



Laboratory Syringe Pump

Manual No. 13544



For research use only. Not for human clinical use.

Important Information

Read this manual carefully before operating the pump.

Warnings

- Use only the power cord supplied or specified for this product.
- The device is grounded through the ground wire of the AC power cord. To reduce the risk of electric shock and electrical interference, connect the device to a properly grounded outlet.
- Do not touch the moving linear mechanical parts while the device is operating. Contact with moving parts may cause personal injury.
- Excessive pushing or pulling of the syringe may cause liquid to overflow. Overflow can injure the operator or damage the device. Operate with care.
- If liquid spills onto the actuator or moving mechanism, turn off the power immediately. Clean the liquid and allow the area to dry fully before powering the device on again.
- If the device malfunctions, contact the seller. Do not open the enclosure or attempt internal repairs yourself.
- Unplug the power cord if the cord or plug is worn, damaged, or otherwise unsafe to use.
- Turn off the device before connecting any external control equipment.
- This device is not registered with the FDA and must not be used clinically on humans.

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1. Product Overview

1.1 Overview

The laboratory syringe pump uses a 5-inch, 800 x 480 HD touch screen. The interface is designed to make parameter setup and routine operation quick and straightforward.

The pump uses a quiet operating design suitable for laboratory environments. The syringe pump is available in 1-channel and 2-channel models. Supported operating modes include infusion, withdrawal, infusion followed by withdrawal, withdrawal followed by infusion, and continuous cycling between infusion and withdrawal.

The interface displays minimum and maximum flow-rate prompts for the selected syringe size, helping the user understand the available flow range before setting the speed. A touch-screen lock function helps prevent accidental operation.

External control can be performed through a foot switch, relay contact, or other external signal. Communication control is available through RS485 or USB.

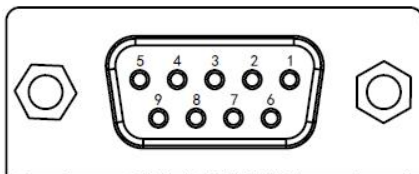
1.2 Models and Reference Flow Ranges

Syringe Capacity	Inner Diameter (mm)	Reference Flow Range (nL/min - mL/min)
0.5 uL	0.103	0.0007 - 0.0013
1 uL	0.146	0.0013 - 0.0027
2 uL	0.206	0.0027 - 0.0053
5 uL	0.343	0.0074 - 0.0148
10 uL	0.485	0.0148 - 0.0295
25 uL	0.729	0.0334 - 0.0668
50 uL	1.03	0.0667 - 0.1333
100 uL	1.457	0.1334 - 0.2668
250 uL	2.304	0.3335 - 0.6671
500 uL	3.256	0.6658 - 1.3320
1 mL	4.73	1.4060 - 2.8110
2 mL	8.92	4.9990 - 9.9980
2.5 mL	8.92	4.9990 - 9.9980
5 mL	12.4	9.6620 - 19.3220
10 mL	14.87	13.8940 - 27.7860
20 mL	19.07	22.8500 - 45.6990
30 mL	23.36	34.2870 - 68.5730
50 mL	28.95	52.6600 - 105.3190
60 mL	29.47	54.5680 - 109.1360

1.3 Physical Interfaces

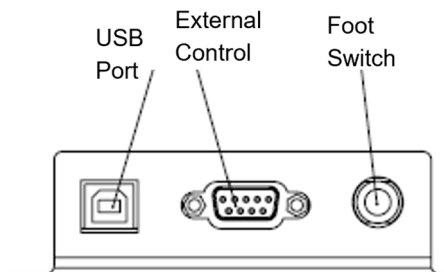
External Control Interface

The external control input uses a DB9 connector. Pin definitions are listed below.



Pin	Definition	Description
1	External start/stop	Selectable start/stop control modes: high level, low level, or pulse. High level mode: high level starts the pump; low level stops it. The high-level input range is 5-24 V. Low level mode: low level starts the pump; high level stops it. The high-level input range is 5-24 V. Pulse mode: each received pulse toggles the start/stop state. Pulse duration must be greater than 200 ms.
4	Start/stop output	TTL output. High level indicates running; low level indicates stopped.
5	Direction output	TTL output. High level indicates infusion direction; low level indicates withdrawal direction.
7	RS485-A	RS485 communication signal A.
8	RS485-B	RS485 communication signal B.
9	Common	Signal common ground.
2, 3, 6	NC	Reserved.

Foot Switch Interface



The foot switch can also be used for external start/stop control. Connect the foot switch plug to the 6.35 mm foot switch jack on the pump.

Select the foot switch start/stop mode under External Start/Stop in the system settings.

- Pulse mode: one complete press/release cycle toggles the pump start/stop state.
- High level mode: pressing the foot switch starts the pump; releasing it stops the pump.
- Low level mode: releasing the foot switch starts the pump; pressing it stops the pump.

2. Product Structure

2.1 Structural Components

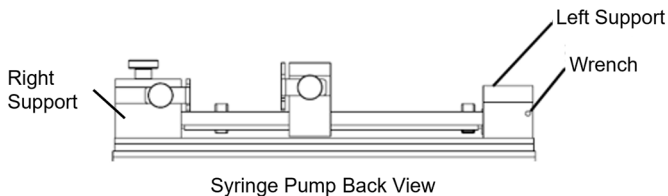
The following instructions refer to the main mechanical parts of the pump.



2.2 Syringe Installation

1. Lift syringe pressure plate and rotate to open position.
2. Place syringe barrel into V-block support.
3. Release pusher drive knob (on both sides), hold slider release button and move pusher block.
4. Align plunger flange between clamps.
5. Tighten syringe barrel and plunger locking knobs.
6. Engage drive mechanism using pusher drive knob.
7. Adjust limit stops to prevent over-travel and damage.

Limit blocks:



- The pump has two limit blocks.
- The limit block between the slider and the right support helps prevent excessive slider force from damaging the syringe.
- The limit block between the slider and the left support helps prevent the syringe plunger from exceeding its travel range and being pulled out of the syringe barrel.
- When loosened, a limit block can move freely along the guide rod. To lock it in place, use the wrench stored in the wrench hole on the left support and tighten the limit block at the required position.

2.3 Indicator Light

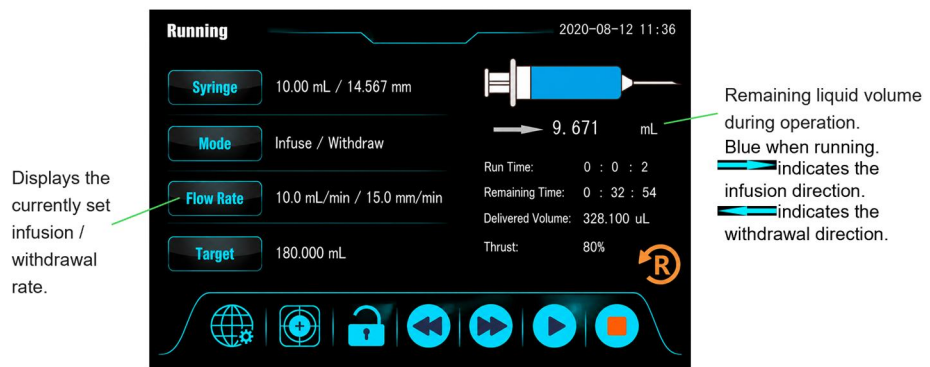
- After the device is powered on, the indicator light remains off until operation starts.
- During operation, the indicator light turns green to show that the pump is running.
- If operation is paused, the indicator light turns yellow to show the paused state.

3. Touch Screen Interface and Operation

3.1 Run Screen and Main Screen

3.1.1 Standby Run Screen

The run screen is the main screen. After power-on, the device automatically enters the standby run screen.



Main run screen and dynamic display area.

The left side of the screen shows the current parameter values. To change a parameter, tap the corresponding parameter area.

The right side is the dynamic display area. After operation starts, it displays the remaining liquid volume, the current direction (infusion or withdrawal), run time, remaining time, and infused volume.

Control	Function
Syringe	Opens the syringe selection screen or the custom syringe specification screen.
Mode	Opens the work mode selection screen.
Flow Rate	Opens the speed setting screen for the selected work mode.
Target	Opens the target value setting screen for the selected work mode.

Control	Function
 System	Opens the system settings screen.
 Calibration	Opens the syringe calibration screen.
 Screen Lock	Locks the touch screen. To unlock, tap the unlock key and enter the correct password. After locking, all keys except the unlock key are grayed out and unavailable.
 Fast Forward	Pushes the syringe at the highest speed while the key is held. The pump stops this motion when the key is released.
 Fast Reverse	Pulls the syringe at the highest speed while the key is held. The pump stops this motion when the key is released.
 Start	Starts the currently configured work mode. The green indicator light turns on while the pump is running.
 Pause	Pauses operation during a run. Press Start again to continue.
 Stop	Stops pump operation.
 Clear	Clears the infused volume value.

3.1.2 Running and Paused Screens

- Running state: after startup, available controls are shown in blue and unavailable controls are shown in gray. During operation, the user can pause, stop, lock the screen, or adjust the speed online.
- Pause function: press Pause during operation to pause the current task. The indicator light turns yellow. Press Start to continue, or press Stop to terminate the run.
- Online speed adjustment: while the pump is running, tap [Flow Rate] to enter the speed setting screen. After entering the new speed and confirming it, the device runs at the adjusted speed.

3.2 Parameter Settings

3.2.1 Syringe Selection

From the run screen, tap the Syringe key to open the syringe selection screen.

The interface includes built-in syringe specifications from five manufacturers. Select the option that matches the syringe being used.

If the syringe does not match the built-in manufacturer specifications, use the custom syringe setting.

- Syringe capacity must be set.
- Enter either the inner diameter or the length. The interface automatically calculates the other value.
- Tap a setting field to open the on-screen keypad and enter the required value.

3.2.2 Work Mode Selection

From the run screen, tap the Work Mode key to open the work mode selection screen. Select the required mode and press Confirm.

Multiple Infusion mode is used when the total volume in a syringe must be dispensed in several separate injections with a time interval between them. Example: a syringe contains 10 mL, each infusion is 2 mL, and a 10-minute interval is required between adjacent infusions. In this case, use Multiple Infusion mode. See Section 3.2.4.

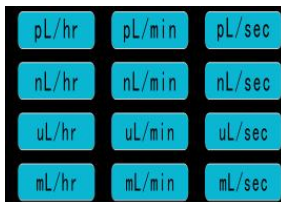
For continuous operation, select Infusion/Withdrawal or Withdrawal/Infusion and set the target value to 0. See Section 3.2.4.

3.2.3 Flow Rate Settings

From the run screen, tap the Flow Rate key to open the speed setting screen for the selected work mode.

- For Infusion or Multiple Infusion mode, enter a speed value within the displayed minimum and maximum range.
- The minimum and maximum speed values depend on the selected syringe specification.

- To set the speed directly to the displayed minimum or maximum value, tap the minimum or maximum field. The value is copied into the speed setting field. Press Confirm to save it.
- Twelve speed units are available in the interface, shown below:



- For Withdrawal mode, set the withdrawal speed on the corresponding speed setting screen.
- For Infusion/Withdrawal or Withdrawal/Infusion mode, set the speed values required for the selected two-direction operation.

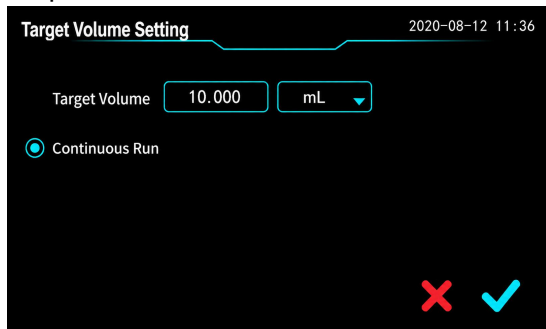
3.2.4 Target Value Settings

From the run screen, tap the Target key to open the target value setting screen.

- 1) For Infusion or Withdrawal mode, choose either Target Volume or Target Time. Only one of these two target types is used at a time.
 - In Infusion or Withdrawal mode, the target volume must be less than or equal to the maximum liquid volume.
 - The maximum liquid volume displayed in the prompt is equal to the selected syringe capacity. For example, if the selected syringe is 10 mL, the maximum liquid volume is 10 mL.
 - Two liquid volume units (uL/mL) are available in the interface.
- 2) For Infusion/Withdrawal or Withdrawal/Infusion mode:
 - The infusion volume and withdrawal volume are both equal to the target volume. In these two modes, the target volume is not limited by the selected syringe capacity.
 - Finite cycling example: if the work mode is Infusion/Withdrawal, the selected syringe is 20 mL, and the target volume is 50 mL, the device automatically calculates the number of cycles. After startup,

it performs two full cycles of 20 mL infusion followed by 20 mL withdrawal. In the third cycle, it performs 10 mL infusion followed by 10 mL withdrawal and then stops automatically.

3) For continuous operation:



- Select Infusion/Withdrawal or Withdrawal/Infusion mode, then select Continuous Run, or set Target Volume to 0.
- The run screen will display Infusion/Withdrawal (Cycle) or Withdrawal/Infusion (Cycle). Continuous operation must be stopped manually with the Stop  key.

4) For Multiple Infusion mode:

- Interval Time is the time between completion of one single infusion and startup of the next single infusion.
- The single-infusion target volume multiplied by the number of infusions must be less than or equal to the maximum value shown in the prompt.
- The maximum value is equal to the selected syringe capacity.

3.3 System Parameter Settings

From the run screen, tap the System key to open the system parameter setting screen.

Parameter	Available Setting or Meaning
Communication Interface	USB or RS485. Select one when communication control is required.
Baud Rate	Three baud rate options are available. 1200bps 4800bps 9600bps
Force	Eight force levels are available. Select the level required for the application. 100% 60% 90% 50% 80% 40% 70% 30%
Volume Completion Sound Reminder	Twelve reminder options are available. Select Silent if no sound reminder is needed.
External Start/Stop	Four options (High level, Low level, Pulse, Disabled) are available for external signal control or foot switch control. Select Disabled if external control is not required.
Address	Communication address. Setting range: 1-32.
Power-on Run	Optional. If selected and power is interrupted while the device is running, the device automatically resumes operation after power is restored.
Password	Screen-lock password. Factory default: 1234. The password can be changed.

3.4 Syringe Calibration

When syringe calibration is required, tap the Calibration key from the run screen to open the calibration screen. The currently selected syringe specification is displayed on the calibration screen.

1. Prepare a container for collecting the dispensed liquid.
 2. Press Start  to begin calibration. The device automatically dispenses one half of the syringe capacity at a fixed speed into the specified container.
 3. Measure the actual dispensed volume.
 4. Enter the measured volume in the blue input field on the screen.
 5. Press Calibration Confirm . If the Calibration Successful pop-up appears, calibration is complete.
- Before calibration, make sure the available liquid volume is greater than one half of the capacity of the syringe being calibrated. If the liquid volume is insufficient, the pump may stall and calibration may fail.
 - Before calibration, use Fast Forward and Fast Reverse to install the syringe or adjust the initial syringe position. You may also adjust the position on the run screen first and then enter the calibration screen to start calibration.

4. Communication Protocol

The communication interface can be USB or RS485. The communication protocol uses Modbus RTU mode. For detailed communication protocol information, contact us at service@ussolid.com.

Contact

Feel free to visit our website: www.ussolid.com

You can email us at service@ussolid.com