



User Manual

Digital Syringe Pump

2802695 - 2802696 - 2802697

Version:V1.0



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Chapter 1 Safety Instructions

1.1 Warnings



- Please check the device, connect wire and accessories before use to ensure that it can work normally and safely. Please stop immediately and contact our after sales service department if there is anything abnormal. Besides, it is possible to cause fault or malfunction of device if there is adhesion or intrusion of medicinal fluid. Therefore, please clean the device after use and store it properly.
- It is not allowed to use the device in the environment with anesthetic or other inflammable or explosive articles to avoid fire or explosion.
- It is not allowed to store or use the device in the environment with active chemical gas (including gas for disinfecting) and moist environment since it may influence the inside components of the syringe pump and may cause performance degradation or damage.
- The operator (trained professional medical care personnel) shall guarantee that the preset infusion parameters of this device are the same as the parameters in medical advice before starting infusion.
- Please do not only depend on alarm system, periodical check is needed to avoid accident.
- Fix this device on the infusion stand tightly and ensure the stability of the infusion stand. Be careful in moving the infusion stand and this device to avoid the device dropping, infusion stand falling or knocking the surrounding objects.
- The pressure in the syringe will rise if the syringe extension line is twisted, the filter or needle is obstructed, or blood in the needle obstructs the syringe. In removing such occlusion, it may cause “bolus infusion” (temporary excess infusion) to the animal. The correct method is to hold or clamp the extension line near the puncturing position tightly, then loosen the syringe to solve the problem of occlusion and restart infusion. If infusion is restarted before the occlusion problem is solved, it may cause constant occlusion alarm, and the pressure in the syringe may keep rising, which may break or cut off the connection, or even hurt the animal.
- This device has the occlusion detection function, which is used for detecting and alarming when the syringe needle deviates the position in the vein or the needle is not correctly punctured in the vein. However, it only alarms when the occlusion pressure has reached certain numerical level. Before it alarms, the punctured part may be reddish, swell or bleed. Besides, it is possible that the device will not alarm for a long period if the actual occlusion pressure is lower than the alarm threshold value. Therefore, it is necessary to conduct periodical check of the punctured part. Please take suitable measures immediately if there's

anything abnormal about the puncturing part, , such as puncture again.

- It is required to adopt the sterile hypodermic syringes for single use and other medical components that meet the requirements from the local laws and regulations and this User Manual. It is suggested to adopt the syringe with same brand as defaulted in this device.
- It is not allowed to disassemble or refit this device or use it for other purposes except normal infusion.
- No one is allowed to repair this device except the athorized repair technicians.
- To avoid risk of electric shock,this device must be connected to the supply main with protective ground.

1.2 Cautions



- Before the first use, or reuse after the device has been idle for a long period, please charge the device with AC power supply. If it is not fully charged, the device can't continue working with built-in battery power supply if there is power failure.
- The device shall not be used in the environment with radiological installation, magnetic resonance equipment or high pressure oxygen therapy.
- The devices used near this syringe pump must meet corresponding EMC requirements, or it may affect the performance of the syringe pump.
- Please use AC power supply if possible since it can prolong the service life of the battery at a certain degree. Please ensure that the syringe pump is connected with the supply main with grounding wire when AC power supply is used. Only the AC power cord supplied with this device shall be adopted. Please pay attention to the plug position of the power cord to ensure that it can be disconnected at any time if necessary. The built-in battery can only be used as an assistant power supply when it cannot be connected with the protective ground of the AC power supply, or it can not be used normally (power failure or in-transport infusion).
- Before the device is connected with the power supply, please keep the power socket and plug dry. The power voltage and frequency shall meet the requirements listed in the device label or the User Manual.
- The device is equipped with the audible and visual alarm system. The red and yellow alarm indicators will light by turn to check if the alarm system can work normally, and the speaker will make the sound "beep" .

- Please keep the device away from the AC power socket for a certain distance to avoid fluid/drug splashing or dropping in the socket. Otherwise, it may cause the fault of short circuit.
- Please use the fluid/drug after it has reached or close to room temperature. When the fluid/drug is used at low temperature, it will generate some air bubbles from the air dissolved in the fluid/drug and result in frequent air bubble alarm.
- It is not allowed to press and operate the button with sharp objects such as pencil tip or nail, or it may cause damage to button or surface film.
- During low flow rate infusion, please pay close attention to avoid occlusion. The lower the infusion flow rate is, the longer the time it is needed to detect occlusion. Before the occlusion is detected, it may cause long-time infusion stop during this period.
- If the device has been dropped or bumped, please stop use immediately and contact our after sales service department. The components inside the device may be damaged even though the appearance is not damaged and no abnormality occurs in working.
- When the pump is used, it is not allowed to install other infusion control device on the same infusion tube. Otherwise, it may cause danger.
- Identical or similar equipment used in any separate areas, e.g. intensive care unit, cardiac operating room, etc., can be potentially dangerous if different alarm presets are used.

Chapter 2 Overview

2.1 Product Specification

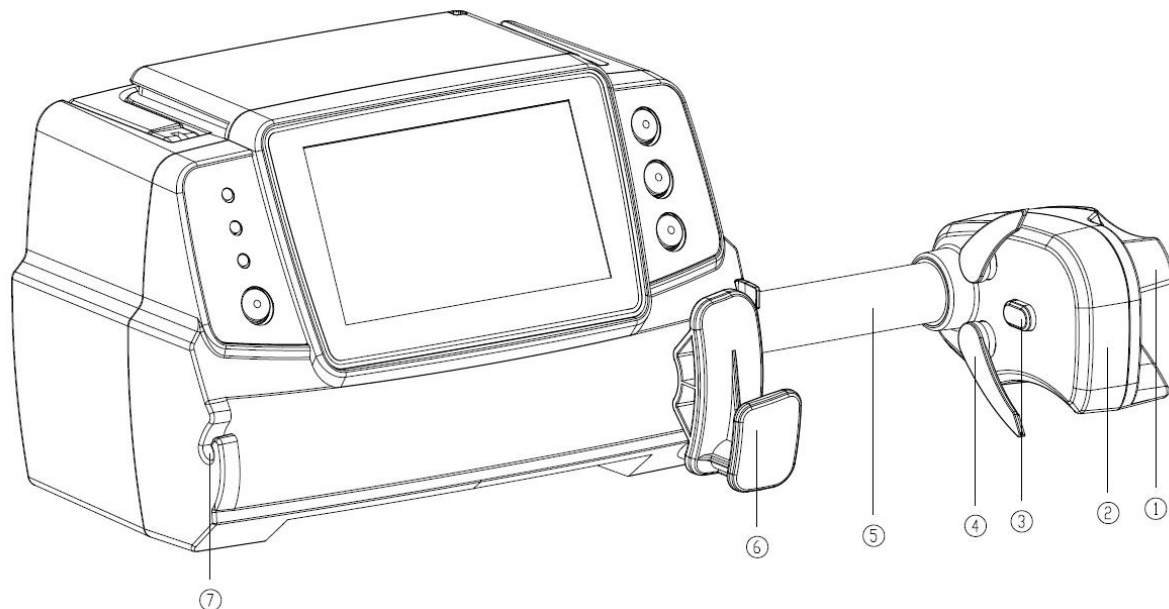
Safety Classification	
Electric protection Type	Class I
Electric protection Level	Defibrillation proof type CF applied Part
Applied Parts	The applied Part is the syringe
Ingress Protection	IP34 (protected from tools and wires greater than 2.5 millimeters and protected from water spray from any direction)
Working mode	Continuous
Classification	Portable device
Specification Parameters	
Compatible Syringes	2ml, 5ml, 10ml, 20ml, 30ml, 50ml
System Accuracy	≥1ml/h, ±2% < 1ml/h, ±5%
Infusion Rate	Syringe size 2ml: (0.1-100) ml/h Syringe size 5ml: (0.1-150) ml/h Syringe size 10ml: (0.1-300) ml/h Syringe size 20ml: (0.1-600) ml/h Syringe size 30ml: (0.1-900) ml/h Syringe size 50ml: (0.1-1500)ml/h
Bolus Rate	Syringe size 2ml: (0.11-100) ml/h Syringe size 5ml: (0.11-150) ml/h Syringe size 10ml: (0.11-300) ml/h Syringe size 20ml: (0.11-600) ml/h Syringe size 30ml: (0.11-900) ml/h Syringe size 50ml: (0.11-1500) ml/h
Bolus preset value	Min: 0.1ml Max: max rate of accordingly loaded syringe size
KVO Rate	0-5.00ml/h, 0ml/h indicates its in the off state.
Micro mode setting range	Syringe size 2ml: (100-100) ml/h Syringe size 5ml: (100-150) ml/h Syringe size 10ml:(100- 300) ml/h Syringe size 20ml: (100-600) ml/h Syringe size 30ml: (100-900) ml/h Syringe size 50ml: (100-1500) ml/h

Flow rate increment	0.01ml/h (0.1-99.99ml/h) 0.1ml/h(100-999.9ml/h) 1ml/h(1000-1500ml/h)
Weight (Body weight)	0.1-550kg
Conc. Unit (Concentration unit)	ng/ml,ug/ml, mg/ml, g/ml, U/ml, KU/ml, IU/ml, EU/ml, mmol/ml, mol/ml, kcal/ml
Dose rate unit	ng/min,ng/h,ng/kg/min,ng/kg/h,µg/min,µg/h,µg/kg/min,µg/kg/h, mg/min,mg/h,mg/kg/min, mg/kg/h etc.
VTBI	0-9999.99ml, minimum step is 0.01ml
Total Volume Infused	0-9999.99ml, minimum step is 0.01ml
Time Range	1min-99hr59min
Fuse Type	Slow fuse 2A 250V
Dimensions	242.5(W)*111(D)*126.5(H) mm without pole clamp included
Weight	1.7kg
Power Supply	
AC power supply	100-240V 50/60Hz
Input power	50VA
DC power supply	12V, 2A; DC chargers conforming to IEC 60950-1/IEC 62368-1 or other relevant safety standards shall be used.
Battery Specifications	Specification: 7.4V 2500mAh Single battery: Charging time is less than 2.5hrs, working time is over 5.5 hrs(after completely charging battery, when the environment temperature is 25℃, flow rate is 5ml/h, the constantly working time). Two batteries: Charging time is less than 5hrs, working time is over 11 hrs (after completely charging batteries, when the environment temperature is 25℃,flow rate is 5ml/h, the constantly working time) .
Alarm	
Alarm signal sound pressure level	When the sound is set at lowest level, alarm signal sound pressure level ≥45dB(A) When the sound is set at highest level, alarm signal sound pressure level ≤80dB(A)
Alarm information	VTBI near end, Syringe near empty, VTBI infused, Syringe empty, Pressure high, Battery nearly empty, Battery empty, No battery inserted, No power supply, Check syringe, Pumpidle alarm, Standby time expired, KVO finished

Environment	
Non AP/APG type equipment	Do not use it in the environment with inflammable anesthetic gas mixed with air, or inflammable anesthetic gas mixed with oxygen or nitrous oxide
Operating	(1) temperature: 5-40℃ (2) humidity: 15-95%, non-condensable (3) atmospheric pressure: 57-106kPa
Transport & Storage	(1) temperature: -20-55℃ (2) humidity: 10-95%, non-condensable (3) atmospheric pressure: 50-106kPa
Safety Standard	
Main Safety Standards	<p>IEC 60601-1:2005+A1:2012+A2:2020 Medical Electrical Equipment, Part 1: General Requirements for basic safety and essential performance</p> <p>IEC 60601-2-24:2012 Medical electrical equipment – Part 2-24: Particular requirements for the safety of syringe pumps and controllers</p> <p>IEC 60601-1-8:2006+A1:2012+A2:2020 Medical electrical equipment –Part 1-8: General requirements for basic safety and essential performance –Collateral Standard: General requirements, tests and guidance for alarm systems in medical electrical equipment and medical electrical systems</p> <p>IEC 60601-1-2:2014+A1:2020 Medical Electrical Equipment - Part1-2: General requirements for basic safety and essential performance-Collateral standard:Electromagnetic Compatibility -Requirements and tests</p>

Chapter 3 Appearance

3.1 Front View



① Handle

Control syringe pump push-pull sliding box and clip.

② Slider box

③ Pressure sensor

Detect the pressure of the syringe

④ Syringe clip

Clamp the syringe plunger

⑤ Lead-screw

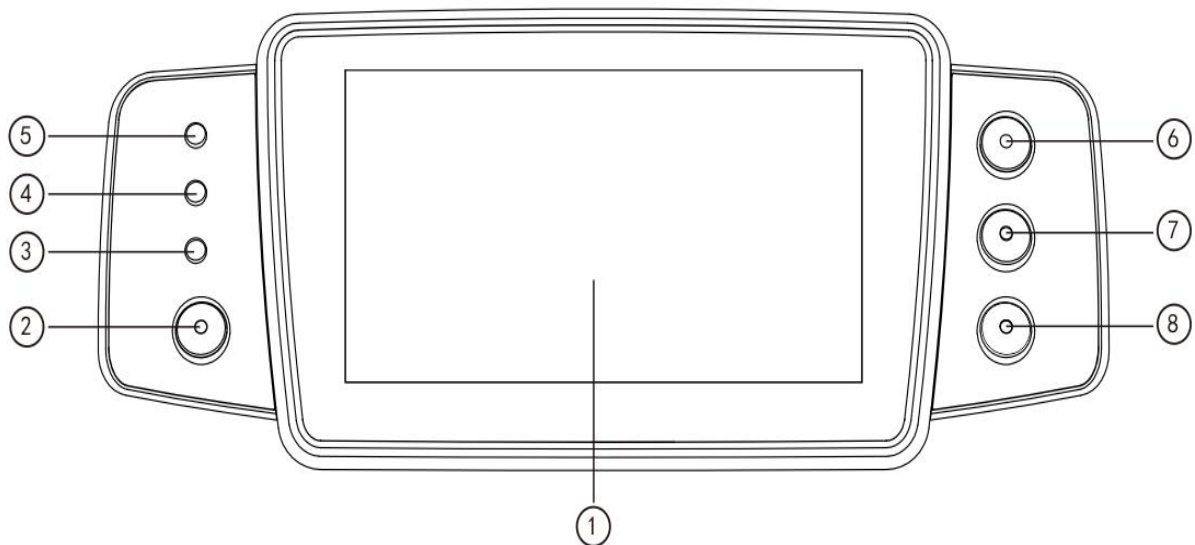
⑥ Syringe fixture lever

Pull then turn 90° right or left , install the syringe into the slot.

⑦ Extension line Clamp

Keep the extension line in line and neat

3.2 Operation Panel



① Touch Screen: 4.3 inches full color LCD (TFT) touch screen

② **【Power】**

Press and hold for 2 seconds, pump power on/off.

Press to select power off, standby or cancel.

③ AC indicator light

Connect with AC power supply, AC indicator lights on.

④ Alarm indicator light

Different flash frequencies and colors refer to different levels of alarm.

For more information, please **refer to Chapter 9.1**

⑤ Running lights

⑥ **【Start/stop】**

⑦ **【Bolus/Purge】**

⑧ **【Home】**

Enter system home page.

3.3 Display Screen








The display screen is composed of title bar and typical interface.



3.3.1 Title Bar

The title bar displays real-time information. Except for 『Brand Select』, others are not selectable. The name of current editing parameter is displayed at the left upper corner.

Table3.3.1-1: Title Bar Icon







Icon	Meaning	Description
	Syringe apparatus indication icon	Syringe apparatus indication icon
	Lock screen indication icon	Unlock state icon is 
	WIFI indication icon	Indicate WIFI connection state.
	Battery charging indication icon	Display the current battery charging state
	Battery status indication icon	The remaining capacity of battery is displayed with the percentage numerical value at the left side . Since the remaining capacity of battery always changes, one of the following states will be displayed: 

3.3.2 Typical Interface

Before and during infusion, the following interfaces will be shown in the typical interface: main interface, working interface, alarm interface, prompt interface, control panel, parameters setting, input method, standby interface etc.

3.3.2.1 Typical Interface Icon

Table: 3.3.2.1-1





Icon	Paraphrase	Description
	Audio Paused	Indicated that the ALARM SYSTEM is in the AUDIO PAUSED state.
	Alarm confirmation	The alarm condition is in the responsibility accepted state.
	Start	Start infusion
	Stop	Stop infusion
	Bolus/Purge	1. During infusion, it means 『Bolus』, select it to start fast infusion 2. Before infusion starting, it means『Purge』, select it to exhaust air from the syringe
	Home	Return to the main interface

3.3.2.2 Input Method Interface

The input method interface is composed of the title bar, input box and edit area.

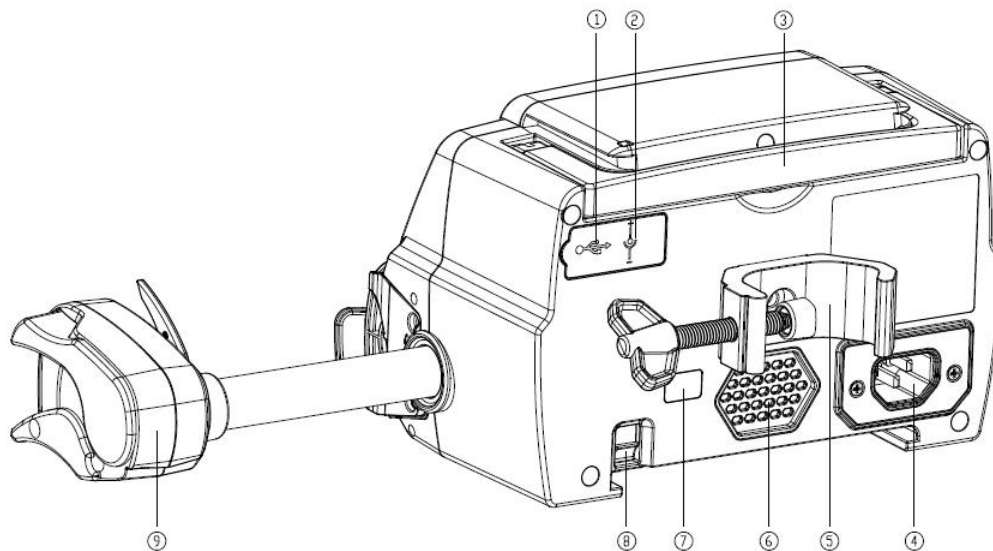


- 1) Title bar: display the name of current editing parameter.
- 2) Input box: real-time display of the input content.
- 3) Edit area: it consists numeric, alphabetic and symbolic keys, which can be switched in sequence by successive selects

Icon	Paraphrase	Description
	Clear key	Select to clear the input content
	Backspace	Select to delete one character
	Cancel	Select to cancel editing and exit
	Confirm	Select to save editing and exit

A/a	Capital and lower Case switch	Select to switch the capital and lowercase of English letters
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3.4 Rear View



① USB Port

The USB Port can be used for:

- Software upgrade. Turn off the pump and connect it to the computer with a USB cable, then upgrade the pump software using a dedicated upgrade tool (PC software).
- Data export. The USB port is converted into RS232 standard interface through a dedicated conversion cable, and can be connected to the computer through RS232.

⚠ Caution: It is necessary to purchase a computer that has passed relevant security verification through formal channels for software upgrade and data export. Otherwise, it may introduce dangerous voltages exceeding 5V and cause harm to the Syringe pump or animal body.

- Nurse call realizing. The connection requirements for realizing the nurse call function is: 3.3V, 25mA.

② DC Input Port

External 12V DC power supply

③ Handle

④ A/C Adapter Port

External 100-240V 50/60Hz AC power supply

⑤ Pole Clamp

Using for fixing the equipment on the infusion stand

⑥ Loudspeaker

⑦ IrDA


Used for communicating with Docking Station (Optional)

- ⑧ Latch for stackable function
- ⑨ Slider box

Chapter 4 Installation

4.1 Unpack and Check

- 1) Please check the appearance before unpacking, if broken, please contact the distributor or our after-sale service department quickly.
- 2) Please carefully open the package to avoid damage of the device and relevant accessories.
- 3) After unpacking, please check according to the packaging list. Please contact distributor as soon as possible if there is any lack or damage of accessories.
- 4) Please keep relevant accessories, warranty card and User Manual.
- 5) Please keep the packing case and packing materials for future transportation or storage.

 **Caution:** Please put the packing materials out of reach of children. Please obey local laws and regulations and the waste treatment system in hospitals for disposal of packing materials.

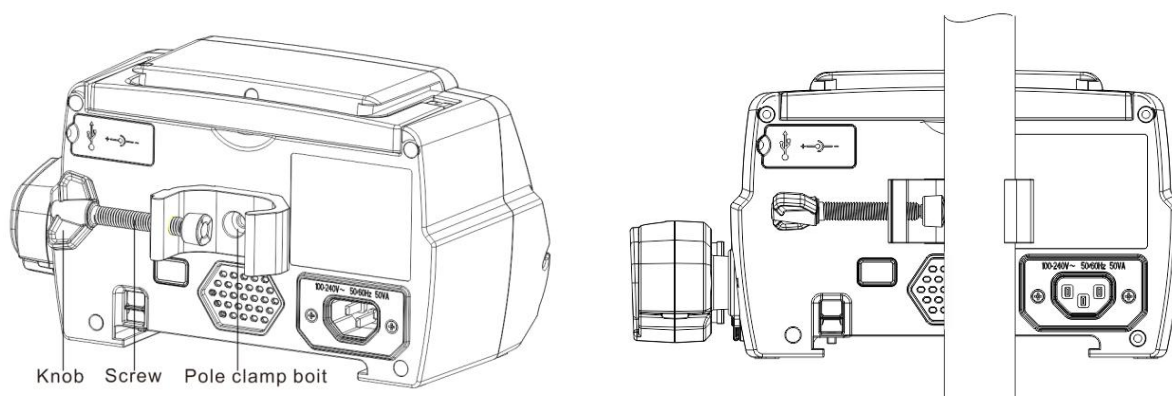
4.2 Installation

 **Caution:**

- This device shall be installed by authorized technicians.
- All devices that connect with this device must pass the certification of designated IEC standards (for example: IEC 60950 information technology equipment safety and IEC 60601-1 medical electric device safety) . All devices must be connected according to the requirements in valid version of IEC 60601-1 standards. The technician who takes charge of connecting additional devices with the device interface shall be responsible for meeting requirements in the IEC 60601-1 standards. Please contact our company if you have any question.
- When the device is connected with other electric devices to form the combination with a special function, please contact our company or the electric expert in hospital to ensure that the necessary safety of all devices in the combination is not jeopardized if it is not sure whether there is a danger.
- This device must be used and stored in the environment regulated by our company.



4.2.1 Install the Syringe Pump

- (1) Rotate the pole clamp screw (knob) and unscrew to leave the space.
- (2) Lock the Pole Clamp on the infusion stand, adjust the position of the syringe pump, tighten the pole clamp to fix the syringe pump on the infusion stand (shown in the below). Hold the syringe pump when tightening the fixing clamp; loose it after tightening to avoid falling.
- (3) The pole clamp supports the vertical pole at default state. To adjust the pole clamp direction, please remove the bolt from the pole clamp screwdriver, take out the pole clamp and adjust the direction, then tighten the bolt.



Chapter 5 Basic Operation

5.1 Operation Flow


- 1) Mount the syringe pump on the IV stand: **refer to Chapter 4.2.1**
- 2) Power on: press  for two seconds to power on and start self test. **Refer to Chapter 5.2.2**
- 3) Install syringe: **refer to Chapter 5.2.3**
- 4) Confirm syringe brand and size: select syringe brand or add new brand
- 5) Remove air bubble from the line: **refer to Chapter 5.2.4**
- 6) Select infusion mode: select infusion modes according to requirements
- 7) Set infusion Parameters: set infusion parameters according to requirements
- 8) Connect infusion line with animal
- 9) Start infusion: press  to start infusion
- 10) Infusion finish **refer to Chapter 5.2.8**
- 11) Remove syringe **refer to Chapter 5.2.10**
- 12) Power off or Standby mode **refer to Chapter 5.2.11**


5.2 Infusion Operation

5.2.1 Installation

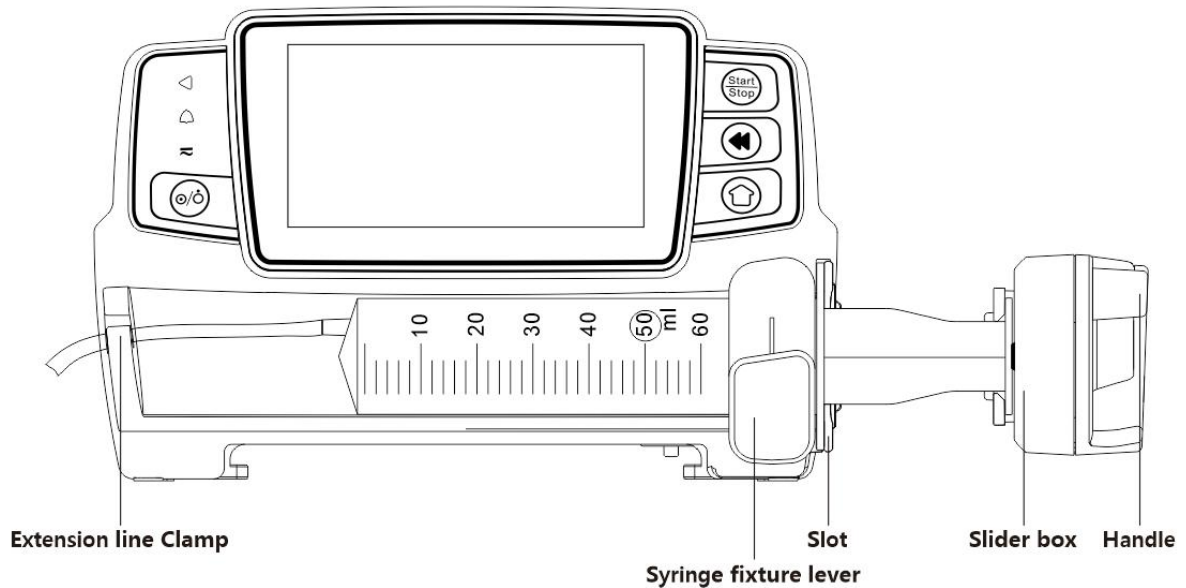
Mount the device on the infusion stand according to **Chapter 4.2.1** Connect it with AC power supply. Check if the AC indicator lights. The battery charge will start once it is connected with AC power.

5.2.2 Start and Self-test

- 1) Press  for two seconds to power on the device.
- 2) After power on, the system will automatically check the motor, sensor, battery, memory, CPU communication and alarm indicator etc.
- 3) After it passes self-test, the pump enters into rate mode interface.

 **Warning:** If self-test fails, it is possible that the pump does not operate properly or is damaged, it is not allowed to use the pump for infusion, please contact distributor as soon as possible.

5.2.3 Install Syringe



- (1) Hold the clutch and pull the slider to the right side.
- (2) Pull the syringe fixture lever, turn 90° right or left.
- (3) Insert the syringe flange into slot, turn syringe fixture lever 90° spring back to tighten the syringe.
- (4) Hold the clutch and push leftward, release after it touches the plunger firmly.
- (5) Put extension line of syringe into the extension line hook.
- (6) Select 『Settings』 → 『Syringe brands』 to choose syringe brands.

Warning:

- It is suggested to use syringes with brands defaulted in this system.
- Please confirm that the displayed syringe brand and specification is the same with the one actually used.
- Although the device supports customizing the syringe, it is strongly recommended that users contact distributor for setting and testing by the professional technicians of our company in order to ensure the infusion accuracy.

Caution:

- Check to ensure no air bubble in syringe.
- Make sure syringe is correctly installed, otherwise accuracy will not assured and may do harm to animal due to no infusion or large dose output due to siphon.

5.2.4 Remove Air Bubble

There are two ways to set parameters: manual purge and automatic purge. Users can choose the method according to their needs. The total purge volume is not included in the Total Volume Infused.

- (1) Manual purge: Long press **【Purge】** button , the device will purge air according to the

default flow rate in the system, release it and return to the setting parameter interface.

- (2) Automatic purge: In the parameters setting interface, select 『Purge』 button on the display and select "Yes" in the pop-up prompt box. Select "Stop" when the air bubbles in the infusion line are eliminated.

Cautions:

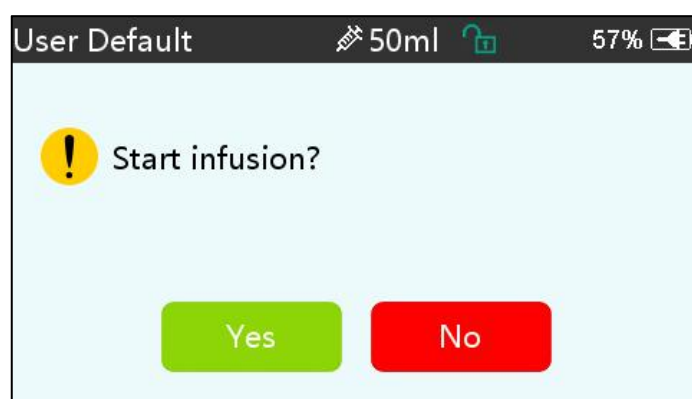
- Before purge air, double check to confirm the infusion line is not connected with the animal.
- Purge rate is the max rate of the syringe size, when purge volume $\geq 5\text{ml}$, purge will automatically stop.


5.2.5 Start Infusion

- (1) Connect syringe extension line with animal, confirm if infusion parameters are set correctly.

Please purge before the infusion, then select 『Start』 button, select 『Yes』 in the pop-up prompt interface to start infusion.

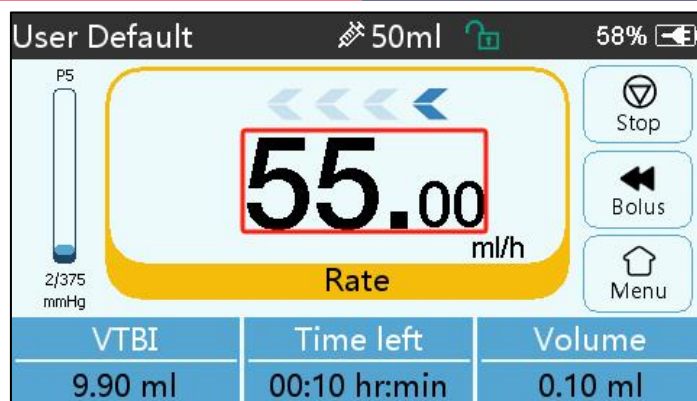
- (2) After starting the infusion, the cumulative infusion volume is displayed on the infusion interface.



 **Warning:** When the pump is running, it is not allowed to exert external force on the lead-screw.


5.2.6 Change the Rate During Infusion


During the infusion process, select a mode, select the value of rate or dose rate on the running interface, the flow rate can be changed online and the infusion can continue at the changed flow rate.

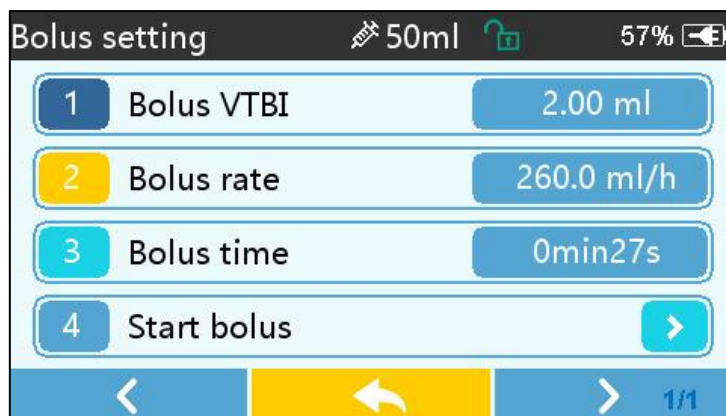


5.2.7 Bolus Application

In operation, Bolus functions have two operation modes: Manual bolus and Automatic bolus.

(1) **Manual bolus:** press and hold the **【Bolus】**  button on product panel, pump will work at the max flow rate of current syringe size, or set max bolus rate under setting interface. (syringe flow rate range please refer to **Chapter 2.1**), release the button, pump will back to the previously set infusion rate.

(2) **Automatic bolus:** In the running interface, select 『Bolus』  on touch screen, set two parameters among bolus infusion volume, rate and time, select 『Start』. The device will make a sound of beep at every 1ml infused. After bolus infusion finished, the device goes back to the previously set infusion rate.



5.2.8 Finish Infusion


When the infusion time of the remaining liquid is close to preset volume to be infused completion time, the pump will alarm. If it is ignored, the system will keep alarming until VTBI infusion is completed. For more information please refer to **Chapter 7.1.9**.

When VTBI is completed, the alarm is activated. If KVO function is ON, it will start KVO function automatically. Select 『OK』 in the alarm interface to stop KVO and remove alarm.

The working time defaulted in the KVO system is 30mins. When 30mins is reached, it will activate KVO completion alarm and stop infusion.

Please refer to **Chapter 7.1.4** to set KVO rate.

5.2.9 Stop Infusion

During infusion , select  to stop infusion. It will return to the parameter setting interface, which displays Total Volume Infused and adjustable parameters.

5.2.10 Remove the Syringe

Disconnect the extension line from the animal, then remove the syringe.

If syringe needs to be replaced, please refer to **Chapter 5.2.3** for installation steps.

5.2.11 Power OFF or Standby

Method 1: long-press the  **【Power】** Button till the screen is OFF, the device is OFF.

Method 2: short-press the  **【Power】** Button to enter into OFF interface.

(1) Turn off the device: select 『Power off』 icon, the device will turn OFF.

(2) Standby: select 『Standby』 icon to enter into standby time setting interface.

In standby mode, the brightness of the screen will be set to the lowest level. It will return to normal brightness after the standby mode is finished .

(3) Cancel: select 『Cancel』 , it will return to the interface before OFF setting.

Note: The standby mode is only available when the device is in the non-working state.

Chapter 6 Set Infusion Parameters

6.1 Introduction to Infusion Parameters Setting


(1) The drug information can only be displayed in the running interface when the drug library is activated.

Select 『Settings』 icon in the main interface to enter sub-menu, find 『Drug Library』 menu item, set the ON/OFF state of drug library and select drug. Please refer to this User Manual **Chapter 7.1.3** for details.

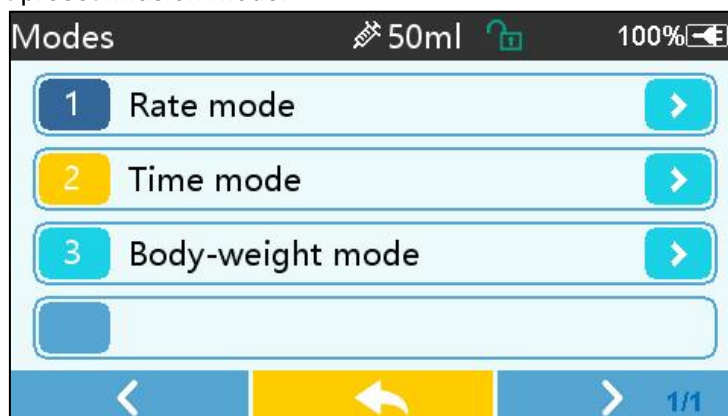
(2) For both rate entered in infusion parameter setting and the rate calculated by the system, the range of which is within the system default flow rate range of the current working syringe specification.

(3) If VTBI (volume to be infused) is not set, it is defaulted that the fluid/drug in the syringe will be completely infused.

6.2 Infusion Mode Setting

After starting the device and finishing self-test, the device automatically enters into the parameters setting interface of rate mode. If you want to select other mode, select 『Menu』 icon  to enter

into the main interface, and then select 『Modes』 icon to enter into the mode selection menu interface and select preset infusion mode.



6.2.1 Rate Mode

In this mode, two parameters can be set: Rate and VTBI (Volume to be infused). When two of the parameters are set, the system will automatically calculate the third parameter. If the VTBI is 0, the device will work at the set rate until it stops after alarm.

6.2.2 Time Mode

In this mode, two parameters can be set: VTBI (Volume to be infused) and Time, the system will automatically calculate the speed, $\text{speed} = \text{Volume(ml)} / \text{time(min)}$.

6.2.3 Body Weight Mode

In this mode, several parameters can be set: the weight (body weight), Acti agentia (drug mass), Conc. unit (concentration unit), Volume (fluid volume), Conc. Dose rate, Dose unit, VTBI.

The system will calculate the flow rate automatically from the specified dose rate according to related formula $\{\text{dose rate} \times \text{weight}\} / \{\text{Acti agentia (drug mass)} / \text{Volume(fluid volume)}\}$, and the time equals to VTBI /flow rate.

Chapter 7 System Setting

7.1 Settings

Select 『Settings』 icon in the main interface to enter into parameters setting interface.

7.1.1 Syringe Brands

Install the syringe first, then select 『Syringe brands』 to enter into the syringe brand selecting interface, and select the preset brand option.

The system built-in syringe brand: BD, Monoject, Terumo, B. Braun . Other syringe models can be added by creating new brands, and re-calibrate as described in section 10.2.

Note: Different brands of syringe may cause deviation in flow rate . Before using the syringe, please confirm if the displayed information in the interface is the same as the actually used syringe.

7.1.2 Cage No.

Click 『Cage No.』 option, enter the cage number (range 0-255), increment is 1.

7.1.3 Drug Library

Select the preset drug name and the name will be displayed in, running interface

The function can be turn on or off.

(1) Digital Syringe Pump support 32 drugs, without upper and lower limits.

7.1.4 KVO Rate

Select 『KVO rate』 and input the numerical value. Select 『OK』 after confirmation .

Please refer to **Chapter 2.1** for the adjustable KVO range.

7.1.5 Bolus Rate

Set the default Bolus rate. Please refer to **Chapter 2.1** for the range of bolus rate.

7.1.6 Occlusion Pressure

Select 『Occlusion pressure』 to enter into occlusion level setting interface. Roll the long box to the preset level and select 『OK』 after confirmation .

The higher the preset level is, the higher the occlusion level is. It is suggested to select suitable occlusion pressure according to actual requirements.



Warning:

- When medicinal fluid with high viscosity is adopted and the occlusion pressure is set at low level, it is possible that the system will show occlusion alarm even when the line is not obstructed. In this situation, please observe the pressure indication icon in the display screen and operation of syringe carefully, and rise the occlusion pressure if needed.
- When the occlusion pressure is set at a high level, the extension line connected to the syringe is likely to pop due to the big pressure inside the pipeline. Please confirm that the extension line is securely attached to the syringe.
- When the occlusion pressure is set at high level, it may cause the animal uncomfortable. After rising the occlusion pressure, please carefully observe the condition of the animal, and take measures immediately if there's anything abnormal.
- When the device has faults, the max pressure generated by the Syringe is 300kPa. Under single fault state, the max infusion volume is 2ml.

(Table 7.1.6-1 Relation between Occlusion level and Pressure)

Applicable Model: Digital Syringe Pump Occlusion Pressure Level: 3 levels					
Level	Pressure Intensity (mmHg)	Level	Pressure Intensity (mmHg)	Level	Pressure Intensity (mmHg)
1	300	2	600	3	900

7.1.7 Pressure Unit

Select 『Pressure unit』 to enter into pressure unit select setting interface, there are four units: mmHg, kPa, bar and PSI. Select the preset unit and then set the value.

Note: Please confirm carefully before changing the current pressure unit.

Unit Mark	Unit Conversion
kPa	1 kPa=7.5mmHg=0.145psi=0.01bar
PSI	1psi=51.714mmHg=6.894kpa=0.068bar
Bar	1bar=750.06mmHg=14.503psi=100kPa

7.1.8 Pump Idle Alert

Select 『Pump idle alert』 to enter into pump idle alarm time setting interface. Select the preset time option to set the time. The available pump idle alert time are 2min, 5min, 10min, 15min, 20min or 30min.

The Pump Idle Alert refers to the alarm that will be activated if there is no push on keys within the preset idle alert time when the device are in the non-infusion and non-alarm state.

7.1.9 Finish Pre-alarm

Select『Finish pre-alarm』to enter into the time setting interface. Select the preset time option to set the time. The available finish pre-alarm time are 2min, 5min, 10min, 15min, 20min or 30min.

The time for pre-alarm refers to the time it takes when the medicinal fluid infused volume is close to the preset value, which triggers near completion alarm.

7.1.10 Micro Mode

Select 『Micro mode』 to enter into setting interface. The function can be set as ON or OFF. In the ON mode, the rate limit can be set, which will limit the infusion rate in any infusion mode. The available range of micro mode is between 100 and 1500ml/h and the minimum step is 1ml/h.

Syringe Size	Max Rate Range
2ml	100-100ml/h
5ml	100-150ml/h
10ml	100-300 ml/h
20ml	100-600 ml/h
30ml	100-900 ml/h
50/60ml	100-1500 ml/h

7.1.11 Reset Total Volume

Select 『Reset total volume』 and then 『Yes』 in the prompt box to confirm reset. Otherwise, please select 『No』.

7.2 General

In the main interface, select 『General』 to enter into the General device setting interface.

7.2.1 Date& Time

Select 『Date & Time』 to enter into the date and time setting interface. It allows the set of date, time and format in the interface.

When setting date and time, input the numerical value directly. For example, to preset the date “2018/08/31”, input “8-31-2018”; to preset the time “12: 34”, input “1234”.


The time can be displayed in 24h format or 12h format. The date can be displayed in British type, American type or Chinese type, please set according to your requirements.

7.2.2 Brightness

Select 『Brightness』 to enter into setting interface. The brightness can be classified into 10 levels.

7.2.3 Sound

Select 『Sound』 to enter into the setting interface. The volume can be classified into 10 levels. The lowest volume should be no less than 45 dB, and the highest volume should be no more than 80 dB. Roll the long box to the preset value and select 『OK』 after confirmation.

 **Caution:** If the sound level of the alarm signal is lower than the environmental noise, the operator's capacity of identifying the alarm status will be affected.

7.2.4 Screen Lock

Select 『Screen lock』 to enter into setting interface, select ON or OFF.

The available automatic lock screen time are 15s, 30s, 1min, 2min, 5min, 10min or 30min etc., which means that the device will lock the screen automatically if the screen is not touched or the button is not pressed within certain period of time after the device runs.

Unlock: select 『Cancel』 in the lock screen interface.

Note: The device will unlock automatically if there's a high Level alarm.

7.2.5 Night Mode

Select 『Night mode』 to enter into ON and OFF setting interface. Set the start and end time of the night mode and brightness. The system will adjust the brightness automatically to the value defined by the User at night.

7.2.6 Battery Capacity Display

When the function is turned on, the battery life will be shown in the upper right corner of the screen. It will show the percentage of remaining capacity if it is turned off.

7.3 System

Select 『System』 in the menu interface to enter the system information setting interface.

7.3.1 Language

This device supports simplified Chinese, English, Spanish, French etc.

Chapter 8 Other Functions

8.1 History Entries

Select 『Records』 in the main interface, select the “History entries” into history records query interface. The device supports over 5,000 history records, which display the event name, event date and time (permanent preservation). When it is full, the new records will cover the old records with first in first out principle.

History entries		50ml 	100% 
1	Stop:10.23ml	10-24 19:59	
2	KVO:5.00ml/h	10-24 19:59	
3	VTBI infused	10-24 19:59	
4	Start:55.00ml/h	10-24 19:57	

8.2 Last Therapy

Select 『Last therapies』 in the main interface to enter therapy records query interface.

- (1) This interface displays the last 20 treatment records. Users can select any one as the current infusion plan, and start infusion after confirming the parameters.
- (2) The system can store up to 20 treatment records. When the records are full, the new records will overwrite the old records.

8.3 Anti-Bolus

When the occlusion alarm is triggered, the motor will automatically reverse to decrease the pressure and decrease the influence of bolus. It will avoid additional harm caused to animals after the occlusion.

8.4 Electronic Memory Function

After power off, the electronic memory function can save for no less than 10 years.

Chapter 9 Alarm Prompt and Troubleshooting

9.1 Introduction to Alarm Level

During infusion preparation and infusion, this device will alarm when the set alarm threshold is reached or exceeded. It will prompt with sound, light and text. According to the importance of alarm information, the emergency and safety, the alarms are classified into three levels: high, middle and low. Please refer to table below for details:

Alarm Level	Sound Signal Interval	Light color /flash frequency
High alarm	10s	Red indicator flashes /2.0±0.6Hz
Middle alarm	15s	Yellow indicator flashes / 0.6±0.2Hz
Low alarm	20s	Yellow indicator lights on

If there is an alarm, the system will prompt the alarm interface. If the alarm level is high, select 『OK』to stop the alarm, and exit the alarm interface. If the alarm level is middle or low, select『OK』, the sound signal will stop, and exit the alarm interface.

Select『Mute』to mute the alarm. If the alarm is not eliminated, the alarm sound will be sound again after 2 minutes.



Warning: Some alarm threshold can be set by the user, such as occlusion pressure, pump idle alarm,VTBI infused pre-alarm and alarm sound volume etc. The users shall confirm the parameters when they set the alarm threshold value. Otherwise, it may influence the alarm function or infusion safety.

9.2 Multilevel Alarm Rules

If several alarms are triggered simultaneously, the system will alarm according to the following rules:

Table 9.2-1

Multilevel Alarm	Rules
Several alarms of different levels are triggered simultaneously	Display the highest level alarm with sound, light and text. Display middle alarm after all alarms of highest level are eliminated.
Several alarms of same level are triggered simultaneously	Alarm is displayed by turns, the time interval is 1s

When it alarms, the corresponding alarm information will be displayed on the title of the screen. Refer to **Appendix A** for more information.

9.3 Alarm Treatment



Warning: When there is an alarm, please check the conditions of the animal and solve the problem reminded by the alarms before continuing working.

Please refer to **Appendix A** for the alarm solution.

9.4 Fault Analysis and Solution

When there is a fault, the alarm information will be shown on the syringe pump screen. It is the high level alarm. Please take countermeasures to the fault and then eliminate the fault alarm. If the fault can not be eliminated, please stop using the device and contact our company for repair and test of the device. It is forbidden to put it into operation before the device has passed the inspection. Otherwise, it may cause unpredictable harm if it works with fault.

If the device is on fire/burns for unknown reason, or there are any abnormal situations, the user shall immediately cut off power supply and contact our customer service department.

Chapter 10 Maintenance

10.1 Cleaning and Disinfecting

Warning:

- Please cut off power supply and unplug the DC /AC power cord before cleaning the device.
- During cleaning and disinfecting, please keep the device horizontal and upwards to protect the device and accessories from fluid.

10.1.1 Cleaning

- (1) The daily maintenance is mainly to clean the shell and pump body. It is inevitable that medicinal fluid may leak into the device during infusion. Some medicinal fluid drug may corrode the pump and cause faults. Therefore, please clean the device timely after infusion. First, wipe it with 75% alcohol or water, clean with damp and soft cloth, and then let it dry naturally.
- (2) For the device interface, please wipe it with dry and soft cloth and confirm the interface is dry before use.
- (3) Please do not soak the device in water. Although this device is waterproof to some degree, please check if the pump works normally when fluid splashes on the device. Please perform insulation and electric leakage test if needed.

10.1.2 Disinfecting

- (1) Disinfection may cause harm to the pump, it is suggested to disinfect the pump if necessary.

Please disinfect the device with common disinfecting agents such as 50% sodium hypochlorite, cidex 2% glutaraldehyde + activating agent, 75% ethanol or 70% isopropyl alcohol etc. Please follow the instructions of the disinfecting agent.

- (2) Clean the device before disinfecting is recommended.

Do not sterilize the device with high pressure steam sterilizer, do not dry the device with dryer or similar product.

Warning: Please do not adopt Cidex OPA ortho phthalaldehyde, methyl ethyl ketone or similar solvent, otherwise, it may corrode the device.

10.2 Add New Brand and Calibration

In the 『System』 sub-menu, select 『Brand maintenance』 to enter into brand setting interface. Users can add new brand, delete existed brand or make calibration.

Warning:

- It is suggested to contact our company or local dealer for customized operation or calibration

by professional technicians. Otherwise, the infusion accuracy cannot be guaranteed.

- The built-in brand of the system shall not be deleted.

(1) Add new brand

If the actually used syringe brand is not built in the system, please add the new syringe brand in this interface, set syringe brand name and specification etc.

(2) Delete brand

Enter into 『Delete』 interface, select it to delete user-defined syringe brand.

(3) Calibration



Caution:

Calibration is needed at the circumstances below:

- When the pump is used for the first time;
- When new brand of syringe is added for the first time;
- After period maintenance is conducted.

The following materials shall be prepared before calibration:

A set of new syringe include 2ml, 5ml, 10ml, 20ml, 30ml, 50ml.

Calibration Steps:

- 1) Select syringe brand.
- 2) Select syringe size.
- 3) Install syringe, pull the syringe piston beyond size scale line a little, press and hold on [bolus], push the piston to the corresponding size line.
- 4) Press [start], begin calibration.
- 5) Calibration completed.
- 6) Exit calibration, select the calibrated brand as the current brand, syringe size is detected automatically after each calibrated size loaded, and the infusion accuracy was verified at 5ml/h and 100ml/h flow rates respectively. The measured infusion accuracy shall conform to the accuracy value specified in the Table of Chapter 2.1.

10.3 Recycle

The normal service life of this equipment is 10 years. The actual lifespan may vary depending on the frequency of use and maintenance practices. Equipment exceeding its service life must be decommissioned and scrapped. Please contact the manufacturer or distributor for further information.

- 1、Decommissioned equipment may be returned to the original distributor or manufacturer.
- 2、Used lithium polymer batteries should follow the same disposal method or be handled in compliance with applicable local laws and regulations.
- 3、Follow the equipment decommissioning procedures established by your medical institution.
- 4、Recycling must adhere to all local laws and regulations.

Chapter 11 Appendix

Appendix A Alarm and Solution

No.	Alarm Type	Alarm Level	Reason	Solution
1	VTBI near end	Low	During infusion, the remaining time reaches or is less than the set nearing completion time	This alarm can't be eliminated until infusion completes
2	Syringe near empty	Low	The syringe is near empty by calculating with liquid medicine remaining in the syringe and current flow rate.	This alarm cannot be eliminated until syringe empty.
3	VTBI infused	High	The preset value infusion Completion	Press 【 Stop 】 button to stop alarm
4	Syringe empty	High	The liquid medicine in the syringe is empty.	Press 【 Stop 】 button to eliminate the alarm
5	Pressure high	High	1. Line occlusion during infusion	Select 『 Mute, manually remove the reason of occlusion, Press 【 Start 】 button to continue infusion
			2. Fluid/drug in the actual infusion line has high viscosity, but the system occlusion level is set too low	Rise the alarm Level, Press 【 Start 】 button to continue infusion
			3. The pressure sensor is damaged	Please contact the dealer or manufacturer for repair
6	Battery nearly empty	Low	1. When power is supplied only with the built-in battery and it is low capacity, the alarm will last over 30min	The alarm automatically eliminates after connecting with the external power supply.
			2. Battery ageing or fault of device charging circuit.	Please contact the dealer or manufacturer for repair.
7	Battery empty	High	1. When only the internal battery is used for power supply and the battery power is close to depletion, the alarm lasts over 3 minutes	Immediately connect with external power supply.
			2. Battery ageing or fault of device charging circuit.	Please contact the dealer or manufacturer for repair.
8	No battery inserted	Low	Battery is removed	Before the battery is installed, please turn off the device and

				disconnect with the AC power supply.
9	Battery in use	Low	In ON state, AC power supply is adopted, but the AC power cord is dropped during the process	The alarm automatically eliminates after connecting with the external power supply.
10	No battery and No power supply	High	Battery is removed, both the AC power cord and DC charger are disconnected.	Reinstall the battery or connect with the external power supply
11	Check syringe	High	Syringe drop off during infusion	Reinstall the syringe
12	Pump idle alert	Low	After installing syringe, in non-working or no alarm state, there is no operation during the set time in the system	Select any button to stop
13	Standby time expired	Middle	In standby mode, after standby time ends	Select 『OK』 button to stop alarm
14	KVO finished	High	KVO working time reaches 30min, syringe pump stops working	Press 【 Stop 】 button to stop alarm
15	System Error (NO.: 1-15)	High	Internal failure or software exception	Turn off and Restart, if the alarm still exists, please contact the dealer or manufacturer for repair

Note: When alarm rings, select the 『Mute』 icon on the screen to temporarily stop sound alarm for 2min.

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