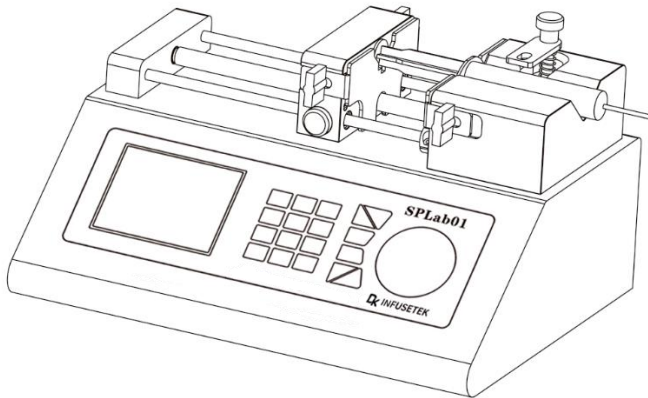


SPLab Series Manual





Note:

- Please read the manual carefully before operating the product.



Warning:

- Connect the power cord to the wall socket directly, and avoid using the extended electric wire.
- If the power cord or plug had wear and other damage, please disconnect the plug. (Hold the plug instead of the wire)
- If following situations happened, please turn off the power supply and disconnect the plug. (Hold the plug instead of the wire)
 1. Fluid splash on the pump.
 2. You think the pump need to maintain or repair.
- The user's power socket must have ground wire, and have reliable grounding.

Note: The foot pedal switch and other external control plugs must be connected or disconnected in the power-off status to prevent the external control interface from being burned.

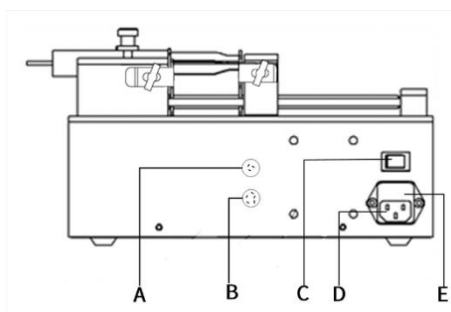
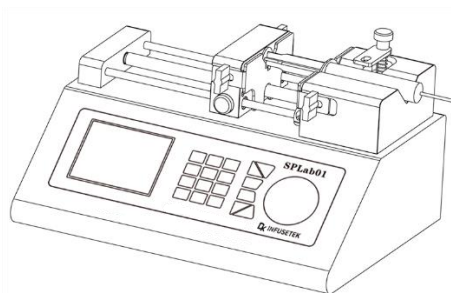
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1. Product Introduction

DK Infusetek push-pull syringe pump has stainless steel housing, large-screen color LCD display. Different specifications of syringes or samplers can be loaded at the same time, suitable for micro flow rate, high-precision liquid transfer (Non-medical).

2. Product Appearance and Interface Instruction



A: Three-core aviation plug

B: Five-core aviation plug

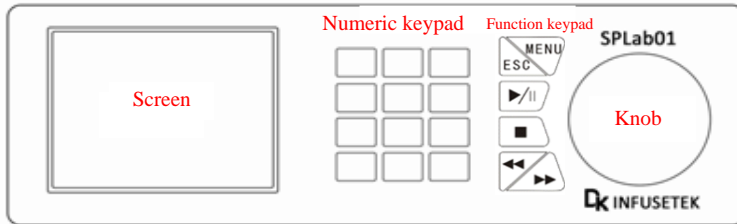
C: Power supply switch

D: Power supply socket

E: Built-in fuse

3. Operation Panel Instruction

The control panel of different channels syringe pump is same as function and is similar as appearance. Take single channel syringe pump operation panel for example.



➤ **Menu**

Enter system settings interface, set relative parameters, working mode, working type and flow calibration etc in this interface.

➤ **ESC**

Return to state of last step operation.

➤ **▶/|| (Start/Pause button)**

Control the motor run and pause. Press one time, the driver will change working state one time. At the running status of motor, enter the system setting interface to set infusion volume, withdraw volume and time etc, but the working mode can not be changed.

➤ **■ (Stop)**

Control running motor to stop, user change working mode only at the stop status of motor. And the ◀◀/▶▶ button can be used only under stop status or blocking status.

➤ **◀◀/▶▶ (Fast reverse/Fast forward)**

Press this button, the pump motor run with full speed when there is a blocked or need to adjust the propulsion mechanism. Release this button to stop running. Other buttons are invalid when running at full speed. This function is used for syringe installation, cleaning and relieving blocked protection.

➤ **Numeric keypad**

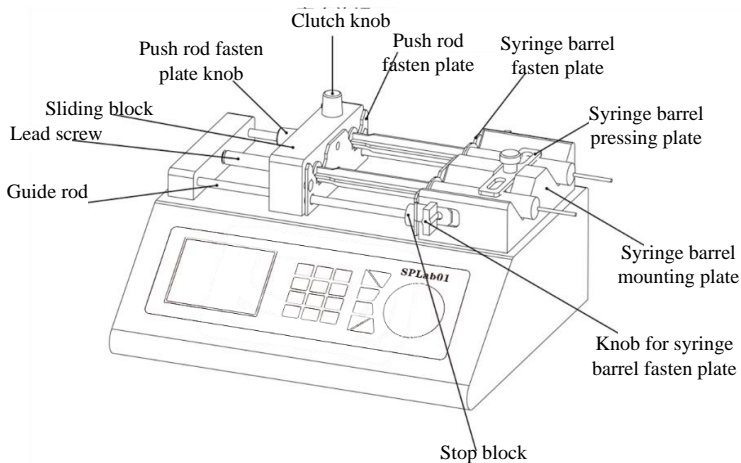
Enter numbers, decimal point and delete function.

➤ **Knob (Press the knob to enter)**

Digital knob, rotate left and right to select up and down. Press it to enter.

4. Syringe Installation

4.1 Single channel syringe installation

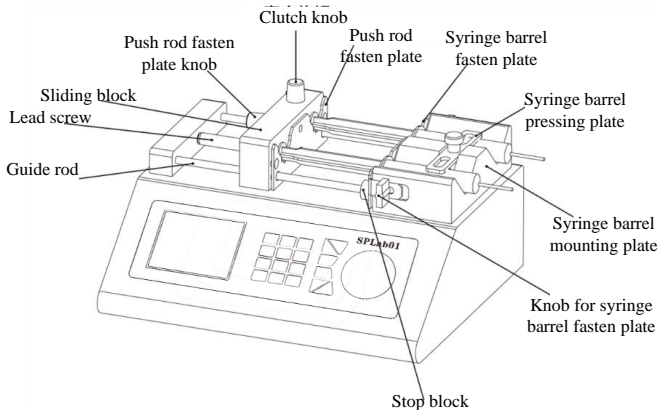


- (1) Press **Clutch Button**, separate the **Sliding Block** and **Lead Screw** and move to another position (or use ◀◀/▶▶ to move **Sliding Block**).
- (2) Rotate **Push Rod Fasten Plate Knob** on the side of **Sliding Block** to open **Push Rod Fasten Plate**. Respectively positive and negative rotation the two **Knob for Syringe Barrel Fasten Plate** on the side of **Syringe Barrel Mounting Plate** to open **Syringe Barrel Fasten Plate**.

- (3) Lift and rotate **Syringe Barrel Pressing Plate**, interpose syringe, and adjust the syringe to a suitable position, rotate turn **Syringe Barrel Pressing Plate** hold the syringe.
- (4) Tighten the knobs to secure the syringe.

Note: If need to install glass syringe, please contact with us for technical support.

4.2 Dual channel syringe installation

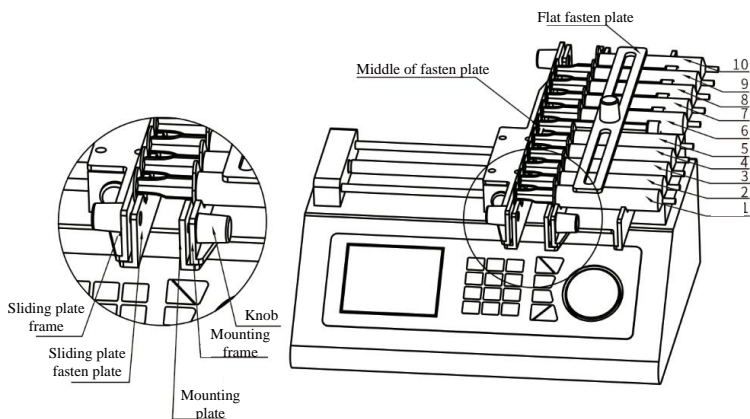


- (1) Rotate **Clutch Button**, separate the **Sliding Block** and **Lead Screw** and move to another position (or use ◀◀/▶▶ to move **Sliding Block**).
- (2) Rotate **Push Rod Fasten Plate Knob** to open **Syringe Push Rod Fasten Plate**. Respectively positive and negative rotation the two **Knobs for Syringe Barrel Fasten Plate** on the side of **Syringe Barrel Mounting Plate** to open **Syringe Barrel Fasten Plate**. Lift and rotate **Syringe Barrel Press Plate**, interpose syringe, and adjust the syringe to a suitable position, rotate **Syringe Barrel Press Plate** to hold the syringe.
- (3) Tighten the knobs to secure the syringe. And rotate **Clutch Button**, make **Sliding Block** occlude with **Lead Screw** into working state.

Note: If need to install glass syringe, please contact with us for technical support.

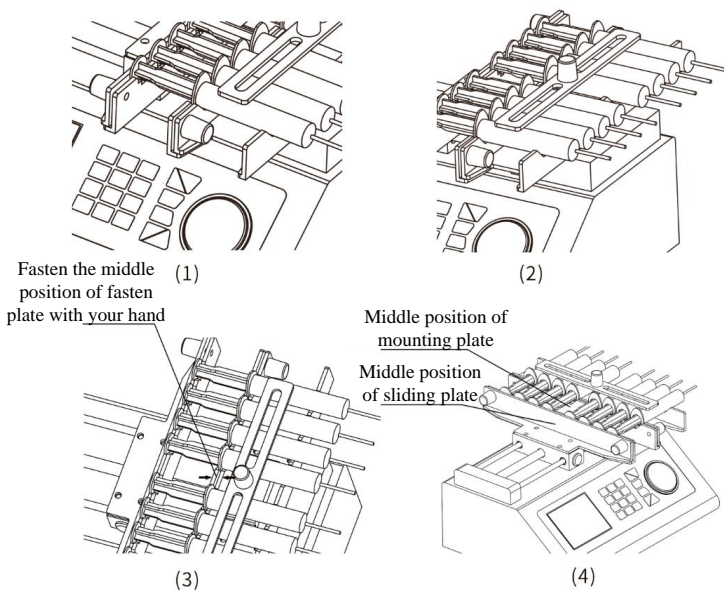
4.3 Multichannel syringe installation

Multichannel syringe pump include SPLab04, SPLab06, SPLab08, SPLab10, SPLab12; below is a 10 channel syringe pump:



- (1) Loosen the **Knob**, move the **Sliding plate fasten plate** to suitable position, put the syringes on **Mounting frame**.
- (2) Put on **Flat fasten plate**, fasten the **Knob**, do not use too much force.
- (3) Fasten the **Mounting plate** and middle of **Mounting frame** by hand, make the plate press the syringes tighten, at the same time, tighten one knob, then tighten the other knob.
- (4) Fasten the **Sliding plate fasten plate** by the same way.

Note: Press the knob in the middle of the plate by hand to prevent the plate from tilting and bending.



Note: If only use 1 syringe, please put another empty syringe in the symmetrical position, do not put on the middle position. If not use all syringes, please also install on the both side with symmetrical position. Do not install in the middle, to avoid the fasten plate deformation.

5. System Settings

<p>System setting</p> <p>Syringe: Mode: I/W Type: Flow/Time Calibration:</p>	<p>Infusion</p> <p>I- volume: 0ml Flow: 0ml/m Time: 0sec Pause: 0sec</p>
<p>Withdrawal</p> <p>W-volume:0ml Flow: 0ml/m Time: 0sec</p>	<p>Ext. control</p> <p>Ext. control: Off Com.: DK protocol Com. address: 1 Data format: 9600, 8, e, 1</p>

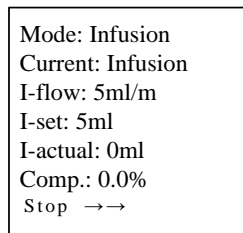
6. Operation Instruction

1) Power On

Display welcome interface when power on the pump (Fig. 1). After waiting 2 seconds enter the working interface automatically (Fig. 2).






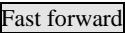
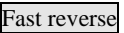


(Fig. 1)



(Fig. 2)






2) Working Interface

Working interface displays the current working mode and working state etc. During operation process, press , motor will stop. The bottom left of the screen will display  and current running direction. At this time, the mode is only temporarily stopped, the working progress was saved. If press  again, motor runs, working progress continued according to status before pause. The bottom left of the screen display  and run direction. Press  (stop button) to stop the motor, the progress of work is clearing, the bottom left of the screen display stop. The fast forward/reverse button only can be used when pump stop. The bottom left of the screen display tips of , , direction ($\rightarrow\rightarrow$, $\leftarrow\leftarrow$).

Note: If using a syringe pump for the first time, there is no data setting, the pump can not run. Need to enter system settings interface to set the working parameters. (Fig. 3).

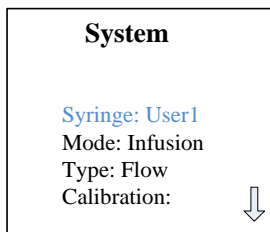
a. System Settings

6.1 Select syringe

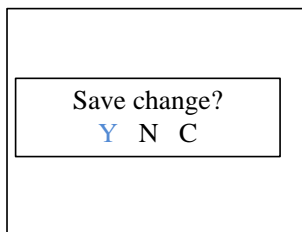
- (1) At operation interface, press  button to enter the system settings interface (Fig.3). Press the knob  to make syringe line be displayed in reverse color, press  again to enter syringe selection interface (Fig.5), the manufacturers list line is in reverse color, press the  to enter manufacturers list interface (Fig 6). Users can choose some syringe models built in the instrument.
- (2) If user need to set the syringe model manually, make the User Define line in reverse color, press the  to enter User Define (Fig 8). The user displayed in reverse color on the User Defined interface is the currently selected user. If need to input syringe diameter (inner diameter) which unit is mm, the range is 0.01-50mm. To ensure the accuracy of flow volume, users need to input the correct syringe diameter, pump will save the setting automatically and do not re-enter it in next time. Use the calibration function to calibrate the pump if the volume still have errors.

- (3) Press **Knob** it will ask whether save change, after setting up the syringe pump, choose 'Y', save the current set up, choose 'N' back to original interface, choose 'C' back to syringe setting interface.

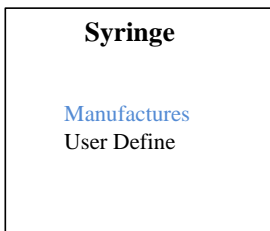
Note: After selection whether save the syringe data, it will clear all the working parameters, this will need to wait for several seconds.



(Fig. 3)



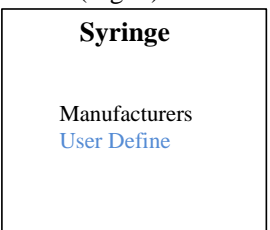
(Fig. 4)



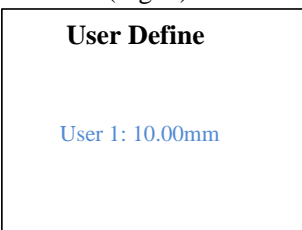
(Fig. 5)



(Fig. 6)



(Fig. 7)



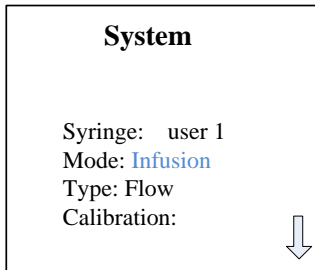
(Fig. 8)

6.2 Working Mode

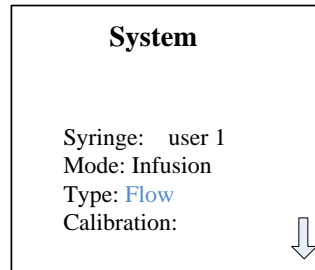
- (1) Rotate the knob in System settings interface, make cursor stop in Mode; Press **Knob** for the first time to shrink the color bar to the specific mode selection (Fig. 9). Rotate knob to display Infusion→ Withdraw→ Infusion/ withdraw→ Withdraw/ infusion→ Continuous→ Additive mode. After the selection is completed, press **Knob** to expand the color bar to the whole line. The working mode is successfully selected.

6.3 Select Working Type

Rotate the knob in System settings interface, make cursor stop in SEL Type mode; Press **Knob** for the first time to shrink the color bar to the specific mode selection (Fig.10). Rotate the knob, it will display flow → time. Press knob to select type. After the selection is complete, press **Knob** to expand the color bar to the whole line. The type mode is successfully selected.



(Fig. 9)



(Fig. 10)

6.4 Working Parameters Setting

Six modes of syringe pump can save corresponding parameters independently. In each working mode have two working types, flow type and time type,

Working modes as below:

1) Infusion Mode

The pump infuses with set flow rate (or time), after reach the target volume stop

working automatically. The pump can be paused, started against and stop during working.

2) **Withdraw Mode**

The pump withdraw with set flow rate (or time), after reach the target volume stop working automatically. The pump can be paused, started against and stop during working.

3) **Infusion/Withdraw**

The pump infuse with set infusion flow rate (or time), until reach the target infuse volume. After pause time, pump start withdraw with set flow rate (or time), until reach the target withdraw volume, stop automatically. This is one cycle of infusion/withdraw. The pump can be paused, started against and stop during this cycle.

4) **Withdraw/Infusion**

The pump withdraw with set flow rate (or time), unit reach the target withdraw volume. After pause time, the pump starts infuse with set flow (or time), unit reach the target infuse volume, then stop automatically. This is one cycle of withdraw/infusion. The pump can be paused, started against and stop during this cycle.

5) **Continuous Mode**

The pump infuse with set flow rate (or time), unit reach the target infuse volume. After pause time, pump withdraw with set flow rate (or time), until reach the target withdraw volume. After cycle pause time, start infuse and run back and forth. In continuous mode, the infuse volume and withdraw volume is same, to make the pump back to initial state after one cycle. The pump can be paused, started against and stop during this cycle.

6) **Additive Mode**

The pump infuse with set flow rate (or time), until reach the target infuse volume. After pause time, pump start withdraw with set flow rate (or time), until reach the target withdraw volume. After pause time again, the pump start infuse with set

exhausting air flow rate (or time), until reach the target excluding air flow volume, then stop working. This is one cycle for infusion, withdraw and exhausting air process. The pump can be paused, started against and stop during this cycle.

Working Type as below:

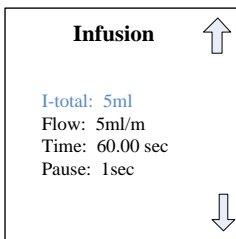
a. Flow Type:

Users need to input flow rate when set up the parameters, the pump will calculate time automatically. When input the flow rate, first input numbers, then choose unit (ml/h, ml/m, ul/h and ul/m), press **Knob** to confirm input. Each syringe have maximum and minimum flow rate, if the input data out of the range, the pump will prompt with red characters at the bottom of the screen and the cursor move to the flow input.

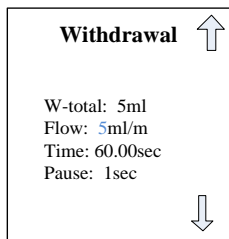
b. Time Type:

Users need to input time when set up the parameters, the pump will calculate flow rate automatically. When input the time, first input numbers, then choose unit (sec, min and hour), press **Knob** to confirm input. Each syringe have maximum and minimum flow rate range, so there is also time range. If input data out of time range, the pump will prompt with red characters at the bottom of the screen and the cursor move to the time input.

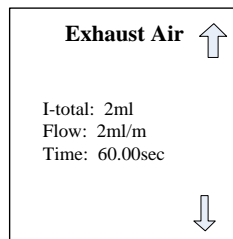
Note: All parameters will be cleared after you change the syringe model.



(Fig. 11)



(Fig. 12)

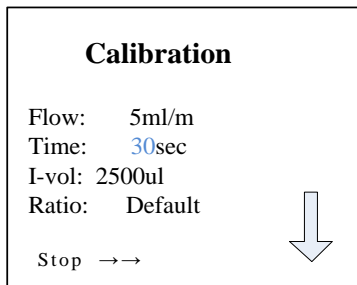


(Fig. 13)

6.5 Flow Calibration

When replace new syringe, working condition changed or other condition makes the flow rate errors, we need to do calibrate with the flow rate, to make it reach the request accuracy.

In system settings interface, turn the knob to stop the color bar to the flow calibration line, press the **Knob** to enter calibration interface (Fig. 14). The calibration function is effective only when users have set the infuse volume and flow rate. After enter the calibration interface, change the infuse time, and make the **I-Vol** line in reverse color, then press start button to start the pump. Input the actual infuse volume after finishing calibration by manually, press knob to display initial data, now the calibration finished. Now the flow parameter change to User Calibration. If need to set the pump to factory default, turn the knob to **Ratio**, select **Default** press knob to confirm. Press **ESC** back to system setting interface. Proceed with other Settings.



(Fig. 14)

6.6 External Control Setting

In external control setting interface (Fig. 15), make the external control enable. Turn the knob to select external control way: Pulse, Level or turn off external control. External input pulse signal to control the pump start, pause and stop. Pulse signal is 0-5V falling edge enable.

Choose DK protocol or Modbus protocol in communication. There is 4 type data formats for option.

9600, 8, n, 1 means: Baud rate 9600, 8 data bits, no parity bit, 1 stop bit.

9600, 8, e, 1 means: Baud rate 9600, 8 data bits, even parity bit, 1 stop bit.

19200, 8, n, 1 means: Baud rate 19200, 8 data bits, no parity bit, 1 stop bit.

19200, 8, e, 1 means: Baud rate 19200, 8 data bits, even parity bit, 1 stop bit.

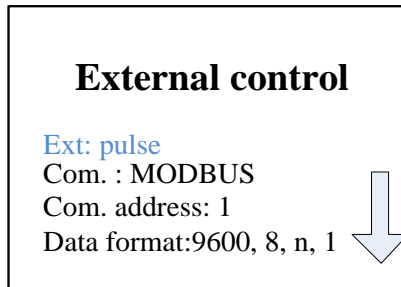


Fig. 15

7. External Control Interface

If external control interface is aviation plug, wiring instruction as below:

External control level mode:

- First click the MENU button in control method to enter the main menu, select the external control mode to turn on the level, and then click the ESC button to return to the operation interface. Connect the 5-core external control interface on the back of the pump body according to (Fig. 16).
- Connect a 5V level signal, connect the negative pole to pin 3 and the positive pole to pin 1. At this time, keep the syringe pump running with continuous 5V signal, and remove the 5V signal, syringe pump is suspended;
- For 5V level signals, connect the negative pole to pin 3 and the positive pole to pin 2. In the running or paused state, the syringe pump will stop with continuous 5V signal.

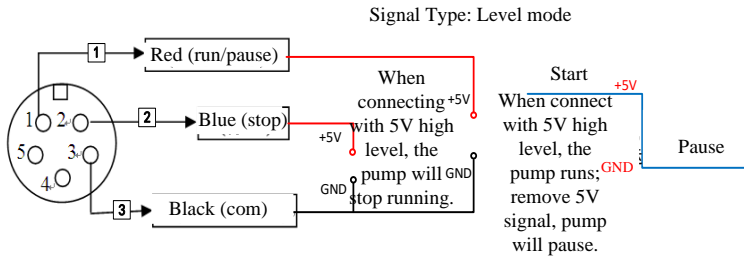


Fig. 16 External control level mode wiring diagram

External control pulse mode:

- First click the MENU button in main interface of the pump to enter the main menu, select the external control mode to turn on the pulse, and then click the ESC button to return to the running interface. Connect the 5V -core external control interface on the back of the pump body according to (Fig. 17).
- Connect a 5V pulse signal, connect the negative pole to pin 3 and the positive pole to pin 1. At this time, one pulse signal syringe pump is running, and then next pulse signal syringe pump is paused. The pulse width is recommended to be 500ms;
- For 5V pulse signals, connect the negative pole to pin 3 and the positive pole to pin 2. The syringe pump becomes stopped every time a pulse is given.

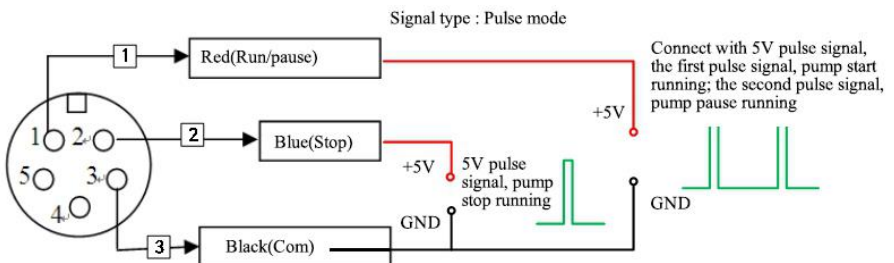
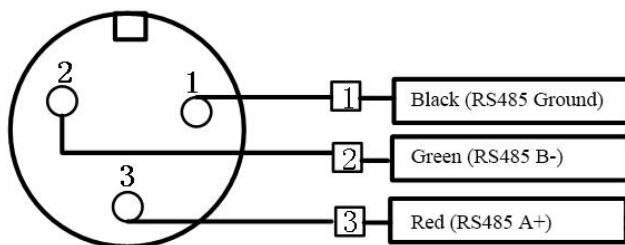


Fig. 17 External control pulse mode wiring diagram

Communication Interface Wiring Instruction:

8. Technical Specifications

Channel number	1	2	4	6	8	10	12
Working mode	Infusion, withdrawal, infusion/ withdrawal, withdrawal/ infusion, continuous, additional mode (infusion/withdrawal, then exclude bubble)						
Syringe size	10 μ L~150ml		10 μ L~10ml				
Flow rate	0.001 μ L/min~127ml/min		0.001 μ L/min~21.997ml/min				
Stroke resolution	0.078 μ m		Min.linear rate	5 μ m/min			
Max.linear force	25kgf		Max.linear rate	132mm/min			
Distance per micro-step	0.078 μ m		Max.step rate	0.035ms/Micro-step			
Accuracy	$\leq\pm 0.5\%$ (travel > 30% of the maximum travel)		Min.step rate	0.937sec/Micro-step			
Operating mode	Digital rotary and mechanical key		Power-off memory	Display the previous data parameter after power supply again			
Display mode	320*240 Color screen display		Voltage range	AC220 \pm 10% (standard) AC110 \pm 10% (optional)			

Relative humidity	<80%	Temperature	0~40°C
Communication interface	RS485 (Modbus protocol, RTU mode)	Stroke	140mm

9. Functions and Features

- **Syringe ID input function:** Users can choose syringe from menu or input the syringe ID directly.
- **Working mode selection:** There are 6 working modes: Infusion, withdrawal, infusion/withdrawal, withdrawal/infusion, continuous, additional mode (infusion /withdrawal, then exclude bubble). Every working mode technical data save separately, do not influence each other.
- **Working way selection: Flow type:** users need to enter infusion (withdraw) volume and withdraw (infusion) flow rate when set the parameters. **Time type:** users need to enter infusion (withdraw) volume and withdraw (infusion) time when set the parameters.
- **Calibration function:** With calibration function, users can control the flow volume more precisely.
- **Memory function:** After turn on the pump again, no need to re-set up the parameters.
- **Block protection function:** When the syringe propulsion mechanism is blocked during operation, the syringe will stop the operation of the propulsion mechanism and sound the alarm
- **External control function:** Input/Output control.
- **Syringe protection function:** Protect syringe break through adjusting the position of stop block.

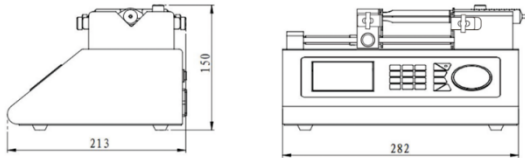
NOTE: Please find the external control interface instruction on page 14.

10. Dimension Drawing

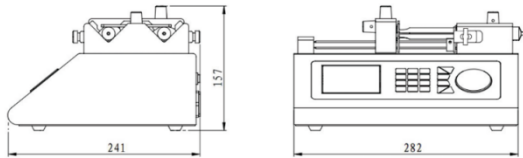
Unit: (mm)

Channel number	4	6	8	10	12
L (mm)	145	190	235	280	325

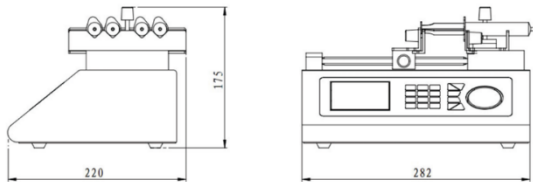
SPLab01



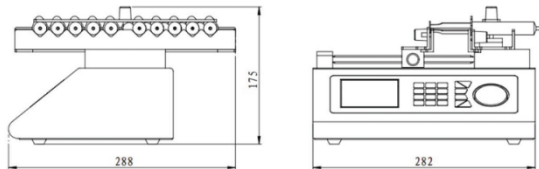
SPLab02



SPLab04



SPLab10



11. Maintenance

- Lead screw lubrication: Before first use the syringe pump, please coat lubrication oil on the lead screw to ensure the lead screw can work normally. To extend the lifetime of lead screw, we suggest to coat lubrication oil every 3 - 5 days. Before coating lubrication oil, please clean the lead screw.
- Check the running status of machine before starting it, normal operation can be put into use.
- Check for leakage, and correct fault which can be appeared.
- If liquid splash on the machine, please turn off the power supply and unplug the power socket (Hold the socket instead of power cord) when liquid splashed on pump. Check whether liquid flows into the machine, if it does, please contact the manufacture.
- The foot pedal switch and other external control plugs must be connected or disconnected in the power-off status to prevent the external control interface from being burned.
- The user's power socket must have ground wire, and have reliable grounding.
- Cleaning and maintenance: during operation or after the completion of the operation, please keep the equipment clean, with a soft cloth to wipe the liquid splashing into the syringe pump.
- Cleaning note:
 1. In the cleaning process, please disconnect the power to avoid electric shock.
 2. Do not immerse the pump in the water
 3. Do not heat or high pressure treatment to the syringe pump.
 4. Do not lift the pump with the syringe and push seat.
- The edge must be inserted into the syringe pump side ring fixing groove, and pay attention to clean syringes.
- Regular check the parts and screws of syringe pump.
- This product has no waterproof measures. Please take protective measures

when using in water environment.

- This product does not have special certification such as medical certification. When it needs to be used in special fields such as medical and military, please self-certify.
- If the pump does not use for a long time, please clean it and coat lubrication oil on the lead screw, keep it in dry and ventilated environment.
- The company shall not bear the direct and indirect losses caused by the malfunction or improper operation of this product.

12. Warranty and After-sales Service

We support 3 years warranty for the pumps, subject to the exceptions below. Our company shall not be liable for any loss, damage, or expense directly or indirectly related to or arising out of the use of its products. This warranty does not obligate our company to bear any costs of removal, installation, transportation, or other charges which may arise in connection with a warranty claim.

If the pump fails during the warranty period, after confirmation by our technical department, we will provide spare parts free of charge. Customers will need to bear the shipping cost.

Exceptions:

- The warranty shall not apply to repairs or service necessitated by normal wear and tear or for lack of reasonable and proper maintenance.
- All tubing and pumping accessories as consumable items are excluded.
- Electrical surge as a cause of failure is excluded.
- Chemical attack is excluded.
- Improper operation or man-made damage as a cause of failure is excluded.

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