Dual channel syringe pump

User Manual

Product Information

Product Name: Dual channel syringe pump

Model Specifications: OSP-600、OSP-600A

Registration Certificate Number: 粤械注准 20202140333

Product Technical Requirement Number: 粤械注准 20202140333

Production license number: 粤食药监械生产许 20152693 号

Product performance, structure and composition: mainly composed of control system and transmission system, control system include power board, motherboard, buttons and display board, LCD display screen, pressure detection system, automatic identification system for syringe model, and syringe installation detection system.The transmission system includes the casing,Complete machine fixed frame, Motor transmission system, Lead screw drive system,propulsion system .

Product Scope of application: For constant-rate intravenous infusion of liquid medicine to patients in hospitals.

Manual version information

Version number: V1.0

Revised date: January, 2024

Product validity period

3 years

Date of Manufacture

See label

Annotations in this manual

⚠**Warning：** Information that you should know about how to avoid possible harm to patients and medical staff.

Contraindication: No

catalogue

1.Safety Guide

1.1 Safety Instructions

In order to avoid any possible injury, please abide by the following safety instructions when operating this instrument:

⚠**Warning:** This device is not an explosion-proof or portable device.

⚠**Warning:** Do not use in areas with flammable gases such as anesthetics, as there is a risk of explosion.

⚠**Warning:** Do not throw the battery into the fire to avoid explosion.

⚠**Warning:** This device uses professional medical consumables, and its accuracy cannot be guaranteed when the syringe used is not a national standard consumable or when using uncalibrated consumables.

⚠**caution:** This instrument must be serviced by authorized qualified engineer. ⚠**caution:** The instrument must be operated by medical professionals, such as doctors, nurses, to avoid operating the equipment by patients, and medical staff need to regularly monitor the running status of the equipment.

⚠**caution:** Keep the instrument clean and avoid oscillations.

⚠**caution:** Avoid high- temperature sterilization or electron beaming, γ radiation sterilization.

⚠**caution:** Electromagnetic interference- - - - -Do not use equipment with high frequency interference nearby, to ensure that the original use environment of this instrument is not disturbed by strong electromagnetic interference sources, such as wireless transmitter or mobile phone.

⚠**caution:** Before use, users must check that the equipment is not significantly damaged that may affect patient safety or instrument performance. The recommended inspection cycle is once a month or less. If obvious damage is found, it is recommended to replace the damaged components before use.

⚠**caution:** The following safety inspections must be carried out by personnel with appropriate training, knowledge, and practical experience, usually once every two years or tested according to public agency regulations and inspection procedures.

- ✧ Inspect if there's mechanical or functional damage on the instrument.
- ✧ Check if safety related labels are easily recognizable.
- ✧ Verify the instrument functions are still the same as the user manual describes.

⚠**caution:** Expired products shall be disposed of or returned to the manufacturer for recycling in accordance with the scrapping regulations for electronic products, and disposed of in accordance with local regulations.

⚠**caution:** The battery should be properly disposed of according to local regulations after use.

⚠**caution:** Keep away from the patient when replacing battery (around 1.5 meters away from the patient).

⚠**caution:** If there is a malfunction during use of this product, please immediately shut down and stop working, and contact the manufacturer in a timely manner. In a single fault state, the maximum capacity of the product for infusion may not exceed 1ml.

2.Dual channel syringe pump Brief Introduction

2.1 Overview

◎Dual channel syringe pump is a constant speed constant volume type Syringe pump, is through the microprocessor of precision stepper motor accurate control, the mechanical transmission device to generate translation thrust, and through various sensors, accurate control of the injection speed of disposable syringe, monitoring the injection process of high precision intelligent pump, through the internal displacement sensor monitoring the injection process, to ensure the injection safety and injection accuracy.

◎Dual channel syringe pump suitable for syringe pumps include disposable sterile syringes (hereinafter referred to as syringes) of 5ml, 10ml, 20ml, 30ml or 50ml (60ml), and also have software debugging functions that can meet the needs of any brand of syringe. The pump also has multiple alarm functions, and the LCD screen has synchronous text display, making it more convenient for users to operate the pump and ensuring safe and reliable injection.

◎Micro syringe pump is particularly suitable for a long time, uniform and precise control of injection speed and monitoring the injection process of clinical treatment can also be widely used in clinical departments of conventional intravenous injection, anesthetic injection, anticoagulant injection and cancer patients drug chemotherapy, also applies to internal medical intensive patient care unit, neurology intensive patient care unit, etc.

2.2 Explanation of graphical symbols

2.2.1 Front view: (Figure 2-1)

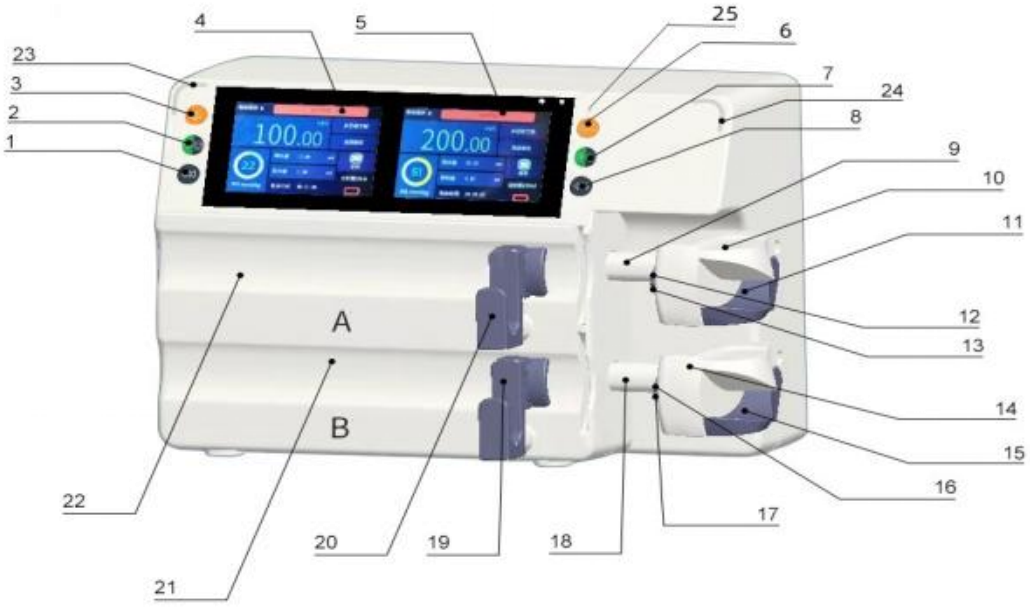


Figure 2-1

1：Channel A fast forward button 2：Channel A Start/Stop button 3：Master mute key

4：Channel A display 5：Channel B display 6：Main on/off key 7：Channel B start and stop button 8：Channel B Fast forward button 9：Channel A moves the catheter 10：Channel A push-block 11：Channel A plate 12：Channel A hook 13：channel A Pressure detection cap 14：channel B Push-block 15：B channel plate 16：Channel B hook 17：Channel B Pressure detection cap 18：Channel B moves the catheter 19：Channel B Pull rod 20：Channel A Pull rod 21：Channel B syringe seat 22：Channel A Syringe seat 23：channel A Alarm light 24：channel B Alarm light 25:Remote control interface

2.2.2 Back drawing: (Figure 2-2)

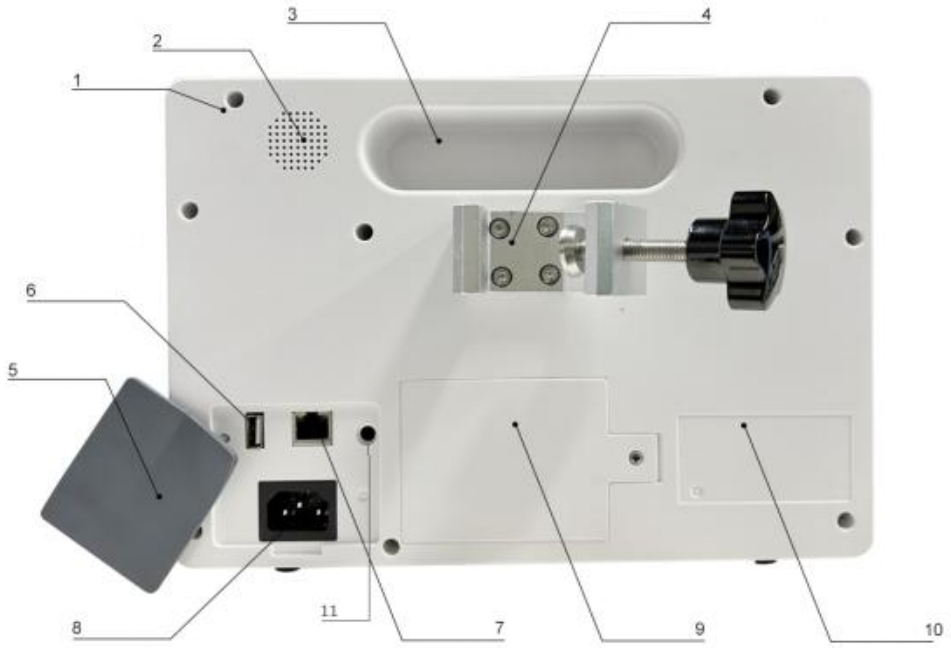


Figure 2-2

1：Screw holes 2：trumpet 3：handle 4：clip 5： dust cap

6：USB 7：net gape 8：power interface 9：battery cover 10：Nameplate tablet

11：ground pole

2.3 Applicable syringe

This syringe pump can be used with five specifications of syringes: 5ml, 10ml, 20ml, 30ml, and 50ml.Through the calibration function, this device can be used to specify the vast majority of syringes. If the syringe has not been calibrated before use, it may cause a decrease in injection accuracy. When choosing a syringe, be sure to choose one with a medical device product registration certificate.

2.4 Display interface introduction

2.4.1 home page

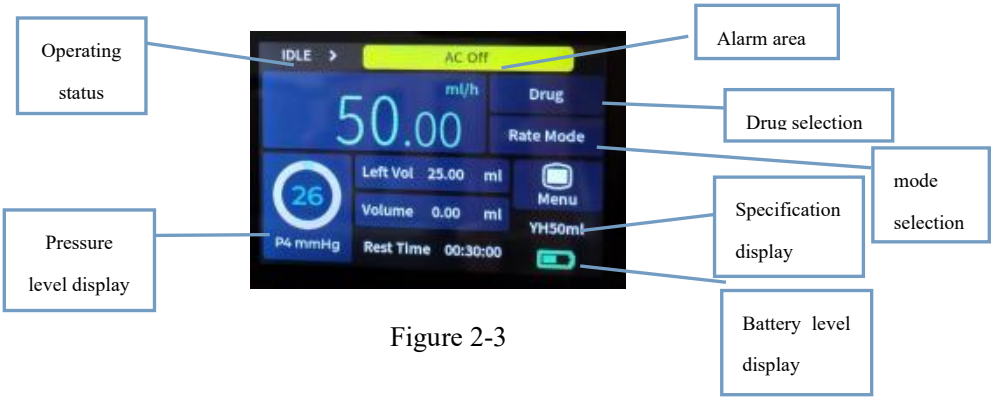


Figure 2-3

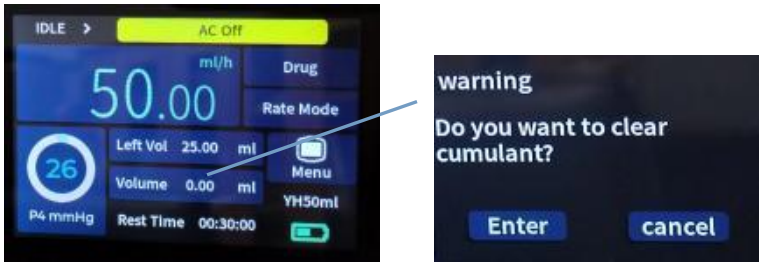
2.4.2 Injection Run Click to Set Injection Speed 

, make settings. Click the start button next to the screen to start the injection (different specifications of syringes have different speed ranges).

Note: The remaining volume setting range is 0.1~9999.99ml. After setting, click ✔ to save and return to the main page.

2.4.3 To clear the cumulative amount, click the cumulative amount button on the main interface. 

, Pop up a prompt box, confirm to clear the cumulative amount.



2.5 General drugs

Click to select medication on the device homepage 

Enter the drug category page.

The device has built-in more than 210 drugs in 13 categories, including cardiovascular, respiratory system, antibiotics, antiviral, digestive system, nervous system, analgesics, urinary system, blood system, endocrine system, anesthetics, muscle relaxants, and anti-tumor drugs for users to choose from. If the user fails to find the drug they need among the 210 drugs in this device, the user can choose to customize it.

2.5.1 Choice of drug

Turn on the device, select the "Select Drug" option, press the confirm key to enter the drug type selection interface, select the drug type according to clinical needs, press the confirm key to enter the drug selection interface, select the drug, and then press the confirm key to enter the drug parameter setting interface.

2.5.2 Drug parameter setting

The parameter setting interface is shown in Figure 2-3.

The dosage indicates the dosage of the drug used, the weight indicates the patient's weight, the drug volume indicates the amount of the drug used, and the liquid volume indicates the capacity of the drug in the syringe during injection. The values of these parameters must be entered according to the actual situation, and the correct dosage and drug volume units must be selected, and then the system will automatically convert them into injection rates.

Dosage unit options：ug/kg/min、ug/kg/h、mg/min、mg/h、mg/kg/min、mg/kg/h、g/h、g/kg/min、g/kg/h、IU/h、U/min、U/h、ml/h、ng/kg/min、ug/h.

Optional units for drug dosage：g、mg、ug、ng、ml、U、IU.

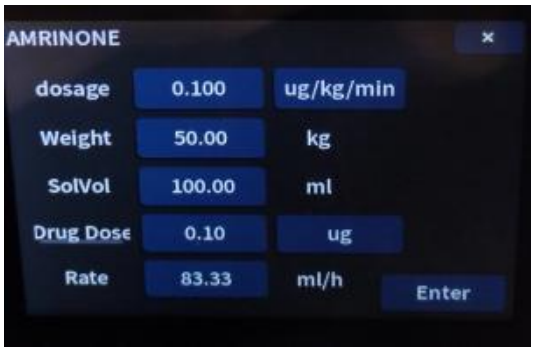


Figure 2-4

The drug volume unit and dosage unit must be of the same type, otherwise the rate cannot be calculated, and the rate position will display "Unit Error". If the calculated rate exceeds the rate range (different syringes have different rate ranges), the rate position will display "Out of Range". At this time, the cursor cannot be moved to the confirmation selection. Only when the calculated rate does not exceed the rate range can the confirmation option be selected, and then press the confirmation key. The system interface jumps to the speed mode injection interface, the

injection rate is equal to the rate calculated when the parameters are set, and the drug name is displayed in the upper left corner of the screen. Press the start key to start the injection.

Once the drug parameters are set, they can only be maintained temporarily and will automatically return to the default values after restarting the machine.

2.6 Speed Mode

Mode Setting Click the Mode Setting button on the main interface. 

, Enter the mode selection interface.

Step 1:Click the mode selection button on the main interface.

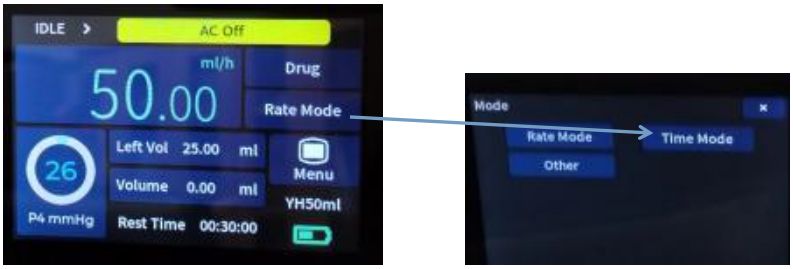
Step 2: Select speed mode in the mode selection interface to enter the speed mode configuration interface.

Step 3: After configuring the speed and preset amount, click ✔ to return to the speed mode page.

Step 4: Click confirm to return to the main interface. Click the start button next to the screen to start the injection.

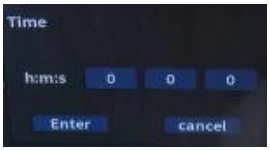
2.7 Time Mode

Step 1: Click the mode selection button on the main interface.



Step 2: Select the time mode in the mode selection interface to enter the time mode configuration interface.

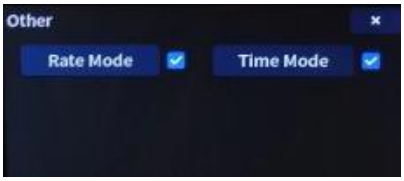
Step 3: Set the time and preset amount, and click ✔ to return to the time mode interface.

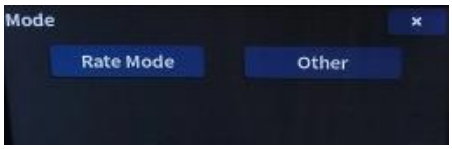


Step 4: Click OK to return to the main interface. Click the start button next to the screen to start the injection.

2.8 Other

Click Other to enter the following figure. If it is not selected, the mode will be hidden.





2.9 Menu

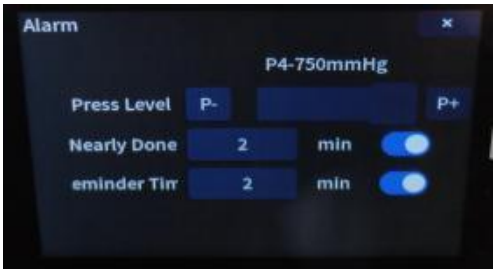
Alarm settings, patient information, logs, parameter settings (independent settings for A and B channels), system settings, maintenance, A and B channels are used together.

A、B channels

2.9.1 Alarm Settings

Step 1: Click the menu on the main interface and click Alarm Settings 

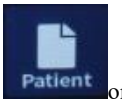
to enter the settings.



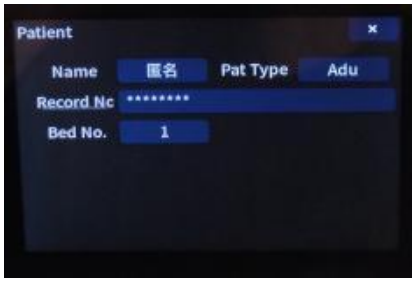
Step 2: Click P+ to increase the pressure level, and click P- to decrease the pressure level.

Step 3: Set the time of near completion and no operation, and click ✔ to return to the alarm setting interface.

2.9.2 Patient Information

Step 1: Click the menu and click Patient Information 

on the main interface to enter the settings.



Step 2: Click to enter the patient's name. After entering, click ✔ to return to the patient information page.

Step 3: Set the medical record number and click ✔ to return to the patient information page.

Step 4: Set the patient type.

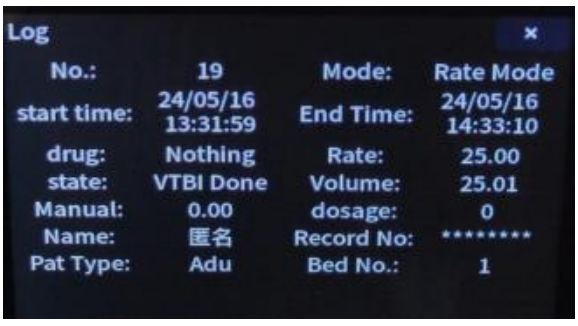
Step 5: Set the bed number and click ✔ to return to the patient information page.

2.9.3 Log

Step 1: click on the log 

on the main interface to enter the view log list.

Step 2: click on the list to view the logs.



2.9.4 Parameter settings

Parameter Settings Click Parameter Settings 

on the main interface to enter the settings.

2.9.5 System settings (set in A channel interface)

Step 1: click System Settings  on the main interface to enter the settings.

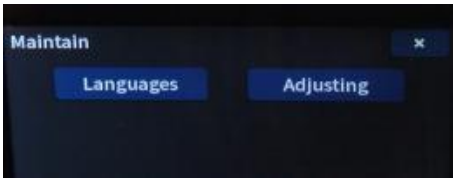
Step 2: Set the date/time and return to the system settings page after confirmation.

2.9.6 Maintenance (set in A channel interface)

When using maintenance, channel B must be in the main interface to modify maintenance parameters.

Click Maintenance  on the main interface to enter the password input interface.

Enter the password "5188" and click "√" to enter the maintenance settings page.



Click “Language Settings” to switch between Chinese and English, and click “Calibrate” to calibrate the content. For operations, see 4.4 Syringe Calibration.

2.9.7 Syringe Specifications Settings

After the syringe is installed, a specification selection box will pop up. Select the installed specification.

Figure 2-5

Figure 2-5 shows the battery power icon, which has six states: charging, four bars, three bars, two bars, one bar, and empty. When the one-bar remaining symbol begins to appear, you need to connect an external power source to charge the battery. Otherwise, the battery can only work at medium speed for about 30 minutes. When the empty symbol begins to appear, an audible and visual alarm will be issued at least 3 minutes in advance, and the "low battery" prompt will be displayed, and the instrument will stop working.

2.10 Key Description

Power on/off button - Single-click this button to turn on the device, double-click to turn off the device, and long-press for more than 5 seconds to force shutdown.

Mute button - press this button to silence the alarm sound for 120 seconds.

A channel start/pause button - Press this button in the injection state to stop the injection pump. Set all parameters and press this button to start injection. At the same time, the injection pump enters the injection state.

A channel quick exhaust key - click this key to enter the quick exhaust selection interface, enter the exhaust state according to the user's selection, and exhaust the gas in the infusion tube.

B channel start/pause button - Press this button in the injection state to stop the injection pump. Set all parameters and press this button to start injection. At the same time, the injection pump enters the injection state.

B channel quick exhaust key - click this key to enter the quick exhaust selection interface, enter the exhaust state according to the user's selection, and exhaust the gas in the infusion tube.

Note: The symbols on the device mask, remote control and labels mean the following:

 Indicates disconnection (power off)	 Indicates power on (on)
 Indicates that this device is a BF type device	 Indicates the start
 Indicates stop	 Indicates Fast forward
 Indicates that the alarm sound is paused	

3.Technical characteristics parameters

Injection speed： 50mlsyringe：0.10ml/h ～ 1800.00ml/h（0.01ml/h step）

30mlsyringe：0.10ml/h ～ 900.00ml/h (0.01ml/h step)

20mlsyringe：0.10ml/h ～ 600.00ml/h（0.01ml/h step）

10mlsyringe：0.10ml/h ～ 300.00ml/h（0.01ml/h step）

5mlsyringe：0.10ml/h ～ 150.00ml/h（0.01ml/h step）

Fast forward speed：

50mlsyringe	1800.00ml/h
30mlsyringe	900.00ml/h
20mlsyringe	600.00ml/h
10mlsyringe	300.00ml/h
5mlsyringe	150.00ml/h

Flow rate accuracy： within ± 3% (excluding the error of the syringe itself)

Mechanical accuracy of the pump： within ± 3%

Preset injection volume： 0.10 ～9999.99ml

Power supply: 100V～240V、50Hz/60Hz；Built-in battery：⎓ 11.1V rechargeable lithium battery pack；Capacity≥3500mAh：the pump can work more than 4 hours at the flow rate of 5ml/h after charging 10 hours (Medium rate specified by GB 9706.224-2021.) Label the battery inside the machine with a 'battery' label.

Power supply method: mains (AC) power supply and built-in rechargeable battery power supply.

KVO rate: 0.10～5.00ml/h（Increment 0.01ml/h）。

Fuse specifications: F1AL/250V (F represents fast, L represents low breaking capacity), two (installed in the pump).

Classification: This equipment is classified as Class I, internal power supply, and BF type continuous operation equipment.

Power: 40VA

Dimensions： 286.7mm（Length）×110.8mm（width）×199mm（height） weight：3.2Kg

Operating environment conditions：

a)Environmental temperature range：+5℃～+40℃

b)Relative humidity range：20%～90%

c)Atmospheric pressure range：86.0KPa～106.0KPa

Transportation and storage conditions：

a)Environmental temperature range：-30℃～+55℃

b)Relative humidity range：≤95%

c)Atmospheric pressure range：50.0KPa～106.0KPa

Prohibit storage in the following environments：

1）、Direct sunlight and strong light.

2）、Places directly blown by cold and humid (hot) airflow such as fans, air conditioners, electric stoves, heaters, humidifiers, etc.

3）、Chemical warehouses or hazardous gas storage areas.

4）、Places with water seepage, splashing, excessive dust, or excessive vibration.

5）、The floor where it is located is uneven.

Blockage alarm threshold pressure level：

P1：225mmHg-375mmHg（30kPa-50kPa）

P2：375mmHg-525mmHg（50kPa-70kPa）

P3：525mmHg-675mmHg（70kPa-90kPa）

P4：675mmHg-825mmHg（90kPa-110kPa）

Syringe： It is recommended to choose the recommended manufacturer's brand of syringe (see Appendix A.3),The syringe brand can be customized by users，The syringe pump has software debugging function，it can meet the debugging and calibration functions of any brand of syringe.

Note: Single use sterile syringe (syringe) for ethylene oxide disinfection in this product，It shall comply with the 《GB15810-2001 disposable sterile syringe》 standard，And in accordance with the nominal capacity of 5mL, 10mL, 20mL, 30mL, 50 mL in Article 3.1，And when the rod core is pushed to the 0 position line，The length between the edge of the outer sleeve of the syringe and the handle core rod shall not be less than 18mm，A syringe with a length of no more than 110mm between the edge of the outer sleeve of the syringe and the handle when the handle is pulled to the total scale capacity mark.

Disposable extension pipes that meet the requirements for ethylene oxide disinfection must be used!

The use of syringes or extension tubes that do not meet the above requirements may result in incorrect injection speed, residual drugs, and other potential hazards.

Type of alarm:

1.Power cord disconnection warning 2.No operation warning 3.Low battery warning

4.Near completion warning 5.Near empty warning 6. KVO completion alarm

7.Injection completion alarm 8.Syringe empty alarm 9.Battery low voltage alarm

10.Speed exceeding limit alarm 11.Pipeline blockage alarm 12.Push rod error alarm

13. Syringe drop alarm 14.Abnormal motor direction alarm 15.Abnormal motor temperature alarm

16.Abnormal motor speed alarm 17.Abnormal movement communication alarm

Main safety features of the product

a) According to the type of anti-shock classification: Class I internal power supply equipment;

b) According to the degree of electric shock classification: BF type equipment;

c) Classification according to the degree of protection of immersion: host IPX1 equipment;

d) According to the disinfection and sterilization method recommended by the manufacturer, it is divided into: equipment recommended by the manufacturer;

e) Classified according to the degree of safety when using flammable anesthetic gas mixed with air or flammable anesthetic gas mixed with oxygen or nitrous oxide: not suitable for use in the presence of flammable anesthetic gas;

f) Classified by operation mode: continuous operation;

g) Rated voltage of equipment: ~ 220V, 50Hz or internal power 11.1V;

h) Input power：40VA

i) Dimensions: 286.7mm (length) × 110.8mm (width) × 199mm (height) allowable error ±5% Weight: about 3.8kg;

j) Application portion: the application portion that is not protected against the effect of defibrillation discharge;

k) Signal input/output part; No.

4.Basic Setting

4.1 Install pump

Fix the syringe pump to the Syringe stand or put it on the table flatly, the pump can not be used as portable. Put it on the table or patient bed is prohibited. Make sure it is firmly fixes and will not tip over before actual use.

4.2 Loading, filling, replacing and reloading syringes

4.3.1 Place the syringe filled with liquid medicine, connected with the extension tube, scalp needle and exhausted air into the syringe holder. The curled edge of the syringe jacket must be pressed into the curled edge slot of the syringe jacket.

4.3.2 Pinch the push block and the wrench, move the push block to the tail of the syringe handle core rod and release the wrench. The push block hooks up and down and turns back to hook the syringe handle.

4.3.3 When all parameters are set (see the injection mode introduction for setting methods), press and hold the "Fast Forward" button, first short press and then long press, release it after the medicine comes out of the scalp needle tip, insert the needle into the patient's venous (arterial) vein, and then press the "Start" button, the device starts injecting.

4.3.4 After the device is started, except for the "Stop", "Mute" and "Fast Forward" keys, all other keys are locked.

Caution：

※ If in the use process needs to replace or reinstall syringes and extend line, please stop injection after finishing injection, then get out the syringe , install or change the extending tube in the same way.

※ After installing the syringe on the syringe pump and priming (cleaning) the extended pipeline, but before inserting the needle into the patient, please place the needle vertically upwards to prevent the medication from flowing naturally.

※When the pipeline is blocked, the infusion pipeline cannot be infused (cleaned) through the purge operation of the pump, and can only be manually infused (cleaned).

※ The syringe and extension tubing should be replaced at one complete injection interval.

4.3 Start working

After checking that the syringe is installed correctly and there is no error prompt displayed, press the "Start" button to start injection. At this time, the values displayed on the screen cannot be adjusted. In normal operation, except for the "Stop" and "Purge" , "mute" and "reset" , buttons, all other buttons are in a locked state.

4.4 Standard (calibration) of the syringe (calibration)

4.4.1 Capacity calibration

1. On the A channel screen, click "Menu" to enter the "Menu" page.
2. Click the Maintenance button on the menu page to enter the password input page.
3. Enter the password "5188" and press OK to enter the "Maintenance" page. Click the "Calibration" button to enter the "Calibration" page.
4. Select the brand that needs to be "calibrated", select the "specification" that needs to be calibrated, click the "Capacity Calibration" button to enter the "Capacity Calibration" page.
5. Pull the syringe that needs to be calibrated (the brand and specifications of the syringe are consistent with the brand and specifications selected in the second step) to the rated capacity position.
6. Fill the syringe as required.
7. Click the "Start" button to enter the automatic capacity calibration state and wait for the calibration to complete.
8. Check that the syringe is empty and recalibrate if not.

4.4.2 Pressure Calibration

1. On the A channel screen, click "Menu" to enter the "Menu" page.
2. Click the Maintenance button on the menu page to enter the password input page.
3. Enter the password "5188" and press OK to enter the "Maintenance" page. Click the "Calibration" button to enter the "Calibration" interface.
4. Select the brand that needs to be "calibrated", select the "Specification" that needs to be calibrated, click the "Pressure Calibration"

button to enter the "Pressure Calibration" page.

5. Fill the syringe to be calibrated (the brand and specifications of the syringe should be consistent with the brand and specifications selected in step 2) with the test liquid to the rated capacity position.

6. Install the syringe as required and connect it to the pressure gauge through the extension tube.

7. Click the "Start" button to enter the manual pressure calibration state.

8. Observe the actual pressure value on the pressure gauge. When the pressure value reaches the value shown on the screen, click the "Sampling" button behind the value.

9. When the actual pressure value exceeds 975mmHg, click the "Stop" button.

10. Click the "Save" button to complete the pressure calibration.

4.4.3 Precision calibration

1. On the A channel screen, click "Menu" to enter the "Menu" page.

2. Click the Maintenance button on the menu page to enter the password input page.

3. Enter the password "5188" and press confirm to enter the "Maintenance" page. Click the "Calibration" button to enter the "Calibration" interface.

4. Select the brand that needs to be calibrated, select the specification that needs to be calibrated, click the "**Precision calibration**" button to enter the "**Precision calibration**" page.

5. Set the “speed” and “preset value” that need to be calibrated.

6. Install the syringe that needs to be calibrated (the brand and specifications of the syringe are consistent with the brand and specifications selected in the second step), and prepare a measuring tool (such as a measuring cylinder) with a capacity larger than the preset volume, and place the needle in the measuring tool.

7. Click the "Start" button to enter the automatic **Precision** calibration state and wait for the calibration to complete.

8. Observe the actual amount of liquid in the measuring tool, enter the value on the page, and press the "confirm" key to save the calibration result.

Note: If the syringe is not calibrated, the system will display the value of the last calibration. Please recalibrate before using syringes produced by different manufacturers (there is a function to remember the previous parameter settings of the same model, which is valid for any mode).

5.Mode Introduction

Boot after the system default display last to turn it off before the work mode, the system will automatically save the last "injection velocity" and "Liquid volume" and "speed" data.

5.1 Speed Mode

5.1.1 Mode selection: Enter the speed mode in the main interface. In the current mode, just set the speed of the equipment. After correct installation and error-free detection, it can start running.
At the same time, the injection volume can be set to achieve the purpose of quantitative injection.

5.2 Time Mode

Mode selection: Enter the time mode in the main interface. In the current mode, you can start running after the device is installed correctly and detected without errors.

At the same time, the injection amount can be set to achieve the purpose of quantitative injection.

Time speed mode parameter settings:

Time setting: The time format is "hh:mm:ss". The system defaults to the last set time. Users can modify the parameters on the screen according to the needs of clinical treatment.

Capacity setting: The default capacity displayed by the system is the capacity measured at this time, in "ml". You can also manually adjust the capacity in the same way as the time setting (increments are 0.01ml).

After setting the time, the system will calculate the injection speed based on the parameters of time and drug amount.

To ensure injection safety, please check each item on the main interface one by one after setting. After confirming that everything is correct, press the "Start" button to start the injection.

6.Other auxiliary functions

6.1 Injection volume limit setting

The injection volume limit function is mainly used to control the injection volume during the injection process. It can be set in any mode introduced in Chapter 5,When the drug volume reaches the value set by the injection volume, the device will send out an alarm and the KVO injection will start.

6.2 Rapid push (fast forward)

6.2.1 This function is mainly used for filling (cleaning) and exhausting. When the device is not working, press the "Fast Forward" key, and then press and hold the "Fast Forward" key to enter the fast forward state.

6.2.2 Fast injection speed (see technical characteristics parameters)

Note: Before starting the injection, be sure to exhaust the gas in the syringe and extension tube to prevent air from entering the patient's body; the needle cannot be inserted into the human body when exhausting air. Otherwise, it will be dangerous.

6.3 KVO (keep injection line open speed)

In normal working state of the equipment, when the injection volume is completed or the injection volume alarm is sounded, the injection pump automatically starts KVO injection, and the system defaults to the last set KVO speed to ensure smooth injection line and prevent blood return, etc. (KVO speed can be manually adjusted in parameter settings, with an adjustment range of 0.10~5.00ml/h).

6.4 Remote Control function

The syringe pump has a unique remote control operation function, which is more convenient to use.The interface of the remote control is shown in Figure 6-1, and the exquisite and compact 8-key remote control is selected.

Note：

1、remote control operation, the infrared transmitter

of the remote control align the remote interface of the pump.

2、When several syringe pumps are used in the same ward,Avoid interference with other pumps during remote operation.

3、the normal remote control distance is greater than 1 meter,when the remote control distance less than 1 meters or remote control failure, should open the battery cover at thebottom of the remote control, replace the same specifications of the battery to continue to use.

6.5 Automatic memory function

After the power is turned off, the device will automatically remember the data of the last operation in each mode, as well as the data of the final calibration of syringes of various specifications.

7.Usage

7.1 Place and secure the syringe pump

Place the syringe pump smoothly on a horizontal table or fix it in an appropriate position on the infusion support (hang the fixed device with the syringe pump); Screw the five star handle on the suspension fixing device of the syringe pump outward so that the outer diameter of the infusion frame rod can be accommodated between the five star handle screw and the V-shaped slot of the fixing device, install the syringe onto the fixing device, and turn the handle to make the infusion frame rod and the suspension and pushing fixing device fixed and clamped.

7.2 Mounting syringe

Pull out the pull rod and turn 90° counterclockwise, put the syringe into the syringe base, insert the rim of the syringe into the fixed groove of the rim, press the handle of the driver, move the driver to the appropriate position, and put the tail rim of the syringe rod into the driver groove of the syringe pump, and then turn the pressure handle clockwise 90° to clamp the wall of the syringe tube.

7.3 Power on

After the syringe pump is connected to the network power supply through the power cord, the AC indicator lights up automatically and is in the standby state.

7.4 Power on system self-test

After pressing the power button, the syringe pump LCD screen lights up and displays the power logo, and enters the main interface, indicating that the device is normal and can be put into use. Please do not operate the syringe pump before entering the main interface.

7.5 Operation process

1、Connect the AC power supply, AC indicator light is steady on, press and hold the power button to start.

2、Input injection rate and injection amount.

3、Press the Start button to start the injection.

4、Change the speed of injection first press the stop button. After entering the required value, press the Start key to start the injection.

5、After the injection is finished, press the stop button or automatically stop the injection, press the shutdown button to shut down.

6、Common function operation method:

Fast forward fluid: double click the fast forward button when injecting, release and stop filling.

Fast exhaust air: Double click the fast forward button when stopping, and release the stop fast exhaust.

8.Alarms & Clearing

The alarm is set to high priority and is a non-latching alarm. The sound pressure range of the auditory alarm signal is: 45dB ~ 85dB.

8.1 Power cord disconnection warning

During use, when the device is disconnected from the AC power supply, it will automatically switch to internal battery power supply, and a prompt sound will be issued, and the power indicator light will go out.

8.2 No operation warning

The cumulative time of equipment inactivity reaches the set value.

8.3 Low battery warning

When the battery level is less than or equal to 1 bar.

8.4 Near completion warning

If the injection time is less than the set alarm time, an alarm will be triggered.

8.5 Near empty warning

When the amount of liquid medicine remaining in the syringe is only 5% of the syringe specification, the display will show a text prompt "Almost empty" and an audible alarm will sound. (The audible alarm will only sound once, and the text prompt will remain on the display).

8.6 KVO completion alarm

KVO injection time reaches the set time.

8.7 Injection completion alarm

When the injection of the liquid medicine is completed, the display screen will show the text prompt "Injection Completed" and enter the alarm mode, accompanied by sound and light alarm. Press the mute button to eliminate the alarm sound.

Note: The mute button can only temporarily silence the alarm sound, and the alarm sound will be restored after 120 seconds.

8.8 Syringe empty alarm

There is no liquid in the syringe.

8.9 Battery low voltage alarm

When the battery icon on the display has only one bar of power, the text prompt "Battery Low" will appear on the display in the working state, and an audible alarm will sound with an alarm interval of 30 seconds. The alarm will disappear after connecting to AC power.

Note: When the undervoltage alarm occurs, please connect the AC power cord to charge in time to avoid affecting normal injection due to insufficient power.

8.10 Speed exceeding limit alarm

The set speed is greater than the speed limit.

8.11 Pipeline blockage alarm

When the syringe, injection extension tube or needle is blocked and the pressure in the syringe is too high, the display will show the text prompt of "Injection occlusion", and the device will stop working, accompanied by sound and light alarms. (For the alarm pressure threshold, please refer to the technical characteristic parameters).

Note: When the occlusion alarm occur, please check the reason in injection extension tube or needles first, before problem resolved, please stop to inject on patients. In case of an accident.

The immediate alarm is usually less than 1 second, and the delay of the blocking alarm is related to the injection speed.

The alarm pressure limit value is ： P1（40±10kPa），P2（60±10kPa），P3（80±10kPa）,P4（100±kPa）

Blocking alarm time is the most important indicator of blocking response characteristics. In this experiment, a 50mL Honda syringe was used, and the following data only represent the conclusion obtained from the syringe used in the experiment. Note: The blocking alarm time is affected by many factors, such as injection rate, syringe manufacturing process, syringe size and absorbed solution amount, length and pressure of patient pipeline, etc.

When the syringe pump runs at medium speed (5ml/h), the time triggered by the alarm is shown in Table 1.

After eliminating the blocking fault, the appropriate alarm pressure gear can be selected according to the use situation.The maximum injection pressure when the equipment is operating is 130kPa.

Table 1

Flow rate （ml/h）	Block rating	Blocking pressure （mmHg）	Blocking alarm time	priority
5	P1	225-375	Within 30 min	High, requires immediate response from the operator
5	P2	375-525	Within 30 min	High, requires immediate response from the operator
5	P3	525-675	Within 30 min	High, requires immediate response from the operator
5	P4	675-825	Within 30 min	High, requires immediate response from the operator

Note：

1、When the syringe pump is running at medium speed (5ml/h), when the selected alarm pressure is low, the amount of pellets produced is not more than 1ml;

When the selected alarm pressure is high, the dose produced does not exceed 2ml.

2、When triggering the blocking alarm, pull up the push block, so that the top of the hand core bar and the push block produce a gap of 1mm, and then exclude the cause of the blocking alarm, which is conducive to reducing the amount of pills caused by the blocking.

Note：

Except for blocking alarm, the sum of the maximum alarm state delay and the maximum alarm signal generation delay is all less than 10s, and the sum of the average alarm state delay and the average alarm signal generation delay is less than 5s.

8.12 Push rod error alarm

The pull rod is not installed and the pressure detection cap is pressed.

8.13 Syringe drop alarm

When the position of the syringe pump rod changes, the display screen will show the prompt text "syringe falls off", the equipment will stop working, and there will be sound and light alarms. Press the "mute" button to silence the alarm, and the duration of the mute is 120 seconds.

8.14 Abnormal motor direction alarm

Motor reverse direction.

8.15 Abnormal motor temperature alarm

The motor temperature exceeds 50 degrees.

8.16 Abnormal motor speed alarm

The motor running speed does not match the set speed.

8.17 Abnormal movement communication alarm

The movement board is faulty and the main board cannot communicate with the movement board.

9.Precautions

◎Please read the user manual before using the pump.

◎Use the recommended syringes to ensure the accuracy.

◎Please check the setting speed before starting working.

◎Do not use Benzene, Ethyl ketone and other organic solvents to clean the pump.

◎Do not use the pump near the high-frequency interference devices, such as mobile phones.Please turn it off when don not use it to extend its life and protect the internal battery.

◎Shutdown to charge the internal battery to 10 hours, the battery can work independently for more than 4 hours.

◎When using this pump, don not add any injection control device to same syringe, otherwise, may cause dangerous.

◎For safety, every time before starting this pump, please check every parameter, to make sure that all parameters are setting under requirement of clinical treatment, or may cause dangerous.

◎Only professional personnel who be trained can maintain this pump.

◎After long-term use of the pump,the buttons on the operation panel may be concave， should contact the manufacturer timely to replace it, or may cause false triggering.

◎When the upper and lower hooks on the push block break ,should be replaced promptly, Otherwise, siphonage may occur, causing the residual solution in the syringe to flow into the patient's body， cause over injection, which will harm patients.

◎Syringe outside crimping must be inserted into the crimping slot, otherwise the liquid can not output, or the siphon cause over injection, which will harm patients.

◎When using the pump，must use the specified brand syringes or calibrated syringes， if use not suitable syringe brands or setting specifications not match the requirements， may cause inaccuracy injection rate, remaining time or residual volume.

◎The built-in battery should be charged and discharged for checking once a month，so as not to affect the use due to low battery condition when working with the battery. When the under-voltage alarm occurs,The pump should be timely connected to the AC power supply for charging or shutdown， Otherwise, insufficient battery power may damage the battery or affect its use.

◎Normal discharge time with for its battery is 4 hours, but by the influence of using time, the environment and incomplete charge etc, working time of this battery may not be guaranteed four hours.

◎Two power supply working modes: mains (AC) power supply and built-in rechargeable battery power supply;If the integrity of the installation or wiring of the external protective conductor is in doubt, the equipment shall be operated from the internal power supply.

◎When there are other injection systems or accessories connected to the injection piping on the pump, please ensure that the injection piping is safe (such as no bubble input) and must be equipped with a one-way valve.

◎The blocking alarm threshold is greatly influenced by environmental temperature and the material quality of the syringe. When choosing a syringe with poor quality, the blocking alarm value may be inaccurate.

◎When the pump is not in use for a long time, it should be charged every 3 months to prevent the built-in battery from automatically discharging and being scrapped.

◎If the pump is not used for a long time, the battery will self-discharge. When it is reused, the system time needs to be reset; The speed, mode, pressure, and syringe brand system will save the last set values.

◎Environmental protection: When the service life of the equipment and accessories (including batteries) expires, it shall be properly disposed of in accordance with environmental regulations to prevent environmental pollution.

◎Pump can not be used under the situation of any flammable anesthetic gas and air mixture, or a mixture of nitrous oxide and oxygen.

◎Pump need clamping or reliable fixed on its own according to demand, it can not be placed on the bed no fences on the tablet. Avoid the pull line makes the pump slide, pose a danger to a patient.

◎This pump will not work by the patient's family, to prevent the incorrect operation bring risk to the patient.

◎This pump is the same with other equipment, must be reliable grounding.

◎If different alarm presets are used for the same or similar equipment used in any independent area,If an alarm is detected, it should be immediately checked and identified.

◎If the product breaks down during use, please shut down immediately to stop working and contact the manufacturer in time!

10.Maintenance

◎Please contact our company If need to replace the fuse, when replacing the fuse, first unplug the power cord, loosen the screw on the pump housing,open the pump and power supply board, remove the fuse body cover, can be replaced. (Replacement must be with fuses of the same specification).

◎The surface of pump shall be wiped by wet cloth added with right amount of detergent or 84 disinfectant, then use wet cloth to wipe surface. Finally use clean cloth dry, and placed on the shelf.

◎Rechargeable battery maintenance：When not use，Please turn off the power switch, to prevent damage to the battery due to excessive discharge.

◎Taking into the lifetime of components and medical devices safety. Advice that the lifetime of medical devices not more than 3 years. Expired products, should be in accordance with the norms of electronic scrap processing. If you continue to use, May be dangerous due to the unreliable operation of the equipment.

◎If the Syringe pump of our company breaks down from the date of purchase, it will be replaced free of charge within one month and guaranteed for one year. Within one year of the warranty period, it should be sent back to our company for maintenance, and our company are responsible for all maintenance costs and shipping costs (except for built-in batteries and man-made damage).

◎The following are not free maintenance range:

1、Due to customer installation, application, maintenance, damage caused by improper storage;

2、Products that have exceeded the replacement and warranty period;

3、Valid certificate, warranty certificate is not fit or altered;

4、Without our permission, the disassemble;

5、Human factors result damage to the product;

6、Damage caused by transportation, loading and unloading on the way of customer repair;

7、Damage caused by force majeure such as earthquake, flood, fire, lightning strike and other natural disasters;

8、Other causes of product malfunction or damage that are not caused by the product itself;

Note: In order to provide you with our company's services and protect your rights, please carefully read the following content after purchasing the machine and strictly comply with it:

1、Please refer to the operating manual before use, and operate and use according to the specified requirements;

2、 Since purchase within one month of performance problems, and the appearance of no damage. Detected by the company's technical staff confirm, can replace same type and number of new products.

3、Due to improper use or product maintenance beyond the warranty period, the company will charge the cost of the corresponding accessories;

4、 Power cord, packaging and accessories (manual, warranty card, certificate) do not belong to the scope of replacement warranty;

5、Customers should pay attention to the packaging and handling of products during transportation during repair to avoid damaging the products;

6、This warranty applies only to territory China (excluding Hong Kong, Macao and Taiwan) use of the product.

◎The Company can provide technical support consultation at any time.

11.Trouble Shooting

Trouble	Cause Analysis	Solutions
Rate Inaccurate	Syringe edge is not inserted into the syringe slot ring or not installed correctly.	Reinstall as required.
	The syringe is not calibrated.	Use the syringe after calibration as required.
Piping drip when down state	The syringe is not installed correctly or use the syringe that does not meet the requirements.	Re-adjust the syringe.
	The needle is not placed upward.	Place the needle facing up.
Battery under-voltage alarm	Placed too long or batteries electricity shortage.	Timely charge.
	Not proper use of the built-in battery, the battery damage or failure.	Replace the battery.
Pump push block Move not smooth	The main moving rod of the pump is stuck with liquid medicine.	Wipe with alcohol.
Start injection having blood return	Needle inserted into a vein before did not press the fast forward to eliminate mechanical clearance.	Make sure there is no air in the extension tube, press the Purge button and push the liquid into the vein.
No display when power on	Battery voltage is too low.	Charge or replace a new battery.
	System error.	1. Restart after shutdown 2.Contact manufacturer to repair

Appendix A Packaging and accessories

A.1 Attached accessories (configuration list)

When the device leaves the factory, the complete packaging should include the following contents:

NO.	Name	Specifications / models	source	Qty

1	Main unit of Syringe Pump	OSP-600	Self-produced	1 set
2	Standard three-core power cord	1.8m	purchase from outside	1 pcs
3	User Manual	/	Self-made	1 copy
4	product qualification certificate	/	Self-made	1 pcs
5	guarantee card	/	Self-made	1 pcs
6	guarantee card	/	Self-made	1 pcs

Note: 1. Please contact the after-sale department of the manufacturer for replacement of the attachment.

2. Non destructive consumables.

A.2 Interpretation of the graphics, symbols, abbreviations and other contents used in the labels of medical devices

	Note, refer to the attached file		Fragile, handle with care
	Up		To avoid the rain
	Stacking layer limit		Manufacturing date
	Serial number		Humidity limit
	Service life		Temperature limit
	Recycling, can be recycled		Atmospheric pressure limit
	Dispose of waste equipment according to environmental regulations	IPX1	Degree of protection against harmful liquid intake

A.3 Recommended syringe brand list

Serial number	Syringe manufacturer	Serial number	Syringe manufacturer
－01－	Xinhua	－06－	Lujie
－02－	Hongda	－07－	Suyun
－03－	Lingyang	－08－	Kangjin
－04－	Jierui	－09－	Sanxin
－05－	Hanahao	－10－	**user-defined**

A.4 Key components list

Component Name	Manufacturer/Trademark	Model/Number	Technical Parameters	Certification Mark
Switching Power Supply	深圳市龙星辰电源有限公司	ACMS23	100-240Vac	Attached circuit diagram
Battery	深圳市璟宏泰科技有限公司	ICR18650	11.1V 3500mAh	IEC62133 Certification
display screen	亦亞徽科技有限公司（广东）	YT350S006-D	3.5inches TFT	/
Pressure Sensor	深圳市捷创力电子科技有限公司	ps-cz00001	25lbf 20mV/V	/
SMD crystal oscillator	深圳市环胜高电子科技有限公司	X3225	12MHz+10ppm 12pF	/
Motor driver chip	TRINAMIC	TMC2208	The packaging form of PLCC24	/

Appendix B Toxic and Harmful Substances or Elements

Name of parts	plumbum（Pb）	mercury（Hg）	Cadmium（Cd）	Hexavalent chromium（Cr（VI））	Polybrominated biphenyls（PBB）	Polybrominated diphenyl ethers（PBDE）
Shell	○	○	○	○	○	○
Operation panel	○	○	○	○	○	○
PCBA	○	○	○	○	○	○
labeling	○	○	○	○	○	○
display screen	○	○	○	○	○	○
Packing material	○	○	○	○	○	○
Connection	○	○	○	○	○	○
Power line	○	○	○	○	○	○
Battery	○	○	○	○	○	○

Note: ○ It means that the content of the toxic and harmful substances in all the homogeneous materials of the parts is below the limit requirements stipulated in SJ/T 11363-2006 standard.

×：denotes that the content of the toxic and harmful substance in at least one homogeneous material of the component exceeds the limit requirements specified in SJ/T 11363-2006 standard.

Appendix C Electromagnetic Compatibility

 Notice:

- OSP-600 syringe pump meets the electromagnetic compatibility requirements of YY9706.102-2021 standards;
- Users should install and use the equipment according to the electromagnetic compatibility information provided in the accompanying documents.
- Portable and mobile RF communication equipment may affect the performance OSP-600 syringe pump, avoid strong electromagnetic interference when using, such as close to mobile phone, microwave oven, etc.;
- Guidelines and manufacturer's statements are detailed in the attachment.

 Caution：

- OSP-600 syringe pump Should not be close to other devices or stacked for use . If it is necessary to approach or stack it for use, it should be observed and verified that it can operate normally in the configuration in use;

- Class A equipment is intended to be used in industrial environments , due to conducting and radiation harassment OSP-600 syringe pumps,it may be potentially difficult to ensure EMC in other environments.

- With the exception of cables sold by the manufacturer of OSP-600 syringe pump as spare parts for internal components, the use of unspecified accessories and cables may result in increased emission or reduced immunity of OSP-600 syringe pump.

Attachment information：

The following cables must be used to meet the electromagnetic emission and anti-interference requirements:

No.	Cable Name	length	shield
1	power line	1.8m	No

Appendix：

Guidelines and Manufacturer's Statement - Electromagnetic Emission		
OSP-600 Syringe pump is intended to be used in the electromagnetic environment specified below, and the purchaser or user shall guarantee that it is used in such electromagnetic environment:		
Emission test	**Conformity**	**Electromagnetic Environments - Guidelines**
radio-frequency emission GB 4824	1 Group	The syringe pump（OSP-600） only uses radio frequency energy for its internal functions. As a result, its RF emission is low and there is little chance of interference with nearby electronic devices.
radio-frequency emission GB 4824	Class A	The Syringe pump（OSP-600）is suitable for non household use and all facilities that are not directly connected to the residential public low-voltage power supply network for household use .
Harmonic emission GB 17625.1	Not Applicable	
Voltage fluctuation/scintillation emission GB 17625.2	Not Applicable	

Guidelines and Manufacturer's Statement - Electromagnetic Immunity			
Syringe Pump（OSP-600）is intended to be used in the electromagnetic environment specified below, and the purchaser or user shall guarantee that it is used in such electromagnetic environment:			
Immunity test	**IEC 60601Test level**	**In line with the level**	**Electromagnetic Environments - Guidelines**
Electrostatic discharge GB/T 17626.2	±8 kV contact discharge ±15 kV Air discharge	±8 kV contact discharge ±15 kV Air discharge	Floors should be wood, concrete or tile, and if covered with synthetic materials, the relative humidity should be at least 30%

Electrical fast transient pulse group GB/T 17626.4	±2kV For the power cord	±2kV For the power cord	The network power supply should have the quality used in typical commercial or hospital environments
Surge GB/T 17626.5	±1 kV Line to line ±2 kV Line to ground	±1 kV Line to line ±2 kVLine to ground	The network power supply should have the quality used in typical commercial or hospital environments
Voltage dips, short interruptions and voltage changes on the power input line GB/T 17626.11	<5 % U_T,Lasting 0.5 cycles （On U_T,>95% Temporary drop） 40 % U_T,Lasting 5 cycles （On U_T,60% Temporary drop） 70 % U_T，Lasting 25 cycles （On U_T,30% Temporary drop） <5 % U_T,Lasting 5s （On U_T,>95% Temporary drop）	<5 % U_T,Lasting 0.5 cycles （On U_T,>95% Temporary drop） 40 % U_T,Lasting 5 cycles （On U_T,60% Temporary drop） 70 % U_T，Lasting 25 cycles （On U_T,30% Temporary drop） <5 % U_T,Lasting 5s （On U_T,>95% Temporary drop	The network power supply should have the quality used in typical commercial or hospital environments.If the user of the syringe pump needs to run continuously during power interruption, it is recommended to use an uninterruptible power supply or battery power supply for the syringe pump.
Power frequency magnetic field （50/60Hz） GB/T 17626.8	400A/m	400A/m	The power frequency magnetic field shall have the level characteristics of the power frequency magnetic field typical of the site in a typical commercial or hospital environment .
Note: U_T refers to the AC network voltage before applying the test voltage			

Guidelines and Manufacturer's Statement - Electromagnetic Immunity			
Syringe Pump is intended to be used in the electromagnetic environment specified below, and the Purchaser or User shall warrant that it is used in such electromagnetic environment:			
Immunity test	**IEC 60601 The test**	**In line with the level**	**Electromagnetic Environments - Guidelines**

The radio frequency transmission GB/T 17626.6 Radiofrequency radiation GB/T 17626.3	3 V（effective value）150 kHz～80 MHz 3 V/m 80 MHz～2.5 GHz	3 V（effective value） 3 V/m	Portable and mobile radio frequency communication equipment should not be used closer to any part of the syringe pump , including cables. The distance shall be calculated by the formula corresponding to the transmitter frequency. **Recommended isolation distance** $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P}$ 80 MHz～800 MHz $d = 2.3\sqrt{P}$ 800 MHz～2.5 GHz In formula: P —Based on the maximum rated output power of the transmitter provided by the transmitter manufacturer, in watts (W); d—The recommended isolation distance is in meters (m). The field strength of the fixed radio frequency transmitter is determined by surveying the electromagnetic field [a], and in each frequency range [b] should be lower than the corresponding level. Interference may occur near devices marked with the following symbols. 

Note 1 :At the frequencies of 80MHz and 800MHz, formulas for higher frequency bands are used.
Note 2 These guidelines may not be suitable for all situations, electromagnetic propagation is affected by absorption and reflection by buildings, objects and the human body.

A Fixed transmitters,such as base stations for wireless (cellular/cordless) telephones and terrestrial mobile radios, ham radios, AM and FM radio broadcasts, and television broadcasts, Its field strength cannot be accurately predicted in theory.In order to evaluate the electromagnetic environment of fixed radio frequency transmitters, the survey of electromagnetic field should be considered.If the measured field intensity syringe pump is higher than the above applicable RF coincidence level, it shall be observed syringe pump to verify its normal operation.If abnormal performance is observed, Additional measures may be necessary, such as readjusting the direction or position of the syringe pump.

b In the whole frequency range of 150kHz ~ 80MHz, the field intensity should be less than 3 V/m.

The recommended isolation distance between portable and mobile radio-frequency communication equipment and syringe pumps

Syringe pump is intended for use in electromagnetic environments controlled by radio frequency radiation harassment.

Depending on the maximum rated power output of the communication equipment, the purchaser or user can prevent electromagnetic interference by maintaining the minimum distance between the portable and mobile radio frequency communication equipment (transmitters) and the syringe pump as recommended below .

The rated maximum power output of a transmitter W	**Isolation distance corresponding to different frequencies of the transmitter/m**

	150 kHz ～ 80 MHz $d = 1.2\sqrt{P}$	80 MHz ～ 800 MHz $d = 1.2\sqrt{P}$	800 MHz～ 2.5 GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

The maximum rated output power of transmitters not listed in the above table, it is recommended to isolate the distance d , in meters (m), which can be determined by the formula in the corresponding transmitter frequency column , where P is the maximum rated output power of the transmitter provided by the transmitter manufacturer, in watts (W).

Note 1 : At the frequencies of 80MHz and 800MHz, formulas for higher frequency bands are used.

Note 2: These guidelines may not be suitable for all situations, electromagnetic propagation is affected by absorption and reflection by buildings, objects and the human body.

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