

Infusion Pump For Veterinary Use



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Chapter 1 Introduction

1.1 Principles and scope

Infusion Pump fully controls the infusion process using SCM, implements monitoring with a variety of sensors, continuously extrudes the infusion tube filled with liquid through a peristaltic pump in fluctuation mode and thus controls the infusion rate.

Infusion Pump is widely used for constant rate intravenous infusion for patients in ICU, CCU, emergency rooms, operating rooms, pediatrics, obstetrics and gynecology, hematology, internal medicine, surgery and general wards in large, medium and small hospitals; for safer transfusion, please carefully read this manual before using this device.

1.2 Environment

Ambient temperature: 5~40°C;

Relative humidity: 20%~90%;

Atmospheric pressure: 700~1060 hPa;

Power: a.c.100-330V, 50 / 60Hz or rechargeable battery of 7.4V rated voltage and 2400mAh capacity.

1.3 Considerations

- (1) The device should be operated by qualified medical staff, and keep away from the equipment producing electromagnetic radiation to prevent mutual electromagnetic interference.
- (2) This device should be used together with infusion apparatus complying with local regulations, and light-tight infusion tubes do not apply.
- (3) Use this device within 50~80CM above the patient's heart.
- (4) The medical care personnel using this device should review the patient's clinical condition regularly, and adjust in time if necessary; do not rely solely on the alarm system of the device.
- (5) The maximum transmission capacity under single fault is $\leq 0.1\text{mL}$.
- (6) The useful life of the device is 5 years or 10,000 hours.
- (7) The priority alarm system of the device comprises: block, air (or bubbles) and finish.
- (8) The sound pressure of the audible alarm signal of the device is not less than 65dB.
- (9) The infusion pump uses 50HZ, 100-240V AC power; it is prohibited to use other types of AC power.
- (10) During use, do not clean the device; if there is liquid on the shell, please shut down the device and immediately cut off the AC power before wiping.

- (11) The device should be commissioned before it is used for different infusion apparatus (see Clause 5.3 for commissioning method), or else the infusion error may exceed the control range.
- (12) The infusion apparatus are disposable, and shouldn't be used continuously over 24 hours.
- (13) When replacing the infusion bottles, do not remove the infusion apparatus from the infusion pump; to remove the infusion apparatus, be sure to first push the stopper tight at the lower end of the infusion tube.
- (14) Do not transfuse medical liquid that can't be warmed under heating condition.
- (15) The equipment isn't portable.

1.4 Contraindications:

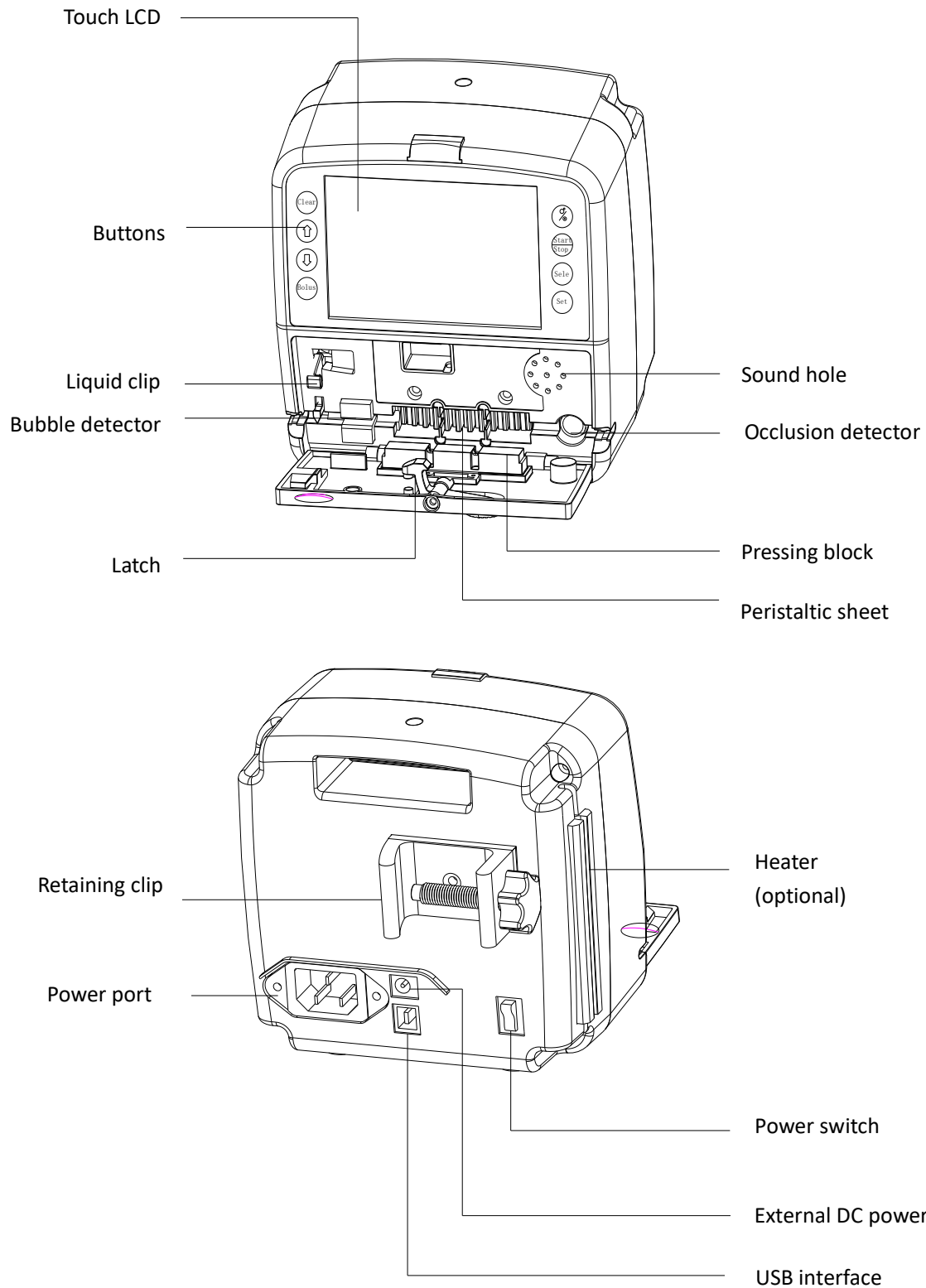
- (1) The intravenous infusion rate should be adjusted by professional health care workers; the patients and their families must not adjust without permission, or else it may cause serious consequences.
- (2) The device is currently not available for hyperbaric oxygen environment.

1.5 Description of Symbols

Symbol	Meaning	Symbol	Meaning
	Pay attention to safety; refer to the instructions		Production date
	BF type application part		Serial number
IPX3	Drop-proof device		Avoid rain during transport
	Class II equipment		Fragile, handle with care
	Manufacturer		Keep upright during transport
	Production batch		Stacks up to 5 layers of same packaging

1.6 Main Structure

The device consists of LCD touch screen, operation panel, peristaltic pump assembly, door assembly, bubble detector, pressure detector, pipe clamp assembly, front housing assembly, rear housing assembly, battery assembly, AC power assembly and retaining clip.



Note:

- (1) External DC power supply (DC connector): Allows connecting 12-24V vehicle power, the inner core is positive and the outer ring is negative;
- (2) **USB** drip sensor interface only can be connected to the dedicated drip sensor of our company.

Chapter 2 Packaging

2.1 Packaging identification (refer to actual packaging)

Infusion Pump	 Quantity: 1 set Gross weight: 2.50 KG Net weight: 1.50 KG Dimensions:135x90x135 mm
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2.2 Label (refer to actual subject product)

Product name: Infusion Pump	
Rated voltage: AC 100-240V, 50/60Hz Power: 30VA	
Product ID:	Production lot number:
 XX- XX-XX IPX3	   
	

2.3 Packing list:

Infusion pump: 1 set (label on the back of the device)

AC power cable: 1 piece

Operation Instructions: 1 piece

Warranty Card: 1 piece (including Product Certificate)

Chapter 3 External Features

3.1 Panel information

3.1.1 Key buttons



3.1.2 Description of buttons (including touch buttons in setup mode)

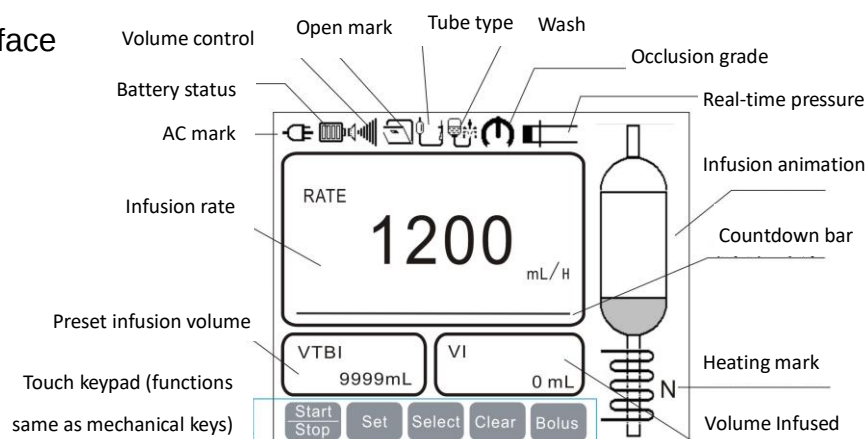
	No.	Name	Function
Physical buttons	1	Clear button	Clear the cumulative amount or audible alarm
	2	Increase button	Increase the value when setting parameters; press and hold it to increase quickly
	3	Decrease button	Decrease the value when setting parameters; press and hold it to decrease quickly
	4	Bolus button	In standby mode, press and hold it to enter quick (washing) air exclusion function; in running mode, tap to enter bolus administration setting interface, tap again after setting to enter bolus administration mode, and switch to original infusion process after bolus administration.
	5	Power on/off button	Press and hold it (about 3 seconds) to turn on the power, press and hold again (about 3 seconds) to turn off.
	6	Start/stop button	After setting the parameters, press the Start/Stop button to start infusion, and press it again to stop the infusion.
	7	Select button	In the main menu, press it to switch to drip/flow rate mode directly; in setup menu, press it to switch the setting parameters.
	8	Setup button	To modify and set common system parameters.
Touch buttons	9	Start/stop button	Same as the physical button
	10	Setup button	Same as the physical button
	11	Select button	Same as the physical button
	12	Clear button	Same as the physical button
	13	Bolus button	In standby mode, tap it to enter quick (washing) air exclusion function; in running mode, tap to enter bolus administration setting interface, tap again after setting to enter bolus administration mode, and switch to original infusion process after bolus administration.
	14	0~9 number buttons	For setting infusion rate, preset infusion volume, system parameters, etc.
	15	Heating button	Heating pattern below infusion animation; when AC power is connected, tap it to change to red, indicating that the pipe heater is turned on (Optional).
	16	Volume setting button (pop-up)	Tap the volume icon to pop up the volume setting window; the number of vertical green bars indicates the volume level; click the window directly to increase the volume, and it will turn to mute if you click again after reaching the maximum level.
	17	Occlusion grade setting button (pop-up)	Click the occlusion grade icon to pop up the occlusion grade setting window; green indicates low, yellow indicates medium, and red indicates high; the setting method is same as the volume.
	18	Trace mode button	The button is below the numeric keypad, and is valid only in operating parameter setting mode.



Note: This device is designed with mechanical button and touch button input. The buttons on the touch screen have the same functions with physical buttons, and can replace the physical buttons.

3.2 Main Display Interface

3.2.1 Display Interface



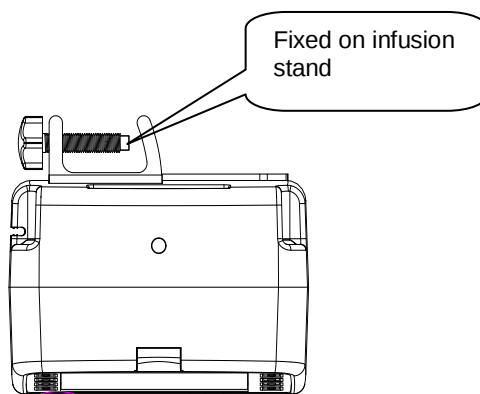
3.2.2 Description of displayed information

No.	Name	Features
1	AC mark	It is red when AC power is connected and gray when AC power is disconnected.
2	Battery status	Display battery capacity and charging status in real-time, and the color changes and alarms when the battery voltage is low.
3	Volume control mark	Display the current volume status.
4	Open mark	This mark is red when the pump door is opened and green when the door is closed.
5	Tube type mark	Display currently selected tube type.
6	Bolus mark	In washing state, this mark changes from gray to green.
7	Occlusion grade mark	Low grade is green, medium grade is yellow, and high grade is red.
8	Real-time pressure mark	Display the current changes in real-time.
9	Infusion animation mark	Play liquid dripping animation dynamically during infusion, and the animation plays faster when the infusion speed is high.
10	Heating mark	When heating is started, this mark changes from gray to red.
11	Flow rate	Set the infusion rate.
12	Preset volume	Set planned infusion volume.
13	Accumulated volume	The infusion volume that has been completed
14	Touch button display area	The function is equivalent to the physical button, and you can tap to enable the corresponding function.
15	Occlusion (pop-up)	Sound beep alarm at 1 sec interval if the tube is occluded, and pop up occlusion alarm window.
16	Air (pop-up)	Sound beep alarm continuously if there are bubbles in the tube or infusion tube is emptied and pop up bubble alarm window.
17	Over (pop-up)	Sound beep alarm continuously when the accumulated volume reaches the preset volume, and pop up alarm window.
18	Power switch (pop-up)	If the power supply is switched, sound beep alarm and pop up the power switch window.
19	Countdown bar	Start countdown when the device is not operating, prompt "Wait Timed Out!!!" and alarm after two minutes.

Chapter 4 Operating Instructions

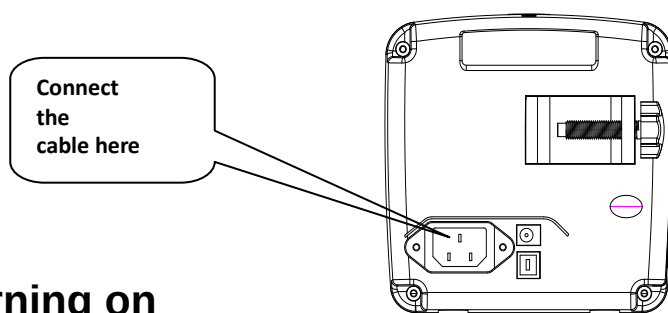
4.1 Fixing the infusion pump

Rotate the tightening knob counter-clockwise, leave enough space, put the infusion pump on the upright tube of the infusion stand, and turn the knob clockwise to fix the infusion pump. (Note: The device must be upright.)



4.2 Connecting the power supply

Connect the AC power cable; Note: The power supply must be AC 50/60Hz, 100-240V.

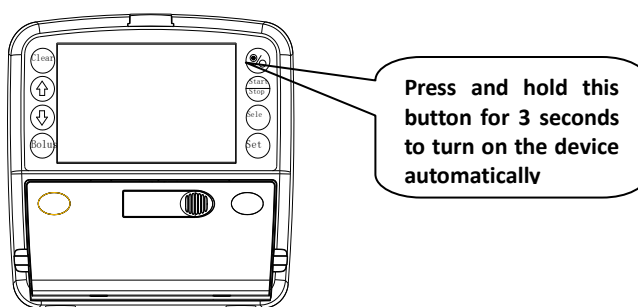


4.3 Turning on

Press and hold the  button for 3 seconds and the infusion pump enters self-test; after test, it displays last infusion rate, which is the initial infusion rate; this function remains valid throughout the lifetime of the device.

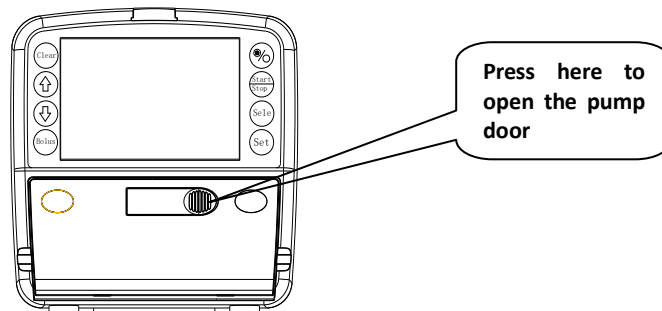


Note: After turning on, check if there is AC symbol in top right of the LCD screen; if not, check if the power cable is connected securely, or else discontinue use and contact after-service personnel.



4.4 Installing infusion apparatus

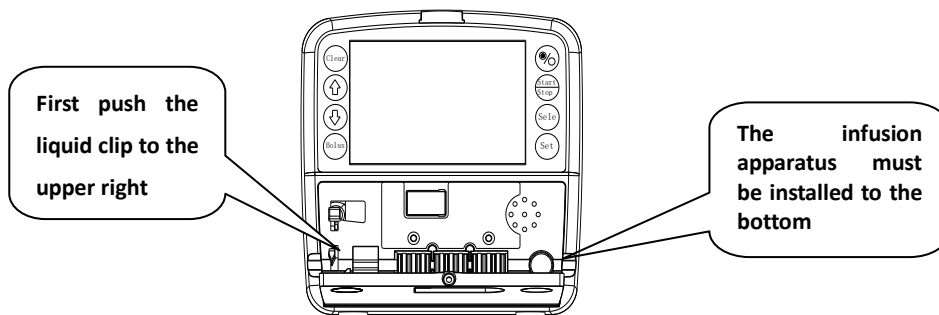
4.4.1 Press the latch to open the pump door;



Note: Before installation, the air in the infusion apparatus should be completely discharged.

4.4.2 Put the infusion apparatus in the tank

First push the liquid clip to the upper right and fix. The infusion tube must be installed in the bottom. Before installation, make sure that the infusion direction is consistent with indicated direction);

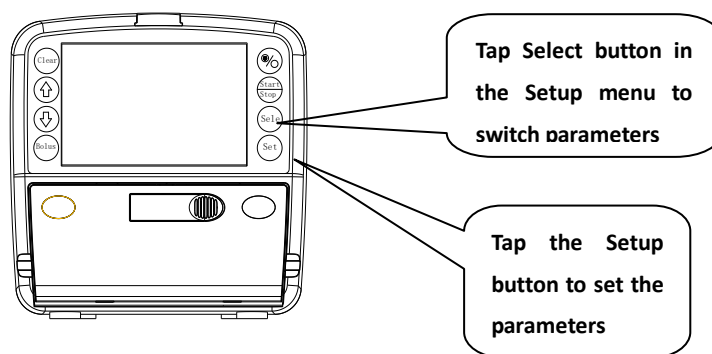


4.4.3 Close the pump door

After closing the pump door, check if the infusion apparatus is properly installed. If yes, the indicator is green; if not, the indicator is red, and the infusion pump can't be started by pressing the **Start/Stop** button (actually the bubble alarm function is triggered); please open the pump door, take out the infusion apparatus and reinstall it.

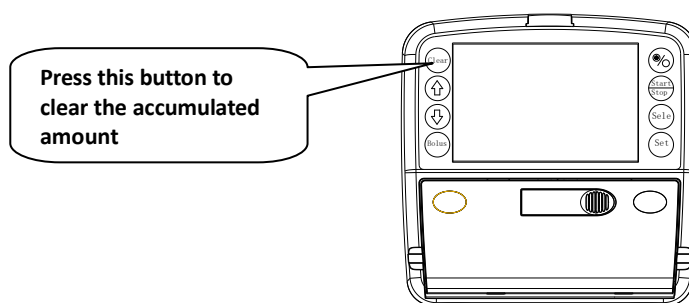
4.5 Setting parameters

Press the **Setup** button, the flow rate flashes on the LCD screen, and you can use the numeric buttons to set the desired flow rate; press the **Select** button, the preset amount flashes on the LCD screen, and you can use the numeric buttons to set the desired preset amount; press the **Setup** button to save the parameters and back to the main menu.



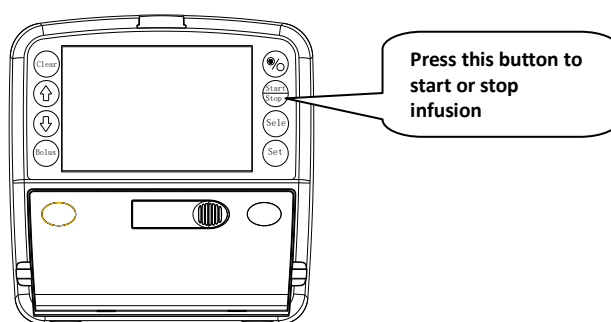
4.6 Clearing accumulative amount

After stopping the infusion, press **Clear** to reset the accumulated amount.



4.7 Starting infusion

Press the **Start/Stop** button to start the infusion; make sure that the infusion apparatus has been installed in place before infusion, or else the device will abnormal run when you press the **Start/Stop** button (Note: refer to 4.4 to re-install the infusion apparatus).



4.8 Finishing infusion

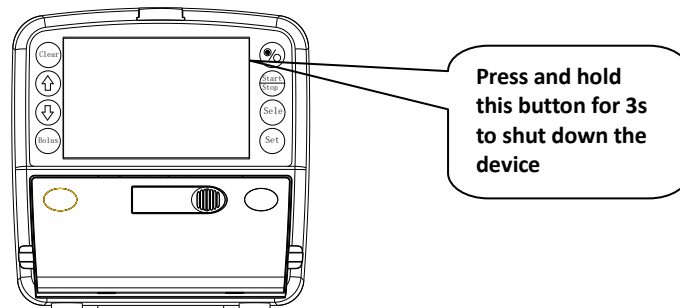
When the accumulated amount reaches the preset volume, the LCD screen will display "Over" and alarm, the infusion pump enter the KVO mode, press the **Start/Stop** button to stop the alarm.



Note: The infusion apparatus can be replaced or removed only when the stopper in the lower end of the infusion apparatus is pushed tightly.

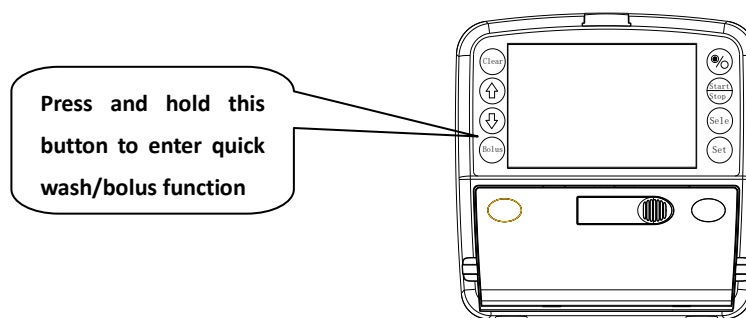
4.9 Shutdown

Press and hold the  button to hear four “beeps” and then release it, and the infusion pump will automatically turn off the power.



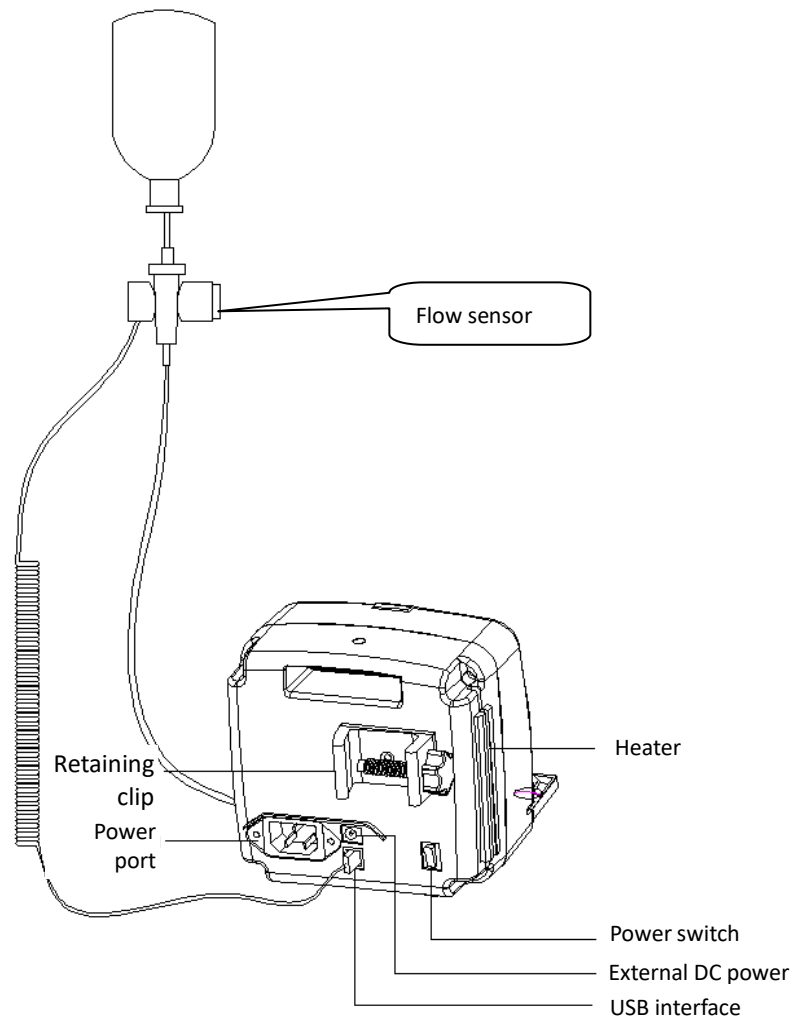
4.10 Wash/Bolus

1. In standby mode, press and hold the **Bolus** button, and the device enters the quick washing state at preset flow rate; release the **Bolus** button to exit this state; tap this button on the the touch screen to enter quick washing state, and tap again to exit. Quick washing is used to exclude air bubbles from the tube and for quick infusion, the volume of quick infusion will be included in the total volume and the preset volume.
2. In running mode, click the **Bolus** button to pop up Bolus Administration menu, enter the administration rate and dose, click the **Bolus** button again to run according to the set data of bolus administration. When the set infusion volume has finished, the system will automatically change to the original parameters and continue infusion; the additional volume will be included in the total infusion volume but not included in the preset volume.



4.11 Flow sensor operation

The flow sensor automatically monitors the infusion rate flowing through the drip cup. The data is displayed on the pump in order to provide the user a reference, but it isn't a control indicator of pump operation. The flow sensor is optional and may not be used.



1. Insert the flow sensor into the interface (USB) located in the rear bottom of the pump.
2. Pull back the handle and connect the flow sensor to the drip cup of the infusion apparatus. See illustration above.



Note:

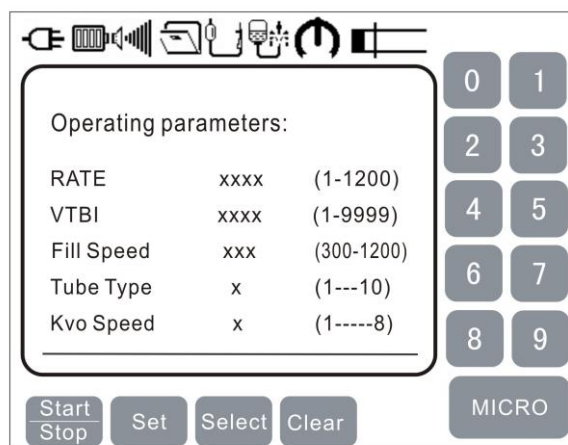
- ① Ensure that the drip cup is half-filled and remains upright;
- ② Avoid using flow sensor in direct sunlight or under AC fluorescent lamp;
- ③ Make sure that the lens is clean;
- ④ Drip cup sensor does not support hot plug; plug in the drip cup sensor before turning on the device, or else it will be invalid.

4.12 External DC power supply

The device provides external DC12V-DC24V power interface, which can be used for ambulances, field ambulances and other occasions or events away from AC power or AC power failure. Pay attention to the polarity of the interface: the inner core is positive and the outer ring is negative. When external power supply is connected, the internal battery will be charged. Do not use the AC power and external DC power at the same time.

Chapter 5 Global Parameter Settings

5.1 Operating parameter setting



5.1.1 Mode selection

Enter the operating parameter setting interface before setting whether to use the micro mode. Below the numeric keypad, click the **MICRO** button to enter the micro infusion mode, tap again to exit and resume the normal mode.

- Note: The effective range in normal mode is 1-1200ml/h, and the step size is 1ml/h; the effective range in micro mode is 0.1-99.9ml/h, and the step size is 0.1ml/h.

Micro mode does not support switching between flow rate and drip rate. Blous mode setting and mode selection are associated, that is, blous mode in normal mode is also normal mode, and blous infusion in micro is also micro mode.

5.1.2 Infusion flow rate setting

Click the **Setup** button to enter the operating parameter setting menu; the first column of the display is the infusion flow rate setting; press the **Setup** button to save and exit.

- Note: The effective range of infusion flow rate parameters in flow rate mode is 1-1200ml/h and 1-300 drops/min in drip mode, and the parameters outside this range can't be entered or saved. The setting value of drip mode is calculated in accordance with the tube of 20 drops/ml. It is only for reference, and the actual liquid drip rate varies by infusion apparatus. The effective range of flow rate in micro mode is 0.1-99.9ml/h, the parameters outside this range can't be entered or saved and drip mode is not available.

5.1.3 Preset flow setting

Click the **Setup** button to enter the operating parameter setting menu, click the **Select** button, and the second column of the display shows the preset flow setting; press the **Setup** button to save and exit.

- Note: The effective range of preset flow parameter is 1-9999ml, and the parameters outside this range can't be entered or saved.

5.1.4 Washing flow rate setting

Click the **Setup** button to enter the operating parameter setting menu, click the **Select** button twice, and the third column of the display shows the washing flow rate setting; press the **Setup** button to save and exit.

- Note: The effective range of washing flow rate parameter is 300-1200ml/h, and the parameters outside this range can't be entered or saved.

5.1.5 Infusion tube type selection

Click the **Setup** button to enter the operating parameter setting menu, click the **Select** button thrice, and the fourth column of the display shows the infusion tube type selection; press the **Setup** button to save and exit.

- Note: The effective range of infusion tube type is 1-10, and the parameters outside this range can't be entered or saved. Numbers 1-10 correspond to tube type 1-10 in tube precision parameter setting menu. In actual use, the users can adjust to the corresponding infusion accuracy when the infusion apparatus is replaced.

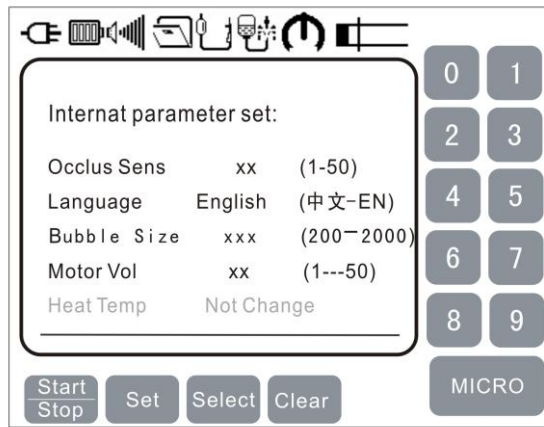
5.1.6 KVO flow rate setting

Click the **Setup** button to enter the operating parameter setting menu, click the **Select** button four times, and the fifth column of the display shows KVO rate setting; press the **Setup** button to save and exit.

- Note: The effective range of KVO rate is 1-8ml/h, and the parameters outside this range can't be entered or saved. When the preset infusion is finished, the system will turn on the alarm and automatically enter KVO mode.

5.2 Internal parameter setting

(This parameter isn't commonly used and should be set by personnel familiar with the internal parameter or the manufacturer)



5.2.1 Occlusion sensitivity setting

Press the **Bolus** and the **Decrease** button at the same time and then release to enter the internal parameter setting menu, and the first column of the display shows the occlusion alarm sensitivity setting; press the **Setup** button to save and exit.

- Note: The effective range of occlusion alarm parameters is 1-50. The greater the value, the lower the sensitivity is. Parameters outside this range can't be entered or saved. The default value of occlusion alarm parameter is 20.

5.2.2 Language setting

Press the **Bolus** and the **Decrease** button at the same time and then release to enter the internal parameter setting menu, click the **Select** button, and the second column of the display shows the language setting; click **Increase**, **Decrease** button or press number button 0 or 1 to switch between Chinese and English menu; press the **Setup** button to save and exit.

- Note: The new language takes effect after exiting the current page.

5.2.3 Bubble sensitivity settings

Press the **Bolus** and the **Decrease** button at the same time and then release to enter the internal parameter setting menu, click the **Select** button twice, and the third column of the display shows the bubble alarm sensitivity setting; press the **Setup** button to save and exit.

- Note: The effective range of occlusion alarm parameter is 200-2000. The greater the value, the higher the sensitivity is. Parameters outside this range can't be entered or saved. The default value of bubble alarm parameter is 1500.

5.2.4 Motor power setting

Press the **Bolus** and the **Decrease** button at the same time and then release to enter the internal parameter setting menu, click the **Select** button thrice, and the fourth column of the display shows the motor power setting; decrease this value appropriately to increase the motor power when the pump is jammed; press the **Setup** button to save and exit.

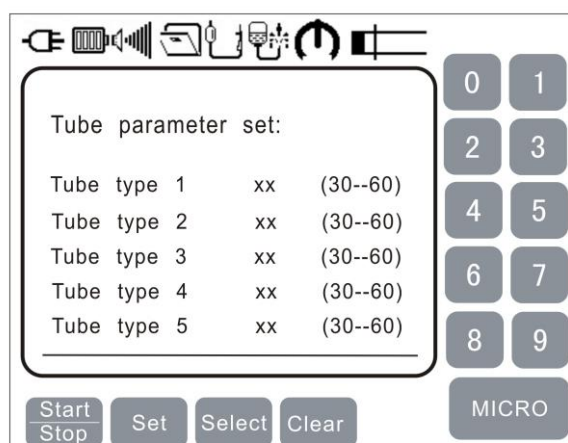
- Note: The effective range of motor power parameters is 1-50. The greater the value, the smaller the motor power is. Parameters outside this range can't be entered or saved.

5.2.5 Tube heater temperature setting (optional)

Press the **Bolus** and the **Decrease** button at the same time and then release to enter the internal parameter setting menu, click the **Select** button four time, and the fifth column of the display shows the heater temperature setting value, which is the heater temperature; press the **Setup** button to save and exit.

- Note: This function is optional and unavailable in basic version. When this function is enabled, the effective range of temperature is 30-70, and parameters outside this range can't be entered or saved. This is the heater temperature rather than the temperature of heated tube. The latter is also affected by flow rate and ambient temperature. It has been tested that the temperature of liquid flowing out the tube may be 3-5°C higher than unheated state.

5.3 Tube replacing parameter setting



The device has been calibrated referring to “Hanaco” infusion apparatus (Tianjin Hanaco Medical Co., Ltd., registration number: GSYJX (Z) 2014 No. 3662354) in the factory (calibration unit: ml). If any other brands are used, please re-set the parameters in the following steps:

5.3.1 Adjustment of infusion precision correction value

Step 1: Press the **Bolus** and the **Decrease** button at the same time and then release to enter the tube precision setting menu; the system can save the precision values of 10 types of infusion tubes;

Step 2: The screen shows the precision correction values of infusion tube 1-5; click the **Select** button to switch the tube type, and press the number button to adjust the value when the corresponding value flashes; the effective range of the value is 30-60 and other inputs won't be saved;

Precision correction value setting method: The initial precision correction value is A, the flow rate is 250ml/h, and the preset volume is 10ml; after test, if the liquid actually flowing out is 11ml, set the precision correction value to (A + 2); if the liquid flowing out is 9ml, set the precision correction value to (A-2); rule: When the difference increases by 1ml, increase the precision correction value by 2, and vice versa; the flow reduces when the correction value is increased, and the flow increases when the correction value is reduced; for infusion apparatus of different diameters, reduce the correction value of small diameter and increase the correction value of large diameter.

Step 3: Press the **Setup** button to save the parameters and exit.

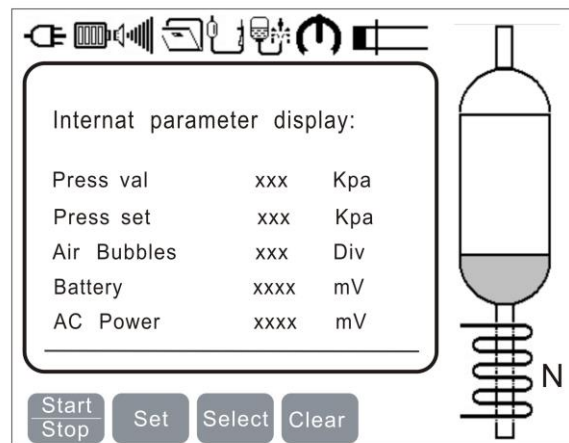
5.3.2 Default infusion precision values of certain infusion apparatus

Brand and manufacturer	Specification	Corresponding infusion precision correction value
Hanaco	H-06DC-T4	40

Tips:

1. The specifications are printed on the small handle of the infusion needle;
2. More brands and manufacturers will be added. The table is subject to update without prior notice; please check on our website;
3. The actual infusion precision using this table may be out of control. It is only intended for reference or emergency use only. For higher infusion precision, please refer to 5.3.1, or consult the dealer or manufacturer;
4. The infusion apparatus are disposable medical products and mustn't be reused. After use, please dispose of according to related requirements.

5.4 Internal parameter display menu



Press the **Bolus** and the **Decrease** button at the same time and then release to enter the internal parameter setting menu; press **Setup** to exit;

- Note:

1. You can also enter this menu during the infusion.
2. This function is used to display several important parameters when the system is running, and is mainly used for parameter setting reference and remote fault diagnosis.

Chapter 6 Product Safety

6.1 Safety Monitoring

This Infusion Pump use a plurality of high-precision sensors for monitoring of various safety conditions and informing the users through alarm.

6.2 Alarm mode

- (1) visible alarm
- (2) Audible alarm, alarm volume adjustable; the minimum sound pressure is not lower than 45dB (A), and the maximum is not less than 65 dB (A).

6.3 Alarm type

Occlusion, Air in line, Over, Low battery, AC power failure, Door open, Error, Wait Timed Out, Countdown

6.4 Alarm info processing

When the device sounds an alarm or a warning (except equipment failure), you can press the **Clear** button to cancel the alarm state. Here are some common troubleshooting methods. Please stop using and contact the supplier as soon as possible if the problems can't be eliminated.

No.	Alarm	Description	Solution
1	Occlusion	The system sets occlusion alarm threshold automatically: you only need to set the sensitivity and occlusion grade; sensitivity range is 5~50g, and beyond this range may cause false alarm or no alarm; when the infusion pressure reaches 50g, the tube pressure reaches the maximum.	When occlusion alarm occurs, all the buttons except Clear and Start/Stop are invalid. You need to press the Start/Stop button to stop the infusion or open the pump door to eliminate the alarm; the Clear button is only used to temporarily stop the alarm.
2	Air in line	Air alarm sensitivity range that can be set: 300~2000; the greater the value the higher the sensitivity is; beyond this range may cause false alarm or no alarm	When bubble alarm occurs, all the buttons are invalid, and you need to open the pump door to eliminate the alarm; the Clear button is only used to temporarily stop the alarm.
3	Over	Send alarm message when the preset infusion volume is finished; it can't be set.	When finishing alarm occurs, the system automatically enters KVO mode, and you need to press the Start/Stop button to stop the infusion and eliminate the alarm; the Clear

			button is only used to temporarily stop the alarm.
4	Low battery	When it is powered by battery, the device beeps every 40 seconds; if the battery voltage is low, the system alarms low battery about 30 minutes before the battery is run out, beeps every 5 seconds and continues to work; if the power is critically low, the system alarms continuously and automatically shuts down.	Connect AC power to eliminate the alarm, and stop the infusion and shut down.
5	Wait Timed Out	The system alarms automatically if there is no operation in 2min.	
6	Door open	If the door is opened during infusion, the system displays door open icon and sounds alarm.	Check lines, close the pump door, and press the <u>Start/Stop</u> button to continue running.

6.5 Accuracy Test

This test used “Hanaco” infusion apparatus (Hanaco Medical Material Limited, registered No.: GSYJX (Z) 2014 No. 3662354). Test based on GB 9706.27-2005 (Medical electrical equipment - Part 2-24: Particular requirements for the safety of infusion pumps and controllers) 50.102.

The test cycle is 120 minutes (repeated tests). The second hour and the last hour of the test are analyzed respectively (Fig. 1 below).

Tests showed that the infusion controller works under dynamic action. With the aging of fatigue strength of the infusion apparatus and the increase in flow rate, the accuracy error will increase (Fig. 2).

Results and recommendations: Keep the running at medium or lower flow rate, and replace the squeezed position of the infusion apparatus after five hours of continuous work.

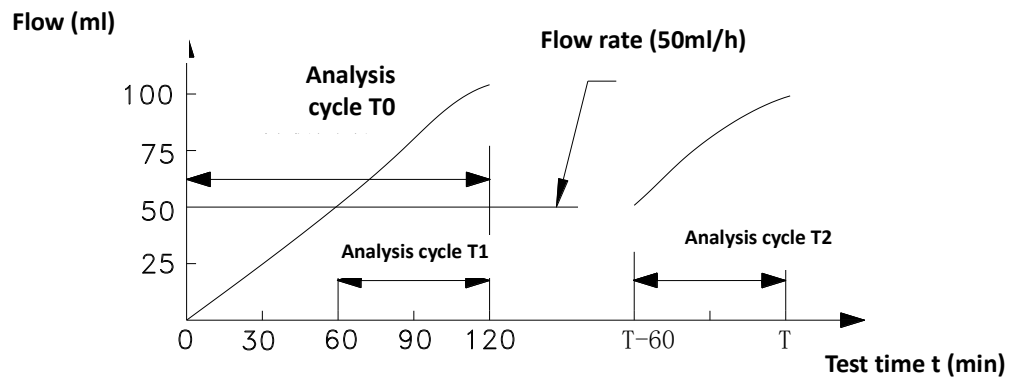


fig 1

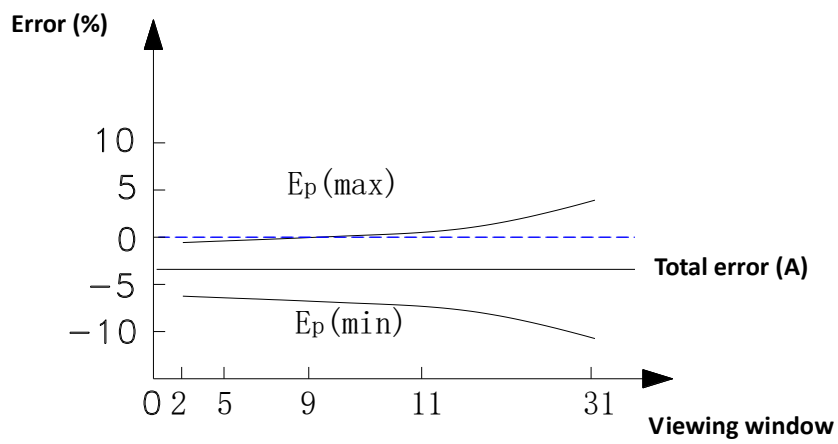


fig 2

Chapter 7 Product Care

7.1 Routine maintenance precautions

1. If necessary, clear the splashed solution after using the infusion pump; you can use disinfectant, but the infusion pump should be wiped with dry cloth or sponge; wait at least two hours before putting into use after cleaning.
2. Check the device for overflow every six months: Clamp the infusion apparatus but do not start operating, wait for a minute and check if any liquid continues to flow out; if yes, stop using it immediately and contact the supplier.
3. Do not use xylene, acetone, or similar chemicals to clean the infusion pump; these chemical agents may damage the plastic components and paint of the infusion pump.
4. If the infusion pump will be stored for a long time, first clean it thoroughly and charge the battery fully; store it in a clean, dry room at normal temperature and pressure; pack in original box to protect the pump.

7.2 Expiration date

The service life of this Infusion Pump completely depends on the aging of mechanical structure of electronic components and the maintenance. We have referred to a number of provisions of validity of domestic and foreign infusion pumps, combined with the life test of key parts of our products, and determined that the expiration date of this Infusion Pump is 5 years.

7.3 Maintenance of rechargeable battery

1. This device uses rechargeable lithium ion battery, which doesn't have memory effect. When the battery power is run out, charge for 12 hours for spare.
2. The battery charging system has overvoltage and overcurrent protection. When device is in use, the charging system automatically charges the battery and automatically disconnects the charging circuitry to prevent over-charging when it is fully charged.
3. The rechargeable battery is a consumable item. If the battery duration is less than one hour, please replace with a new battery. Abide by local laws and regulations to dispose of waste batteries.

**Note:**

1. Do not place the battery near flame or heat sources;
2. Only use dedicated batteries provided by our company.
3. The battery life is 3 years; it is recommended to replace the battery with a new one in advance.

7.4 Periodic replacement of parts

The following parts should be changed regularly, depending on the actual use.

Part	Recommended replacement period
Battery	2 years
Peristaltic pump assembly	3 years

7.5 Troubleshooting

Failure	Possible reason	Elimination method
Can't start	1. The power cable is not connected securely. 2. The power button isn't pressed for enough time.	1. Make sure that the AC power cable is connected securely; 2. Press and hold the power button until the device is started.
Can't shut down	The power button isn't pressed for enough time.	Press and hold the power button until the device is started.
Can't open pump door by pressing latch key	Pump door is damaged or opened in a wrong way.	Press the Stop button to shut down and try again or contact your dealer.
Press the "Start" button and the device alarms	1. Pump door is not closed. 2. Infusion apparatus isn't in place. 3. The power cord isn't connected properly, it is powered by battery, but the battery power is low.	1. Close the pump door. 2. Open the pump door, take out the infusion apparatus and reinstall it. 3. Check if there is AC symbol in upper right corner of the LCD screen, make sure that the AC power cord is firmly connected; if the battery power is low, please charge in time.
No AC symbol in top left corner of LCD screen	AC power cord is not connected securely.	Make sure that the AC power cord is connected securely.
"Beep" alarms every 40 seconds	1. The power cord is not connected securely. 2. It is currently powered by battery.	1. Check if there is AC symbol in upper left corner of the LCD screen; if not, make sure that the AC power cord is connected securely. 2. It is normal if powered by battery.

"Beep" alarms every 3 seconds	The battery is about to run out	The battery power will be used up soon; please charge in time.
Liquid leaks from the needle when the device is not working.	Infusion apparatus isn't in place.	Open the pump door, take out the infusion apparatus and reinstall it.
"Occlusion" alarms upon start	1. Infusion apparatus isn't in place. 2. Occlusion sensitivity is set too low	1. Open the pump door, take out the infusion apparatus and reinstall it. 2. Reset occlusion sensitivity.
"Air" alarms upon start	1. Infusion apparatus isn't in place. 2. Tip occluded 3. Air bubble in infusion apparatus	1. Open the pump door and reinstall 2. Check if the infusion tip is occluded and if manual switch is opened 3. Discharge air bubbles in the infusion apparatus.

Chapter 8 Specifications

Applicable model	Infusion Pump
Flow rate	Normal mode: (1-1200) ml/h, micro mode: (0.1-99.9) ml/h
Total injection	Range of preset infusion volume: 1-9999 ml, 0 is empty.
Bolus rate	300-1200ml/h adjustable
Accuracy	±5%
KVO rate	Continue to work at settable speed after finishing alarm to keep the vein open; setting range 1-8ml/h
Power supply	AC 100-240V, 50/60Hz
Fuse	T 2AL 350V
Built-in battery	Rechargeable lithium-ion battery, 7.4 V, 2400mAh;
Battery duration	When fully charged, work at least 3.5 hours continuously at 25ml/h speed
Battery charging	Fully charging normally takes 12 hours
Display info	Infusion rate; VTBI; VI; Air in line; occlusion; Over; AC power supply; Low battery; Door open; Real-time pressure; Countdown bar; Heating indication (optional); Infusion status indication, Error, Time Waited Out!!!, Tube, Real time
Alarm	Air in line; occl.; over; AC power failure; L.batt.; Wait Timed out!!!; door open, countdown
Occlusion alarm value	When the tube pressure is 0.08Mpa ~ 0.16Mpa, occlusion alarms; occlusion bolus dose ≤0.1ml (sensitivity 10, low pressure level), where: The occlusion response time of high-speed (flow rate 1200ml/h) running is 1~2 seconds The occlusion response time of medium speed (flow rate of 300ml/h) running is 1~2 seconds The occlusion response time of low speed (flow rate 25ml/h) running is 10~15 seconds The occlusion response time of slow (flow rate 1ml/h) running is 8~10 minutes
Bubble alarm value	Maximum sensitivity is greater than 10ul; setting 1500 is equivalent to 40ul.
Maximum dimensions	135x90x135 mm (length × width × height)
Maximum weight	≤1.6kg
Classification	Class II BF type drop-proof device
Housing material	Environmentally friendly ABS plastic
Operating environment	Ambient temperature 5~40°C, barometric pressure: 70~106kPa, relative humidity: 20%~90%

Storage conditions	Ambient temperature -15~50°C, barometric pressure: 70~106kPa, relative humidity: 20%~90%
Applicable infusion apparatus	Complying with GB 8368-2005 standard
Electrical safety	GB 9706.1-2007, GB 9706.27-2005, YY0709-2009
Technical requirement No.	xxxx2016XXXXXXXXX