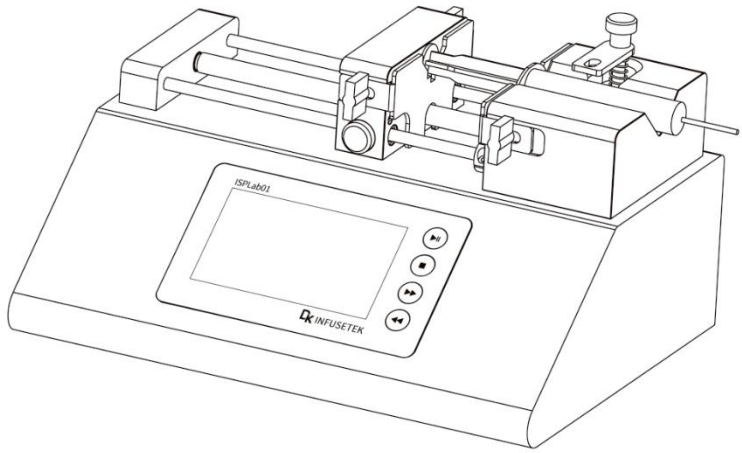
INFUSETEK

ISPLab Series Manual



Note:

- Please read the manual carefully before operating the product.

Warning:

- Connect the power cord to the wall socket directly. Do not use extension cords.
- If the power cord or plug is damaged, 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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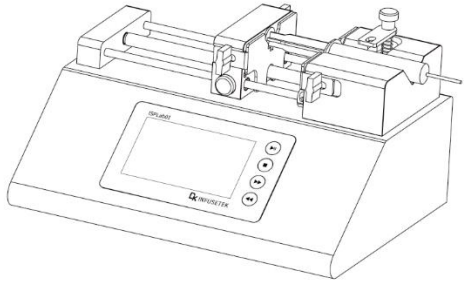
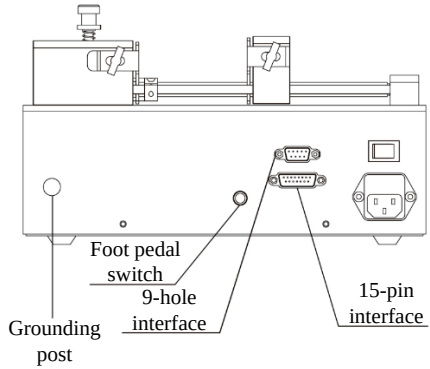
1. Product Introduction

The ISPLab series is a push-pull syringe pump with a stainless-steel housing, 4.3-inch color LCD touch screen and mechanical keypad. During operation, the LCD screen displays the real-time working status along with the initial parameters. Additionally, the ISPLab supports RS232 and RS485 MODBUS communication, convenient for remote control.

The series includes: ISPLab01, ISPLab02, ISPLab04, ISPLab06, ISPLab08, ISPLab10, ISPLab12.

2. Product Appearance and Interface Instruction





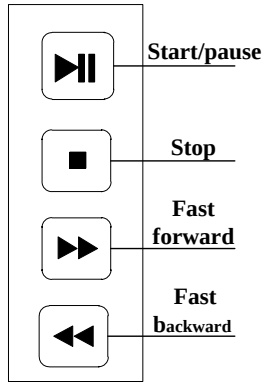
(1) Foot Pedal Interface: Connect with foot pedal switch

(2) 9-Hole Interface: RS232 and RS485

(3) 15-Pin Interface: External input and output

(4) Grounding post: Connect with ground wire.

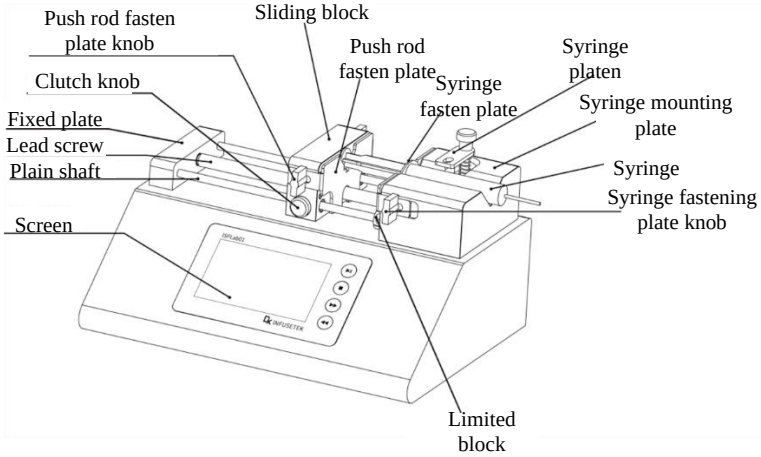
3. Mechanical Keypad Instruction



- **Start/pause**: Press the start/pause button to begin or temporarily stop the syringe pump. Pressing the button will disable the common mode while the other indicators become colorful in the main interface.
- **Stop**: Click the button to stop the current program. Main interface disabled status button becomes available.
- **Fast forward**: Press this button when the pump stops, the syringe pump will run to right with the highest speed, press this button again, pump stops running.
- **Fast backward**: Press this button when the pump stops, the pump will run to left with the highest speed, press this button again, pump stops running.

4. Syringe Installation

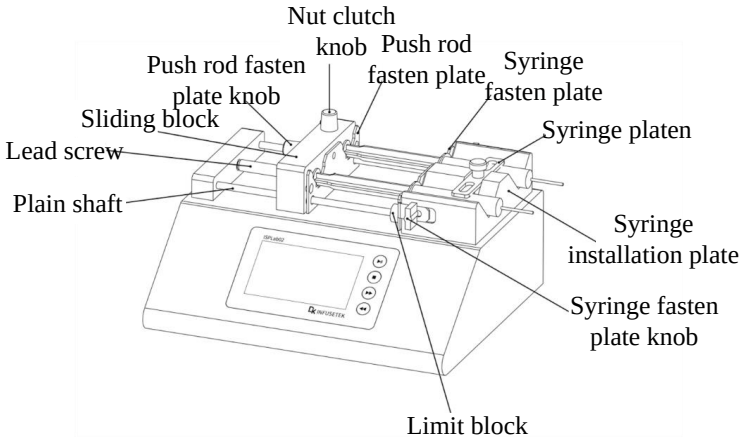
4.1 Single Channel Syringe Installation



1) Hold down [Clutch knob] to disengage [Sliding block] from [Lead screw] and move to other positions manually (or use the fast forward and rewind buttons to move [Sliding block]).
2) Loosen the two [Push rod fasten plate knob] setscrews located on the side of the [Sliding block] to open the [Push rod fasten plate]. Repeat for the two [Syringe fasten plate knob] setscrews located on the side of the [Syringe mounting plate] to open the [Syringe fasten plate].
3) Lift and rotate the [Syringe platen] clamp, install the syringe, and rotate the [Syringe platen] to hold the syringe.
4) Tighten the knobs to secure the syringe.

Note: If need to install glass syringe, please consult the technical department of the company.

4.2 Dual Channel Syringe Installation

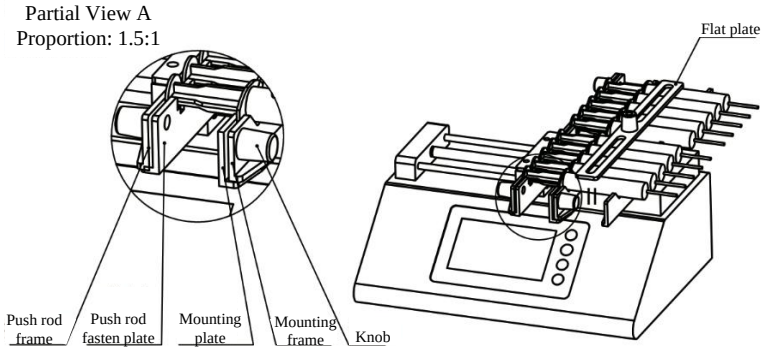


1) Rotate [Clutch knob], separate the [Sliding block] and [lead screw] and move [Sliding block] by hand (or use ◄◄/►► to move [Sliding block].
2) Rotate [Push rod fasten plate knob] on the side of [sliding block] to open [Push rod fasten plate]. Rotate the two [Syringe fasten plate knob] on the side of [Syringe installation plate] respectively forward and reversely to open [Syringe fasten plate]. Lift and rotate [Syringe platen], interpose syringe, and adjust the syringe to a suitable position, turn [Syringe platen] to hold the syringe.
3) Tighten the knob fixing syringe, and rotate [clutch knob], make [Sliding block] engage with [lead screw] into working state.

Note: If need to install glass syringe, please consult the technical department of the company.

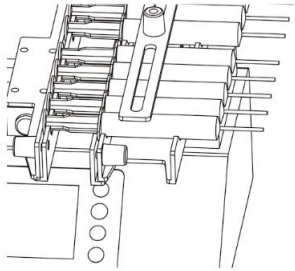
4.3 Multichannel Syringe Installation

Multichannel syringe pump include ISPLab02, ISPLab04, ISPLab06, ISPLab08, ISPLab10, ISPLab12, we take ISPLab 10 for example.

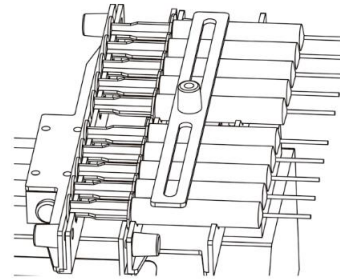


1) Loosen the knob for [mounting plate] and [push rod fasten plate], move the push plate to suitable position, put the syringes on [mounting frame].
2) Put on the [flat plate], fasten the [knob]. Don't use too much force.
3) Fasten the [mounting plate] and middle of [mounting frame] by hand, make the plate press the syringes tightly. In the same time, tighten one knob, then tighten the other knob.
4) Fasten the [push rod fasten plate] by the same way.

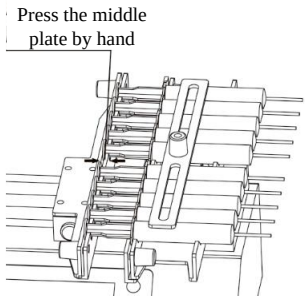
Note: Fasten the middle of fasten plate with hand to avoid fasten plate incline, and avoid fasten plate curve.



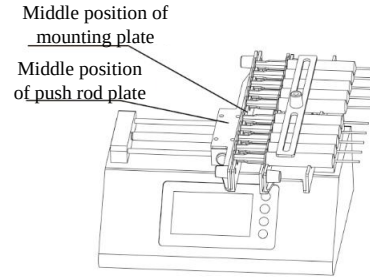
(1)



(2)



(3)

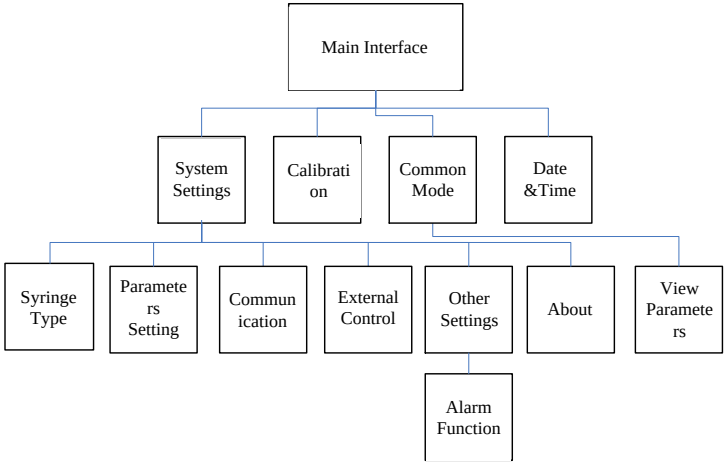


(4)

Note: If only use 1 syringe, please put another empty syringe in the symmetrical position, do not put on the middle position. When using a small amount of syringe, please also install on the both side with symmetrical position. Do not install in the middle, to avoid the fasten plate deformation**.**

5. Operation Interface Structure

The function of operation panel for every channel syringe pump are same, and the operation panel appearance is similar, now take the single channel as example:



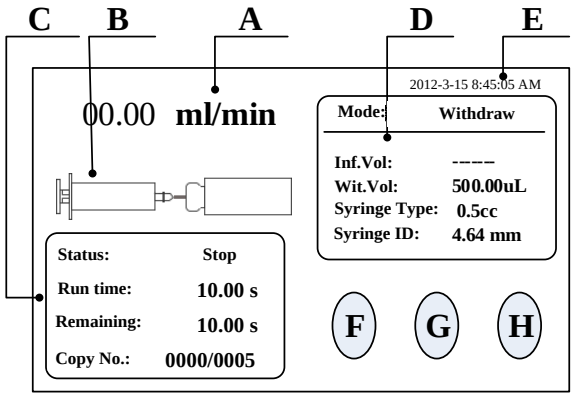
ISPLab Series Controller Operation Interface Instruction

5.1 Booting Interface

Display welcome interface when power is turned on. Click any place or wait 2.5 seconds enter English main interface automatically.

5.2 Main Interface

Main interface structure as follow:



A. Real-time flow rate display: Display the current flow rate after starting running, click this area to change the flow rate in real time.

B. Real-time Dynamic Display: Display the filling unit running state in real time and animation displays monitoring results.

C. Real-time Parameter Display: Display the current running state, setting time, remaining time, repeat count.

D. Set Parameter Display: Display the current working mode, infusion volume, withdraw volume, syringe size and syringe ID.

E. Date and Time Display: Display the current data and time in real time, you can change it by clicking this area.

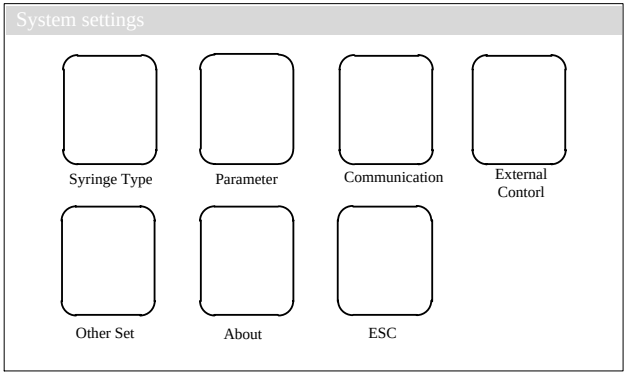
F. System Settings: Click this button, enter system settings interface, set up syringe size, running parameters, communication setting, external control, other settings, parameter view.

G. Calibration: Click this button enter the flow rate calibration interface.

H. Common Mode: Click this button enter the common mode interface.

5.3 System Settings Interface

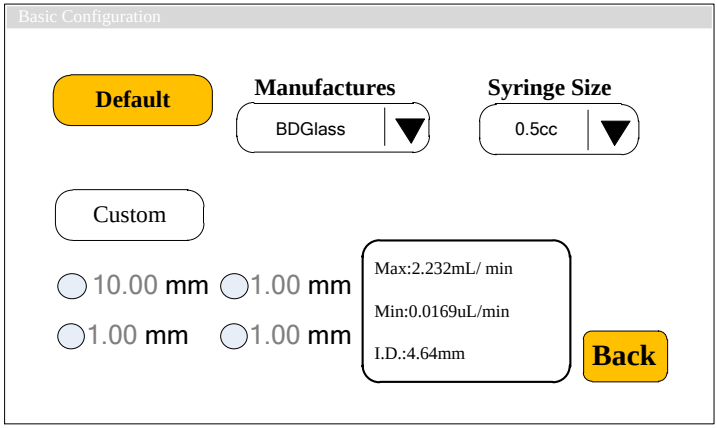
System settings is shown as follow picture



Click **System settings** button, enter system settings interface.

5.4 Syringe Type Interface

Syringe type interface is shown as follow picture



In the main interface clicks **System settings** button, click **Syringe** button, enter syringe size set interface.

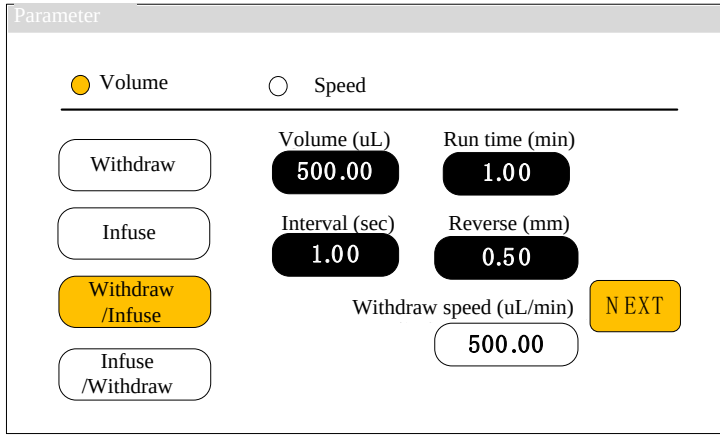
In this interface, click **Default** to choose manufacture's built-in syringe. Select Manufacturers and size from **Manufacturers** list and **Syringe** list. After click Default, the Custom is forbidden to use.

Click **Custom** in Syringe interface, select customized syringe size. Can set 4 groups of customized syringes. After select the syringe, you can change the syringe ID (ID range is 0.1mm-50mm). After select **Custom**, the **Default** part is forbidden to operating.

At the right side of the interface, display the maximum and minimum flow rate and syringe ID.

Click **Back** , back to system settings interface.

5.5 Parameter Set Interface



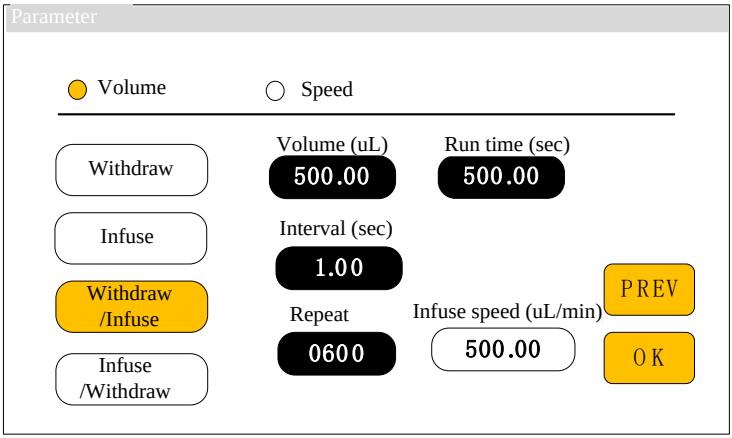
In main interface, click **System Settings** button, then click **Parameter** enter parameter setting interface.

Firstly, select **working types** (take Flows for example), then select **Working mode** (take Withdraw-infuse for example), it is necessary to set the operating parameters for the withdraw action (liquid volume, running time), the number of rollback steps, and the reciprocating interval time. Click **NEXT** button to enter to next interface, and set infusion parameter.

Reverse: That is, after the extraction is completed, run a certain distance in the opposite direction, which can be used to eliminate the mechanism gap. The Reverse range is 0.01mm-10mm (recommend 0.2mm); Mechanism clearance is the motion error during the return stroke caused by some complex factors including manufacturing, friction, etc., and is generally unavoidable.

Note: Reverse can be set only in withdraw action.

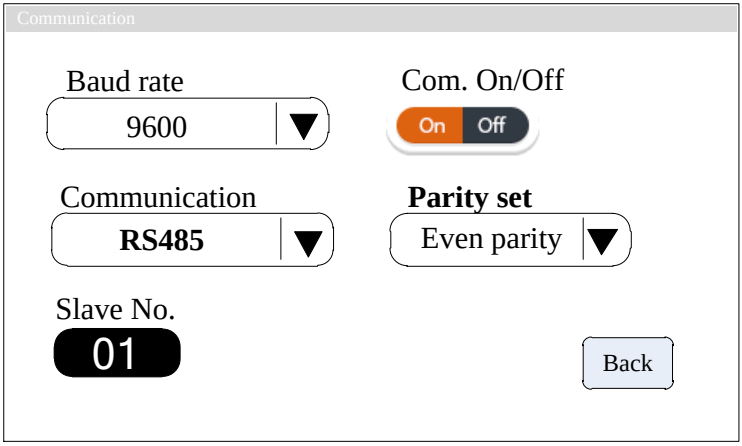
The working type is flow, the volume parameters can not be set.



In this interface, set the parameters of infuse data of Withdraw-Infuse working mode. Set the **Interval** and **Repeat** (Repeat number between 1-9999, 0 means infinite repeat). Click **PREV**, back to check and edit the parameters of withdrawal. Click **OK** to save the working parameters and exit.

Note: You can enter this interface to modify the operating parameters during operation, but you cannot modify the working mode.

5.6 Communication Interface



The interface is setting communication between pump controller and HMI, if there is multiple syringe pumps, need to change slave (syringe pump) address.

In main interface click **System Settings** button, click **Communication** button, enter communication setting interface.

The syringe pump support Modbus communication protocol-RTU mode. First need to select **Baud Rate and** communication interface **RS485** (or **RS232**). Click **Slave No.** to enter pump address number (between 1-32). Click **Com. ON/OFF** to On, select **Parity**, then the pump controller can communicate with HMI, receive signal control from HMI.

When the button displays 

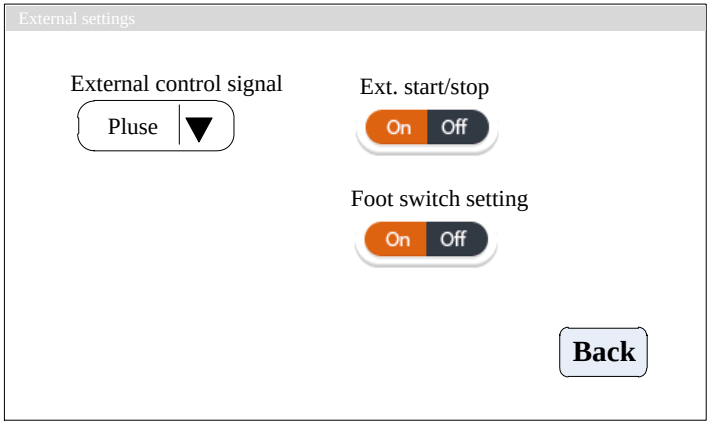
, it means the communication function is turned on, otherwise turned off.

Note:

(1) After the setting, the syringe pump only receives communication signals on the main interface, and other setting interfaces are invalid.

(2) One HMI can cascade connect up to 32 pumps.

5.7 External Control Setting Interface



In this interface to set the external control signal, external control signal include:

Pulse signal and Level signal.

Please note: Level mode is not supported for fast withdraw and fast infuse.

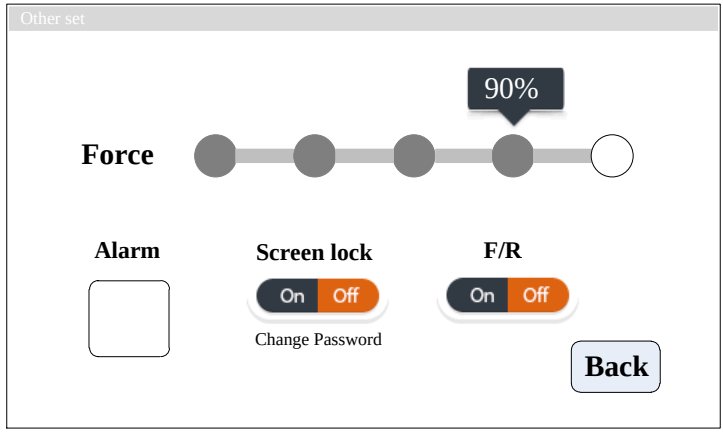
In level mode, external control start/stop and foot pedal switches can not be turned on in same time.

In level mode, the relative internal buttons can not be used.

When the button displays 

, it means that the corresponding external control function is turned on, otherwise is turned off.

5.8 Other Setting Interface



In the main interface clicks **System Settings** button, click **Other set**, enter other set interface.

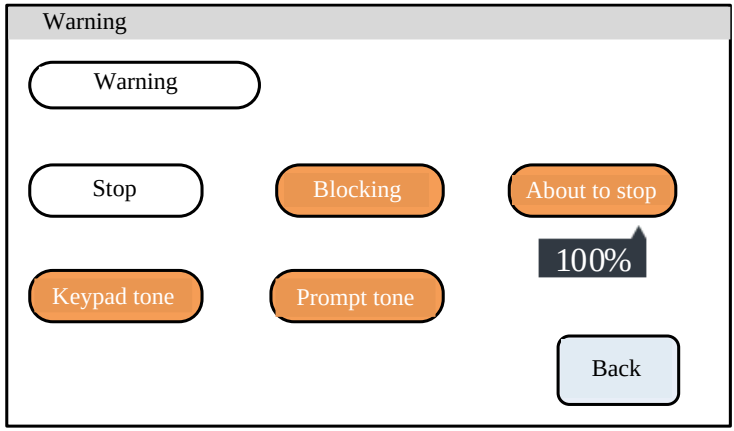
In this interface, click **Alarm** to enter warning function setting interface; Click **Force** buttons to adjust the pump torque online. (**Note: Please set the suitable torque force according with actual situation. Not suitable torque force may cause the pump working abnormally. The pump torque force is divided into 5 stages: 40%, 60%, 70%, 90%, 100%**).

Click **Screen lock** button to turn on or turn off the screen lock function. Turn on or turn off the screen lock function both need to input password, the default password is

12345678. Click '**Change password**' to change the password freely.

In this interface, click **F/R** button to turn on the jog function of fast forward/rewind jog mode.

Warning Set Interface as below:



In this interface, we can turn on or turn off the warning function. Include:

Stop: After the function is turned on, the buzzer warns after pump stop working, and indicate the current status with red words in main interface.

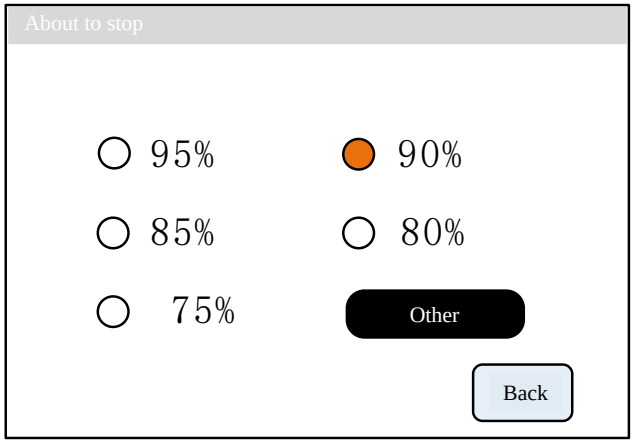
About to stop: After the function is turned on, when the operation reaches the specified percentage, the buzzer will give an alarm, and there is a red font on the main interface to indicate the current state. Click the percent number to enter percent set interface. Note: The percent number should be between 0-100 integer.

Blocking: After Turn on this function, the buzzer warns when the pump blocked, and indicate the current status with red words in main interface.

Keypad tone: After turn on this function, when click mechanical keypad, the buzzer will give 'beep' sound.

Prompt tone: Turn on this function, the buzzer warns when the prompt interface or warning interface come out.

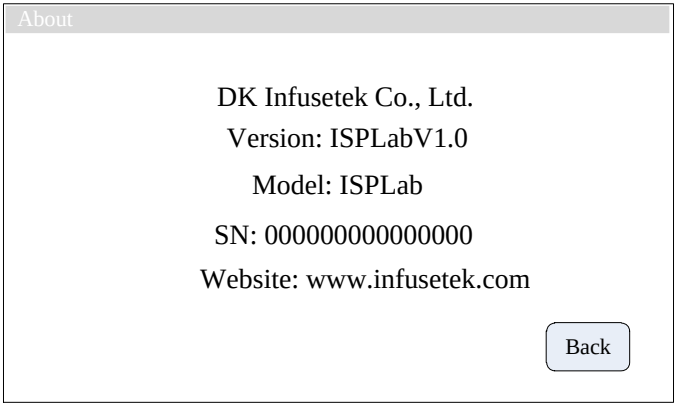
Percent Set interface as below:



In warning set interface click the **percentage number** under 'About to stop' button, enter percentage set interface.

Several commonly used values are preset in this interface. Click the radio button in front of the commonly used value to set the value. Click '**Other**' button to input other percentage value.

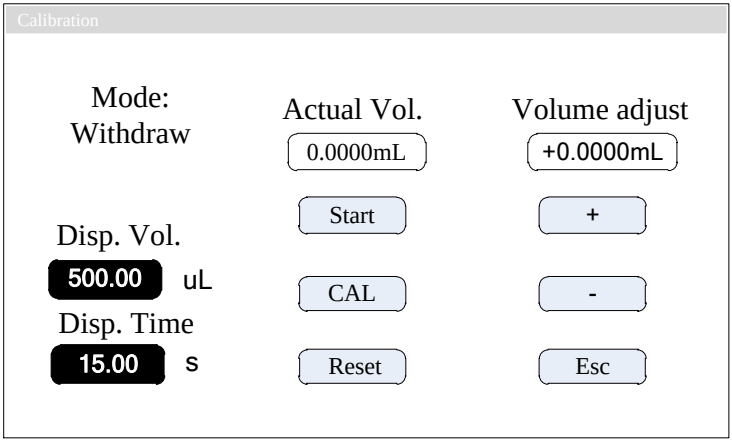
5.9 About



In the main interface click **System settings**, click **About**, enter About interface. Can

check syringe pump and company information.

5.10 Calibration Interface



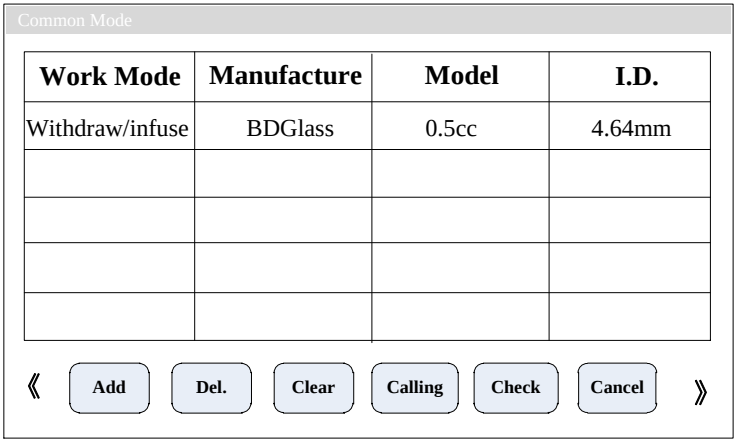
The process of calibration data before operation is as follows:

1) If the working mode is withdraw/infuse or infuse/withdraw, firstly need to choose calibrate for withdraw or Infuse.
2) Click Test to start the test. Disp. Time count-down display, the pump stop running automatically when finish the Disp. Time. The digital keyboard for inputting the actual volume is automatically popped up. After inputting the actual volume, click the confirmation button, ask if the test should continue (more than three times recommended), select 'Yes', to continue. Select' No', back to calibration interface.
3) After several tests, the actual volume display area shows the average value of the actual volume of the tests, then click **CAL,** indicate calibration success.
4) Test again, check whether it meets the volume requirement or not. If need high precision, can click the button **"+"** or **"--"** at the '**volume adjust**' to achieve high-precision volume.
5) Click **Reset**, back to factory default calibration data.

Online micro adjusting process as below:

1) If the volume is larger or smaller in the production process, it can be micro adjust online without affecting the production line.
2) In the main interface click **Calibration**, enter calibration interface.
3) Now only the mode button (withdraw/infuse, infuse/withdraw), **increase** (+), **decrease** (-) and **ESC** button are valid. Other buttons are forbidden.
4) Click "+" or "--" to micro adjust online.

5.11 Common Mode Interface



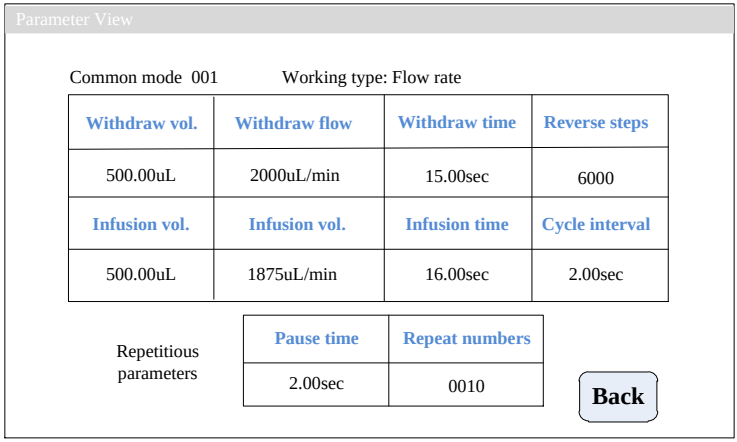
In the main interface click **Common mode**, enter common mode interface.

- **Add:** Click it to save current parameters as common mode. In this function, up to 60 modes can be stored.
- **Del.:** Select one common mode, click **Del.**, a dialog box asking whether to delete will come out. Click 'OK' to delete this mode.
- **Clear:** Click this button, a dialog box asking whether to confirm clear all or not. Click "OK" delete all common modes.
- **Calling**: Select one common mode, click **Calling**, a dialog box asking whether to call common mode or not, click 'OK', back to the main interface, running

parameters are selected common mode data.

- **View**: Select a stored mode and click the View button to enter the parameter viewing interface to view the detailed parameters of the mode..
- **Cancel**: Click the button to back to main interface.
- **"<","">"**: View the common mode on the previous or next page.

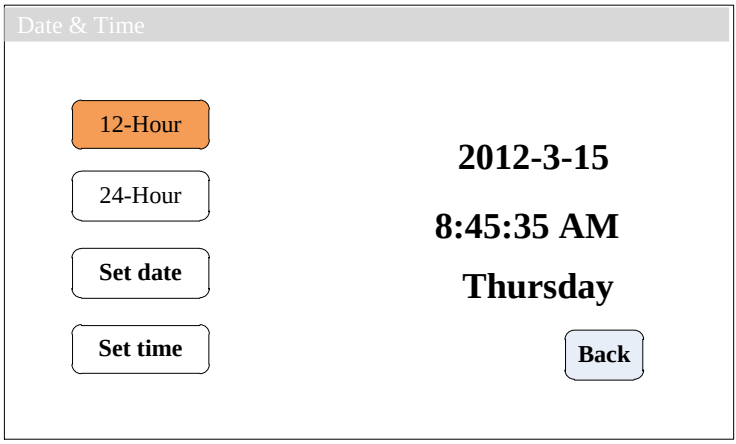
Detailed parameters view interface as follows:



In common mode interface, select one common mode, click **View** button, enter to parameter viewing interface.

This interface allows you to view the working type, detailed operating parameters and repetition parameters of the selected common mode.

5.12 Date &Time



In the main interface clicks the time and date in the upper right corner to enter the time and date setting interface.

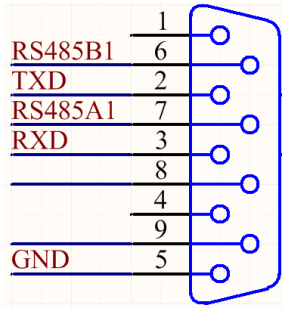
Click the **Set Date** button, come out keyboard to Set Year Number. Set the year from 1970 to 2099. After set up the year, click the **ENT** to enter the Set Month Number Keyboard, and then set the Day Number Keyboard.

Click the **Set Time** button come out the digital keyboard and set the time, minutes and seconds in turn.

6. External Control Interface Instruction

6.1 Communication Interface

The communication interface is located in the DB9 pin plug on the back of the syringe pump, as shown in the below picture.



(1) RS232 interface, in the external control setting interface, select RS232, the port is valid.

GND: Communication ground terminal

TXD: Master sends, syringe pump receives signal terminal

RXD: Syringe pump sends, master receives signal terminal

(2) RS485 interface, in the external control setting interface, select RS485, the port is valid.

RS485A1: connect RS485 A+.

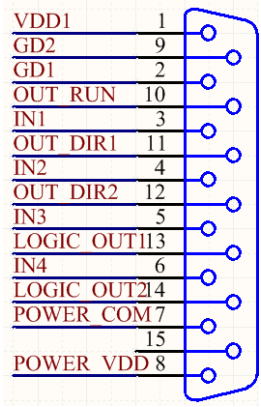
RS485B1: connect RS485 B-.

Note: No matter select RS232 or RS485, the communication protocol is MODBUS protocol standard.

Note: The syringe pump only can support communication when the pump is in main interface.

6.2 External Control Interface Instruction

The external control interface is located in the DB15 pin plug on the back of the syringe pump, as shown in the below picture:



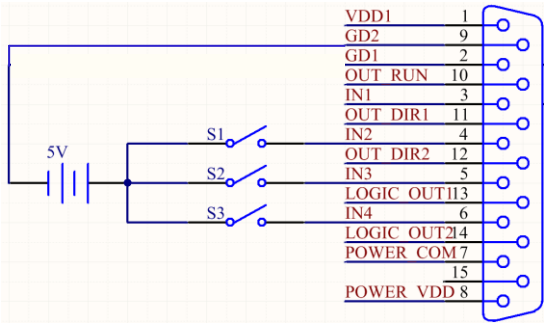
(1) VDD1 and GD1: internal 5V output.

(2) IN2, quickly start withdrawal (active signal)

(3) IN3, quickly start infusion (active signal)

(4) IN4, active start and stop

Wiring diagram as below:



Function Instruction:

In Pulse Mode:

Short-circuited S1 and disconnect it, the syringe pump starts running according with the parameters in withdraw mode (repeat number is 1), short-circuited it again and disconnect it, the syringe pump stops running.

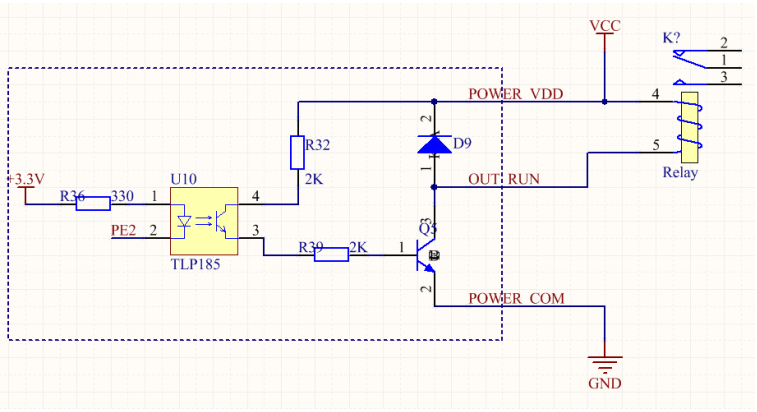
Short-circuited S2 and disconnect it, the syringe pumps starts running according with the parameters in infusion mode (repeat number is 1), short-circuited it again and disconnect it, the syringe pump stops running.

Short-circuited S3 and disconnect it, the syringe pump starts running according with current setting working mode, short-circuited it again and disconnect it, the syringe pump stops running.

In Level Mode:

Short-circuit S3, the syringe pump starts running with current setting working mode; after disconnect, the syringe pump stops running.

(5) OUT_RUN motor working status output, OUT_DIR1 and OUT_DIR2 motor running direction output, wiring diagram as below:



If you want to connect an external relay, when the motor runs, K1 closed; when it stops, K1 disconnect.

(6) Foot Pedal Interface

Foot pedal interface is located in the aviation plug on the back of the syringe pump.

In Pulse mode: Step on the foot pedal switch and then lift it up, the syringe pump will start running according with the current setting working mode; step on it and lift up again, the syringe pump will stop running.

In Level mode: Step on the foot pedal switch, the syringe pump will start running according with the current setting working mode; lift it up, the syringe pump will stop running.

7. Technical Specification

Working mode	Infusion, withdrawal, infusion/withdrawal, withdrawal/infusion						
Channel No.	1	2	4	6	8	10	12
Syringe size	0.5μL-150mL		10μL-10mL				
Flow rate	0.008nL/min-165.871mL /min		0.2nL/min-26.177mL/min				
Route resolution	0.078μm/μstep						
Linear speed range	1μm/min-132mm/min						
Min. step rate	0.035ms/Micro step						
Max. step rate	0.937sec/Micro step						
Linear force range	8—25kgf, it can be adjusted online						
Distance of each step	0.078μm						
Accuracy	Error≤±0.3% (Stroke≥30% of the maximum stroke)						
Syringe selection	Inner syringe size and custom syringe ID						
Display	Industrial grade 4.3’’LCD color display						
Control method	Touch screen and Mechanical keypad						
Power-off memory	Display the previous data parameter after power on again						

Output state	OC gate signal output, used to indicate running status and direction.
External control signal	Active switch signal: 5V-24V Passive switch signal: foot pedal switch
Communication interface	RS232/RS485 (Modbus protocol, RTU mode)
Power supply	AC 90-264V/65W
Condition temperature	0-40℃
Relative humidity	<80%
IP rate	IP31

8. Functions and Features

- **Input syringe ID function**: Users can choose syringe from menu or input the syringe ID directly.
- **Choose working types**: This syringe pump has two working types: Volume and Speed.
- **Choose working modes**: Syringe pump has 4 working mode--Infusion, withdrawal, infusion/withdrawal, withdrawal/infusion. Each working mode technical data save separately, do not influence each other.
- **Calibration and online micro adjusting function**: Users can control the flow volume more precisely with this function.
- **Memory function**: After power 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 function.
- **Syringe protection function**: Prevent syringe damage by adjusting the

position of the limit block.

- **Online adjusting linear force**: The linear force can be adjusted on the interface, 8-25kgf for option.
- **Common mode**: It can save up to 60 common modes and reduce the input time of customers.
- **Communication interface**: Support RS232 and RS485 communication port, Modbus protocol RTU mode.

9. Dimension Drawing

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

(Unit: mm)

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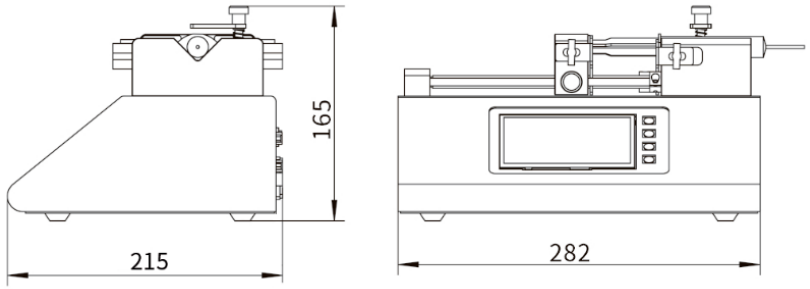

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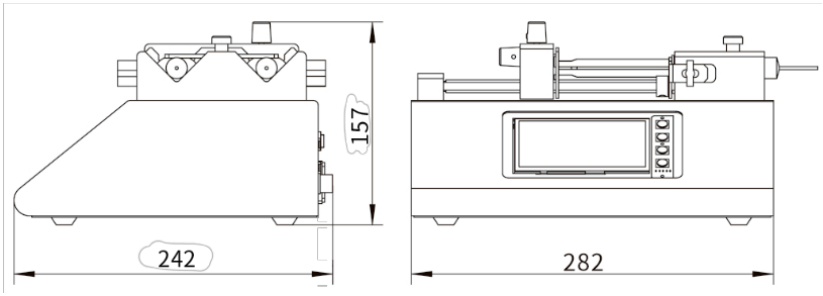

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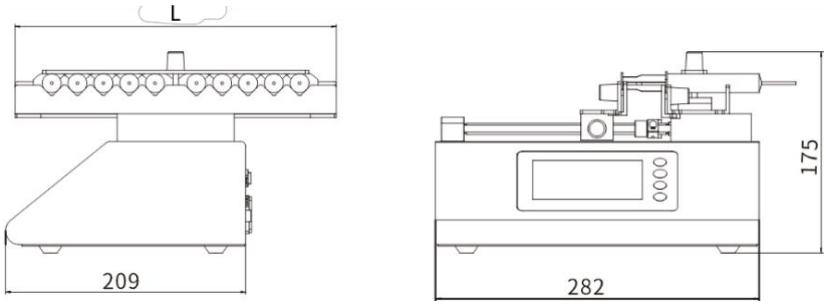

10. Maintenance

- **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 or 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.
- Please be attention that the outlet of high-voltage static electricity shall not form tip discharge to the pump body if using in electrospinning.

11. 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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