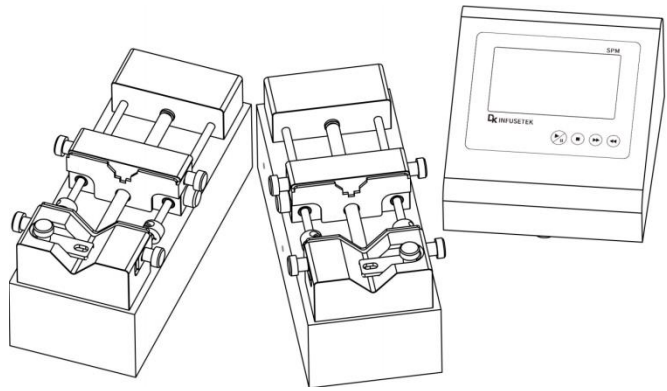
INFUSETEK

SPM 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.

Table of Contents

1. Product Introduction

The SPM series consists of a controller and multiple independent units, and multiple operating units work independently of each other. Each unit can be used as an independent syringe pump unit to achieve liquid infusing or withdraw. Multiple units work independently, and can simultaneously infuse or withdraw liquids at different speeds.

The SPM series uses a 4.3-inch industrial-grade true-color LCD screen, imported mechanical keypad operation, and has intelligent calibration and online fine-tuning functions. Abundant external control modes are arbitrarily selected, support RS485/RS232 communication interface, standard MODBUS communication protocol, can realize remote control. Suitable for high-precision filling or liquid extraction.

2. Product Composition

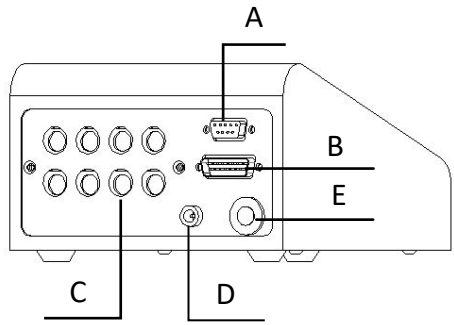
It consists of one controller and multiple independent syringe pump units. The number of syringe pump unit can be arbitrarily increased or decreased according to needs. And the effectiveness of the matched syringe pump units can be set at will to meet different production needs.

Connection note:

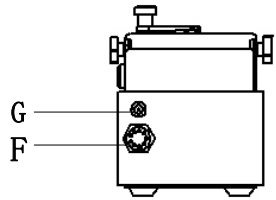
(1) All split syringe pump units are connected to one controller, and the controller has an independent control interface for each split syringe pump unit.

(2) Each controller can control maximum 8 syringe pump units.

3. Product Appearance and Interface Instruction



Back of Controller



Back of Operation Unit

Interface description:

A: DB 9 hole communication interface

B: DB15 pin external control interface

C: MD8 socket, connect to the pump unit interface (F)

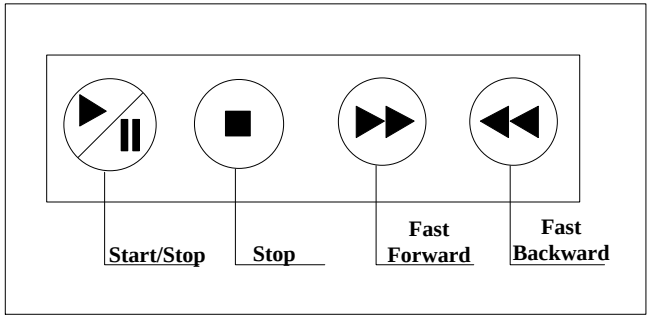
D——DC5V power socket

E——Power switch

F——MD8 socket, connect controller interface (C)

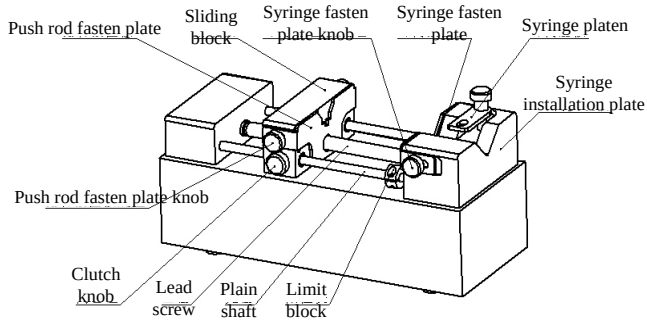
G——DC 24V power supply

4. Keypad Instruction



- **Start/Stop button:** After setting the operation parameter, click this button, the syringe pump will start running according to setting parameters, click this button again, pause current operation. After clicking Start/Stop button, in main interface, other buttons are colored (available) except common mode button and communication setting button which are gray (disabled).
- **Stop button:** Click Stop button, the pump stops. The buttons which are disabled change to be available in main interface. Keep pressing this button and turn on the power supply of this device at the same time, that will initialize the pump and all the parameters will be lost.
- **Fast forward:** In stop status, press this button, the syringe pump will run to the right at the highest speed, and press this button again, the pump stops.
- **Fast backward:** In stop status, press this button, the syringe pump will run to the left at the highest speed, and press this button again, the pump stops.

5. 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) Rotate two [Push rod fasten plate knob] on the side of the [Sliding Block] to open the [Push rod fasten plate]. Rotate the [Syringe fasten plate knob] on the side of the [Syringe mounting plate] to open the [Syringe fasten plate].

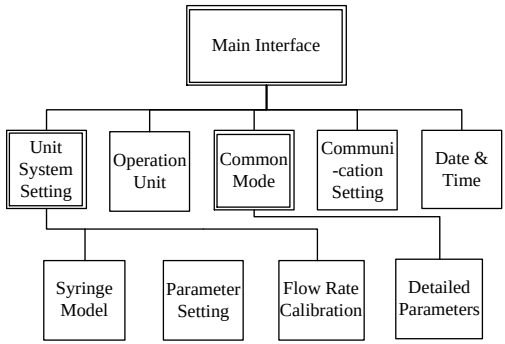
(3) Lift and rotate the [Syringe platen], place the syringe, adjust the syringe to the appropriate position, and rotate the [Syringe platen] to hold the syringe.

(4) Tighten the knobs to secure the syringe.

(5) The syringe can be prevented from being damaged by adjusting the stop block. Especially glass syringe type syringes need to be adjusted and fix this stop block.

Note: When installing the glass syringe, push the slider toward the limit position after fixing the syringe, then move it about 1mm in the opposite direction, and fix the stop block with the wrench provided with the factory product. Then move the slider to the initial position of the syringe and enter the working state.

6. SPM Structure Diagram of Operation Interface



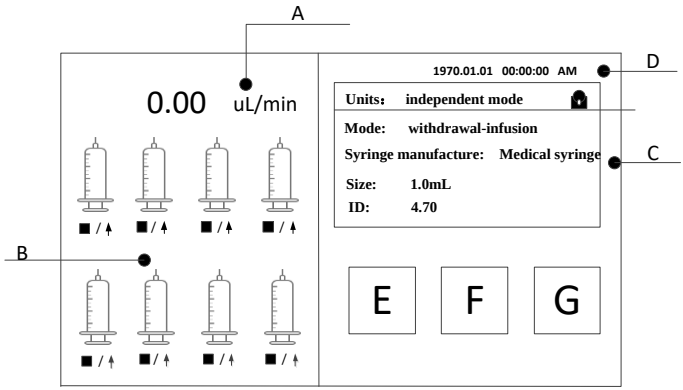
SPM series controller operation interface instruction

6.1 Booting interface

After turn on the pump, enter welcome interface, after 2.5 seconds system enter main interface automatically.

6.2 Main Interface

The main interface structure is shown in the figure below:



A. Flow rate display: polling every 5s to display the flow rate selected as

a valid unit

B. **Real-time animation display**: display the running status of each unit in real-time, animation displays monitoring results, and alarm function. If a red alarm signal appears on a syringe, the corresponding unit is blocked. Please check the traffic jam condition of the syringe pump unit; Click the syringe icon to enter the corresponding unit parameter setting interface.

C. **Parameter display:** Every 5s polling display effective unit system settings parameter.

D. **Date & time:** Display the current date and time in real time, click here to modify.

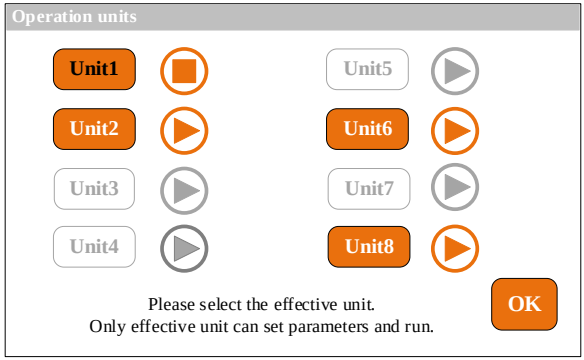
E. **Operation unit button:** Click this button to enter effective unit selection interface. In this interface, user can choose effective unit or control effective unit start or stop separately.

F. **Common mode button**: Click this button to enter common mode interface.

G. **External control setting button:** Click this button to enter the external control setting interface

6.3 Operation Unit Interface

The operation unit interface as the below picture shows:



Click Operation units button in main interface, then enter to operation units interface, click Unit number button (like 

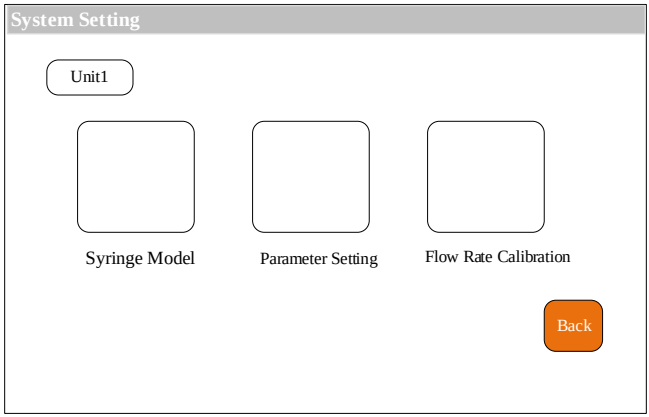
) to set unit effectiveness. After setting, click OK button back to main interface, then click start/stop button of mechanical key to control all effective unit start/stop. If a certain unit is running, and this unit is forbidden operating.

Click  or  button, the unit can be started and stopped independently.

It should be noted that the unit must be selected as a valid unit to perform this operation.

Note: Selecting effective unit is the first step for parameter setting, only the unit which is selected as effective unit can be operated.

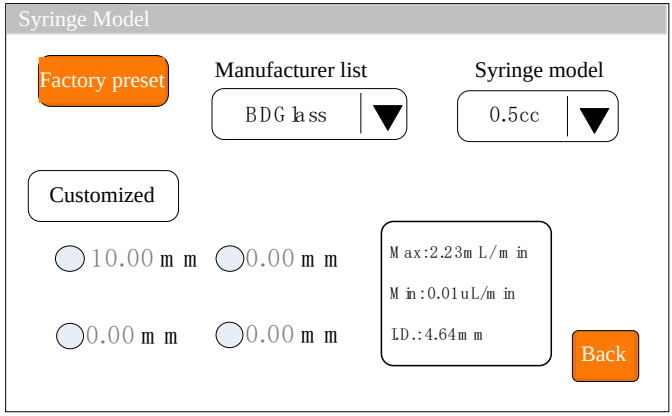
6.4 Unit System Settings Interface



In the main interface, click the **syringe** which has been set as effective unit to enter the system settings interface. In this interface, you can choose to enter the syringe model setting interface, parameter setting interface, and flow rate calibration interface.

6.5 Syringe Model Setting Interface

The syringe model interface is shown in the figure below:



In main interface, click the syringe icon you want to set parameters, then click the **syringe model** button to enter the syringe model setting interface.

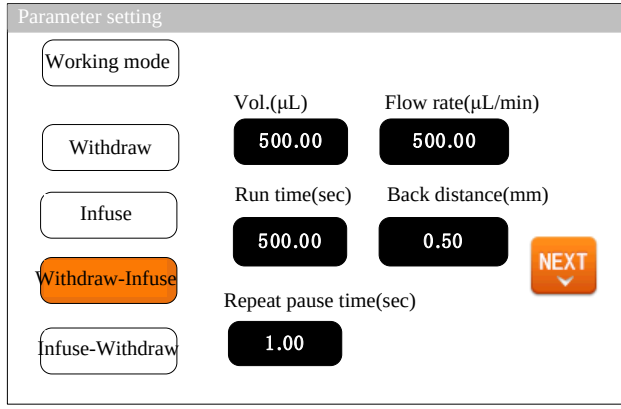
In this interface, click the **factory preset**, select the syringe built in by the manufacturer, select the syringe manufacturer from the **manufacturer list** drop-down menu, and select the syringe size from the syringe size drop-down menu. After selecting the factory preset, the **customized part** is prohibited and cannot be operated.

In this interface, click **customized**, select the customized syringe, 4 groups of custom syringes can be set, and the inner diameter of the syringe can be set after selection. After selecting **customized**, the **factory preset** part is prohibited and cannot be operated.

The right side shows the maximum and minimum flow rate of the selected syringe and the inner diameter of the syringe.

Click the **back button** to return to the system settings interface.

6.6 Parameter Setting Interface

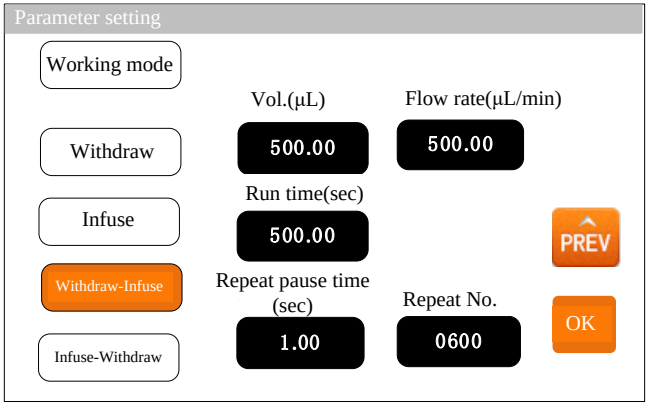


In main interface, click **System Settings** button, then click **Parameter** enter parameter setting interface.

Select working **Mode** (take Withdraw-infuse for example), set the working parameters of withdrawal (**Volume, Run time** and **Flow**) and **Reverse** and 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 0mm-5mm (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: Only the withdraw action can set the number of backward step.

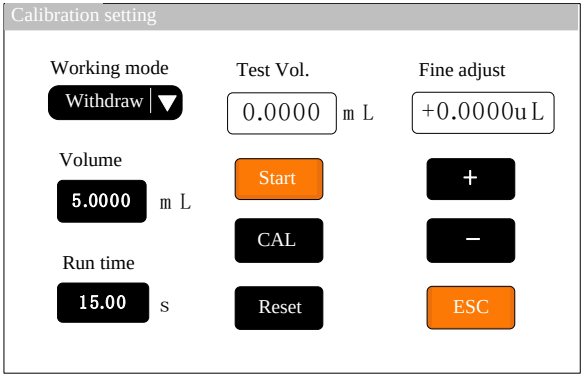


This interface sets the parameters of the infuse action in the mode of **withdraw-infuse**; Setting the **Repeat pause time** and the **repeat No.** (the number of repetitions is 1-9999 times, 0 means unlimited repetitions). Click the **PREV button** to return to view and edit the parameters of the withdraw action; click the **OK** button to save the operating parameters and exit.

Note: Enter the interface at running status, only flow rate and running time can be modified, other parameters can not be changed.

6.7 Calibration Interface

The calibration interface as the below picture shows:



The process of calibrating data before running is as follows:

A. If the working mode is withdraw-infuse mode or infuse-withdraw mode, firstly, you need to choose the withdraw action or infuse action to do the calibration.

B. Click '**Start**' button to start the test, the run time countdown display, when the run time is automatically stopped, a numeric keyboard for entering the actual test volume is automatically popped up, then enter the actual measured liquid volume. After clicking the OK button, it is asked whether to continue the test (it is recommended to test more than three times), select 'Yes', retest, select 'No' back to calibration interface.

C. After multiple tests, the actual volume display area displays the average value of the actual volume of the test group. Click the '**CAL**' button, indicate calibration is successful.

D. Test again to check whether the volume can meet requirement, if request high accuracy, click '**+**' or '**-**' button to micro adjust the volume.

E. Click '**Reset**' button, the previous multiple tests are canceled and the parameters are restored to the parameters before calibration.

The process of fine-adjust the liquid volume during operation is as follows:

A. If the liquid volume is too large or too small during the production process, you can fine-adjust the liquid volume online without affecting the production line

B. Click the calibration button from the main interface to enter the flow calibration interface

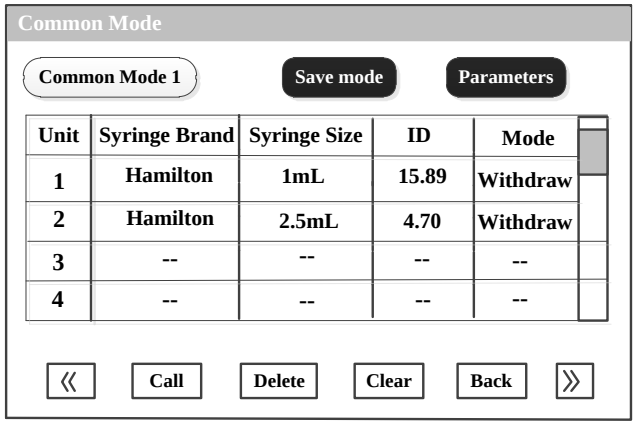
C. At this time, only the select mode button (withdraw-infuse mode or infuse-withdraw mode), + button, - button, and ESC button are

available, and other buttons are disabled.

D. Click the "+" or "-" button to fine-adjust the liquid volume.

6.8 Common Mode Interface

Common mode interface as the below picture shows:



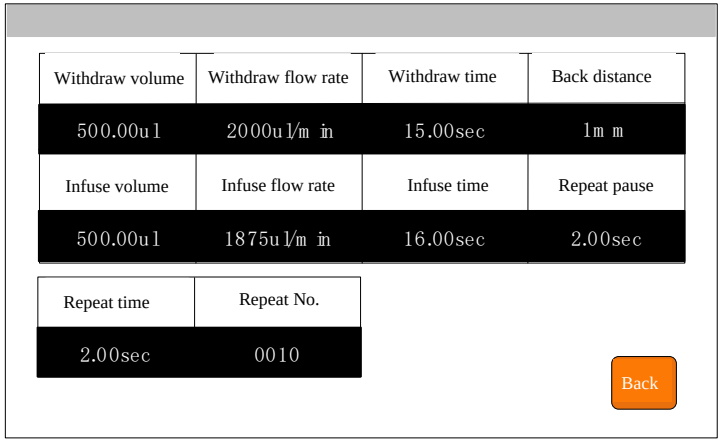
Click **Common Mode button** in main interface, enter common mode interface:

- **Call button**: Click this button to use the common mode, after call the common mode, the relative unit parameters changes to the common mode parameters.
- **Delete button**: Select a common mode, click this button, a dialog box popped up, and ask whether delete it, click YES, then you can delete delete the relative common mode.
- **Clear button**: Click this button, a dialog comes out and ask whether clear all, click YES to delete all the modes.
- **Back button**: Click this button back to system settings interface.
- **"<<" and " >>" button**: If there are many modes, click page up and

down button, to check previous or next page common button.

- **Save mode button** (Independent working common mode interface): Click this button to save the all current independent working parameters to common mode, save maximum 10 groups data.
- **Parameter button** (Independent working common mode interface): After select unit of dispensing mode from the below the list, click this button to check the detailed parameters.

Detailed Parameter checking interface as below:

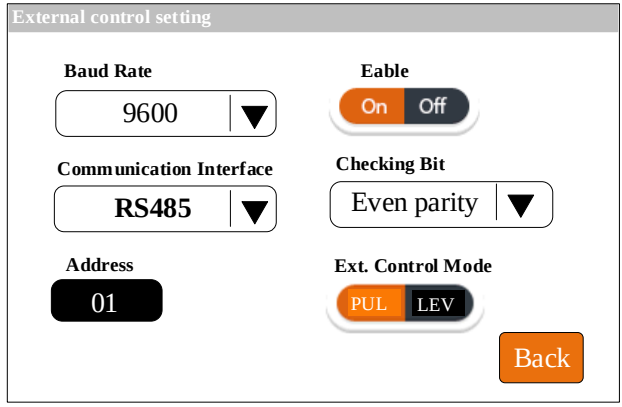


In common mode interface, select one common mode, click view button to enter viewing parameter interface.

In this interface, you can view selected common mode and detailed running parameter and repetitious parameters.

6.9 External Control Setting Interface

External control setting interface as below picture shows:



This interface setting is for the communication between the controller and the man-machine interface. The communication between the controller and the man-machine interface only needs to change the address of the lower computer (ie, the controller).

Click the **external control settings** button on the main interface, and enter to external control setting interface.

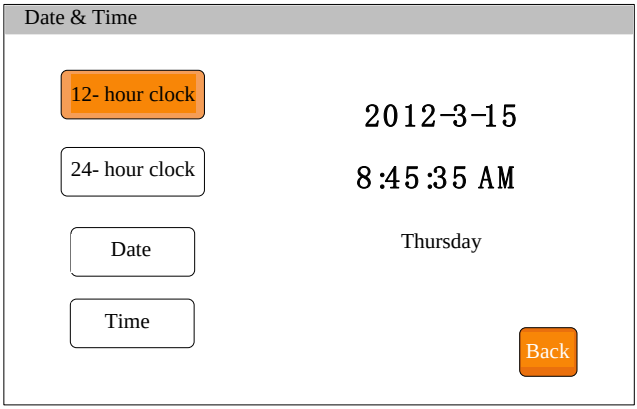
This product supports Modbus communication protocol-RTU mode, first select th**e communication baud rate** and **communication interface** RS485 (or **RS232**), click the **address** button, enter the pump address number (range 1-32), select communication **enable** to ON, selecting checking bit. At this time, the HMI interface communicates with the controller and receives the HMI interface signal control.

Support switching of external control level and pulse mode.

Note: After setting, the syringe pump will only receive communication signals in the main interface, and other setting interfaces are invalid.

6.10 Time & Date Setting Interface

Setting date & time interface as below picture shows:

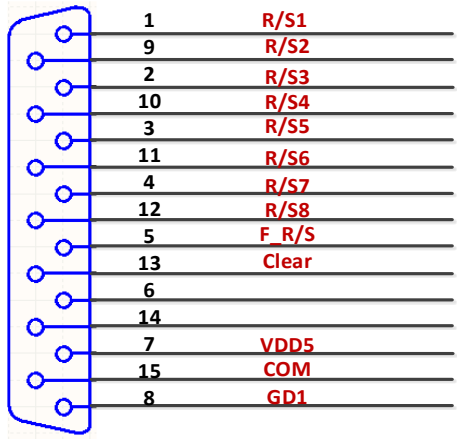


Click the **time and date** in the upper right corner of the main interface to enter the time and date setting interface. In this interface, the current date and time can be set and displayed in the upper right corner of the main interface.

Click the **Date button** to pop up the year setting numeric keyboard. Set the year range to 1970-2099. After setting, click 'ENT' to enter the month numeric keyboard and then the day numeric keyboard. Click the **Time button** to pop up the numeric keyboard and set the **hour, minute, and second** in sequence.

7. External Control Interface Instruction

External control start/stop interface instruction



① **Independent start/stop signal:**

COM: Common port for external control signal input.

R/Sn: Start/stop signal line for pump unit "n" (Pulse mode: signal rising edge is valid, high level duration is 200ms; Level mode: high level is valid).

② **All start/ stop signals:**

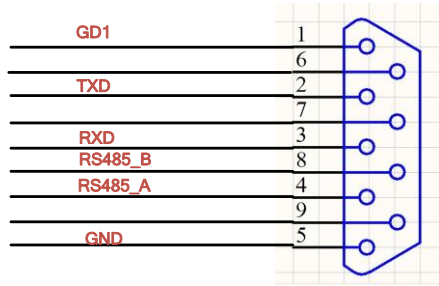
COM: Common port for external control signal input.

F_R/S: All start/stop signal for independent operation unit. (Pulse mode: the signal is recognized as valid on the rising edge, and the minimum duration of high-level is 200ms; Level mode: high level is valid).

③ **Internal 5V power signal output: 5VDC output**

GD1: the negative pole of 5V power output.

VDD5: the positive pole of 5V power output.



TXD, RXD, GND: RS232 communication interface, select RS232 in the communication setting interface, this interface is valid.

RS485_A, RS485_B, GD1: RS485 communication interface, select RS485 in the communication setting interface, this interface is valid.

8. Technical Specification

Working mode (Four)	Infuse, Withdraw, Withdraw/infuse, Infuse/withdraw	Pump units	1-8 for option
Max stroke	90mm	Stroke resolution	0.078μm (each micro step)
Liner speed	1μm/min-132mm/min	Line speed adjustment resolution	1μm
Max and min speed	Max: 0.035ms/micro step Min: 0.937sec/micro step	Control accuracy	Stroke≥ 30% of the maximum stroke, Accuracy≤ ±0.5%
Linear Power	16Kgf	Display	4.3 inch color touch screen and

			imported mechanical keypad.
Memory	After re-power on, the parameters before power-off will be kept	Flow rate calibration	Save calibration parameters independently for each channel
Signal Input	Controlling start/stop	Communication port	RS485/RS232
Back distance	0.01-5mm	Voltage	Controller: DC5V Pump unit: DC24V

9. Function and Features

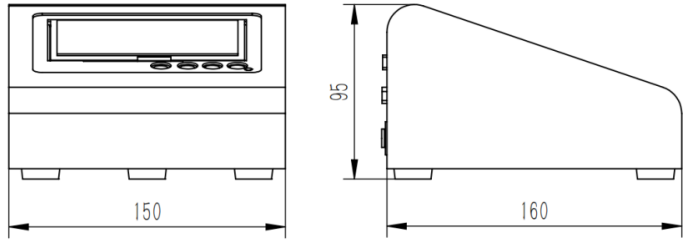
- Multiple types syringes can be installed on the pump; The same controller can control multiple different types of syringes to work at the same time, can also work independently at different times.
- Precision angle control technology to achieve high-precision distribution.
- Color touch screen control, animation displays infusion status, and the same screen polling display system settings of 8 units.
- On-line modify flow rate function, you can modify the flow rate or running time at the pump running to meet complex needs.
- Intelligent calibration function, automatically calibrate the infusion amount before production to ensure the infusion accuracy.
- On-line fine-tuning function, it is convenient for you to fine-tune the liquid volume of a split syringe pump unit during the production process, with less infusion error.
- Multiple split syringe pump units can be expanded on one controller to

maximize cost savings.

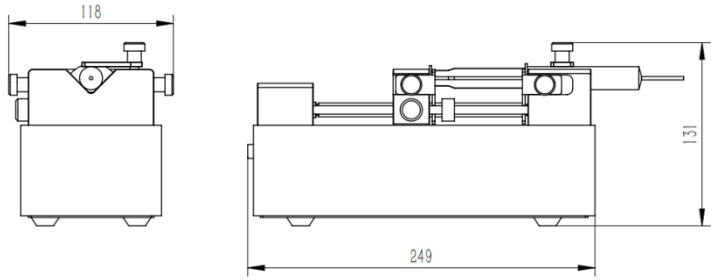
- Each unit is independently controlled, and different infusion parameters can be set, which can be started or stopped independently or simultaneously.
- Real-time monitoring, animated display of monitoring results, and alarm function to ensure safe production.
- Effective unit setting, one or several split syringe pump units can be turned on or off arbitrarily.
- The setting of the back distance can eliminate the air bubbles in the syringe and improve the filling accuracy.
- External control start and stop function, each channel can independently receive external control start and stop signals, and all effective channels can also be started and stopped at the same time, which can realize the unified operation of the controller.
- The controller can receive the independent block signal of each channel to realize the block alarm function and shutdown of the individual channel to ensure safe production.
- Fast forward and fast backward function is used for the loading, cleaning of the syringe and the release of the protection status of traffic block.
- By adjusting the position of the limit block, the syringe can be prevented from being damaged. Especially the glass injector type syringe needs to adjust and fix this limit block.

10. Dimension Drawing

Unit: mm



Controller



Pump Unit

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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