

Shenchen Precision Pump

Manual of SPM Syringe Pump





Warning:

- Please read the manual carefully before operation
- 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.
- If following situations happened, please turn off the pump, take off the power plug.
 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: Must connect foot pedal switch or external control when the pump is power off.

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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 system 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.

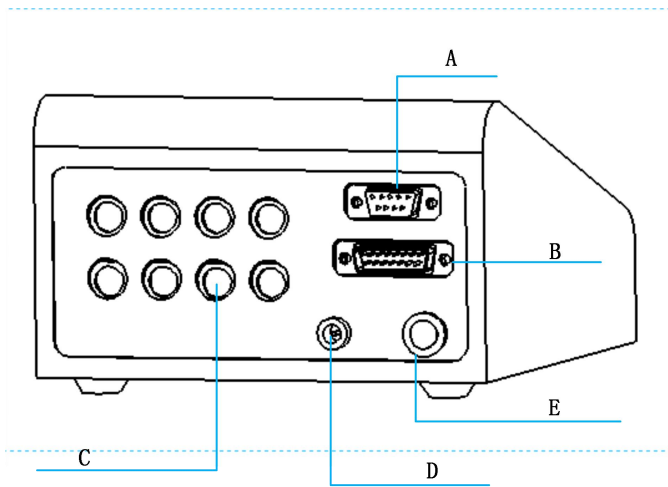
2. Product Composition

It consists of one controller and multiple independent syringe pump unit. 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.

2.1 Controller Connection Interface Instruction



Interface description:

A——DB 9 pin communication interface

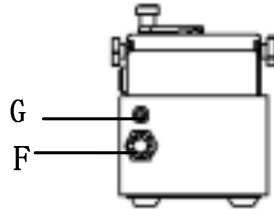
B——DB 15 pin external control interface

C——MD8 socket Connect to the pump unit interface (F)

D——DC 5V power socket

E——Power switch

2.2 Syringe Pump Unit Connection Interface

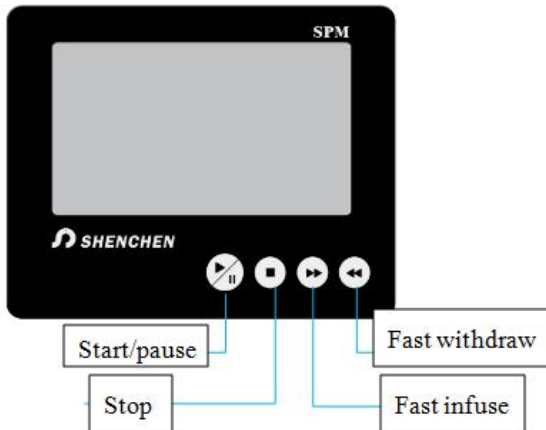


Syringe Pump Unit Backside

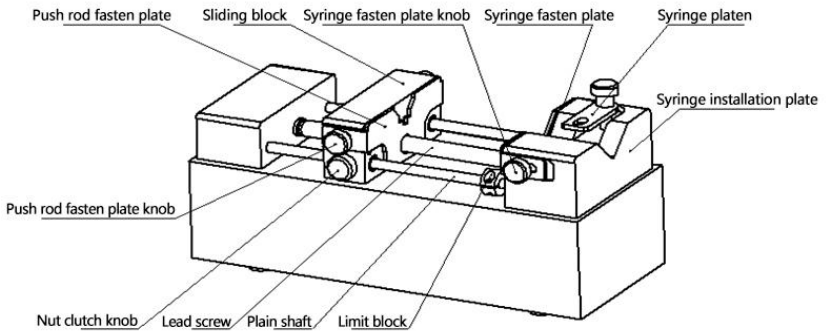
G: DC 24V power supply

F: MD8 socket, Connect controller interface (C)

2.3 Keypad Instruction



2.4 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.

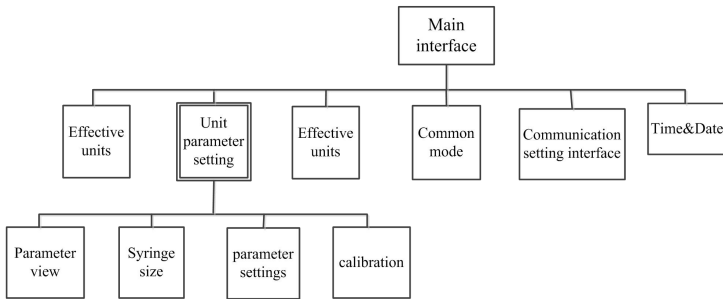
(4) Tighten the knobs to secure the syringe.

(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.

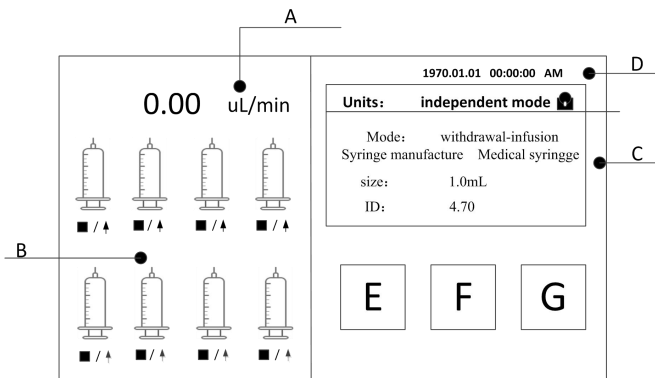
3. SPM Controller Composition



4. SPM Controller Operation Instruction

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

4.2 Main Interface



A. Flow rate display: polling every 5S to display the flow rate selected as a valid unit

B.Real-time animation display: Real-time display the running status of each unit, animation display of 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; when the unit is stopped, click the syringe to enter the corresponding unit parameter setting interface. When the unit is running in independent working mode, click syringe to enter corresponding unit parameters viewing interface, can micro adjust the speed online.

C.Parameter display: Every 5 seconds polling display effective unit system setting parameter.

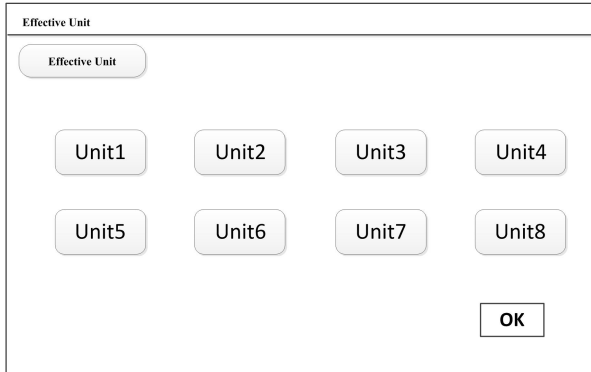
D.Date & time: Real-time display the current date and time, click here to modify.

E.Effective unit button: Click this button to enter effective unit selection interface.

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

G.Communication setting button: Click this button to enter the communication setting interface

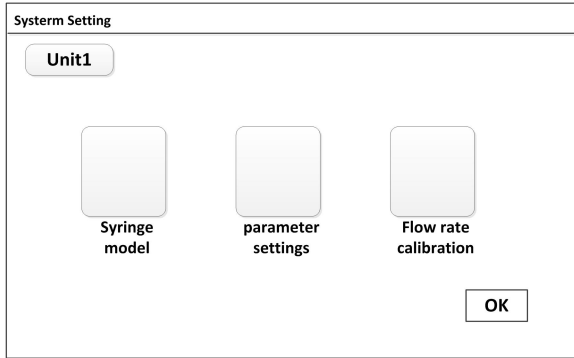
4.3 Effective Unit Interface



Click [Effective unit] button in main interface, enter effective unit selection interface to set unit effectiveness. After setting, click confirm button back to main interface. If a unit is running, the currently running unit cannot be edited.

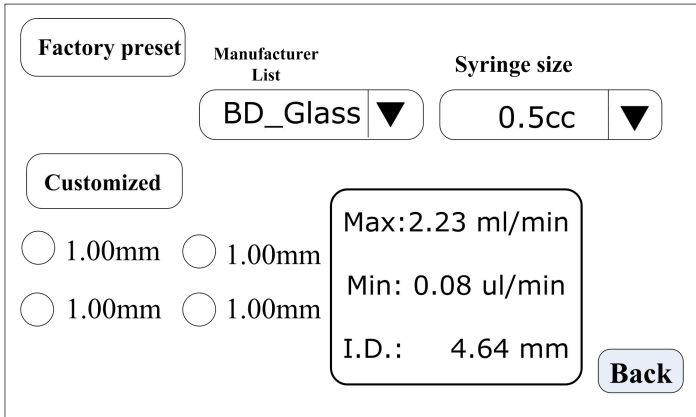
Note: Selecting effective unit is the first step of parameter setting, only the unit selected as effective unit can be operated.

4.4 System Setting Interface



In the main interface, click on the syringe selected as the effective unit to enter the system setting interface. In this interface, you can choose to enter the syringe model setting interface, parameter setting interface, and flow rate calibration interface.

4.4.1 Syringe Model Setting Interface



Click the **system setting button** on the main interface, and click the **syringe model button** to enter the syringe model setting interface.

In this interface, click the **factory preset**, select the built-in syringe of 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 setting interface.

4.4.2 Parameter Setting Interface

Working mode		
Withdraw	Vol. uL <input type="text" value="500.00"/>	Flow uL/min <input type="text" value="500.00"/>
Infuse	Run time Sec <input type="text" value="500.00"/>	Back distance mm <input type="text" value="0.5"/>
Withdraw - infuse	Repeat pause time Sec <input type="text" value="1.00"/>	<input type="button" value="NEXT"/>
Infuse- Withdraw		

Click the **system setting button** on the main interface and click the **parameter setting button** to enter the **parameter setting interface**.

First select the **working mode** (take first pumping and then fill as an example). First, you need to set the operating parameters of the pumping action (liquid volume, running time, and flow), and the number of **back distance** (that is, run a distance in the opposite direction after the

pumping is completed, which can be used Discharge air bubbles, the input range is 0.01mm-10mm), and the repeat pause time. Click the **NEXT button** to enter the next interface to set the parameters of the filling action.

Note: Only the withdraw action can set the number of backward step.

Work mode				
Withdraw	Vol. uL	500.00	Flow uL/min	500.00
Infuse	Run time Sec	500.00		
Withdraw -infuse	Repeat pause time Sec	1.00	Repeat No.	06000
Infuse-withdraw				PREV
				OK

This interface sets the parameters of the infuse action in the mode of **withdraw-infuse**; setting the **Repeat pasue 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.

4.4.3 Calibration Interface

Calibration settings		Test Vol.	Fine adjust
Work Mode		0.0000 mL	+0.0000 uL
Infuse ▼		Start	+
Volume		CAL	-
5 mL		Reset	Esc
Run Time			
15 s			

The process of calibrating data before running is as follows:

- A. If the working mode is withdraw-infuse mode or infuse-withdraw mode, first 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 **'Add'** or **'Dec'** button to micro adjust the volume.
- E. Click **'Reset'** button, the previous multiple tests are cancelled and the parameters are restored to the parameters before calibration.

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

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

- A. Click the calibration button from the main interface to enter the flow calibration interface
- B. At this time, only the select mode button (withdraw-infuse mode or infuse-withdraw mode), increase button, decrease button, and exit button are available, and other buttons are disabled.
- C. Click the increase or decrease button to fine-adjust the liquid volume.

4.4.4 Common Mode Interface

Common Mode

Common Mode 1
Save mode
Parameters

Unit	Syringe Brand	Syringe Size	ID	Mode
1	Hamilton	1mL	15.89	Withdraw
2	Hamilton	2.5mL	4.70	Withdraw
3	--	--	--	--
4	--	--	--	--

<<
Call
Delete
Clear
Back
>>

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:** Click this button to delete the relative common mode.

- **Clear** button: Click this button to delete all the common mode.
- **Back** button: Click this button back to system setting interface.
- << >> button: Click page up and down button, to check previous or next page common button.
- **Save mode** button: Click this button to save the current working parameters to common mode.
- **Parameter** button: After select one common mode in the list, click this button to check the detailed parameters.

Detailed Parameter checking interface as below:

Withdraw volume	Withdraw flow rate	Withdraw time	Back distance
500.00ul	2000ul/min	15.00sec	1mm
Infuse volume	Infuse flow rate	Infuse time	Repeat pause
500.00ul	1875ul/min	16.00sec	2.00sec
Repeat time	Repeat No.		
2.00sec	0010		

4.4.5 Communication Interface

Communication interface as below:

Baud rate	Enable
9600 ▼	On Off
Communication	Checking bit
RS485 ▼	Even Parity ▼
Address	
01	
	Back

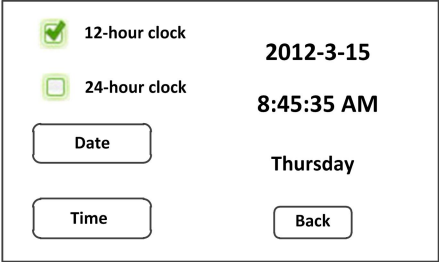
This interface setting is for the communication between the controller and the man-machine interface. The communication between the controller and the man-machine interface only needs to change the address of the lower computer (ie, the controller).

Click the system setting button on the main interface, and click the communication setting button to enter the communication setting interface.

This product supports modbus communication protocol-RTU mode, first select the communication baud rate and communication interface RS485 (or RS232), click the local address button, enter the pump address number (range 1-32), select communication enable When it is ON, the check digit is selected. At this time, the man-machine interface communicates with the controller and receives the man-machine interface signal control.

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

4.4.6 Time & Date Setting Interface

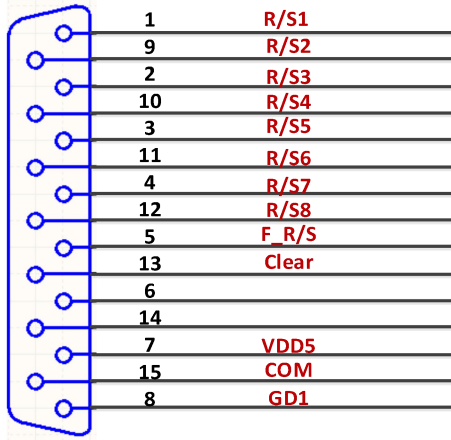


The screenshot shows a settings interface for time and date. On the left, there are two radio button options: '12-hour clock' (which is selected with a green checkmark) and '24-hour clock'. Below these are two buttons: 'Date' and 'Time'. On the right side, the current date is displayed as '2012-3-15', the current time as '8:45:35 AM', and the current day as 'Thursday'. At the bottom right, there is a 'Back' button.

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.

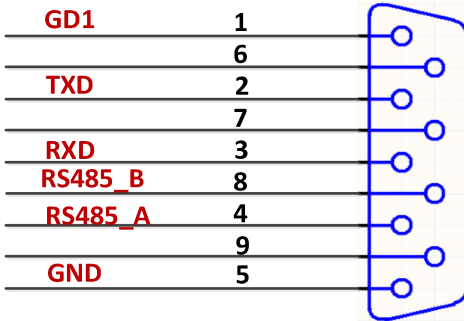
Click the **Date button** to pop up the year setting numeric keyboard. Set the year range to 1970-2099. After setting, click 'ENT' to enter the month numeric keyboard and then the day numeric keyboard. Click the **Time button** to pop up the numeric keyboard and set the **hour, minute, and second** in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

5. External Control Interface



- ① **Independent start / stop signal, logic external signal:** Active signal input(5VDC, 12VDC, 24VDC)
COM: Common port for external control signal input.
R/S_n: Pump unit n start/stop signal line (signal rising edge is valid, high level duration is 200ms).
- ② **All start/ stop signals:** Active signal input (5VDC, 12VDC, 24VDC)
 The signal is recognized as valid on the rising edge, and the minimum high-level duration is 200ms.
COM: Common port for external control signal input.
F_R/S: All start and stop signal for independent operation unit.
- ③ **Internal 5V power signal output: DC 5V output**
GD1: 5V power output negative.
VDD5: 5V power output positive

6. Communication Interface Instruction



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.

7. SPM Syringe Pump Technical Specification

Working mode	Infuse, Withdraw, Infuse/withdraw, Withdraw/infuse	Pump units	1-8 for option
Max stroke	90mm	Resolution	0.078um (each micro step)
Liner speed	5um/min— 132mm/min	Flow rate	0.001uL/min- 127ml/min

Max and min speed	MAX:0.937sec/micro step Min:0.035ms/micro step	Control accuracy	Stroke \geq Maximum stroke *1.3, Accuracy \leq \pm 0.5%
Linear Power	15Kgf	Display	4.3 inch color screen
Memory	Power off memory function	Calibration	The parameters before power down
Signal Input	Start/Stop	Communication port	RS485/RS232
Back distance	0-5mm	Voltage	Controller: DC5V Pump unit: DC24V

8. SPM Function and Features

- Can install multiple types of syringes, 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, friendly interface, animation display infusion status, and the same screen polling display system settings of 8 units.
- 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

9. 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.

10. Warranty

We support 3 years warranty (not including syringe). During the warranty, the products are damaged because of users' wrong operation or other human damages, our company do not responsibility for warranty. Beyond the warranty, we only charge the cost of maintenance. Refer to all maintenance including in and beyond the warranty, we do not bear any freight charges because of maintenance.

MADE IN CHINA

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