display Panel and Operating Keypad

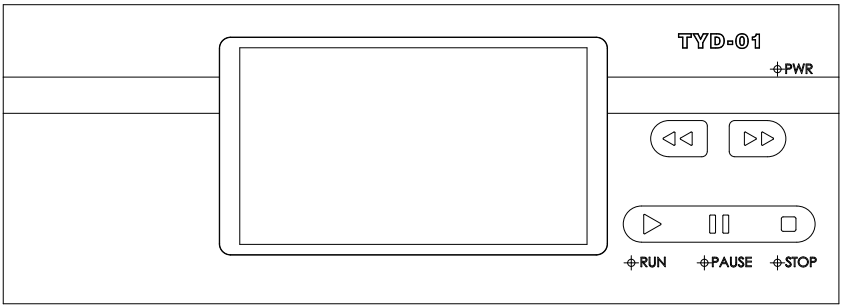


Figure 2. Display Panel

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 drive stopped, press and hold the key to push at the maximum speed

FAST BACKWARD key. When drive stopped, press and hold the key to retreat at the maximum speed

Blue indicator: power indicator.
Green indicator: operation indicator. When drive starts, the indicator turns on.
Yellow indicator: pause indicator. When operation pauses, the light turns on.
Red indicator: The light turns on when an operation stopped or completed. The light blinks wen 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. See the picture below.

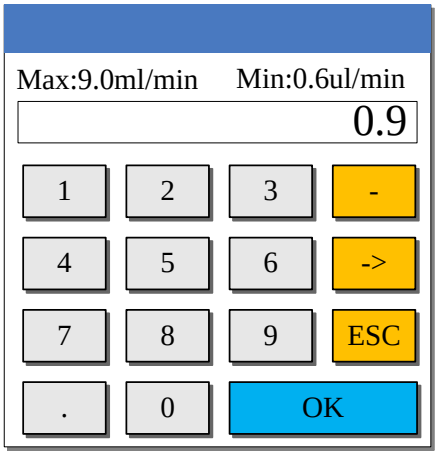


Figure 3. Flow input screen

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

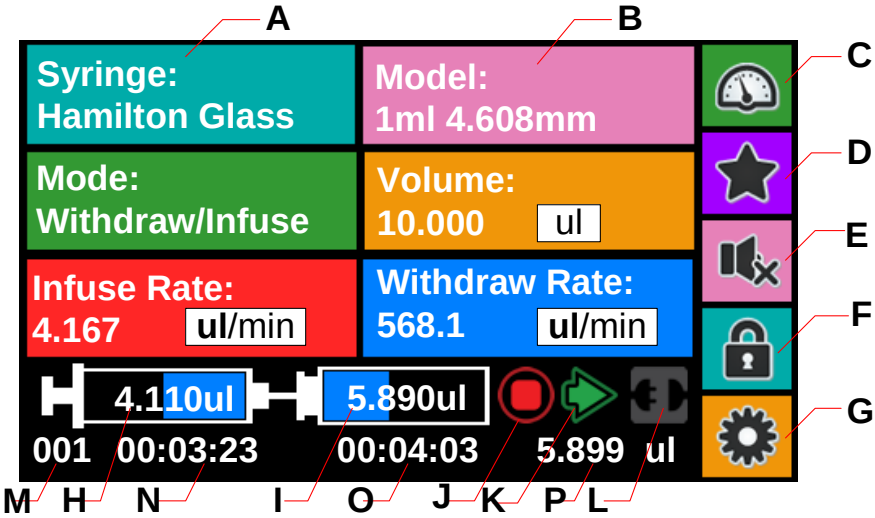


Figure 4. Main Interface Display

A - 

Selection of syringe manufacturers. Press here to choose the brand of syringe. “Custom “is for self-defined syringe. See the picture below.

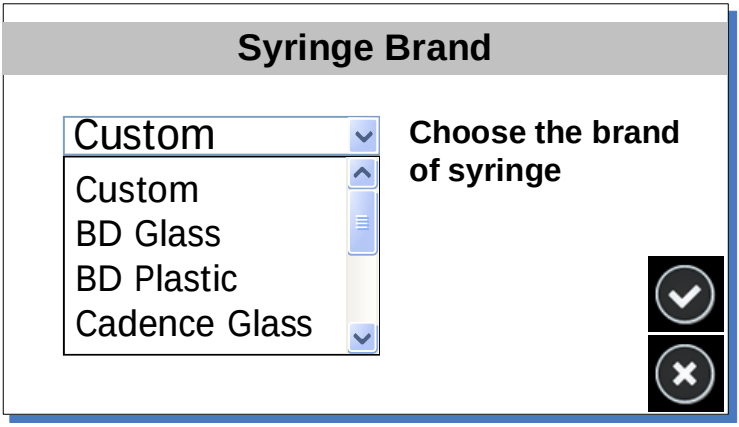


Figure 5. Syringe manufacturers

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

Syringe specifications, indicating the inner diameter of the syringe and the volume of the syringe respectively. Press to enter syringe selection interface, see the picture blow.

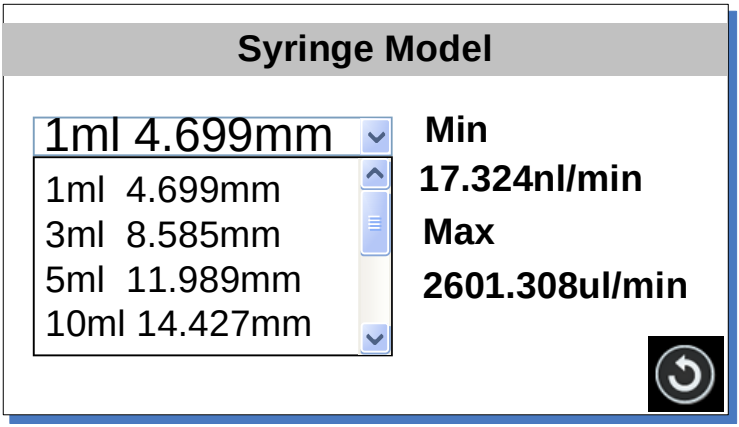


Figure 6. Syringe model selection

When “Custom” is selected as the syringe manufacturer, press to enter the custom syringe setting page, see below.

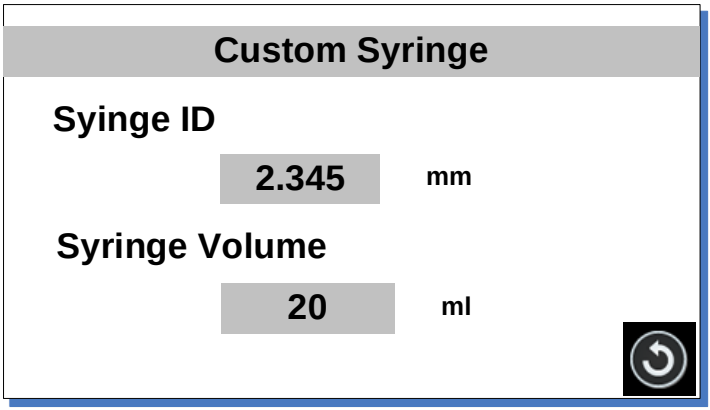


Figure 7. Custom Syringe

C - 

Process Setup. Press this icon to the interface of process setup (see the picture below)

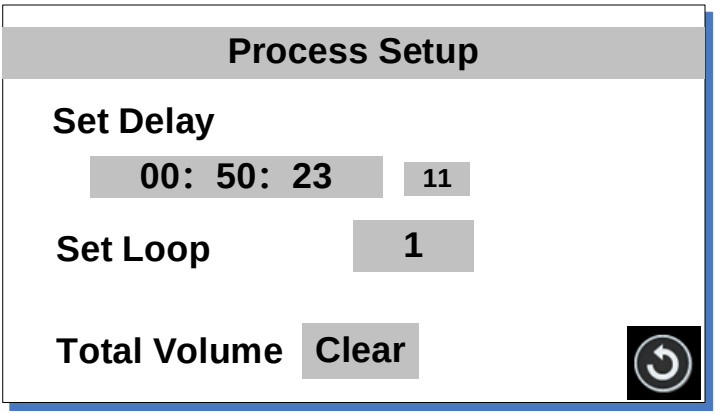


Figure 8. Process Setup

- Set Delay: Set the delay time in motion, first delay then operation.
- Set Loop: Set how many loops for repetitive operation.
- Total volume：Clear accumulative volume.

D - 

Quick Change Para: Press this icon to enter quick setting interface to allow the selection of pre-entered three sets of data, see the picture below

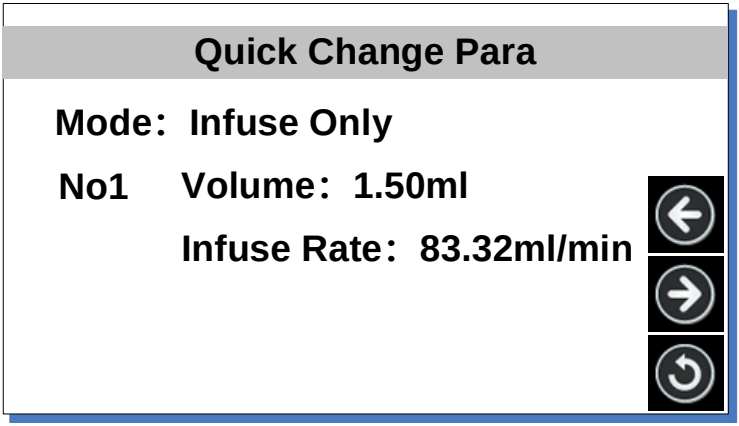


Figure 9. Quick Change Para

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

G - 

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

H - 

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

I - 

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

J - Operation status. The current operation of motor is displayed.

Motor in operation

Motor off

Motor loss speed

Fast forward

Fast backward

Figure 12. Operation status

K - Direction

Injection

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 work mode selection interface.

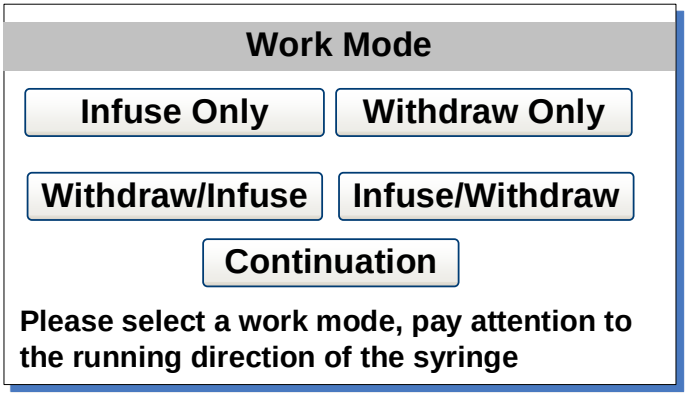


Figure 15. Work Mode interface

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

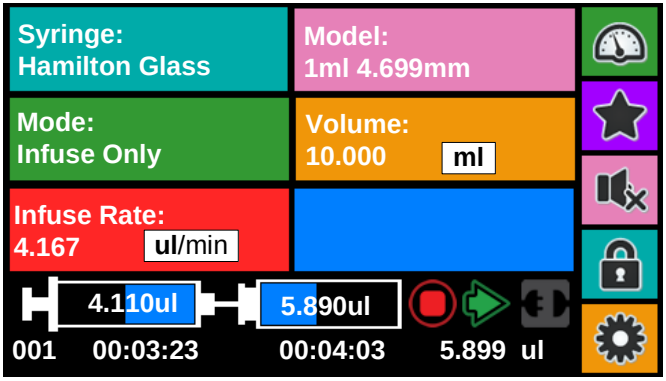


Figure 16. Infuse only display Interface

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

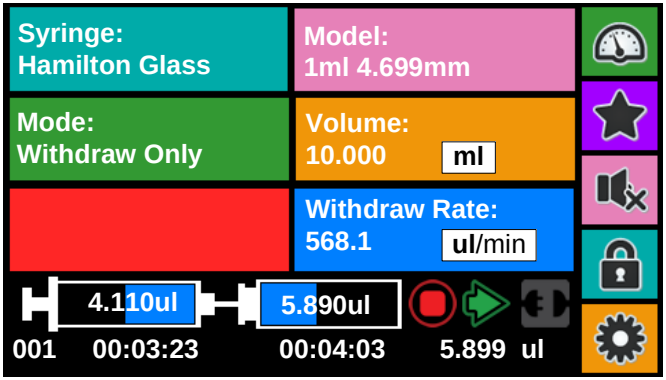


Figure 17. Withdraw only display interface

Withdraw/infuse: It allows withdraw first then infusion. Multiple loops can be set to allow multiple operations.

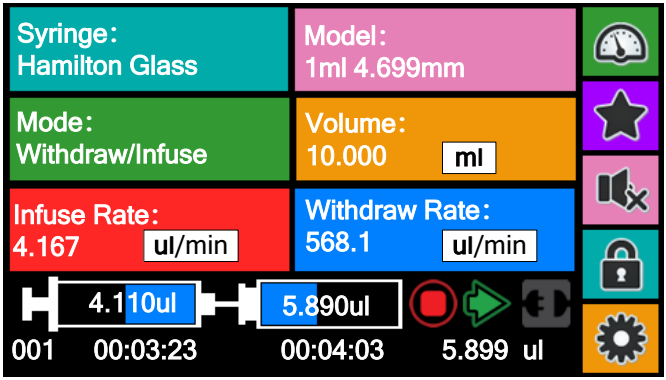


Figure 18. Withdraw/infuse display interface

Infuse/withdraw: First infuse the set volume then withdraw it. Multiple loops can be se for multiple operations.

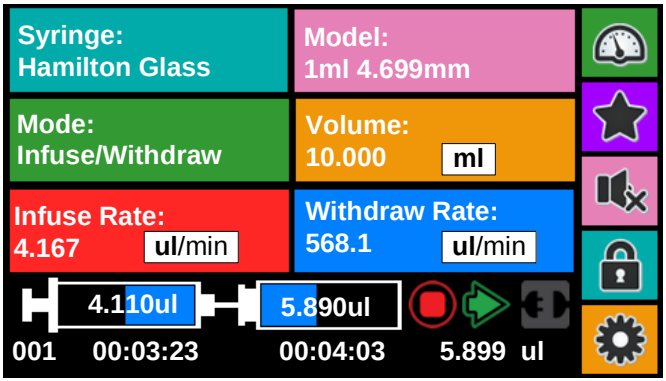


Figure 19. Infuse/Withdraw display interface

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

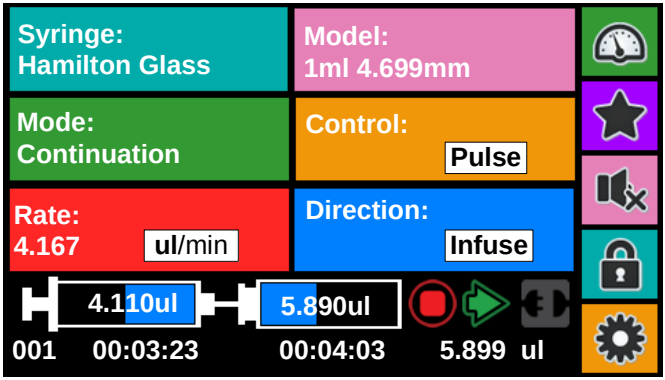


Figure 20. Continuation display interface

R - 

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

S - 

Infuse Rate/ Withdraw Rate: Set infuse flow rate and withdraw flow rate. Press the flow rate value to change it. Press the unit of flow rate to switch among nl/min, ul/min and ml/min.

Attention: If it shows “Overflow” or “Underflow”, that means the value entered is out of range, please enter the number again, 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.

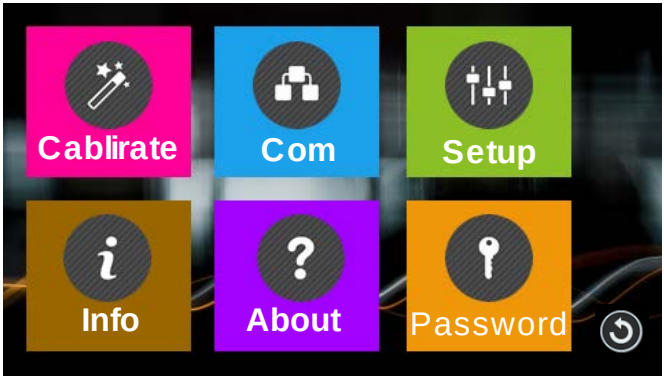


Figure 21. System Setting

Calibrate - Calibrate the flow rate for custom syringe. By following the instruction of the calibration wizard, measure the volume has dispensed, to make the screen show 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.

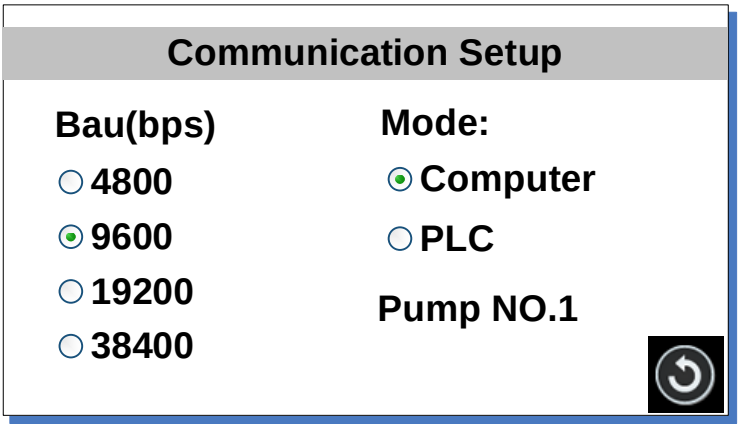


Figure 22. Communication Settings

Setup - Set up the general settings shown below.

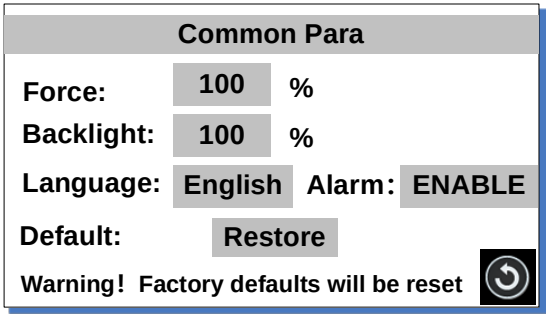


Figure 23. General Settings

- **Force**: The force according to the material of the syringe, to prevent damage to the syringe. Press the number to change the value.
- **Backlight**: The brightness of the backlight. Press the number to change the value.
- **Language**: System langue, English or Chinese.
- **Alarm**: The alarm when jammed, enabled or disabled.
- **Default**: Reset the drive to factory settings. Restart drive to apply the settings.

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

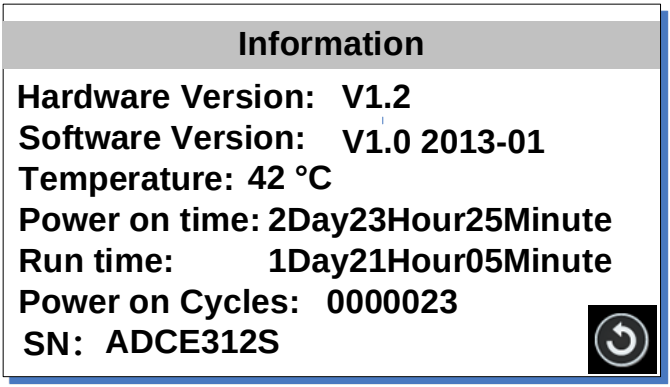


Figure 24. Information

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

Password - It is to set a password to unlock the screen. It will prevent user from changing parameters accidentally. The default password is empty.

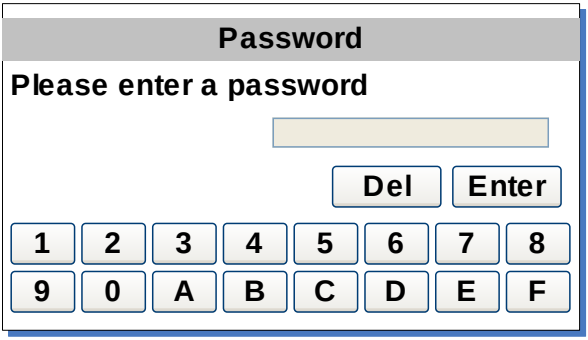
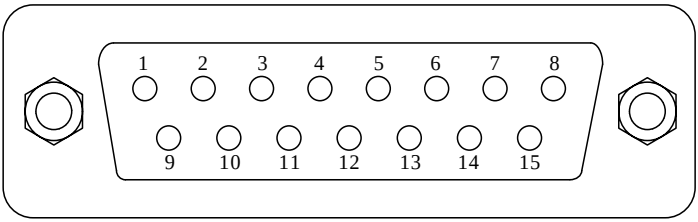


Figure 25. Password

5 External Control Interface

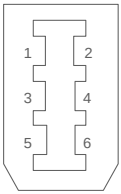


- **DB15 Interface**

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		

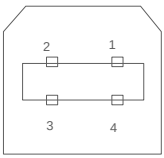
6	CW_IN	External input signal to control direction
7		
8	COM	Ground of external power
9		
10	+24V	Positive of internal +24V power source
11	GND	Ground of Internal power source
12	CW	Direction signal output
13	RS_IN	External start/stop signal input
14		
15	RS	Start/stop signal output

- **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 make sure nothing is wrong or damaged in the package. If there is problem, please contact the manufacturer or distributor.
2) Read through the instruction manual**.**
3) There should be more than 200 mm space for the back of the drive when it is running.

6.2 Install Syringe

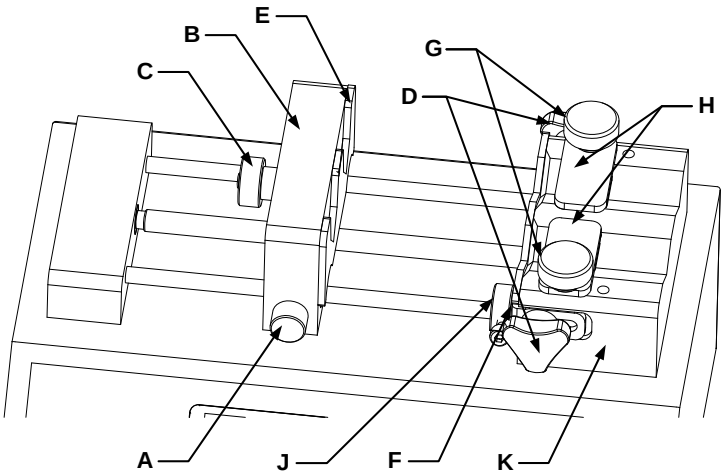


Figure 26. Install Syringe

1) Press release button A, move block B to the position for the length of the syringe.

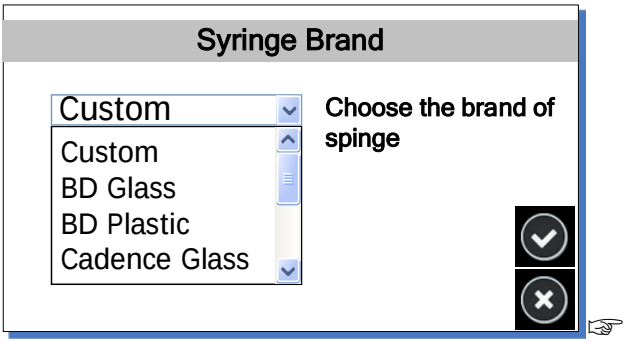
2) Loose the fasten bolts C and D, adjust the position of the fixed brackets E and F.
3) Lift the screw G, rotate the syringe clamp 180 degrees.
4) Place the syringe in the groove of the syringe holder K, fix the plunger flange of the syringe on the fixed bracket E, and fix the barrel flange on the fixed bracket F.
5) Lift the screw G, rotate the syringe clamp 180 degrees to hold the syringe on the position.
6) Tighten the fasten bolts C and D.
7) Use Allen Key to adjust the position of stop block J to prevent over pushing the syringe.

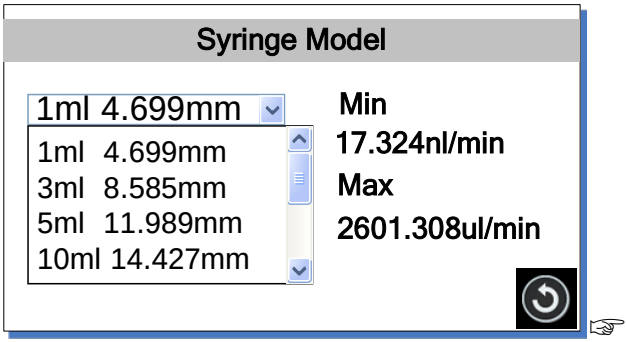
6.3 Power Connection

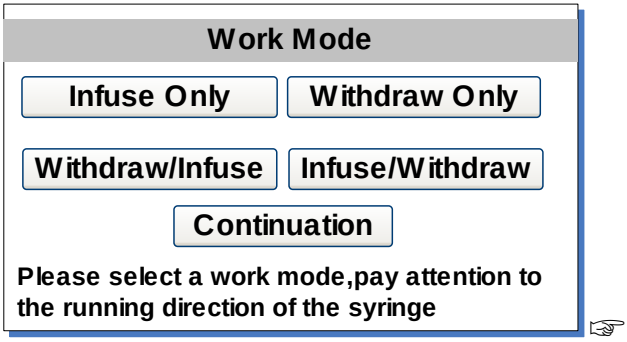
The voltage of the power supply should be marked on the sticker of the pump. Please make sure to use the right power source for the drive. Please plug the power cord into the power connector on the rear of the drive and plug the opposite end of the power cord into an electrical outlet. Flip the power switch located on the rear of the drive.

6.4 First Run Wizard

When use the drive at the first time or after factory reset, the system will show welcome screen. The next step is to choose the syringe brand -> syringe model -> Work Mode. User can set the parameters and operation mode according to the requirement. The drive will save the information and you only need to run the wizard once.







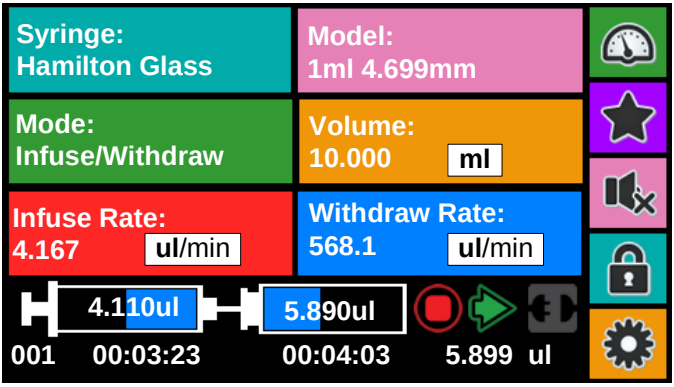


Figure 27. First Run Wizard

6.5 Operation Flowchart

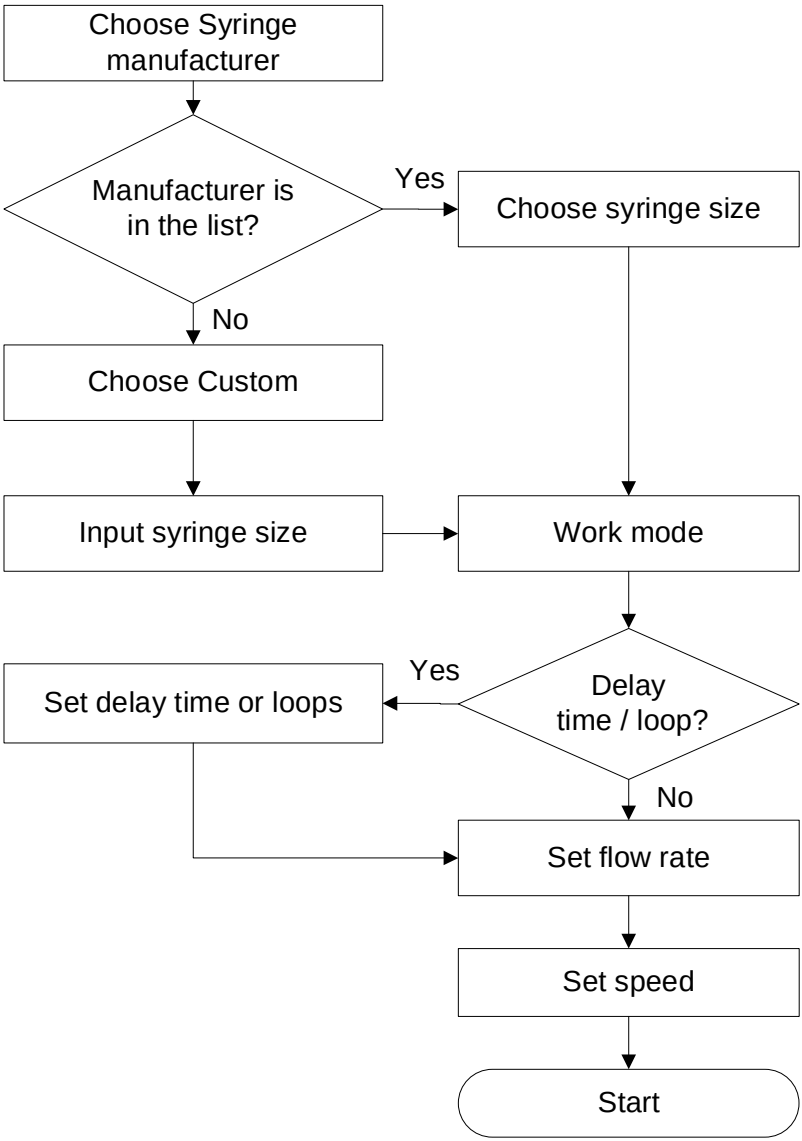


Figure 28. Operation Flowchart

6.5.1 Choose syringe

On the main screen, press **Syringe: Hamilton Glass**.

Select the syringe manufacturer in the Syring Brand window. If the manufacturer is not in the list, please choose Custom， press to return to the main screen.

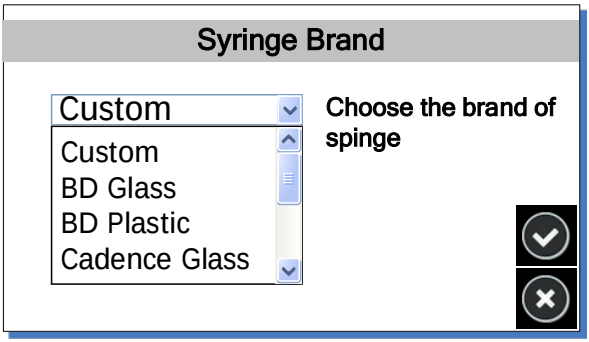


Figure 29. Choose syringe manufacturer

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 flow rate and minimum flow rate.

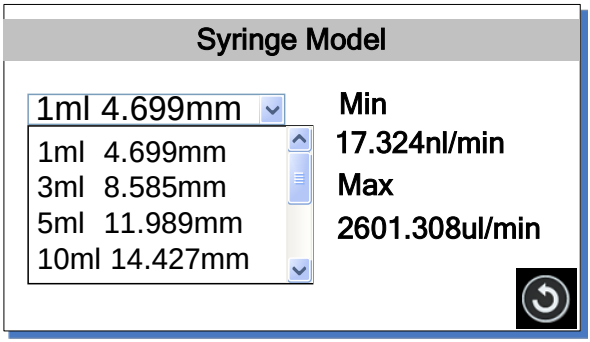


Figure 30. Choose syringe model

If the syringe manufacture is Custom, it allows user to input the specification of the syringe.

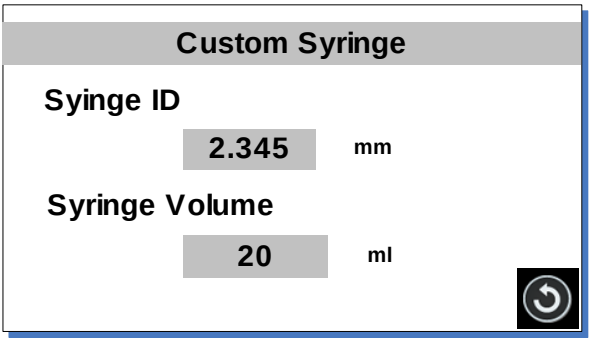


Figure 31. Custom Syringe

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 Choose work mode

On the main screen, press **Mode: Withdraw/Infuse**.

Select the work mode in the Work Mode window.

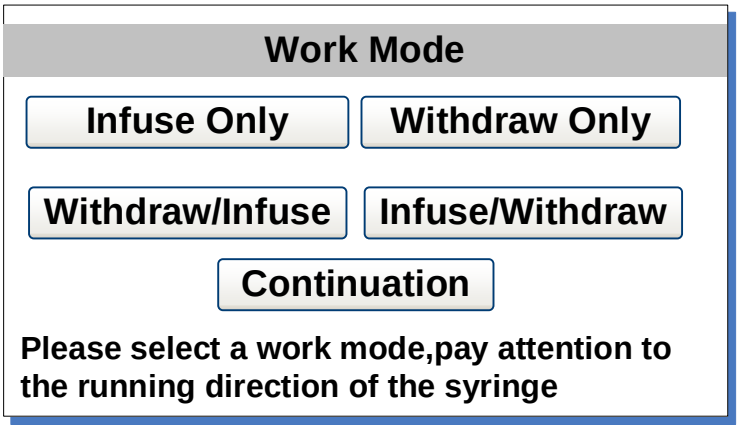


Figure 32. Work Mode

Press  to set delay time and loop as shown below.

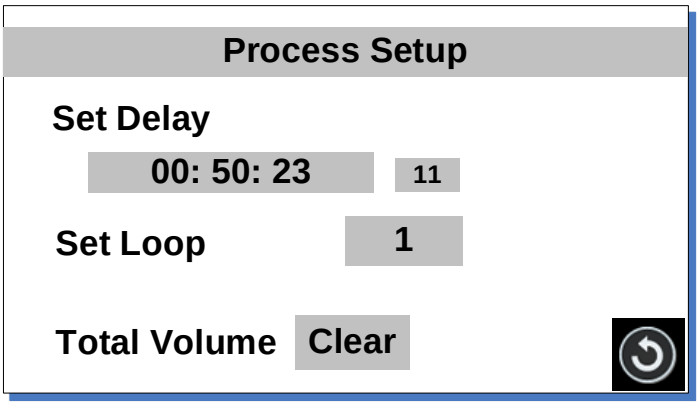


Figure 33. Process Setup

Below is the work flow chart.

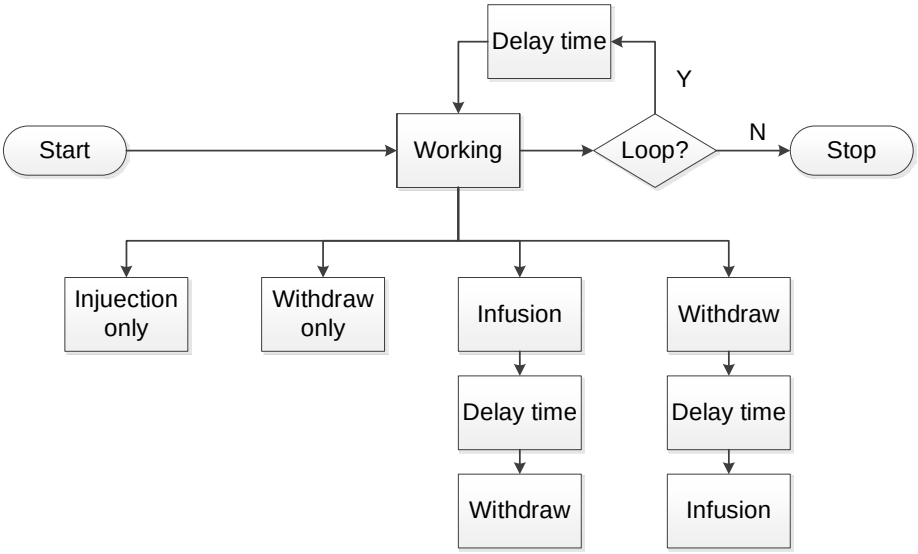


Figure 34. Work flow chart

6.5.3 Set 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 injection/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.

6.5.4 Start the process

Press the start button ▶ to start the running process, the green indicator will be on; when finished, red indicator will be on.

When the process is running，press the pause button ❚❚ to pause the process, 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.

When in the middle of the process, if the Push Block reaches the Stop block, or it is stopped by something unexpected, the alarm will be triggered, the main screen will show  and the buzzer will beep intermittently and the red indicator will be blinking. Press

the stop button to dismiss the alarm. Press 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 the icon.

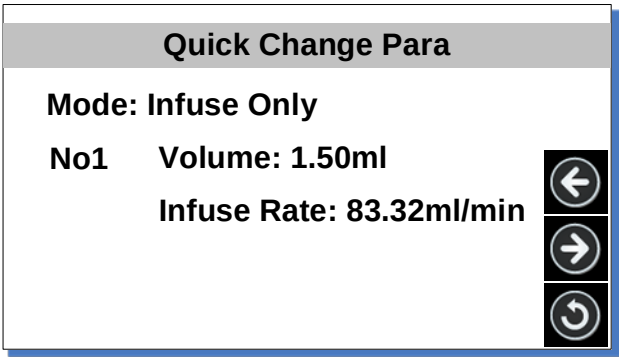


Figure 35. Quick settings

Press or button to choose which group slot you want to save the settings, when initiates, the default group slot is No. 1. Then press the button to return to the main screen, set the volume and flow rate, 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 the icon , in the Quick Settings window, press

or button to choose settings saved in the group slot, then press the button 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) Install syringe on the drive.
2) On the main screen, choose Custom syringe, enter the ID 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，then press calibrate icon.

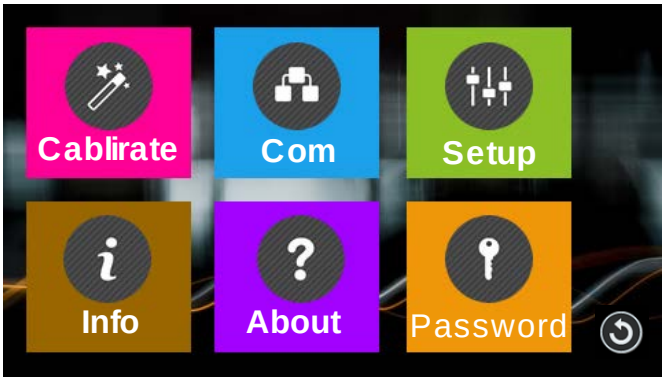


Figure 36. System setting

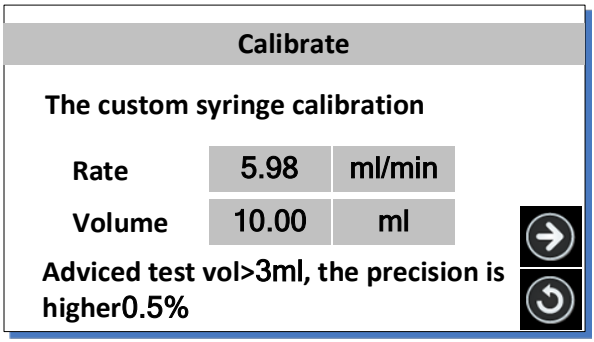


Figure 37. Flow rate calibration

Flow rate and volume are shown in Calibrate window. Flow rate is the value you want the flow rate to be when calibrating, and the volume is the volume for testing. Press the number to change the value if necessary, press to enter test window or press to return to the system setting window.

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

5) Calibrate window shown below.

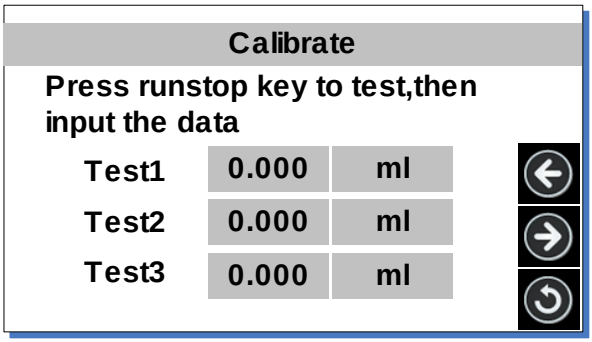


Figure 38. Calibration

First, please make sure the syringe is filled with fluid, then press

start button , the syringe will start injecting fluid. Wait for the drive to stop, measure the volume of the transferred fluid, enter the result value for the Test1 on the screen. Repeat the above steps two more times (optional), and enter the result value for the Test2 and Test3. Please pay attention to the unit to make sure it is correct. Press to enter Analyze and calculate window.

If you want to modify the desired flow rate and volume to test, press button to re-enter the values. Then input the results to the system. The system will ignore the result of 0 and will only use the results you input to calculate the actual flow rate.

Note: Please press key to stop the test anytime when an accident occurs during the test, and press to resume the test.

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

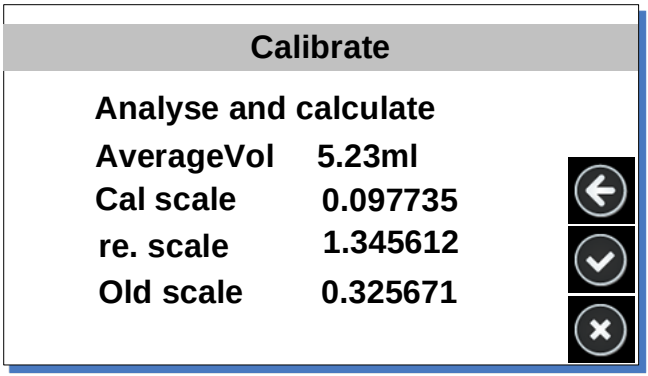


Figure 39. Analyze and calculate

If there's no result data entered, it will show the window below.

Please press  to redo the test.

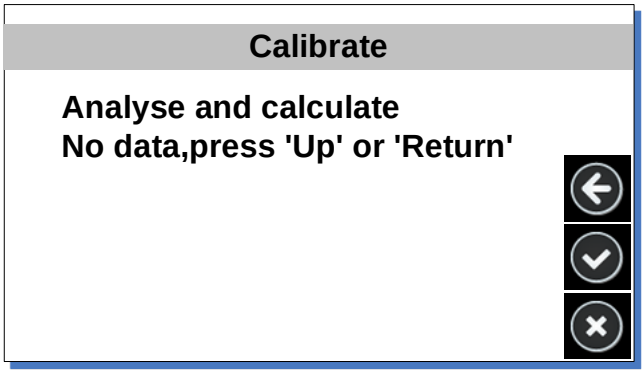


Figure 40. No date entered

6.7 Password

It is to set a password to unlock the screen. It will prevent user from changing parameters accidentally. The default password is empty.

How to set or change the password:

On the main screen, press the icon  , then press Password.

In the Password window, enter a new password.

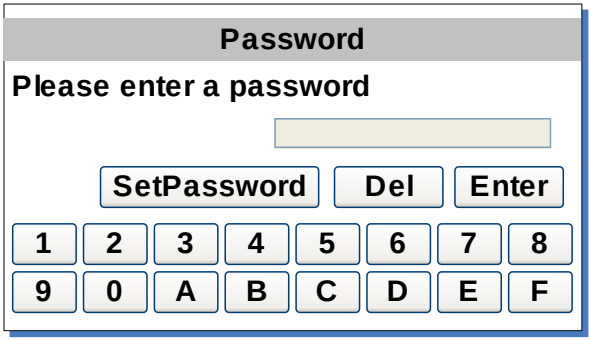


Figure 41. Set password

On the main screen, press  to lock the screen. The icon will changed to be  . 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 pump by 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.

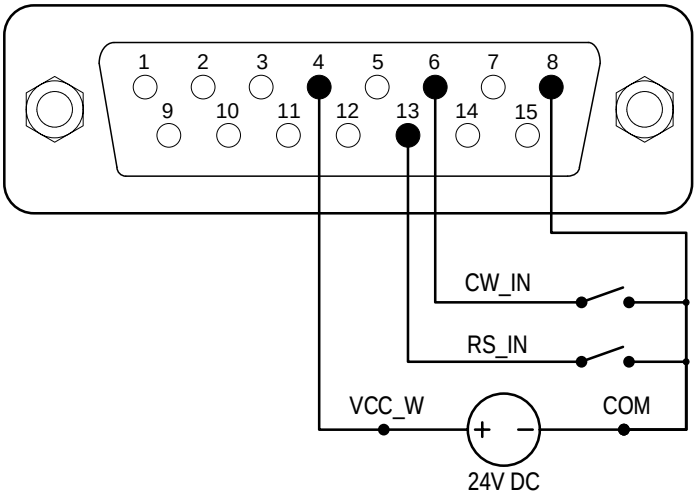


Figure 42. DB15 wiring with external 24VDC power source

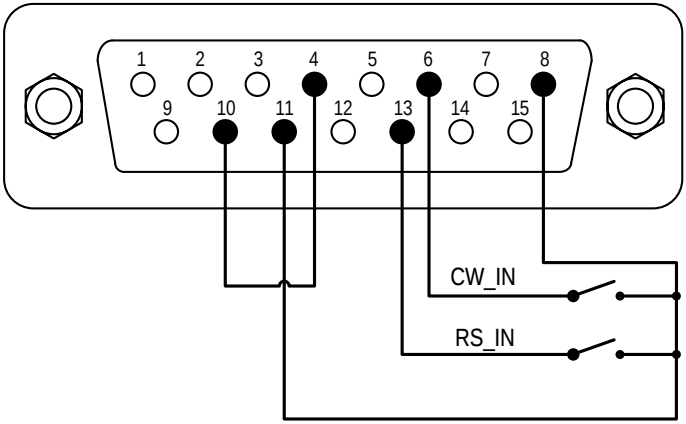


Figure 43. DB15 wiring with internal 24VDC power source

2) Turn on the power switch. The display will show the main screen.
3) 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 RS_IN switch again to stop the drive.

4) When the work mode 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 RS_IN switch again to stop the drive.

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

   When open the external CW_IN switch, the drive will run in injection direction; when close CW_IN switch, the drive will run in withdraw 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.

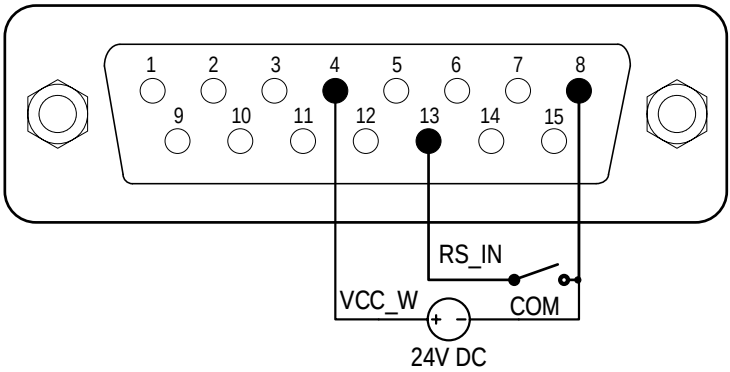


Figure 44. Control with external 24V DC power source

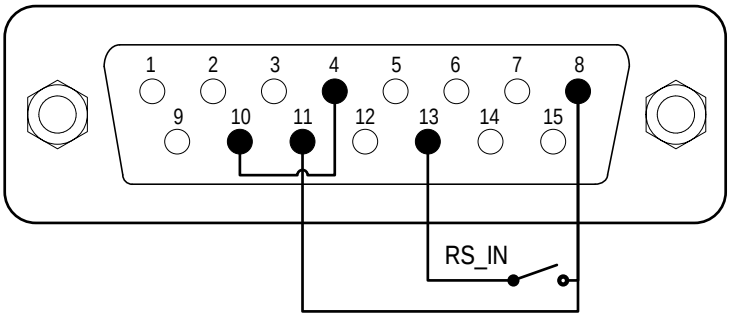


Figure 45. Control with internal 24V DC power source

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 RS_IN switch again to stop the drive.
4) When the work mode 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 RS_IN switch again to stop the drive.

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

6.10 Communication Mode

The RS485 interface supports standard MODBUS protocol. Pump can communicate with external device 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. External DC power source is recommend to avoid electrical interference.

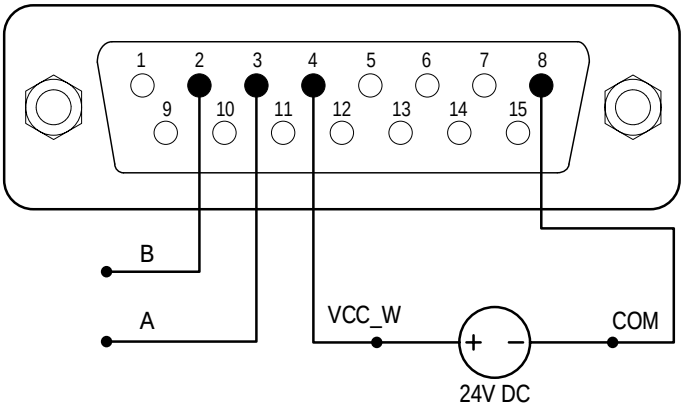


Figure 46. RS485 MODBUS wiring with external 24V DC Power Source

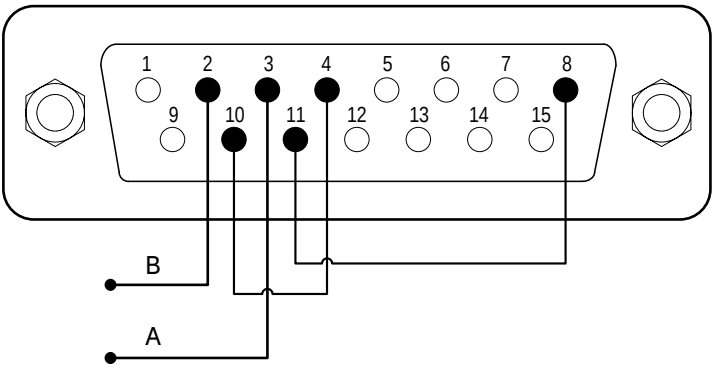


Figure 47. RS485 MODBUS wiring with internal 24V DC power source

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 pump with 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, 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	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 LCD and main control board.
2	Hardware	Motor does not work	1. Check the wire connection between motor and driver board. 2. Check the power voltage for the drive.
3	Hardware	Motor is trembling	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	1. Check the wire connection between keypad and the main board. 2. Check if the key is broken.
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 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.
8	Hardware	Noisy when running	Check the wire connection between motor and mail board.
9	Software	Touch screen does not work	Press and hold the FAST FORWARD and FAST BACKWORD 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	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 the problem can not be solved, please contact the manufacturer or distributor.

8 Dimensions

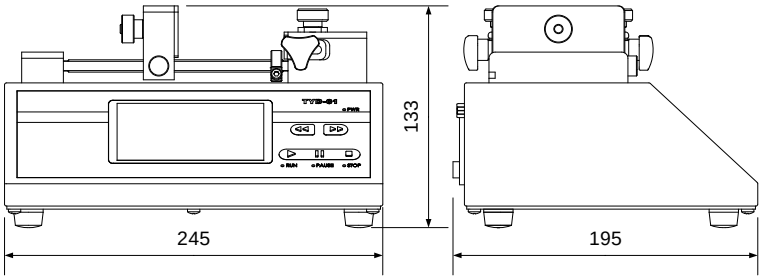


Figure 48. Dimensions (mm)

9 Naming Rule

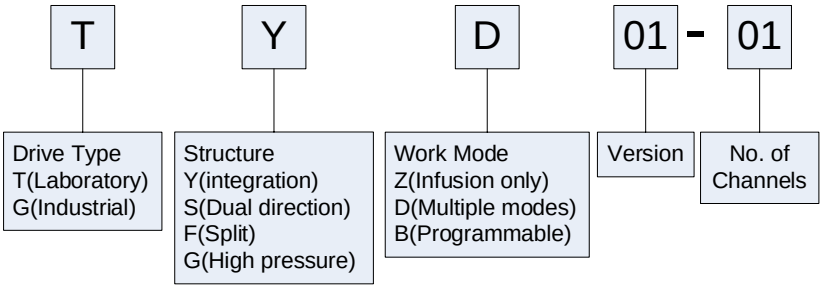


Figure 49. Naming Rule

10 Specifications

TYD01-01: for one syringe
TYD01-02: 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