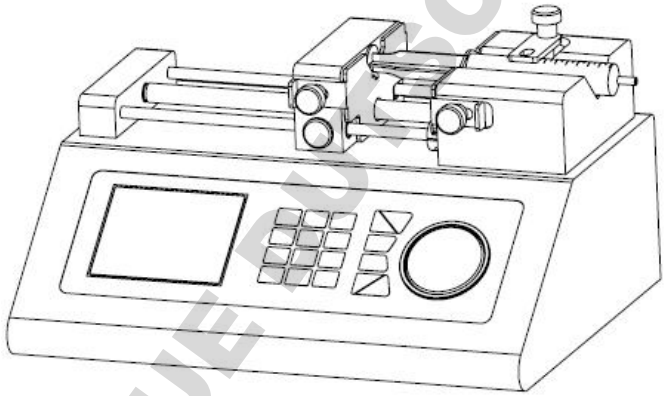
DK Infusetek Syringe Pump

Manual of SPLab Series



DK INFUSETEK CO., LTD.

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Note:

- Please read the instruction before operating the product.

Warning:

- Please connect directly the power line to the wall socket, and avoid using the extension electric line.
- If power line or plug have wear and other damage, please unplug it, holding the plug, not the line.
- If following situations happened, please turn off the electric power and unplug the plug, holding the plug, not the line.
  1. Fluid splash on the pump.
  2. You think the pump need to maintain or amend.
- The customers' power socket must have ground wire, and have reliable grounding.

Note: The foot switch and other external control plugs must be installed and removed when the power is off to prevent the external control interface from being burned.

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Catalogue

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1. Product Introduction

DK Infusetek SPLab series Syringe pump, 304 stainless steel housing, large-screen color LCD display, friendly operation interface, can be loaded with different specifications of syringes or samplers at the same time, suitable for micro flow rate, high-precision liquid transfer. (Non-medical)

2. Function & Features

Syringe ID input function: Users can choose syringe from menu or input the syringe ID directly.

Working mode selection: There is 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 I/W volume and W/I flow rate when set the parameters . Time type: users need to enter I/W volume and W/I 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: The pump will stall and give an alarm when the drive structure of the pump is blocked.

External control function: Input/Output control.

Syringe protection function: Protect syringe break through adjust the position of stop block.

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

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3. 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	10μL~140ml		10μL~10ml				
Flow rate	0.001μL/min~127ml/min		0.001μL/min~21.997ml/min				
Infusion volum per microstep	0.078μm		**Min.linear rate**	5μm/min			
Max.linear force	≥16kgf		**Max.linear rate**	132mm/min			
Advance per microstep	0.078μm		**Min.step rate**	0.035ms/Mirco step			
Accuracy	≤±0.5%		**Max.step rate**	0.937sec/Mirco step			
Operating mode	Rotary encoded switch and imported membrane keypad		**Power-off memory**	Display the previous data parameter after power supply again			
Ddisplay mode	320*240TFT-LCD		**Power supply**	AC220±10%(standard) AC110±10%(optional)			
Relative humidity	＜80%		**Temperature**	0~40℃			

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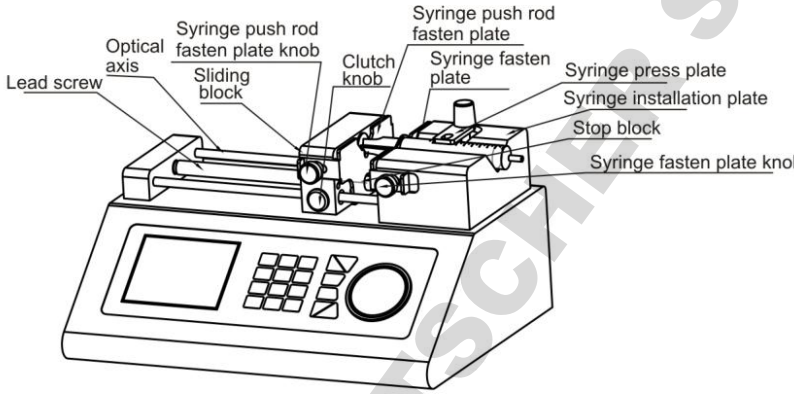
4. Syringe Installation

4.1 Single channel syringe installation



①Press 【Clutch knob】, separate the 【sliding block】and【 lead screw】by hand or use ◄◄/►► to move【sliding block】.

②Turn【Syringe push rod fasten plate knob】on the side of【sliding block】to open【syringe push rod fasten plate】. Respectively positive and negative rotation the two【Syringe fasten plate knob】on the side of【Syringe installation plate】to open【Syringe fasten plate】.

③Lift and turn【Syringe press plate】,interpose syringe, and adjust the syringe to a suitable position,turn【Syringe press plate】hold the syringe.

④Tighten the knob to fixing syringe.

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

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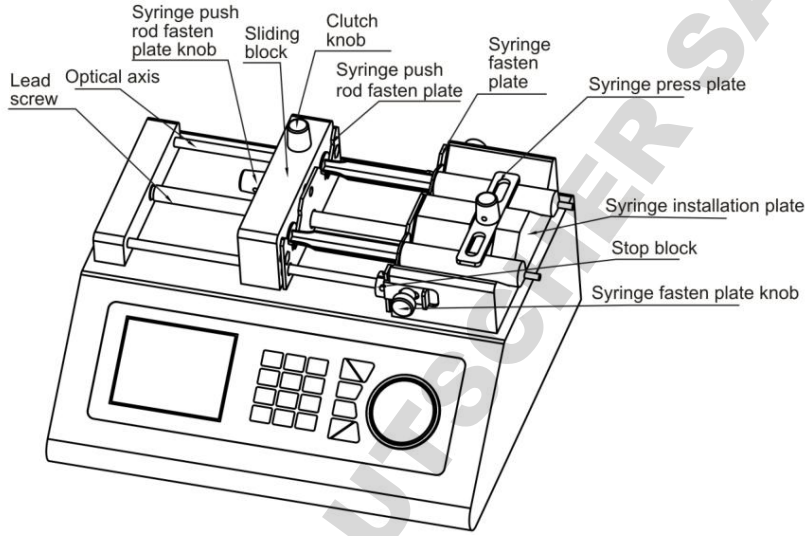
4.2 Dual channel syringe installation



①Turn 【Clutch knob】, separate the 【Sliding block】and 【lead screw】and move 【Sliding block】by hand (or use ◄◄/►► to move【Sliding block】.

②Turn【Syringe push rod fasten plate knob】on the side of【sliding block】to open【syringe push rod fasten plate】. Respectively positive and negative rotation the two【Syringe fasten plate knob】on the side of【Syringe installation plate】to open【Syringe fasten plate】.Lift and turn 【Syringe press plate】,interpose syringe, and adjust the syringe to a suitable position,turn【Syringe press plate】hold the syringe.

③Tighten the knob to fix syringe, and turn 【clutch knob】, make 【Sliding block】 occlude with 【lead screw】into working state.

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

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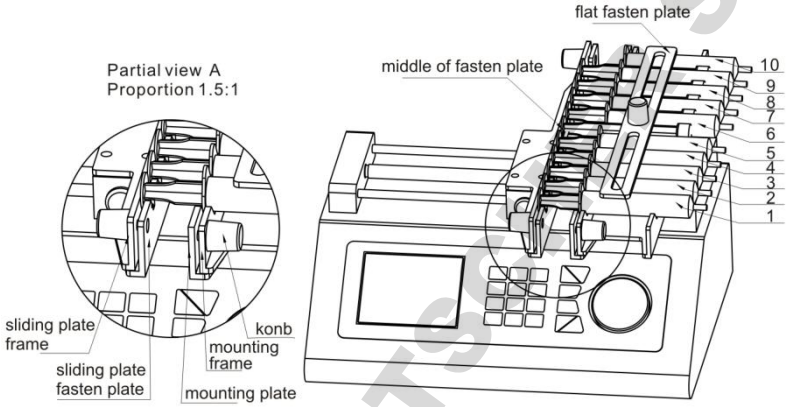
4.3 Multichannel syringe

Multichannel syringe pump include SPLab04, SPLab06, SPLab08, SPLab10, SPLab12; below is a10 channel syringe pump:



①Loosen the 【mounting plate】 and 【sliding plate fasten plate】, move the sliding plate to suitable position, put the syringes on 【mounting frame】.

②Put on the 【flat fasten plate】, fasten the 【knob】.

③Fasten 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.

④Fasten the 【sliding plate fasten plate】by the same way.

Note: Fasten the middle of fasten plate with hand to avoid fasten plate incline, and avoid fasten plate curve.

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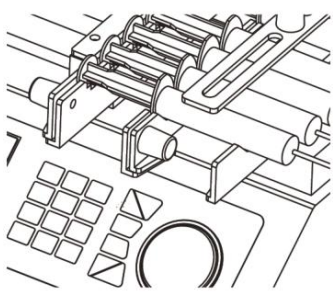
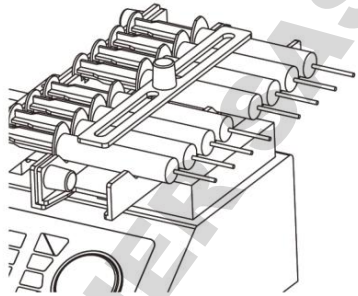
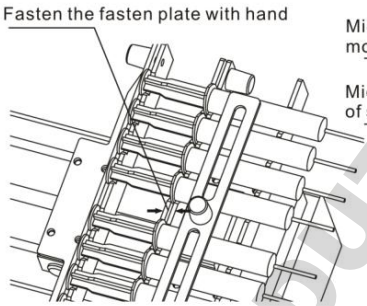


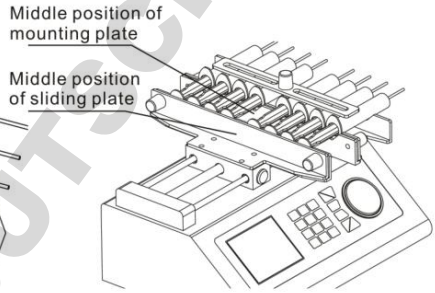
(1)



(2)



(3)



(4)

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.

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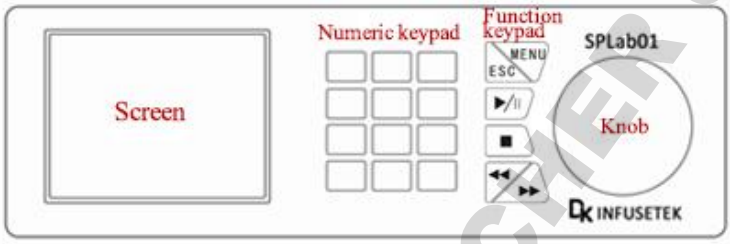
5. Syringe Pump Operation Instruction

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



- **Menu**

  Enter system setting interface, setting parameters in this interface, set up working mode, working type and calibration etc.

- **ESC**

  Return to last step operation.

- **▶/Ⅱ (Start/Pause)**

  Control the motor run and pause. Press one time, the driver will change working state one time. When the motor is running, user can change infusion volume, withdrawal volume, flow rate and time from system setting interface, but can not change working mode.

- **■ (Stop)**

  User can change working mode only when motor stop.◀◀/▶▶ Fast forward and backward button only effective when motor stop or blocked.

- **◁◁/ ▷▷ (Fast backward/Fast forward)**

  Press this button, the pump motor run with full speed. Release this button to stop running. Other buttons are invalid when running at full speed. This function is used for syringe installation, cleaning and relieve blocked protection.

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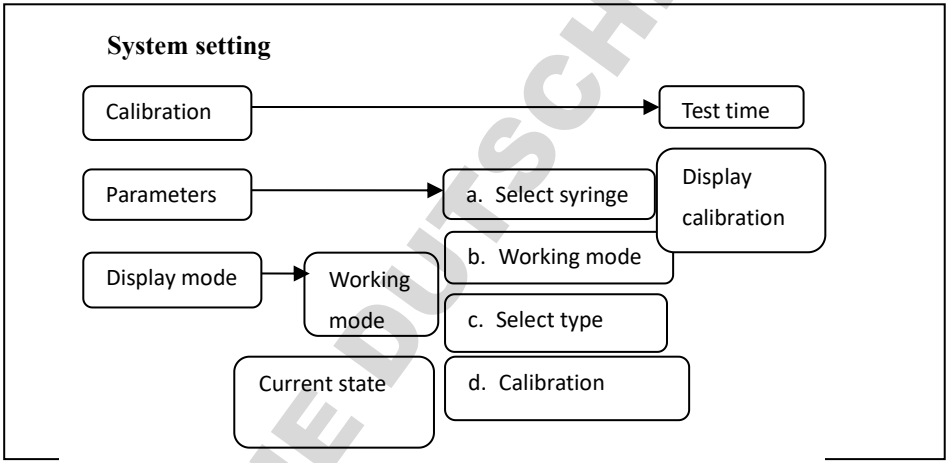
- **Numeric keypad**

  Enter numbers, decimal point and delete function.

- **Knob (Press the knob to enter)**

  Digital knob, turn the knob to choose up and down. Press it to enter.

6. Syringe Pump System Settings



7. Operation Instruction

7.1 Power On

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

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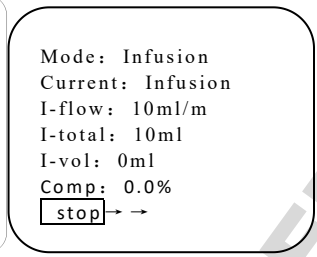

Fig.1.Welcome interface **Fig.2**.Working interface

7.2 Working Interface

Working interface display the current working mode, working state etc. When motor is running, pressing ▶ /‖ , motor will stop. The bottom left of the screen will display pause and currently running direction. This mode is only pause stop, the working progress was saved. If press ▶ /‖ again, motor running, working progress continue. The bottom left of the screen display run 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/backward button only can be used when the pump is stop.

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

7.3 System Setting

（1） Select syringe

- ①Press MENU to enter the system setting interface (Fig.3). Turn the knob to select syringe line and press the knob to enter syringe selection. Turn the knob to choose manufacturers, press knob to enter manufacturers list (Fig 5) . Turn the knob to select manufacturer, press knob to confirm selection. (Fig 6).

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②If need to set the syringe model manually, turn the knob to enter User Define. (Fig 7). Turn the knob to select syringe size. (Fig. 8). If need to input syringe diameter (inner diameter), 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. If the volume still have errors, can use calibration function to calibrate.

③ After set up the syringe pump, it will ask whether save change. Choose 'Y', save the current set up, choose 'N' back to original interface, choose 'C' back to syringe setting interface. (Fig.4)

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

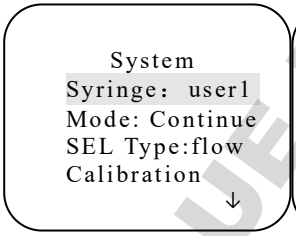

Fig.3.System setup interface

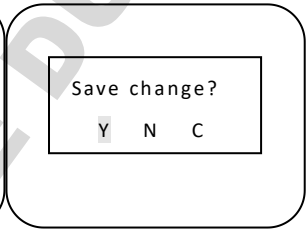

Fig.4.Save setting interface

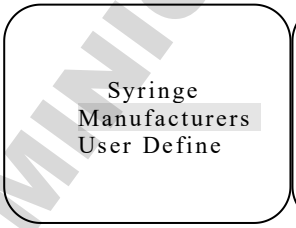

Fig.5.Select syringe interface

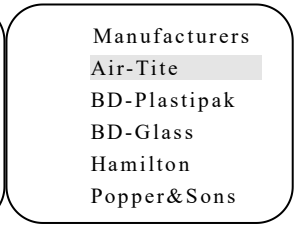

Fig.6.Syringe manufacturer interface

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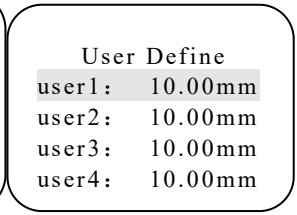


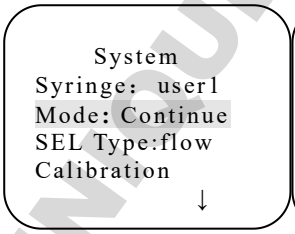
Fig.7.Select syringe interface **Fig.8**.User-defined interface

（2）Working Mode

Turn the knob in System setting interface, select 'Mode', press knob to enter. (Fig.9). Then it display Infusion, Withdraw, Infusion/withdraw, Withdraw/infusion, Continuous, Additive mode. Turn the knob select working mode, press knob to enter.

（3）Select Working Type

Turn the knob in System setting interface, select 'SEL Type', press knob to enter. (Fig.10). Turn the knob, it will display flow or time. Press knob to select type.



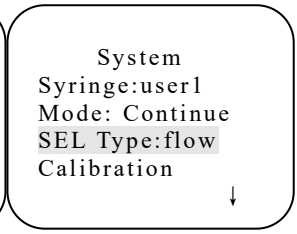


Fig.9.Select working mode interface **Fig.10**.Select working mode interface

（4）Working Parameters Setting

Six modes of syringe pump can save corresponding parameters independently. In each working mode have two working types.

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Working modes as below:

① **Infusion Mode**:

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

③ **Infusion/Withdraw**

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, stop automatically. This is one cycle of infusion/withdraw. The pump can be paused 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 start 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 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 again and repeat. In continuous mode, the infuse volume and withdraw volume is same, to make the pump back to initial state after one 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,

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withdraw and exhausting air process.

Working Type as below:

① **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.

② **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.

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

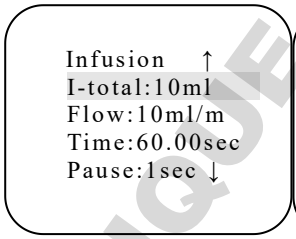

Fig.11.Infusion setup interface

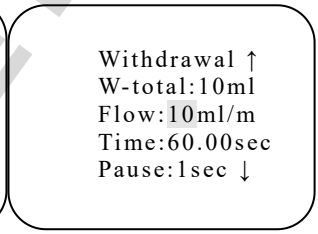

Fig.12.Withdraw setup interface

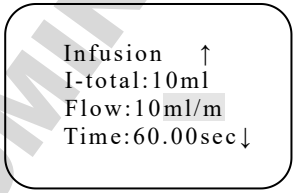

Fig.13.Exhaust Air setup interface

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（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 setting interface, turn and 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, then turn the knob to I-Vol, press start button to start the pump. Input the actual infuse volume, press knob to confirm, the I-Vol display to initial data, now the calibration finished. 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.

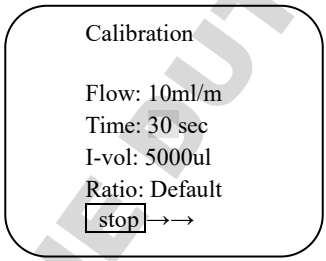

Fig.14.Calibration interface

（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.

Communication can choose Shenchen protocol or Modbus protocol. 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.

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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.

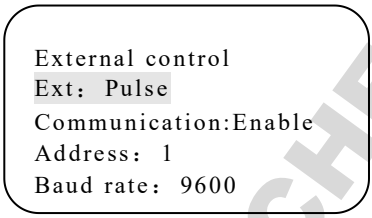

Fig.15.External control interface

8. External Control Interface

External control interface is aviation plug, wiring instruction as below:

External control level mode:

- First click the MENU button in main interface 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 running interface. Connect the 5-core external control interface on the back of the pump body according to (Figure 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 5V signal syringe pump continues to run, 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, keep 5V signal syringe pump stop.

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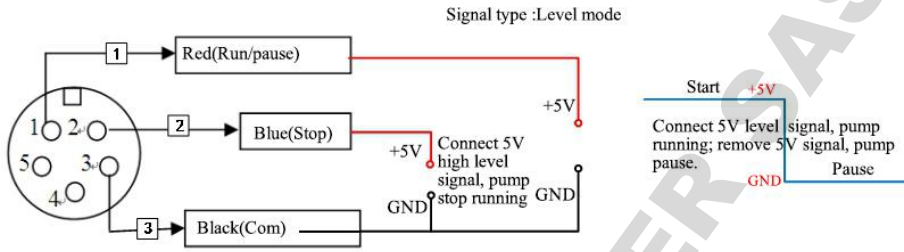

Fig. 16 External control level mode wiring diagram

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 (Figure 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.

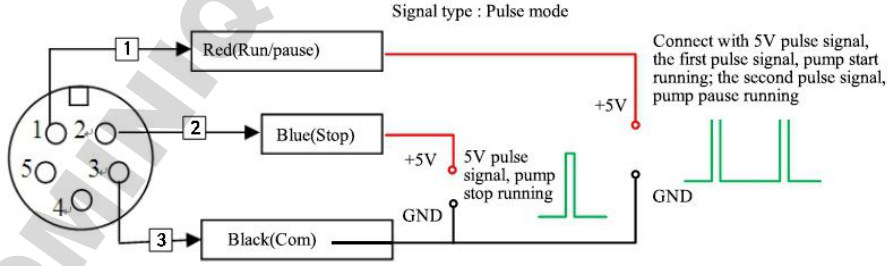

Fig. 17 External control pulse mode wiring diagram

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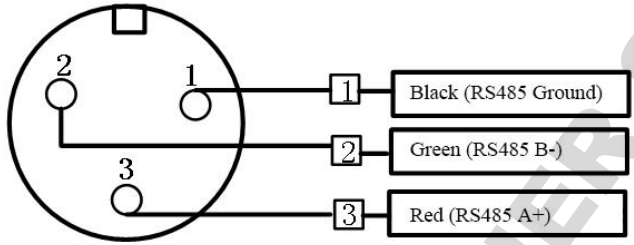
Communication Interface Wiring Instruction:



9. Dimension (Unit: mm)

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

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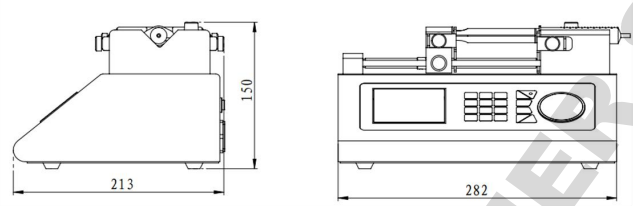
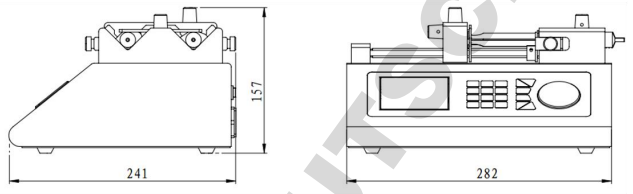
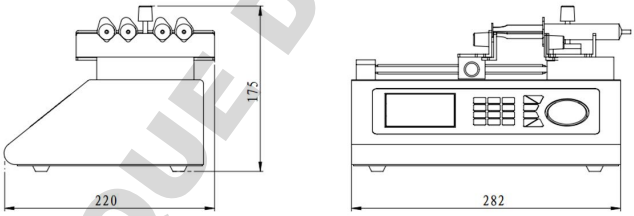
SPLab01



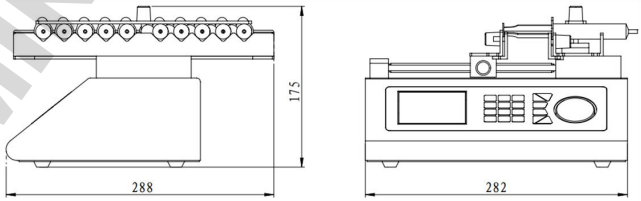
SPLab02



SPLab04



SPLab10



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10. Maintenance

- In order to keep the machine good performance and long service life, please pay attention to routine maintenance, regular inspection of syringe pump.
- 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 the syringe pump at high pressure.
- 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.
- Keep good working condition.
- Lubrication of screw:

  Apply lubricant to the screw before initial use to ensure the normal operation of the screw. In order to extend the life of the screw, it is recommended to apply the lubricant once every 3-5 days. The screw should be cleaned before applying the lubricant.

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11. **Warranty and After Sales Service**

We support three years warranty (do not include tubing or syringe). During the warranty, the pump is damaged by wrong operation or man-made sabotage, our company do not responsible for warranty. If the product out of warranty, we only charge cost for the replacement parts and shipping cost.

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