Product Information

- Product Model: BioFusion S500 Vet
- Product Name: Veterinary Infusion Pump
- Manufacturer Name: Guangdong Biolight Meditech Co., Ltd.
- After Service Contact Information:

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  Post code: 519085

  Consultation hot line: +86-400-8818-233
- Service life: 10 years

Revision History

This manual has a revision number. This revision number changes whenever the manual is updated due to software or technical specification change. Contents of this manual are subject to change without prior notice.

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CE mark

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Manufacturer's Responsibility

Only under the following circumstances will manufacturer be responsible for the safety, reliability and performance of the device:

- All the installation, expansion, readjustment, renovation or repairs are conducted by the personnel certified by manufacturer.
- All the replaced components, assorted accessories and consumables involved in maintenance are original or approved by Biolight.
- The storage condition, operation condition and electrical status of the instrument conform to the product specification. The electrical installation of the relevant room complies with the applicable national and local requirements;

- The instrument is used in accordance with the user's manual.

Signs in this manual:

WARNING: Indicates a potential hazard or unsafe practice that, if not avoided, will result in death or serious injury.

CAUTION: Indicates a potential hazard or unsafe practice that, if not avoided, could result in minor personal injury or product/property damage.

NOTE: Provides application tips or other useful information to ensure that you get the most from your product.

After service

Name:	Guangdong Biolight Meditech Co., Ltd.
Address:	No.9, Yonghe Road, Hi-Tech Zone, Zhuhai, Guangdong, 519085, P.R. China
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About this manual

This manual contains the instructions necessary to operate the product safely and in accordance with its function and intended use. Observance of this manual is a prerequisite for proper product performance and correct operation and ensures patient and operator safety.

This manual is based on the most complete configuration and therefore some contents may not apply to your product. If you have any question, please contact us.

This manual is an integral part of the product. It should always be kept close to the equipment so that it can be obtained conveniently when needed.

The manual is geared for clinical professionals who are expected to have a working knowledge of medical procedures, practiced and terminology as required for monitoring

patients.

All illustrations in this manual serve as examples only. They may not necessarily reflect the setup or data displayed on your product.

Conventions:

- ***Bold Italic*** text is used in this manual to quote the referenced chapter or sections.
- 【】is used to enclose screen texts.
- → is used to indicate operational procedures.

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Chapter 1 Product Overview

1.1 Intended Use

The veterinary infusion pump is expected to be used to control the dose of liquid infused into the patient's body.

The veterinary infusion pump is expected to be used in institutes or units with healthcare capabilities.

The veterinary infusion pump delivers infusion fluids through clinically accepted routes of administration, including intravenous route.

1.2 Intended users

The veterinary infusion pump is intended to be used by clinical professionals who had experience in clinical practice and had experience with similar products.

1.3 Composition

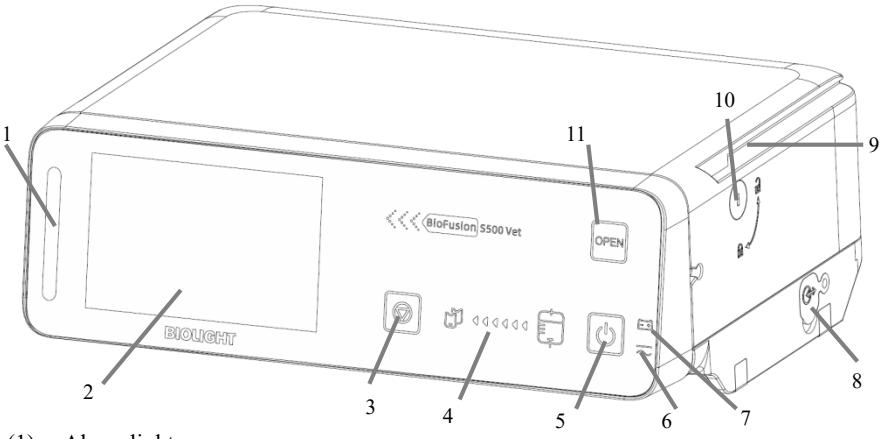
The veterinary infusion pump is composed of man-machine interaction module, pump body motion control module, door and anti free-flow clamp module, measuring and monitoring module, communication module, alarm module, battery, drop sensor (optional) and software components.

1.4 Applied part

The applied part of the pump is the infusion set.

1.5 Main Unit

1.5.1 Front View



(1) Alarm light

When an alarm occurs, this lamp lights and flashes corresponding with the alarm priority:

- High-priority alarm: the lamp quickly flashes red.
- Medium-priority alarm: the lamp slowly flashes yellow.
- Low-priority alarm: the lamp lights yellow without flashing.

(2) Display screen

(3) Stop key

In case of emergency during infusion, for example, the screen cannot be unlocked, press this key to stop the infusion.

(4) Infusion direction signs

(5) Power switch

(6) External power indicator

- On: when external power supply is connected.
- Off: when external power supply is not connected.

(7) Battery status indicator

- Green: the pump runs on battery power.

- Yellow: the battery is being charged.
- Off: no battery is installed, or no external power is connected when the equipment is off.

(8) Multi-functional connector

Used to connect the drop sensor, the nurse call system in hospitals, the veterinary patient monitor and urine monitor produced by Biolight, etc.

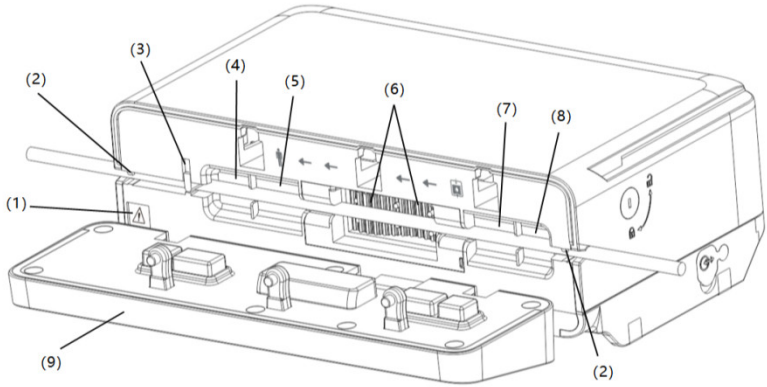
(9) Stacking chute

Used to install the handle or stack the pumps.

(10) Emergency door opening knob

When the pump door cannot be opened by the door opening key, it can be opened by manually rotating the knob.

(11) Door opening key



(1) Anti free-flow clamp indicator

Indicate the status of anti free-flow clamp. The indicator flashes when the anti free-flow clamp is open or malfunctions.

(2) Tubing channel notches

Secures the infusion set.

(3) Anti free-flow clamp

Occludes the tubing.

(4) Downstream pressure sensor

Detects the downstream pressure in the infusion set.

(5) Downstream air sensor

Detects air in the infusion set.

(6) Pumping mechanism

Pumping the liquid in the infusion set to flow as per the set direction and rate.

(7) Upstream air sensor

Detects air in the infusion set.

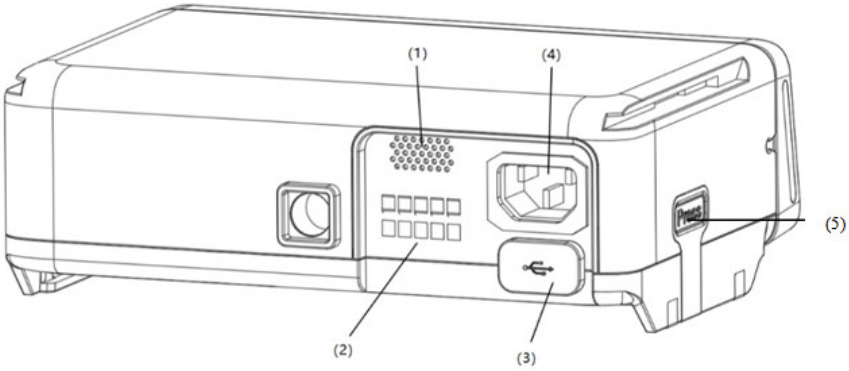
(8) Upstream pressure sensor

Detects the upstream pressure in the infusion set.

(9) Door

Open or close the pump when installing or replacing an infusion set.

1.5.2 Rear View



(1) Speaker: provides sound for audible alarms and reminder.

(2) Contact interface

- Used to connect with the Veterinary Infusion Supervision System (hereinafter called "Dock").
- Used as the DC power input interface.

(3) USB interface: used to connect USB devices.

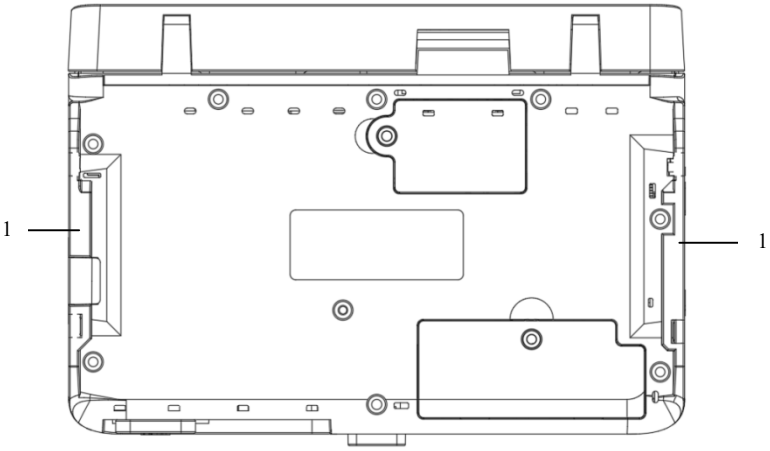
(4) AC power interface: used to connect AC power cord.

(5) Stacking clasp: used to fix or unlock the stacking.

CAUTION:

- **To prevent poor contact of the contract interface due to dust accumulation, please clean the contact interfaces as needed. Use medical cotton or a brush to gently clean the surface and ensure that no dust accumulation is found visually.**

1.5.3 Bottom View



(1) Stacking rail: used to stack the pumps.

1.6 Screen Display

The screen may look slightly different in different infusion modes. The following figure shows the infusion screen of the rate mode:



(1) Patient information area

Displays the patient type.

(2) Alarm information area

Displays the alarm status, alarm icon, alarm information or prompt information.

(3) Infusion status area

Displays the current mode, brand information, drug name, infusion status bar and major infusion parameters.

(4) System status information area

Displays the battery status, network status, relayed status, and system time. See ***1.6.1 On-screen Symbols*** for more information.

(5) Key area

Different screens display different keys. See ***1.6.3 Operation Keys*** for details.

(6) Infusion status area

Displays other infusion parameters.

(7) Pressure status area

Displays the pressure status of tubing through different symbols.

- Green: normal pressure
- Yellow: near occlusion alarm pressure
- Red: up to the occlusion alarm pressure

1.6.1 On-screen Symbols

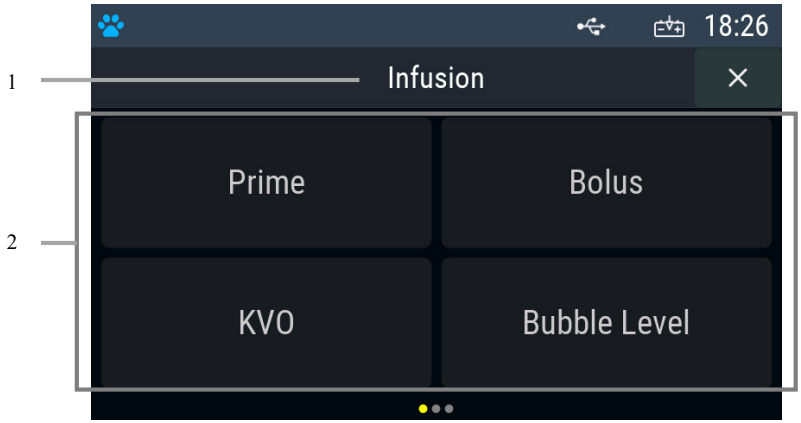
The following table lists the on-screen symbols:

Symbol	Description	Symbol	Description
	Cat, Male or Neutered		Cat, Female or Spayed
	Dog, Male or Neutered		Dog, Female or Spayed
	Other, Male or Neutered		Other, Female or Spayed
	Alarm sound pause		Alarm reset
	Wireless network is connected. The solid part indicates network signal strength.		Wireless network is not connected.
	Customized relay. The number in the green circle indicates the current pump serial number in relay.		Circular relay. The number in the green circle indicates the current pump serial number in relay.
	The battery works correctly. The solid portion represents the remaining charge.		The battery has critically low charge and needs to be charged immediately. Otherwise, the equipment will automatically shut down.

Symbol	Description	Symbol	Description
	The battery has low power and needs to be charged.		Use AC power supply.
	No battery is installed.		Battery is being charged.
	Indicates that the alarm sound is turned off.		
	A green progress bar indicates that infusion is in progress.		
	A blue progress bar indicates that prime or bolus is in progress.		
	A white progress bar indicates that KVO infusion is in progress.		
	A gray progress bar indicates that no infusion has been performed.		

1.6.2 Menu

All menus have a similar style and structure, see the figure below:



(1) Menu heading: summary of the current menu

(2) Submenus tabs or menu options

1.6.3 Operation Keys

The equipment provides operation keys for you to access some functions. The following table shows available operation keys.

Symbol	Description	Functions	Symbol	Description	Functions
	Audio pause	Pauses alarm sound.		Alarm reset	Resets the alarm.
	Lock	Locks the touch screen.		Relay	Enters the Relay Settings menu.
	Standby	Enters standby.		Prime	Initiates a prime.
	Volume	Enters the 【Volume】 menu.		Menu	Enters the menu.
	Exit	Returns to the main screen.		Bolus	Initiates a Bolus infusion.
	Start	Starts an infusion.		Stop	Pauses an infusion.
	Back	Returns to the previous menu.		Setup	Enters the setup menu.
	Restore sound	Restore the sound of the reset alarm.			
The following symbols will appear when long pressing the power switch:					
	Standby	Enters standby screen.		Turn off	Shuts down the equipment.
	Cancel	Cancels shutdown and return to the main screen.			

Chapter 2 Safety

2.1 Safety Information

WARNING:

- **To avoid risk of electric shock, the equipment must only be connected to mains power with protective earth. If a protective earth conductor is not provided, operated it on battery power, if possible.**
- **Do not use the multiple portable socket outlets (MPSOs) or AC mains extension cords. Ensure that the sum of the individual ground leakage currents does not exceed the allowable limits.**
- **To avoid fire or explosion, do not use the equipment in the presence of oxygen-rich atmospheres, flammable anesthetics, or other flammable agents.**
- **The equipment is not suitable for use in Magnetic Resonance (MR) environment.**
- **Do not open the equipment housing, or there might be a risk of electric shock. All servicing and future upgrades must be carried out by trained and authorized personnel.**
- **During infusion, the occlusion caused by tube twisting and filter condensation will increase the pressure inside the infusion set. Clearing the occlusion at this time may cause extra bolus to patients. Appropriate measures should be taken.**
- **To avoid electric shock, do not touch patient and other non-defibrillation proof equipment during defibrillation. Defibrillation will not affect the performance (infusion accuracy, alarms, signal transmission, etc.) of the equipment.**
- **The veterinary infusion pump cannot be used for blood transfusion.**

CAUTION:

- **When several infusion lines are connected to the same vascular access, there may be back flow or prolonged response time of occlusion alarm. Therefore, use check valve at the line end or follow local hospitals' instructions while in connection with other infusion system.**

- **Ensure that the equipment is supplied with continuous electric power in use. Sudden power failure may cause data loss.**
- **Electromagnetic fields may affect the equipment performance. This makes it necessary for other equipment used in the vicinity to meet the EMC standards. Mobile phones, X-ray and MRI equipment are all potential interference sources because of their high-intensity electromagnetic radiation.**
- **Always install or carry the equipment properly to avoid damage caused by drop, impact, strong vibration or other mechanical force.**
- **Dry the equipment immediately in case of rain or water spray.**
- **Some settings are password protected. Please contact the relevant personnel for password access, if needed.**
- **Do not touch the screen with sharp objects, otherwise the screen may be damaged.**
- **Do not disassemble or modify the veterinary infusion pump without authorization.**
- **Medical professionals should monitor the use on a regular basis.**
- **The veterinary infusion pump cable and accessories should be prevented from contact with high-frequency electrosurgical (ESU) equipment to avoid risk of burning in high-frequency surgery.**
- **When connecting cables of accessories, please ensure they are not in contact with other conductive parts or the ground.**
- **The contact interface should be prevented from short circuit by external foreign objects.**
- **3-CPUs design and dual-channel real-time monitoring of infusion status for preventing exceptions like insufficient or excessive dose and reporting an alarm in case of exception in time.**
- **Do not start an infusion unless the setup was verified to be correct.**
- **Please arrange the power cords and various cables reasonably to reduce risks of entanglement by or suffocation of patients, twisting of cables, or electrical disturbance.**
- **There is no patient circuit in the equipment, please keep the patients away from the equipment.**
- **Do not touch the patient and device interfaces (contact interface, USB interface**

and multi-functional interface) simultaneously. Otherwise, leakage current may result in patient injury.

- **Children shall not play with the pump.**

NOTE:

- **This manual describes the most complete configuration of the equipment. The product you purchased may not have all of them.**
- **The equipment provides power-down storage. Alarm settings and history records can be saved and will be maintained if the equipment is powered down suddenly. The storage time equals to the equipment's service life. The alarm settings before power-down will be reloaded after the equipment is restarted.**

2.2 Equipment Symbols

Some symbols may not appear on your equipment.

Symbol	Description	Symbol	Description
	Serial number		Follow the operating instructions
	Alternating/direct current		Alternating current (AC)
	Direct current		Input/output
	USB interface		Battery
IP33	Protected against solid foreign objects with a diameter no less than 2.5 mm in diameter. Protected against spraying liquid water.		Defibrillation-proof Type CF applied part
	Manufacture date		Manufacturer
	General warning sign		Non-ionizing radiation

Symbol	Description	Symbol	Description
	Standby		Stop
	Authorized representative in the European Community.		CE mark
	UK Authorized Representative		UKCA mark
	Batch code		Waste electrical and electronic equipment disposed of separately

2.3 Package Labeling

Symbol	Description
	Fragile. Handle with care.
	This Side Up.
	Keep dry.
	Stacking layer limit, where ‘n’ represents the maximum permissible number of layers. (N = 8).

Chapter 3 Equipment Preparation

Prior to use, please read this Manual carefully and get familiar with the performance, as well as the operation methods and precautions for the use of the equipment.

3.1 Safety Information



WARNING:

- **Use accessories specified by Biolight. We suggest using the infusion set of specified brand for the veterinary infusion pump. Otherwise, the equipment accuracy and alarm accuracy will be affected.**
- **The equipment software copyright is solely owned by Biolight. No organization or individual shall resort to modifying, copying, or exchanging in any form or by any means without due permission.**
- **All analog and digital devices connected to the equipment meet the requirements of specified standards (e.g. IEC 60950-1 or IEC 62368-1 safety standards for information technology equipment and IEC 60601-1 safety standards for medical electrical equipment), and all devices shall meet the requirements of IEC 60601-1 standard. Any personnel who connect the auxiliary devices to the equipment's signal input/output port are responsible for whether the system complies with IEC 60601-1. For any doubt, please contact Biolight.**
- **If it is not evident from the equipment specifications whether a particular combination with other devices for a specific function is hazardous (e.g. risk of electric shock due to summation of leakage currents), please consult us or a hospital's expert in this field. A determination must be made that the proposed combination will not negatively affect the devices themselves or the patient's safety.**
- **Ensure that the equipment is properly secured and positioned. Position change and severe shock may lead to changes to the infusion accuracy.**

CAUTION:

- **The equipment should be installed by the authorized personnel.**
- **The equipment may be contaminated by microorganisms during storage, transportation, or use. Before use, verify whether the packages are intact. In case of any damage, do not use it.**

NOTE:

- **Save the packing case and packaging material as they can be used if the equipment must be reshipped.**

3.2 Unpacking and Inspection

Check the packing case carefully before unpacking it. Please contact the manufacturer or local dealer immediately in case any damage is found. After confirming that the package is intact, open the packing case in the correct way as follows.

1. Carefully take out the veterinary infusion pump and spare parts from the packing case;
2. Save the packing case and packaging material as they can be used if the equipment must be reshipped;
3. Check the items according to the packing list and check whether there is any mechanical damage of the veterinary infusion pump and spare parts and whether all items are supplied. Please contact the manufacturer or agent immediately in case of any problem.

CAUTION:

- **Please keep the packaging materials out of reach of children. The handling of packaging materials must comply with local regulations or the waste disposal systems of hospitals.**

3.3 Environmental Requirements

The operating environment of the equipment must meet the requirements specified in this Manual.

The environment where the equipment is used shall be reasonably free from noises, vibration, dust, corrosive, flammable, and explosive substances. If it is installed in a cabinet, reserve enough space in the front and rear for easy operation, maintenance, and repair. Moreover, to maintain good ventilation, the equipment shall be at least 5 cm away from around the cabinet.

When the equipment is moved from one place to another, condensation may occur as a result of temperature or humidity differences. In this case, never start the system before the condensation evaporates.

CAUTION:

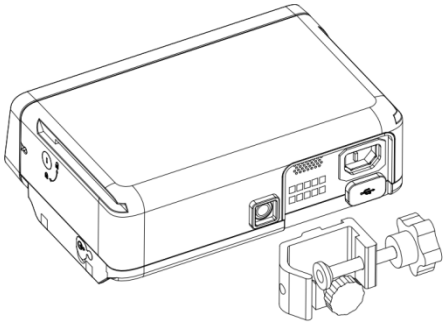
- **Make sure that the equipment operating environment meets the specific requirements. Otherwise, unexpected consequences, e.g., damage to the equipment, could occur.**

3.4 Installation

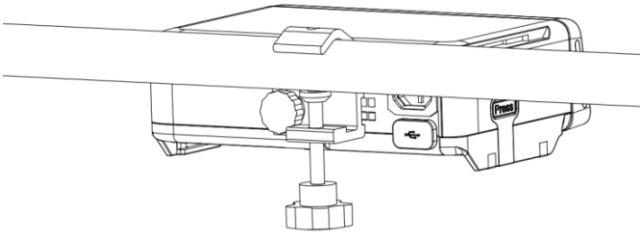
3.4.1 Installing the Pole Clamp

A pole clamp is needed to secure the pump to either the horizontal or vertical bar of the medical hanging tower or an infusion support. For its installation, please refer to the following steps:

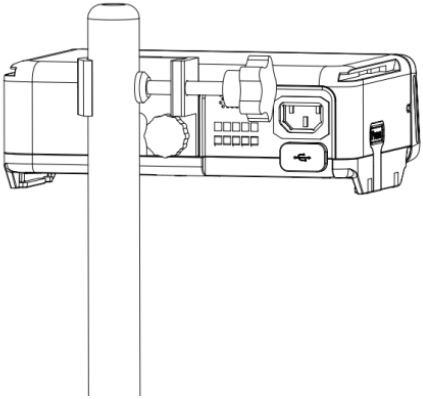
1. Install the pole clamp on the pump.



2. Loosen the clamp knob until the infusion support can be inserted.
3. Adjust the pump to a proper position and tighten the clamp knob to make it securely fixed on the horizontal or vertical bar.
   - Installing to horizontal bar



   - Installing to vertical bar



NOTE:

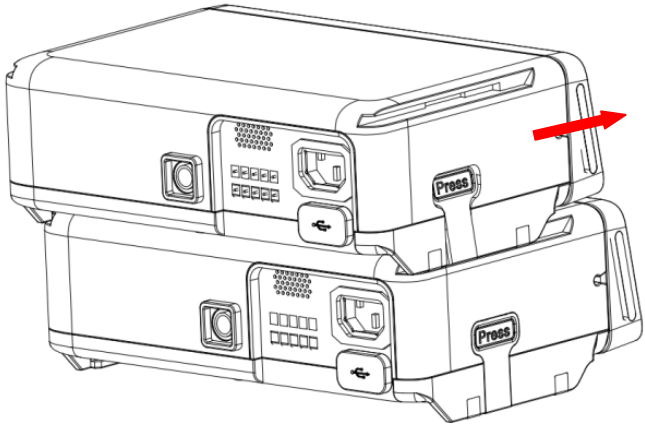
- **Infusion supports with a diameter ranging from 12 mm to 30 mm are**

recommended. Those with a diameter beyond this range may lead to insecure installation.

- **If the pump is installed on a movable infusion stand or trolley, the castors should be locked before use to prevent undesired movement.**

3.4.2 Pump Stacking

The equipment supports the stacking of multiple pumps. And support the stacking of veterinary infusion pump and veterinary syringe pump.



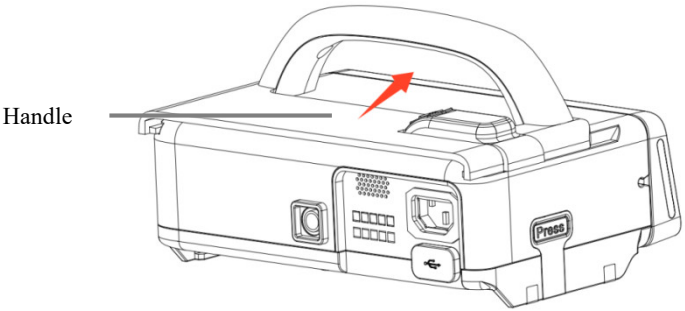
NOTE:

- **Check the infusion support for stability before mounting the pumps.**
- **Install a single pole clamp to each pump before mounting the stacked pumps to a hanging tower or infusion support.**
- **Prior to installation, ensure that the infusion support or hanging tower complies with the requirements stated in IEC 60601-1 for four times the load, and that the declared load of the infusion support or the hanging tower is greater than the total weight of the veterinary infusion pump.**

3.4.3 Connecting the Handle

The equipment can be connected with a handle for easy movement. Align the connecting

slide rail of the handle with the stacking chute of the pump, and slide the handle forward until a "click" sound is heard to complete the installation successfully.



NOTE:

- **A maximum of three pumps (stacking of veterinary syringe pump and veterinary infusion pump) can be used when a handle is used for portable use.**

3.4.4 Installing the Drop sensor (optional)

To install the drop sensor, follow this procedure:

1. Connect the signal line of the drop sensor to the multi-functional interface of the pump.
2. Install the drop sensor to the drip chamber, ensuring that the lower edge of the drop sensor is above the surface of the liquid.

CAUTION:

- **To ensure that the pump operates properly, the drop sensor should be properly installed before it is switched on.**
- **To avoid mistakenly triggering the 【Empty Bottle】 alarm, adjust the rate to lower than 400.0 ml/h when using the infusion set of 60 drops/ml.**
- **After long time infusion, small drops may hang inside the drip chamber. These small drops should be eliminated, Otherwise, they may affect the drop detection accuracy and cause the【Empty Bottle】alarm.**

NOTE:

- **The liquid surface in the drip chamber should be lower than the lower edge of the drop sensor, and lies between the one third and a half of the drip chamber.**
- **The positioning block of the drip chamber must be vertically inserted through the positioning groove of the drop sensor.**
- **Do not excessively tilt the drop sensor, or expose it to direct sunlight during infusion. Otherwise, accuracy of the drop sensor may be affected.**

3.5 Connecting the Power Source

3.5.1 Connecting the AC Mains

The equipment is powered by AC power supply. Before connecting the equipment to the AC mains, check the followings:

- The voltage and frequency ratings of the AC power input are the same as those indicated besides power plug.
- The inside and surroundings at both sides of the power cord are free of liquid or other residues.
- The inside and surroundings of the AC power connector of the equipment are free of liquid or other residues.

To connect the AC power source, follow this procedure:

1. Connect one end of the power cord to the AC power connector of the equipment.
2. Connect the other end of the power cord to the AC outlet.
3. Check that the external power supply indicator is on to ensure the AC power source is connected correctly.

The external power indicator lies on the right side of the display. When the AC mains is not connected, the external power indicator is off; when AC mains is connected, the external power indicator is illuminated in green.

CAUTION:

- **Always use the accompanying power cord delivered with the pump.**
- **Before connecting the equipment to the AC mains, check that the voltage and frequency ratings of the power line are the same as those indicated on the equipment or specified in the Manual.**
- **Do not touch the power connector with wet hand. Eliminate the liquid or any residue inside of or at the surroundings of the AC power connector and power cord connectors.**
- **Use the battery if the integrity of the protective earth conductor or the protective earthing system in the installation is in doubt.**

3.5.2 Charging the Battery

To optimize performance, a fully or nearly fully discharged battery should be charged as soon as possible. The battery is automatically charged when the pump is connected to the AC power. The battery can also be charged when the pump is in use with a Dock if the Dock is connected to the AC power.

CAUTION:

- **When the pump is installed in the Dock and works at a large infusion rate for a long time, the temperature of the pump enclosure may rise. To avoid the risk of discomfort or burns to the operator, please do not touch the pump enclosure for more than 1 second.**

NOTE:

- **The battery can only be charged by the pump or the Dock.**
- **The battery cannot be charged by the pump or the Dock when the infusion runs at a rate higher than 1200ml/h.**
- **If the pump is run by battery power, ensure that the battery is adequately**

charged. Recharge the battery as needed.

3.6 Operation and View

3.6.1 Using the Touchscreen

You can use the touchscreen to complete information input. Some operations can be completed by directly pressing on the screen.

To avoid misuse, the touchscreen is locked automatically if no operation is detected in the preset time.

To manually lock the touchscreen, swipe the touchscreen from top down, and select 【**Lock**】. To unlock the touchscreen, touch anywhere on the touchscreen and swipe the slide as instructed.

NOTE:

- **Check whether the touchscreen is damaged or cracked before use. In case of any damage or crack, stop using the equipment immediately and contact maintenance personnel.**
- **Before use, wipe off any water on the touchscreen in case of rain or water spray.**

3.6.2 Using the On-Screen Keyboard

The on-screen keyboard of the pump enables you to enter information, and the functions are as follows:

- Enter the information by selecting the characters on the keyboard.
- Select the Backspace key to delete the previous character.
- Select the Shift Up key to switch uppercase letters and lowercase letters.
- Select the Enter key to confirm the entry and close the on-screen keyboard.

3.7 General Setting

3.7.1 Setting the Screen Brightness

When the equipment is powered by battery, you can set the brightness at a lower level to

save battery power. To adjust the screen brightness, follow this procedure:

1. Swipe the touchscreen from top down → select 【**Menu**】 → select 【**System Settings**】 → select 【**Brightness**】.
2. Set the 【**Brightness [AC]**】 and 【**Brightness [Battery]**】. The pump automatically adjusts the screen brightness to the set value when the pump switches between the external power and battery power.

3.7.2 Setting the Time and Date

Prior to first use, set the system time and date to ensure that history records can be properly recorded. To set the system date and time, follow this procedure:

1. Swipe the touchscreen from top down → select 【**Menu**】 → select 【**Maintenance**】 →input password to enter the menu.
2. Select 【**Time and Language**】.
3. Select 【**Date**】 and 【**Time**】, and set the current date and time.
4. Set 【**Date Format**】.
5. If you want to use the 12h format, switch off the 【**24h Format**】.

NOTE:

- **The pump refreshes the displayed date or time format of history record after the date or time format is changed.**

Chapter 4 Getting Started

4.1 Quick Start Guide

1. Press the power switch to turn on the pump.
2. Install the infusion set: For detailed information, see ***4.4 Installing the Infusion Set***.
3. Set the infusion parameters: For detailed information, see ***4.5 Starting Infusion***.
4. If required, prime the line: For detailed information, see ***4.6 Prime***.
5. Connect the infusion set to the patient access device.
6. Press  to start infusion.
7. Press  to pause infusion.

4.2 Equipment Preparation

To ensure the accuracy of infusion, the following items need to be confirmed before starting infusion:

- The pump is placed on a stable surface, or securely mounted to a infusion support by pole clamp, or placed in the module slot of the Dock.
- The pump is plugged into a properly-grounded AC power outlet. See ***3.5.1 Connecting the AC Mains*** for details.
- Press the power switch to turn on the pump. The pump automatically performs a self-test at startup. Check that the alarm tone is heard, and the alarm light illuminates, one after the other, in red, yellow and cyan. This indicates that the visible and audible alarm indicators function correctly.
- If the pump is run on battery power, ensure that the battery is adequately charged.

 **CAUTION:**

- **Before use, the operator must verify that the equipment and accessories can work normally and safely.**
- **Check that whether the alarm system performs a self-test when the equipment is powered on, and whether relevant alarms are given then. Please contact your service personnel or us immediately if the equipment cannot work properly.**
- **Do not use the equipment if you suspect it is damaged or cannot work properly. Please contact your service personnel or us immediately.**

NOTE:

- **To ensure that you have a clear view of the pump interface, stay within 0.5 meter of the pump while setting up and operating the pump.**
- **The equipment uses a mains plug as an isolation means to the AC mains. Please place the pump in a place where the power plug can be easily plugged in and out.**

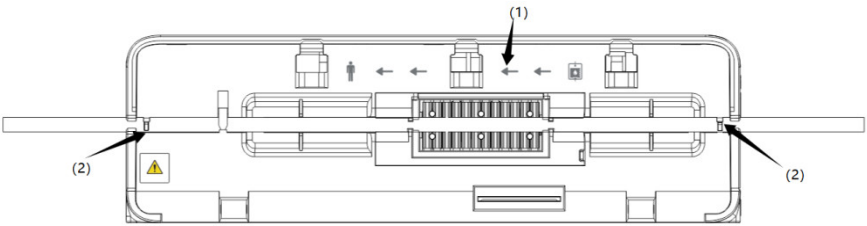
4.3 Preparing the infusion bag

The height of infusion bag affects the pump running accuracy. To prepare the infusion bag, follow this procedure:

1. Hang the infusion bag to the infusion support.
2. Adjust the height of the pump so that there is 51 ± 5 cm (20 ± 2 in.) between the fluid line and the middle of the pump. Distances beyond this tolerance can adversely affect the infusion accuracy.

4.4 Installing the Infusion Set

1. Close the roller clamp or Robert clamp of infusion set.
2. Press Door opening key to open the pump door.
3. Straighten the infusion line and insert it into the tubing channel notches (2) from left to right, following the flow direction indicator (1). Ensure that the infusion line is secured into the tubing channel notches (2) on both ends.



4. Close the pump door.

CAUTION:

- **To ensure the accuracy of air bubble detection, check and remove the remained fluid in the tubing channel notches before installing the infusion set.**
- **While installing the infusion set, do not touch the anti free-flow clamp to avoid being hurt.**
- **The pump must be mounted to the same level as the patient's heart. The most accurate pressure monitoring in the infusion set is achieved when the pump is positioned close to the patient's heart level.**
- **We recommend you to use an infusion set stated in this manual. If a non-recommended infusion set must be used, please contact us for calibration and performance test on the equipment before use. Otherwise, the infusion performance, including the accuracy, pressure detection and alarm function of the pump, may be adversely affected.**
- **To ensure the accuracy of rate and alarm detection, the infusion set should be calibrated on this pump before use.**
- **Disposable infusion sets are not designed to be reused. Reuse may cause performance degradation or cross infection.**
- **Too slack or too tight of the infusion line may lead to inaccurate flow.**

NOTE:

- **To avoid pinching your hands, do not put your fingers in the crack of the door when the electric pump door is closed.**
- **Make sure that the infusion set is securely clipped into the tubing channel notches after installing the infusion set.**
- **Disposable infusion set with a Luer port meeting the standard is recommended.**

4.5 Starting Infusion

Enter the setup screen after the infusion set is installed properly:

1. Select the brand of the infusion set.

2. Select the drug. If the prescribed drug is not available, exit the drug selection screen, or select 【**Undefined**】.
3. If required, set the infusion mode. For more information, see ***Chapter 5 Infusion Modes***.
4. Set infusion parameters.
5. Open the roller clamp or Robert clamp.
6. Prime the line, if necessary. For more information, see ***4.6 Prime***.
7. Connect the infusion set to the patient.
8. Check the following:
   - Verify parameter settings according to the prescription.
   - Verify that the displayed infusion set brand and type correspond with the currently used infusion set.
9. Press ⏀ to start infusion.

WARNING:

- **Do not connect the pump to the patient until the infusion set has been primed and installed into the pump.**
- **Check that no drops are falling in the drip chamber before infusion starts or stops. If drops are falling, close the roller clamp or the Robert clamp, do not use the equipment, and contact the manufacturer.**

NOTE:

- **The infusion could not be started when the door is open. During an infusion, the door opening key is invalid.**

4.6 Prime

The infusion set should be primed prior to infusion. If the infusion set is not primed manually before being installed into the pump, proceed as follows to prime the tubing.

1. Ensure that the infusion line is disconnected from the patient.
2. Open the roller clamp or Robert clamp of infusion set.

3. Swipe the touchscreen from top down and select .
4. Select OK to start priming.
5. If required, set the 【**Rate**】 of Prime.
6. When priming is completed, select  to stop priming.

**WARNING:**

- **Disconnect the infusion tube from the patient before priming.**
- **Only during the non-infusion can the prime be performed.**

**NOTE:**

- **If required, adjust the prime rate after the prime is started. The initial prime rate is 1200ml/h.**
- **The【Single Bubble】or【Cumulative Bubble】alarm will not be given during priming.**
- **The volume used for priming is not added to the infused volume.**
- **High-speed priming may cause an occlusion alarm when high-viscosity solutions and small needles are used. At this point, reduce the flow rate and continue priming.**

4.7 Bolus Infusion

Bolus infusion is a controlled volume of fluid or drug being delivered at an increased rate for diagnostic or therapeutic purposes. The pump should be connected to the patient during bolus infusion.

**NOTE:**

- **The delivered bolus volume will be added to the total infusion volume and subtracted from the volume to be infused (VTBI).**
- **The pump gives a beep every time a 0.50 ml bolus volume is infused.**

4.7.1 Setting the Bolus Rate

To set the bolus rate, follow this procedure:

1. Swipe the touchscreen from top down → select 【**Menu**】→ select 【**Infusion**】→ select 【**Bolus**】.
2. Set the 【**Default Rate**】**.**

4.7.2 Automatic Bolus Infusion

To perform an automatic bolus infusion, follow this procedure on the infusion running screen or parameter setting screen:

1. Select  from the main screen.
2. Set the bolus volume in the popup on-screen keyboard.

The pump continues the infusion when the configured bolus volume has been infused. If required, select  to stop the bolus infusion.

NOTE:

- **If required, adjust the bolus rate in the 【Rate】 area during bolus infusion.**

4.7.3 Manual Bolus Infusion

To perform a manual bolus infusion, follow this procedure on the infusion running screen or parameter setting screen:

1. Long press on the main screen to start a manual bolus infusion.
2. Release  to end the manual bolus infusion. The pump automatically stops the manual bolus infusion when the preset bolus volume limit is reached.

NOTE:

- **The manual bolus volume limit is set in the 【Infusion】 menu. For details, *see 10.2.2 Bolus*.**

4.7.4 Setting the Bolus Volume Unit

To set the bolus volume unit, follow this procedure:

1. Swipe the touchscreen from top down → select **【Menu】** → select **【Infusion】** → select **【Bolus】**.
2. Select the **【Bolus Unit】**:
   - **【ml】**: the **Bolus Volume Unit** is ml in each infusion mode.
   - **【Dose】**: in the **Weight Mode** or **Dose Time Mode**, **Drug Amt.** and **Volume** or **Conc.** is set up, the **Bolus Volume Unit** is the **Drug Amt.** unit or the corresponding unit of the **Conc.**

4.8 Changing the Infusion Parameters

You can modify flow rate and dose rate without stopping the infusion in the fusion process. This function is called online titration:

1. Select the parameter area to be modified on the infusion running screen.
2. Reconfigure the infusion parameters in the popup screen and ensure the modified parameters are consistent with the prescription.

NOTE:

- **The online titration function is disabled by default, which can be enabled by password. For details, see *11.11 Parameter Switch*.**

To change other infusion parameters, it needs to pause the infusion. Follow this procedure:

1. Select on the infusion running screen to pause the infusion.
2. Select the desired parameter area, and reconfigure parameters as per the prescription and select **Enter**. Ensure the modified parameters are consistent with the prescription.
3. Close the parameter area and conform the change.
4. Select to resume the infusion.

4.9 Pausing the Infusion

If required during infusion, select on the main screen to pause the infusion.

Select to restart the infusion.

4.10 Setting Keep Vein Open (KVO) Rate

At the end of infusion, the pump continues to infuse at a very low rate. KVO is used to keep the patient's vein open, to prevent back flow or vascular occlusion.

The default KVO rate is 0.50 ml/h. To edit the KVO rate, follow this procedure:

1. Swipe the touchscreen from top down → select **【Menu】** → select **【Infusion】** → select **【KVO】**.
2. Set the **【Rate】** of KVO.

NOTE:

- **If the KVO rate is greater than the current infusion rate, the pump will continue to infuse at the current infusion rate after the volume to be infused is completed.**
- **The pump runs for 30 minutes at a KVO rate. At the completion of the KVO infusion, the pump stops infusion, and gives a 【KVO Finished】 alarm.**
- **The volume used during KVO infusion will be added to the total infusion volume.**

4.11 Replacing the Infusion Bottle (Bag)

To replace the infusion bottle (bag), follow this procedure:

1. Before replacing the infusion bottle (bag), please be sure to close the roller clamp or Robert clamp to prevent harm to the patient caused by free flow. If it needs to replace the infusion bottle (bag) during infusion, press  to stop infusion first and then close the roller clamp or Robert clamp.
2. Remove the infusion bottle (bag) installed, and replace a new one.

NOTE:

- **Check the infusion status after replacing the infusion bottle (bag). If the pump is running at a KVO infusion, reconfigure the infusion parameters before restarting the infusion.**

4.12 Executing the Treatment Regimen

You can choose a treatment regimen from the most recently recorded 20 regimens. Follow

this procedure:

1. Swipe the touchscreen from top down → select 【**Menu**】 → select 【**Infusion**】 → select 【**Treatment**】.
2. Click 【**Select**】 on the right side of the regimen to be executed.
3. Set the infusion parameters on the infusion parameter setting screen.
4. Press  to start infusion.

4.13 Removing the Infusion Set

1. Select  in the main screen to pause the infusion.
2. Close the roller clamp or Robert clamp and disconnect the patient from the infusion set.
3. Press the door opening key to open the pump door.
4. Grasp the infusion line on both sides of the pump and take it out.
5. Proceed the next operation as needed:
   - Continue the therapy: see ***4.4 Installing the Infusion Set*** and ***4.5 Starting Infusion***.
   - Enter the Standby mode: see ***4.17 Entering the Standby Mode***.
   - Turn off the pump: see ***4.18 Turning Off the Pump***.



WARNING:

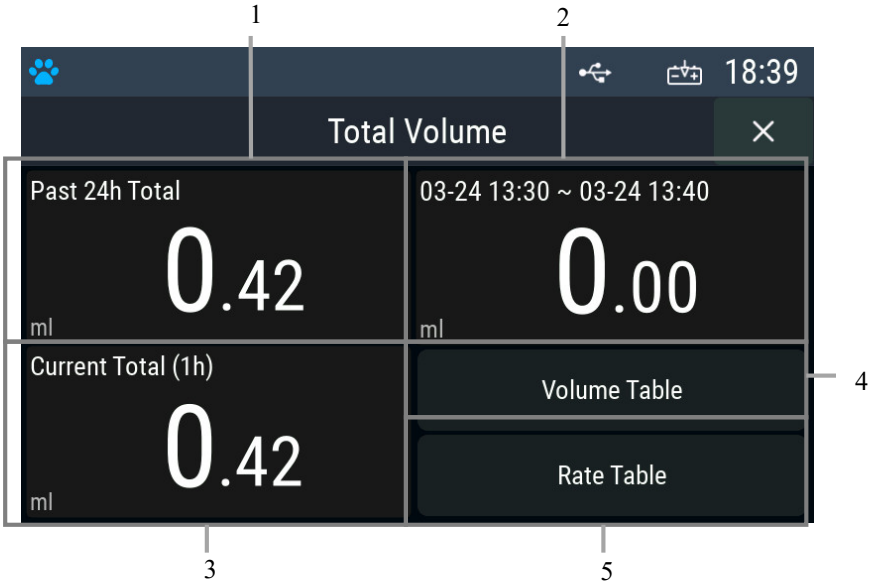
- **To prevent the liquid from flowing due to gravity, ensure that the roller clamp or Robert clamp is closed before removing the infusion set from the pump.**
- **It is recommended to replace the infusion set every 24 hours.**
- **Long-time fixing without moving or replacing the infusion tubing may result in underdose infusion, which may affect the infusion accuracy. After the pump works for 8 consecutive hours or as per local regulations, it is recommended to stop the infusion, open the pump door, change the infusion tubing's position at the peristaltic pump tablet for about 10 cm and then continue the infusion. If infusion sets not recommended by this Manual are used, adjust the fixing site every 4 hours.**

4.14 Viewing the Infused Volume

The total infused volume is how much fluid the pump delivers to the patient in a certain time. The pump supports the set time period or time interval for the user to view the infused volume of the patient as per the set time period or time interval.

Choose either of the following ways to view the cumulative infused volume in a certain time:

- Swipe the touchscreen from top down → select 【**Volume**】.
- Select the 【**Volume**】 on the pause screen.



(1) 【**Past 24h Total**】: the total infused volume in the past 24 hours (display range: 0.00 ml to 99999.99 ml). Select 【**Clear**】 to clear the total infused volume.

(2) View the total infused volume within the configured time period.

Configure the time period before viewing the total infused volume in the configured time period.

(3) View the recent total infused volume.

Configure the time before viewing the total infused volume within the configured time.

(4) 【**Volume Table**】: view the total infused volume of the configured time interval.

Configure the time interval in the lower right corner before viewing the total infused volume of that interval.

(5) 【**Rate Table**】: view the history rate.

NOTE:

- **The total volume cannot be cleared during infusion.**

4.15 Drug Library

The pump can be configured with a drug library (optional), which can at least save 5000 drug names, provide at least 20 colors for drug marking and support at least 30 drug categories. It also supports hard limits and soft limits (drug correction function), that is, the drug infusion parameters cannot exceed the hard limits of the drug library. When the infusion parameters exceed the soft limits of the drug library and are within the hard limits, the pump can still start infusion with a prompt. To set drug parameters, such as the default concentration, infusion rate, hard and soft limits, please contact the manufacturer and local dealer.

4.16 Prescription

After the pump is inserted into the Dock, which is connected with the veterinary infusion central monitoring system (CMS) as per ***9.3 Connecting the CMS***. Then the prescription can be issued from the CMS to the pump and the patient information can be also synchronized to the pump. Patient information and prescription information can be viewed.

NOTE:

- **After the pump is inserted into the Dock, the CMS will issue the prescription to the pump via the Dock.**
- **After the prescription is issued, it needs to confirm whether the prescription issued to the pump is consistent with the actual one before starting infusion.**
- **The pump cannot be operated through the CMS.**

4.17 Entering the Standby Mode

The standby mode is used to temperately stop an infusion without switching off the pump.

In non-infusion state, swipe the touchscreen from top down, and select  to enter the standby mode.

While the pump is in the standby mode, select  to set the time to exit the standby mode. When the configured standby time is expired, the pump exits the standby mode automatically. Range of standby time is: 00:00:00~24:00:00.

To manually exit the standby mode, select .

4.18 Turning Off the Pump

Before turning off the pump, perform the following check:

1. The infusion can be completed.
2. The patient is disconnected from the pump.
3. The infusion set is removed from the pump.

To turn off the pump, select 【**Turn Off**】in the popup dialog.

**CAUTION:**

- **Press and hold the power switch for no less than 3 seconds to forcibly shut down the pump if it could not be shut down normally. This may cause data loss or damage to the equipment, and therefore is not recommended.**

 **NOTE:**

- **Turning off the pump does not disconnect the pump from the AC mains. To completely disconnect the power supply, unplug the power cord.**

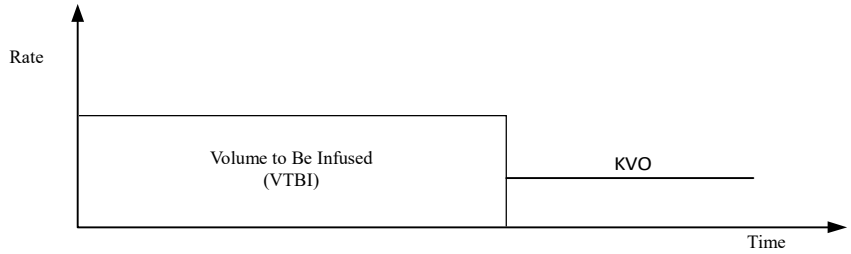
Chapter 5 Infusion Modes

The pump provides the following infusion modes:

- Rate mode
- Time mode
- Drip Mode
- Weight Mode
- Loading Dose Mode
- Micro mode
- Sequence mode
- Intermittent Mode
- Ramp Mode
- Dose Time Mode

5.1 Rate Mode/Time Mode

Both the rate mode and the time mode apply to drugs that are infused continuously at a set rate (ml/h). Rate mode and time mode offers three parameters: Rate, Time and VTBI. When two of these parameters are entered, the third is calculated.



NOTE:

- **The above diagram is also applicable for Drip Mode, Weight Mode, Micro Mode and Dose Time Mode.**
- **When infusing in the rate mode and time mode, the rate must be set, but the time and VTBI settings are optional.**

5.2 Drip Mode

Drip mode is suitable for continuous infusion of drugs at a set drop rate (dot/min) as specified in the prescription. Drip mode offers three parameters: rate, time and VTBI. When two of these parameters are entered, the third is calculated automatically.

NOTE:

- **When infusing in the drip mode, the drop rate must be set, but the time and VTBI settings are optional.**

5.3 Weight Mode

Weight mode allows you to enter the drug amount, volume or concentration.

After the patient weight, dose rate, VTBI and concentration are entered, the pump can automatically calculate infusion rate and time. The conversion formula is as follows:

- Rate (ml/h) = (Dose Rate* Weight)/Conc.
- Dose Rate = (Rate* Conc.)/Weight
- Time = VTBI/Rate
- Conc. = Drug Amt./Volume

【Drug Amt.】, **【Volume】** or **【Conc.】** can be configured as needed. Weight unit can also be set as needed. See ***Chapter 11 User Maintenance Settings***.

You can change the units of drug amount, dose rate, and concentration before starting an infusion or when the infusion is paused.

NOTE:

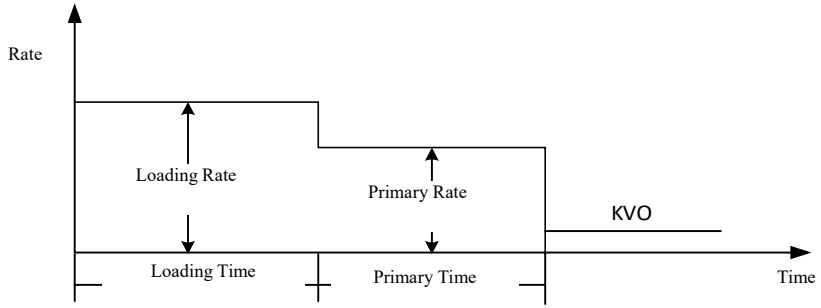
- **Rate and time can only be obtained by calculation, which are not available for manual input.**
- **In the weight mode, the supported dose rate units are X/kg/min, X/kg/h, X/kg/24h, in which X represents ng, ug, mg, g, mU, U, kU, EU, mmol, mol, mcal, cal, kcal, and mEq.**

5.4 Loading Dose Mode

In the loading dose mode, an infusion is divided into two stages:

- Deliver the **【Loading VTBI】** at the **【Loading Rate】**.

- Deliver the remaining infusion volume at the 【**Primary Rate**】 (VTBI minus Loading VTBI).



5.5 Micro Mode

Micro mode is typically used for the low-rate infusion for patients.

Micro mode offers three parameters: rate, VTBI and time. When two of these parameters are entered, the third is calculated automatically.

The setting ranges of rate and VTBI in Micro mode are as follows:

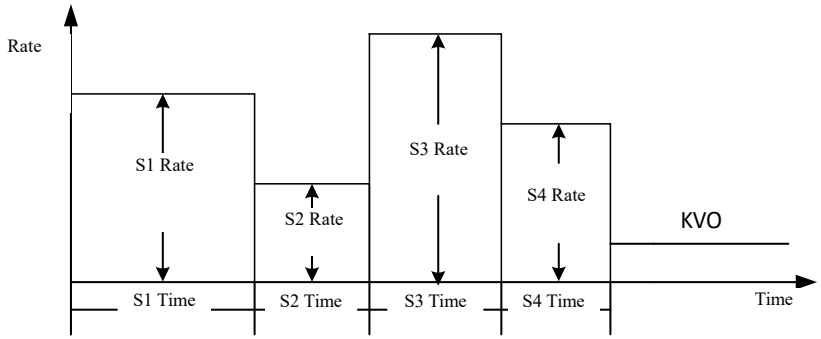
Parameter	**Set Range**
Rate	(0.10~100.0) ml/h
Volume to Be Infused (VTBI)	(0.10~1000.00) ml

NOTE:

- **In Micro mode, the rate must be set before starting infusion, while VTBI and time are optional.**

5.6 Sequence Mode

In sequence mode, you can set several sequences. Each sequence defines a set of parameters: rate, time and VTBI. The pump infuses at the set sequence.



In sequence mode, when two of the rate, VTBI and time are entered, the third is calculated automatically.

5.6.1 Adding/Deleting Sequences

You can add up to 10 sequences in the sequence mode. To add or delete a sequence, follow this procedure:

1. Long press a desired sequence (such as S1) on the parameter setup screen.
2. In the popup dialog, make the following settings as needed:
   - Select **【Add Sequence Upward】** to add a sequence before the current sequence.
   - Select **【Add Sequence Backward】** to add a sequence after the current sequence.
   - Select **【Delete】** to delete the current sequence.

5.6.2 Changing the Infusion Parameters

You can change the rate of the current sequence during an infusion. If you want to change the time or VTBI of the current sequence, press to pause the infusion and select the desired parameter area to make the change.

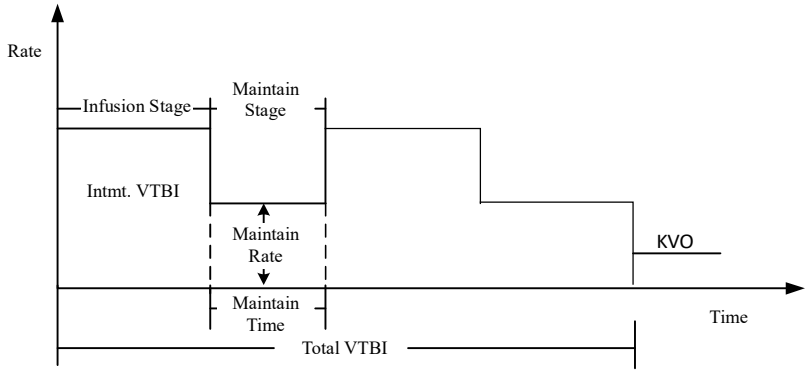
To change parameters of other sequences, follow this procedure:

1. Press to pause the infusion.
2. Enter the parameter area and select the sequence to be changed.
3. Change the sequence as needed.

5.7 Intermittent Mode

In the intermittent mode, intermittent infusion and maintenance are performed alternately and circularly until the infusion is completed.

- Infusion stage: the pump runs a high-rate infusion at the set **【Intermittent Rate】** and **【Intermittent VTBI】** and then automatically enters the maintenance stage.
- Maintenance stage: the pump runs a low-rate infusion at the set **【Maintain Time】** and **【Maintain Rate】**. The pump does not infuse at this stage if **Maintain Rate** is not set.



NOTE:

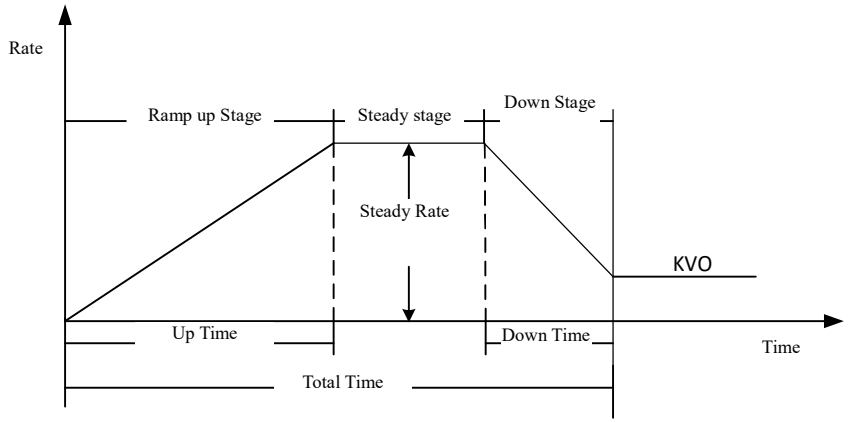
- **Total VTBI and Maintain Rate are optional parameters. If Maintain Rate is not set, infusion stops at the maintenance stage. If the Total VTBI is not set, the infusion stops when the infusion bag is empty**.

5.8 Ramp Mode

In the ramp mode, the infusion is running at increasing or decreasing rates, including the following three stages:

- Ramp up stage: in the set ramp up time, the infusion rate increases until the preset steady rate is reached, and then enters the steady stage.
- Steady stage: the pump infuses at a steady rate.
- Ramp down stage: after the steady infusion is completed, the infusion rate decreases

in the set ramp down time until the set VTBI is completed.



NOTE:

- **The Steady Rate can only be obtained by calculation. It is not available for manual input.**
- **Up Time and Down Time are optional parameters. The pump runs an infusion at the steady rate if they are not set.**

5.9 Dose Time Mode

The dose time mode allows the operator to directly enter the drug amount, volume or concentration. In dose time mode, the pump can automatically calculate the infusion rate after the drug amount, volume, concentration, VTBI and dose rate are set. The calculation formula is as follows:

- Rate = Dose Rate/Conc.
- Dose Rate = (Rate* Conc.)/Weight
- Time = VTBI/Rate
- Conc. = Drug Amt. /Volume

【Drug Amt.】, **【Volume】** or **【Conc.】** can be configured as needed. See ***Chapter 12 Maintenance***.

You can change the units of drug amount, dose rate, and concentration before starting an

infusion or when the infusion is paused.

NOTE:

- **In the dose time mode, the supported dose rate units are X/min, X/h and X/24h, in which X represents ng, ug, mg, g, mU, U, kU, EU, mmol, mol, mcal, cal, kcal, and mEq.**
- **Rate and time can only be obtained by calculation, which are not available for manual input.**

Chapter 6 Patient Management

6.1 Discharging/Admitting a Patient

Before admitting a new patient, discharge the previous patient. After the patient is discharged, all patient data, including the patient information, are cleared. After a patient is discharged, the pump automatically admits a new patient.

To discharge a patient: swipe the touchscreen from top down → select **【Menu】** → select **【Patient】** → select **【Discharge】**.

The pump discharges the patient automatically after the veterinary CMS or patient monitor discharges the patient.

CAUTION:

- **Always discharge the previous patient before starting an infusion for a new patient. Failure to do so can lead to data of the next patient being stored to the current patient.**

6.2 Managing Patient Information

6.2.1 Editing Patient Information

After a patient is admitted, you can edit the patient information if it is incomplete or needs to be changed. The procedure is as follows:

1. Swipe the touchscreen from top down → select **【Menu】** → select **【Patient】** and enter the Patient Management menu.
2. Edit patient information as required.

6.2.2 Exporting Patient Information

You can export the information of the current patient with a USB disk. The methods as follows:

1. Insert the USB disk to the USB interface on the rear housing of the pump. If the pump is connected to the Dock, you can connect the USB disk to the USB interface on the rear housing of the Dock.

2. Swipe the touchscreen from top down → select 【**Menu**】 → select 【**Patient**】 → select 【**Export Patient**】.
3. Select 【**OK**】 to export the patient information.

6.2.3 Importing Patient Information

You can import the information of the current patient with a USB disk. The methods as follows:

1. Insert the USB disk to the USB interface on the rear housing of the pump. If the pump is connected to the Dock, you can connect the USB disk to the USB connector on the rear housing of the Dock.
2. Swipe the touchscreen from top down → select 【**Menu**】 → select 【**Patient**】 → select 【**Import Patient**】.
3. Select 【**OK**】 to import the patient information.

Chapter 7 Using the Dock

This equipment can be used together with the Veterinary Infusion Supervision System (Dock) developed by Biolight. For how to use the Dock, see the ***User Manual of Veterinary Infusion Supervision System***.

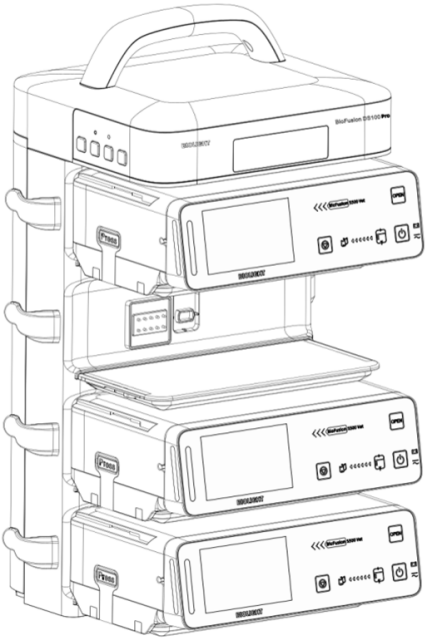
7.1 Securing the Pump in the Dock

Firmly push the pump into the module slot in place, and you will hear a "click" sound.

To remove the pump out of the slot, press the Stacking clasp and remove the pump.

CAUTION:

- **After the pump is secured in the Dock, the alarm sound from the pump is enabled and is given through the Dock.**



7.2 Relay Infusion

Multiple pumps can be combined to infuse at a preset sequence when used with the Dock. Pumps in a single Dock or pumps in a cascade Dock are all available for relay infusion.

NOTE:

- **Relay infusion is available for Rate Mode, Micro Mode, Time Mode, and Weight Mode.**
- **When a relay infusion is set up, the sequence of the current pump in the relay is displayed in the system information area of the main screen. For example,  indicates that the sequence of the current pump is 2 in a circular relay.**
- **You cannot change the sequence of the pumps when the relay infusion is set up.**

7.2.1 Setting up a Relay Infusion

To set up a relay infusion, follow this procedure:

1. Connect the pumps to the Dock.
2. Swipe the touchscreen from top down → select 【**Relay**】.
3. Select one of the following options:
   - 【**Custom**】: The relay infusion runs in a preset order, and completes when the last relay pump finishes the infusion.
   - 【**Cycle**】: The relay infusion in an order of the slot sequence in the Dock. The first pump continues to infuse when the last relay pump completes the infusion.
   - 【**Order**】: The relay infusion in an order of the slot sequence in the Dock, and completes when the last relay pump finishes the infusion.
4. Select whether to agree to the relay on the pumps in the dialog.
5. Please select the sequence of the relay pumps if the relay method is 【**Custom**】.
6. Set the infusion parameters respectively for the relay pumps.
7. Start the infusion of the first pump in the relay.

7.2.2 Canceling the Relay

To cancel a relay infusion, swipe the touchscreen from top down → select 【**Relay**】 → select 【**Exit**】→select 【**OK**】 in the dialog.

- For the 【**Cycle**】, canceling at the current pump.
- For the 【**Custom**】, canceling at the current pump.
- For the 【**Order**】, canceling at the current pump.

CAUTION:

- **Removing a relay pump from the Dock cancels the relay infusion.**
- **For a circular relay, initiating a middle pump cancels the relay. For Custom relay, initiating a middle pump (including the Bolus) disrupts the relay before it and remains the rest after it.**

7.3 Setting the Dock

When pumps are connected to the Dock, you can configure the Dock through the pump and can configure in batches for all pumps through the Dock. For Details, see the ***User Manual of Veterinary Infusion Supervision System***.

NOTE:

- **【Dock】 setup and 【Batch Setting】 menu is only displayed when the pump is uploaded to the Dock.**

Chapter 8 Alarms

8.1 Alarm Safety Information

CAUTION:

- **A potential hazard can exist if different alarm limits and default settings are used for the same or similar pumps in the same care area, for example an intensive care unit or operating room.**
- **The pumps in the same care area may each have different alarm settings to suit different patients. Always check that the alarm settings are appropriate for the infused patient before start infusing.**
- **When the alarm sound is paused, the pump gives no alarm tones even if a new alarm occurs. Be careful about whether to pause the alarm sound or not. When the alarm sound is paused, observe the patient frequently.**
- **Do not rely exclusively on the audible alarm system during an infusion. Adjustment of alarm volume to a low level may result in a hazard to the patient. Always make sure that the audio alarm volume level is adequate in your care environment, and keep the patient under close surveillance.**

8.2 About the Alarms

All alarms of the pump are technical alarms.

8.2.1 Alarm Priorities

By severity, the alarms are classified into the high priority alarms, medium priority alarms and low priority alarms.

8.2.2 Alarm Indicators

When an alarm occurs, the pump indicates it visually and audibly. For more information, see the following table:

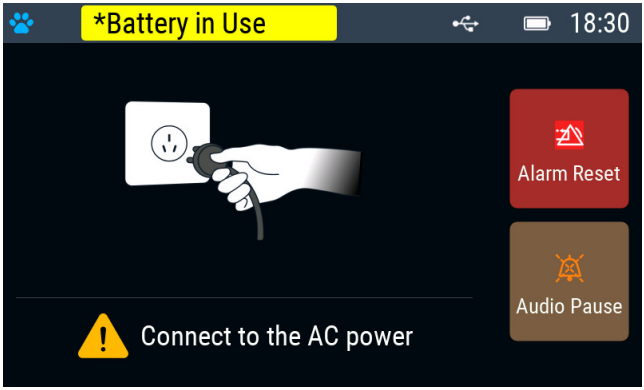
Alarm Priority	Indicator Color	Indicator Flash Frequency	Alarm Sound Interval	Alarm Info.	Alarm Priority Symbol	Duty Cycle
High priority alarm	Red	2.0±0.6Hz	10s (±2s)	White text and symbol with a red background	***	20%~60 %
Medium priority alarm	Yellow	0.5±0.2Hz	20s (±2s)	Black text and symbol with a yellow background	**	20%~60 %
Low priority alarm	Yellow	Continuous on	25s (±2s)	Black text and symbol with a yellow background	*	100%

NOTE:

- **The interval of the reminder sound is 5min.**
- **When multiple alarms occur simultaneously, the alarm messages are displayed circularly, and the sound and light of the higher priority alarm are given.**

8.3 Alarm Screen

When an alarm occurs, the alarm screen is displayed to help you identify the problem.



NOTE:

- **The alarm screen always displays the alarm of the highest priority.**

8.4 Resetting Alarms

When an alarm occurs, press **【Alarm Reset】** on the alarm screen to reset the current alarm. The alarm reset state has the following features:

- The alarm sound is silenced, and the alarm screen disappears.
- The symbol is displayed before the alarm message.

Press **【Alarm Reset】** on the alarm list page to reset the alarm system. At this status, the pump can provide periodic alarm prompts.

After the alarm is reset, you can press the key on the alarm list page to restore the sound of this alarm.

For the following alarms, when the **【Alarm Reset】** key is pressed, all the alarm indications (alarm sound, alarm message, and alarm light) will be cleared:

- **【Finished】**
- **【KVO Finished】**
- **【Standby Finished】**
- **【Empty Bottle】**
- **【Single Bubble】**
- **【Cumulative Bubble】**
- **【Inlet Occlusion】**
- **【Outlet Occlusion】**
- **【Line Exception】**
- **【Drop Rate Exception】**
- **【Line Disengaged】**
- **【No Drop sensor】**
- **【Relay Invalid】**

8.5 Pausing the Alarm Sound

To enter the audio pause state, follow this procedure::

- Select in the alarm screen.

- Swipe the touchscreen from top down with a finger, and select **【Audio Pause】** .

The audio pause state has the following features:

- The pause time of alarm sound shall not exceed 2 minutes.
- The audio pause symbol  is displayed in title bar.
- If a new alarm is triggered in the audio pause state, the sound of the new alarm will also be silenced.

The equipment exits the audio pause state automatically in the following cases:

- The fixed pause time of 2 minutes is reached.
- The pause key  is pressed again.

NOTE:

- **Except for the 【Battery Empty】 alarm, the sounds of all other alarms can be paused by pressing** **.**

8.6 Setting the Alarm Sound

8.6.1 Setting the Alarm Volume

To change the alarm volume, follow this procedure:

1. Swipe the touchscreen from top down → select **【Menu】** → select **【System】** → select **【Volume】** →input the password to enter the setting menu.
2. Set the **【Alarm Volume】**. The alarm volume can be set from X to 10, in which X is the minimum alarm volume preset, and 10 is the maximum alarm volume.

NOTE:

- **For setting the minimum alarm volume, please see the alarm setting in *User Maintenance Settings*.**

8.7 Nurse Call

When an alarm occurs, the equipment outputs a signal to the nurse call system to call the nurse. The equipment provides a multi-functional interface, which can be connected to the hospital's nurse call system through a nurse call cable to enable the nurse call function.

The nurse call function can only be activated when the following conditions are met:

- The nurse call function is enabled.
- A user-defined alarm occurs.

NOTE:

- **Do not rely exclusively on the nurse call system for alarm notification. Remember that the most reliable alarm notification combines audible and visual alarm indications with the patient's clinical condition.**

To set the alarms that are sent to the nurse call system, follow this procedure:

1. Swipe the touchscreen from top down → select **【Menu】** → select **【Maintenance】** → enter the maintenance password → select **【Nurse Call】**.
2. Set the nurse call switch.
3. Select **【Signal Type】** to set the type of nurse call signal.
   - **【Pulse】**: the nurse call signal is a pulse signal that lasts one second. When there are multiple alarms at the same time, only one pulse signal is output; if another alarm occurs before the current alarm is cleared, another pulse signal will be output.
   - **【Continuously】**: the nurse call signal lasts as long as an alarm, that is, from the occurrence to the end of the alarm.
4. Select **【Contact Type】** to set the work mode of the nurse call relay.
5. Select **【Alarm Priority】** to set the priority of alarms that triggers a nurse call.

8.8 Alarm Solutions

When an alarm occurs, check the pump's status and handle the alarm as soon as possible. If the alarms do not conform to the actual situation, contact your service personnel.

Alarm Info.	Alarm priority	Causes	Solutions
【Single Bubble】	High	Single air bubble in the infusion set exceeds the preset Bubble Size limit.	● Press  to eliminate the alarm. ● Disconnect the patient from the pump, and prime the line. ● Check the single bubble limit setting. Reset the **【Single**

Alarm Info.	Alarm priority	Causes	Solutions
			Bubble】 if necessary.
【Cumulative Bubble】	High	The accumulate air bubbles in the infusion set exceeds the preset Accumulated Air limit.	● Press  to eliminate the alarm. ● Disconnect the patient from the pump, and prime the line. ● Check the accumulated bubble limit setting. Reset the **【 Cumulative Bubble 】** if necessary.
【Empty Bottle】	High	The drop sensor is installed and Drop sensor is On, or the drop sensor is not installed and Drop sensor is Off, and the drug bag or drug bottle is detected empty by the pump during infusion.	● Press  to eliminate the alarm. ● Continue the therapy or select a new therapy.
【Drop Rate Exception】	High	The fluid is dripping too slow or too fast detected by the drop sensor during infusion.	● Press  to eliminate the alarm. ● Check that the drop sensor is connected properly. ● Replace the drop sensor. ● If the alarm persists, contact your service personnel.
【Inlet Occlusion】	High	An occlusion occurred at the supply end (the tubing between the infusion bag and the pump).	● Press  to eliminate the alarm. ● Check the line squeezing condition. ● Check all connectors to see if there is an occlusion.
【Outlet	High	An occlusion occurred at	● Press  to eliminate the

Alarm Info.	Alarm priority	Causes	Solutions
Occlusion】		the patient end (the tubing between the patient and the pump). The preset pressure limit is exceeded.	alarm. ● Check the line squeezing condition. ● Check all connectors to see if there is an occlusion. ● Check whether the occlusion limit is reasonable. Reset the **【Occlusion Level】**if necessary.
【Line Disengaged】	High	The infusion set is disengaged from the pump during infusion.	● Press  to eliminate the alarm. ● Close the roller clamp or the Robert clamp to stop the infusion, and reinstall the infusion set with reference to ***4.4 Installing the Infusion Set***.
【Line Exception】	High	The pressure signal is detected abnormal by the pump after the infusion tube is installed and the door is closed. The infusion tube is detected not to be installed in position when the pump door is closed.	● Press  to eliminate the alarm. ● Reinstall the infusion set with reference to ***4.4 Installing the Infusion Set***.
【No Drop sensor】	High	No drop sensor or drop sensor fault.	● Press  to eliminate the alarm. ● Install a drop sensor or replace the drop sensor.
【Battery Empty】	High	The battery is depleted when the pump is	Connect the pump to an external power source.

Alarm Info.	Alarm priority	Causes	Solutions
		powered by battery.	
【Finished】	High	The preset VTBI is completed.	● Press to eliminate the alarm. ● Continue the therapy or select a new therapy.
【KVO Finished】	High	The KVO infusion is running for 30 minutes.	● Press to eliminate the alarm. ● Continue the therapy or select a new therapy.
【Relay Invalid】	High	• The pump is disconnected from the Dock. • In the relay state, the upstream pumps have completed the infusions, yet the downstream pumps are not ready for infusion.	● Press to eliminate the alarm. ● Check the connection between the pump and the Dock. ● Check that the downstream pumps are properly configured for infusion.
【System Fault】	High	The pump system faults, such as storage error, hardware fault, etc.	Stop using the pump, and contact your service personnel.
【In KVO】	Low	KVO infusion is started.	● The alarm is cleared after the KVO infusion reaches 30 minutes. ● Press the stop key to stop the KVO infusion. ● Complete the infusion or prepare for a new therapy.
【Battery Not Exist】	Low (Three tones)	No built-in battery	Install a battery.
【Battery in	Low	The pump switches to	Connect the pump to an external

Alarm Info.	Alarm priority	Causes	Solutions
Use】		battery supply due to the interruption of external power supply during running.	power source.
【Battery Fault】	Low (Three tones)	Battery fault, such as battery over heat, charging failure, or aging, etc.	Contact your service personnel.
【CMS Disconnected】	Medium	The pump is disconnected from the CMS, and the wireless network connection symbol is displayed in disconnection.	● Restore the connection between the pump and the CMS, and the wireless network connection symbol will restore. ● If the alarm persists, contact your service personnel.
【Standby Finished】	Low	The preset standby time is reached.	Press  to eliminate the alarm.
【Outlet Occlusion Warning】	Medium	The pressure in the infusion tube rises to the yellow warning area of the preset occlusion limit indication value.	● Check if the infusion tube is occluded. If an occlusion occurs, identify the cause and eliminate the alarm. ● Check whether the occlusion limit is reasonable. Reset the occlusion limit if necessary.
【Dock Disconnected】	Low	The pump is disconnected from the Dock.	● Reconnect the pump with the Dock. ● Insert the pump to another module slots of the Dock. ● If the alarm persists, contact your service personnel.
【System Clock Error】	Low	The real time clock (RTC) reset or RTC fault.	● Re-set the system time. See ***3.7.2 Setting the Time and Date***

Alarm Info.	Alarm priority	Causes	Solutions
			for details. ● If the alarm persists, contact your service personnel.
【Relay Near Invalid】	Low	In the relay state, the upstream pumps have almost completed the infusions, yet the downstream pumps are not ready for infusion.	Check that the downstream pumps are properly configured for infusion.
【Time Near End】	Low (Three tones)	The remaining infusion time reaches the configured time near end.	Complete the infusion or prepare for a new therapy.
【No operation】	Low (Three tones)	No operation is detected after the preset **Reminder Time** is reached.	Confirm whether to turn off the pump or enter standby.
【Battery Low】	Low (Three tones)	Low battery.	Connect the pump to an external power source.

NOTE:

- **The pump stops infusion when a high priority alarm is triggered.**
- **The pump continues infusion when a low priority alarm is triggered.**
- **The pump stops infusion after the system gives a 【Battery Empty】 alarm, and the shutdown delay is at least three minutes.**
- **The pump continues to work for at least 30 minutes after the first 【Battery Low】 alarm occurs in the specified conditions (operating with a fully charged new battery at 20°C ± 2°C, rate at 25.00 ml/h, screen brightness configured to 2, volume configured to 1, WIFI disabled).**
- **When an occlusion occurs, the pump stops the infusion and triggers the occlusion alarm. Then, the motor reverses to release the pressure in the infusion**

tube to prevent additional impact dose to the patient after the occlusion is eliminated.

- **The inherent delay in determination of the alarm state is ≤1s.**

8.9 Occlusion Alarm

Signals are collected by the built-in pressure sensor and the pressure value is calculated by the internal Central Processing Unit (CPU). The calculated pressure value is compared with the set occlusion alarm limit. The pump gives prompt message **【Outlet Occlusion Warning】** when this pressure value continuously increases for a period of time. The pump stops the infusion and gives an Occlusion alarm when the pressure exceeds the set limit.

To set the occlusion pressure, follow this procedure:

1. Swipe the touchscreen from top down → select **【Menu】** → select **【Infusion】**.
2. Set the **【Occlusion Level】**.

The pump can automatically reduce the bolus volume and release the pressure in the infusion tube after the occlusion alarm is triggered.

CAUTION:

- **When the infusion is blocked, the patient end of the infusion set should be clamped first, and then disconnect the infusion set with the patient to avoid unintended bolus.**

NOTE:

- **If this pump is running at 0.10 ml/h, and respectively configure the occlusion pressure alarm limit to the lowest level and highest level, the occlusion alarm response time may reach up to 6h35min and 42h29min. Adjust the pressure limit to a lower level, or use the veterinary syringe pump for a low rate infusion.**
- **An occlusion alarm may occur when a fluid of high viscosity is infused rapidly through a small needle. So the occlusion level should be increased or the rate should be lowered for the infusion.**

Chapter 9 Interconnected Communication

This pump can be connected to the Veterinary Infusion Central Monitoring System (CMS), the veterinary patient monitor and the Urine Monitor manufactured by Biolight.

9.1 Safety Information

CAUTION:

- **The design, installation, commissioning and maintenance of the wireless network layout must be carried out by the service personnel authorized by the manufacturer.**
- **Wireless networking must comply with local laws.**
- **In order to ensure the security and stability of the network, all data communications between the network-related functions must be conducted using the hospital's special closed network. The hospital should ensure the security of this private network.**
- **Ensure the security of encrypted network information, such as passwords, and prevent any unauthorized personnel's access to the encrypted information.**
- **Non-medical equipment should not be connected to this network.**
- **CMS may suffer the risk of data loss when the wireless signal is weak.**
- **Radio frequency interference may cause disconnection from the wireless network.**
- **Disconnecting from the network may lead to CMS data loss or malfunctions. In case of network disconnection, check the patient condition and resume the network as soon as possible.**
- **Ensure that the IP address of the equipment is correctly set. Changing network settings may cause network disconnection. For any problem with IP settings, please contact your service personnel.**

9.2 Connecting the Veterinary Patient Monitor

This pump can be connected to the veterinary patient monitor manufactured by Biolight through the multi-functional interface or the Dock. After connected with the veterinary patient monitor, this pump can upload the infusion information and alarm information to

the monitor.

9.3 Connecting the CMS

This pump can be connected to the veterinary infusion central monitoring system (CMS) manufactured by Biolight through a wireless network or the Dock. After connection, the following functions are available:

- Sending the infusion information, alarm information and pump information (such as the battery and network) to CMS.
- Supporting patient information and data synchronization between the CMS and the pump.
- Support receiving or discharging patients on the CMS and synchronizing the information to the pump.

For details, see the ***User Manual of Veterinary Infusion Central Monitoring System***.

To connect the pump to the CMS, following this procedure:

1. Wireless network settings

To enable WI-FI function, please see ***11.13 Network Settings***. To set the wireless network, follow this procedure:

(1) Swipe the touchscreen from top down → select **【Menu】** → select **【System】** → select **【Communication】** → select **【WIFI Setup】** submenu.

(2) Peripheral wireless networks are displayed on the Settings screen. You can select a wireless network as required.

(3) To manually add a wireless network, select the **【Add Net】** key at the bottom of the menu, and set the **【SSID】**, **【Security】**, **【Password】** and **【DHCP】** Switch:

- Select **【SSID】**: set the network name.
- Select **【Security】**: set the encryption mode.
- Select **【Password】**: set the password for access to the network.
- Set **【DHCP】** Switch: turn on the **【DHCP】** Switch, the pump automatically obtains the IP address; if the **【DHCP】**Switch is turned off, you need to manually enter the **【IP Address】**, **【NetMask】** and **【Gateway】**.

2. Setting the CMS

(1) Swipe the touchscreen from top down → select **【Menu】** → select **【System】**

→ select 【**Communication**】 → select 【**CMS Setup**】 submenu.

(2) Set the 【**Server IP**】 address and the 【**Device No.** 】. The veterinary infusion pump can be received by the CMS at this IP address. For details, see the ***User Manual of Veterinary Infusion Central Monitoring System***.

The pump can transmit data to the CMS when it is used in combination with the Dock connected with the CMS. For how to connect the CMS with the Dock, see the ***User Manual of Veterinary Infusion Supervision System***.

NOTE:

- **Whether this pump can communicate normally with the CMS depends on it is connected to the network successfully. In case of communication interruption, the operator will not be able to observe the infusion status of the pump in real time through CMS.**

9.4 Connecting the Urine Monitor

This pump can be connected to the Urine Monitor manufactured by Biolight through the multi-functional interface or the Dock. After connection, the patient's fluid intake and discharge can be calculated to assist in observing the patient's internal fluid metabolism.

NOTE:

- **The results of fluid balancing are for reference only, not for diagnosis, and therefore cannot be used as the basis for clinical treatment.**

Chapter 10 Menu Settings

This chapter describes the main menu settings.

10.1 Main Menu Options

Menu Item	Description
Infusion Settings	See ***10.2 Infusion Settings***.
System Settings	See ***10.3 System Settings***.
Patient Management	See ***Chapter 6 Patient Management***.
Maintenance	See ***Chapter 11 User Maintenance Settings***.
Dock Settings	See the ***User Manual of Veterinary Infusion Supervision System.***
Review	View the total volume, history rate, and history records.

10.2 Infusion Settings

The Infusion Settings menu provides infusion-related parameters and alarms that can be set.

The steps to enter the **【Infusion】** menu are as follows:

1. Swipe the touchscreen from top down → select **【Menu】** → select **【Infusion】**.
2. Select the options to be set. This section mainly describes the following settings:

10.2.1 Prime

Menu Item	Default	Set Range	Description
Auto Rate	1200ml/h	0.10~2350ml/h	Sets the default rate of prime.
Single Auto Volume	15ml	0.10~100.00ml	Sets the default volume of prime.

10.2.2 Bolus

Menu Item	Default	Set Range	Description
Max Volume	99.99ml	0.10~99.99ml	Sets the maximum value of bolus volume.
Default VTBI	3ml	0.10~99.99ml	Sets the default value of bolus volume.

Menu Item	Default	Set Range	Description
Default Rate	1200ml/h	See ***A.6 Infusion Specifications***.	Sets the rate of bolus infusion.
Bolus Unit	ml	ml, dose	Sets the unit of bolus volume.

Note:

- **When the bolus volume is 0.1ml, the maximum bolus rate can be set at 120 ml/h.**

10.2.3 KVO

Menu Item	Default	Set Range	Description
KVO Switch	On	On, Off	When it is set as Off, KVO will not be initiated after VTBI completion.
Rate	0.50ml/h	See ***A.6 Infusion Specifications***	Sets the rate in KVO running.

10.2.4 Bubble Level

Menu Item	Default	Set Range	Description
Single Bubble	100ul	See ***A.6 Infusion Specifications***	Sets the alarm limit for single air bubbles.
Cumulative Bubble	400ul/15min	See ***A.6 Infusion Specifications***	Sets the alarm limit for the accumulated air.

* Settings of this feature are particularly important in the following cases:

- Infusions given to patients who are particularly sensitive to air bubbles;
- The infusion supplies used can produce a large number of small bubbles.

10.2.5 Drop sensor

Menu Item	Default	Set Range	Description
Use Sensor	Off	On, Off	Sets the drop sensor switch.
Drip Abnormal	Off	On, Off	Sets the abnormal drop rate alarm switch.

10.2.6 Occlusion Level

Menu Item	Default	Set Range	Description
Occlusion Level	P5 (450mmHg)	See ***A.6 Infusion Specifications***	Sets the downstream occlusion pressure alarm limit.

10.2.7 Near End Time

Menu Item	Default	Set Range	Description
Time Near End	3min	Off, 1min, 2min, 3min, 4min, 5min, 6min, 7min, 8min, 9min, 10min, 15min, 20min, 25min, 30min	Sets the time period before the **【Time Near End】** alarm is triggered near the end of infusion. The **【Time Near End】** alarm will not be triggered when it is set as **【Off】**.

10.2.8 Limit Switch

Menu Item	Default	Set Range	Description
Limit Switch	Off	On, Off	On when it is set as **【On】** can the preset maximum rate and maximum VTBI become valid.
Max Rate	2350ml/h	See ***A.6 Infusion Specifications***	Sets the maximum value (limit) of rate. If the set infusion rate exceeds the limit, the equipment prompts you to

Menu Item	Default	Set Range	Description
			reset the rate.
Max VTBI	9999.99ml	See ***A.6 Infusion Specifications***	Sets the maximum value (limit) of VTBI. If the set VTBI exceeds the limit, the equipment prompts you to reset the VTBI.

10.2.9 Common Modes

Menu Item	Default	Set Range	Description
Common Modes	Select all	Rate mode, Time mode, Micro mode, Weight mode, Sequence mode, Loading Dose mode, Intermittent mode, Ramp mode, Dose time mode and Drip mode	Selects or deselects the infusion mode. The selected infusion mode can be displayed in the Infusion mode list box in the infusion status display area.

NOTE:

- **The rate mode and the selected infusion mode in the current infusion status display area cannot be deselected.**
- **If a new patient is admitted, check that the settings are appropriate for the new patient.**

10.3 System Settings

10.3.1 Volume

Menu Item	Default	Description
Alarm Volume	2	Sets the alarm volume. Range: X~10. (Note: X represents the set minimum alarm volume in maintenance menu.)
Reminder Volume	2	Sets the Reminder Volume. Range: 0~10.

10.3.2 Brightness

Menu Item	Default	Description
Brightness [AC]	6	Sets the screen brightness when the external power supply is used. Range: 1~10.
Brightness [Battery]	2	Sets the brightness of the screen when battery power is used. Range: 1~10.

10.3.3 Night Mode

Menu Item		Default	Description
Night Mode	Switch	Off	Sets the night mode switch. ● 【On】: When the system time reaches the preset start time, the night mode is enabled. ● 【Off】: The night mode is not enabled.
	Alarm Volume	2	Sets the alarm volume and screen brightness after the pump enters the night mode.
	Brightness	1	
	Start Time	18:00:00	Sets the start time and stop time of night mode.
	Stop Time	07:00:00	

CAUTION:

- **Please check the volume and screen brightness of the night mode before entering the night mode. Pay attention to the potential risk if the setting value is low.**

10.3.4 Communication Settings

10.3.4.1 WIFI Setup

Menu Item	Default	Description
SSID	/	/

Menu Item	Default	Description
Security	None	Sets the way of encryption.
Password	/	/
DHCP	On	Sets whether to obtain the IP address automatically.
IP Address	/	Sets the 【**IP Address**】, 【**NetMask**】 and 【**Gateway**】.
NetMask	/	
Gateway	/	

10.3.4.2 CMS Setup

Menu Item	Default	Description
Server IP	/	Sets the IP address of CMS.
Device No.	/	Sets the pump number in the CMS.

10.3.5 Protection

Menu Item	Default	Description
Lock Time For No Infusion	3min	Sets the time of automatic screen lock after no operation in non-infusion state. Range: Off, 1min, 2min, 3min, 4min, 5min. The screen will not lock automatically in non-infusion state when it is set as 【**Off**】.
Lock Time In Fusion	30s	Sets the time of automatic screen lock after no operation in infusion state. Range: Off, 15s, 30s, 1min, 2min, 3min, 4min, 5min. The screen will not lock automatically in infusion state when it is set as 【**Off**】.
No operation Reminder Time	2min	Sets the time of triggering a 【**No Operation**】 alarm after no operation of the equipment. Range: Off, 1min, 2min, 3min, 4min, 5min. The 【**No Operation**】 alarm will not be triggered when it is set as 【**Off**】.
Param Changed	Off	When it is set to 【**On**】, the pump will prompt when

Menu Item	Default	Description
Tips		the parameters are modified in the non-infusion state.

10.3.6 Alarm

Menu Item	Default	Description
Occlusion Warning	On	Sets the near occlusion alarm switch.
CMS Disconnection	Off	Sets the CMS disconnection alarm switch.

10.3.7 Version

Menu Item	Default	Description
Software Version	/	Views the software version information.

Chapter 11 User Maintenance Settings

In this chapter, the default settings and function descriptions of each item in the menu of 【**Maintenance**】 are listed.



CAUTION:

- **User maintenance settings are protected by password. Changes to the settings must be conducted by an authorized person. If you need to obtain the password to access these functions, please contact the relevant personnel.**

11.1 Entering the User Maintenance Menu

The steps to enter the 【**Maintenance**】 menu are as follows:

1. Swipe the touchscreen from top down → select【**Menu**】→ select【**Maintenance**】 → enter the password to enter the Settings menu.
2. Select the submenu to be accessed.

11.2 Unit

Menu Item	Default Settings	Description
Height Unit	cm	Sets the unit of height. Options include: cm, inch.
Weight Unit	kg	Sets the unit of weight. Options include: kg, lb.
Pressure Unit	mmHg	Sets the unit of pressure. Options include: mmHg, kPa, bar, psi.

11.3 Time and Language

Menu Item	Default Settings	Description
Date	/	Sets the current date.
Time	/	Sets the current time.
Date Format	yyyy-mm-dd	Sets the date format.
24h format	On	Sets the time format. If you want to use the 12h format, switch off the **24h Format**.
Language	Simplified Chinese	Sets the language. **Note:** The language settings take effect only after

Menu Item	Default Settings	Description
		the equipment is restarted.

11.4 Concentration Config

Menu Item	Default Settings	Description
Concentration Type	Conc.	Sets the concentration parameters for the Weight mode and Dose time mode. ● 【**Conc.**】: After setting, the concentration parameter is displayed as 【**Conc.**】 in the above modes. ● 【**Amount & Volume**】: After setting, the concentration parameter is displayed as 【**Drug Amt.**】 and 【**Volume**】 in the above modes.

11.5 Nurse Call

Menu Item		Default Settings	Description
Nurse Call	Call Switch	Off	Sets the nurse call switch, signal type, contact type and alarm priority.
	Signal Type	Pulse	
	Contact Type	Normally Open	
	Alarm Priority	High	

11.6 Alarm

Menu Item	Default Settings	Description
Alarm Minimum Volume	2	Sets the minimum alarm volume that the operator can set in the main menu.

11.7 Equipment

Menu Item	Default Settings	Description
Hospital	/	Enters the name of the hospital, department, and current equipment.
Department		
Equipment		

11.8 Drug Library

Menu Item	Default Settings	Description
Import Drug Library	/	After the system detects the USB disk that has been loaded with the drug library, click **【OK】** to import the drug library file. **Note:** The drug library can be activated after the equipment is restarted.

11.9 Brand Management

Menu Item	Default Settings	Description
Common Brand	/	Checks or unchecks the brand, and select **【Confirm】**. The checked brand will be displayed in the brand list.
Add Brand	/	Enters the brand name, selects the type (**【 Regular 】**, **【 Light-sensitive 】**, **【Filter】**) and specification **【Model】**, and then selects **【Confirm】**. After the brands are successfully added, they can be listed as common brand options on the **【Common Brand】** screen.
Delete Brand	/	Selects the undesired brand, and select **【Confirm】** to delete this brand. **Note:** The built-in brand is not allowed to be deleted.
Modify Brand	/	Select the brand that needs modifying, modify this brand name and select **Enter**. **Note:** The built-in brand is not allowed to be modified.
Import Brand	/	After inserting the USB disk loaded with brand library into the USB interface on the back of the pump, select the brand library file to import.

NOTE:

- **Up to 64 brands are available in this pump.**

11.10 System Calibration

Menu Item	Default Settings	Description
Rate Calibration	/	See ***12.2 Maintenance Plan***. Contact our service personnel for calibration.
Pressure Calibration	/	See ***12.2 Maintenance Plan***. Contact our service personnel for calibration.
Calibration Data Review	/	Review the calibration data.

11.11 Parameter Switch

Menu Item	Default Settings	Description
50mmHg	Off	Sets the switch for special specifications. If this switch is turned on, 50 mmHg is available for the **【Occlusion Level】** setting.
Online Titration	Off	If this switch is turned on, the flow rate and dose rate can be modified without interrupting the infusion.

11.12 Device Location

Menu Item	Default Settings	Description
Room No.	/	Set the number of room where the pump is located.
Bed No.	/	Sets the bed number.

11.13 Network Settings

Menu Item	Default Settings	Description
WIFI Switch	Off	Sets the WIFI switch. **Note:** The setting take effect only after the equipment is restarted.

Chapter 12 Maintenance

Regular maintenance is essential to ensure that the pump functions properly. This chapter contains information on testing and maintenance of the pump.

12.1 Maintenance Safety Information

WARNING:

- **To avoid electric shock, stop using the equipment if you find the housing of the equipment has signs of broken. Contact your service personnel.**

CAUTION:

- **Failure on the part of the responsible individual hospital or institution using this equipment to implement a recommended maintenance schedule may cause undue equipment failure and possible health hazards.**
- **This equipment contains no user serviceable parts. Please contact the service personnel if necessary.**
- **The safety checks or maintenance involving any disassembly of the equipment should be performed by professional service personnel. Otherwise, undue equipment failure and possible health hazards could occur.**
- **The service personnel must be properly qualified and thoroughly familiar with the operation of the equipment.**
- **The equipment and accessories shall not be served or maintained while in use with a patient.**
- **If you discover a problem with the equipment, such as the product label falls off, contact your service personnel.**
- **No modification of this equipment is allowed.**

NOTE:

- **If calibration is necessary, please contact your service personnel.**
- **If needed, contact the manufacture for circuit diagrams, component part lists, descriptions, calibration instructions, or other information concerning the repair of the equipment.**

12.2 Maintenance Plan

Ensure that maintenance tasks are performed according to the maintenance plan or local regulations. Clean and disinfect the equipment before testing or maintenance.

The testing and maintenance items and recommended frequency are as follows:

Test/Maintenance Item		**Recommended Frequency**
Performance Tests		
Select test items based on requirements of IEC 60601-2-24.		• Once every two years. • When you suspect that the occlusion alarm is abnormal. • When you suspect that the rate is abnormal.
Safety Tests		
Select test items based on requirements of IEC 60601-1.		• When the power module is repaired or replaced. • At least once every two years, or as needed. • When the main board is replaced or the equipment drops to the ground.
Other Tests		
Visual Inspection		Every day, before first use.
Power-on Test		Each time the equipment is powered on.
Battery Inspection	Function Test	• When the battery is first installed. • When the battery is replaced.
	Performance Test	Every three months or if the battery run time reduces significantly.
For pressure calibration and precision calibration, see the service manual		When the performance test fails.

NOTE:

- **When the veterinary infusion pump is used in combination with the Dock that meets the requirements of IEC 60601-1, the power supply function of the Dock's contact interface should be checked periodically. For details of the periodic check, see the *User Manual of Veterinary Infusion Supervision System*.**

12.3 Testing Methods and Procedures

Except the following maintenance tasks, all other tests and maintenance tasks should only be performed by the service personnel recognized by us.

- Regular check, including visual inspection and power-on test
- Battery Inspection

If the equipment requires tests or maintenance of other items, please contact the service personnel in time.

12.3.1 Visual Inspection

Visually inspect the equipment before it is first used every day. In case of any damage or fault to the equipment or accessories, stop using the equipment and contact the hospital's equipment engineer or our service personnel.

Verify that the equipment meets the following requirements:

- Environment and power supply specifications are met.
- The equipment housing and display screen are free from cracks or other damages.
- The power cord is not damaged and the insulation is in good condition.
- Connectors, plugs, and cables are not damaged or kinked.
- Power cord and cable are securely connected with the equipment.

12.3.2 Power-on Test

The equipment automatically performs a self test at startup. Check the following items for the power-on test:

- The equipment powers on properly.
- The alarm system works properly.
- The equipment displays properly.

12.3.3 Checking the Battery Performance

See step 1 to step 5 of ***12.4.4 Conditioning the Battery*** to battery test. The operating time of the battery reflects their performance directly. If the operating time of a battery is noticeably shorter than that stated in the specifications, the battery may reach its service life, or may be damaged or malfunction. In such case, please contact your service personnel.
If the battery performance meets the requirement, fully charge the battery again for use or charge it to 50% for storage.

12.4 Maintaining the Battery

This equipment is designed to run on rechargeable lithium-ion battery power when the external power is not available. The equipment can switch between battery power and the external power without interrupting working. If both the external power and the battery power are available, the equipment uses the external power in preference to the battery power.

12.4.1 Battery Safety Information

WARNING:

- **Use only specified battery. Use of a different battery may present a risk of fire or explosion.**
- **Extremely high ambient temperature may cause battery overheat protection, resulting in equipment shutdown.**
- **The lithium-ion battery has a service life. Replace your battery when it reaches the end of its service life. Failure to do so may cause serious damage to your equipment due to overheating.**
- **Do not disassemble the battery, put it in a place above 60 °C, incinerate or short-circuit it. Otherwise, it may ignite, explode, leak or heat up, causing personal injury.**

CAUTION:

- **Remove the battery if it is not used for an extended period of time; otherwise,**

over-discharge may occur, leading to battery damage.

- **Please keep the battery out of reach of children.**
- **Do not crush, drop or puncture the battery. Mechanical abuse can lead to internal damage and internal short circuits. If a battery has been dropped or banged against a hard surface, whether damage is externally visible or not, stop using it.**
- **If the battery shows signs of damage or leakage, replace it immediately.**

NOTE:

- **Storing the battery at high temperature for an extended period of time will significantly shorten its service life.**
- **Storing the battery in a cool place can slow the aging process. Ideally, the battery should be stored at 15 °C.**

12.4.2 Installing and Replacing the Battery

The battery must only be installed by service personnel trained and authorized by Biolight.

The battery is installed when the equipment leaves the factory.

Replace and recovery the battery in the following cases:

- The battery has damage or malfunction.
- The battery is aged and its runtime is significantly shorter than that stated in the specification.
- The battery service life expires.

CAUTION:

- **Lithium batteries replaced by inadequately trained personnel could result in a hazard, such as over-temperature, fire or explosion.**
- **Properly dispose of the battery according to local regulations.**

12.4.3 Charging the Battery

To optimize performance, a fully or nearly fully discharged battery should be charged as soon as possible. The battery is automatically charged when the pump is connected to the AC power.

NOTE:

- **The battery should be charged only in this equipment.**
- **The battery can also be charged when the pump is in use with a Dock, which is connected to the AC power.**
- **Check the battery for adequate power when the equipment runs on battery power. Recharge the battery as needed.**

12.4.4 Conditioning the Battery

The service life of a battery depends on how frequent it is used. When properly used, the lithium-ion battery has a service life of approximately three years. If improperly used, its service life can be shorten. We recommend replacing the battery every three years.

The performance of the battery deteriorates over time. You should condition the battery every two months.

To condition a battery, follow this procedure:

1. Disconnect the equipment from the patient.
2. Turn off the equipment, and connect the equipment to the external power source.
3. Allow the battery to be charged uninterruptedly till it is fully charged.
4. Disconnect the equipment from the external power source, and turn on the equipment. Allow the equipment to run on the battery until the battery is completely depleted and the equipment automatically shuts down.
5. Fully charge the battery again for use or charge it to 50% for storage.

NOTE:

- **If the battery is not conditioned for a prolonged time, its charge indication may not be accurate and you may wrongly evaluate the remaining battery runtime. In addition, if the battery is fully charged in a long term and is not maintained**

regularly, the aging of the battery will be accelerated and the battery will fail in advance.

- **Do not use the pump for infusion during battery conditioning.**
- **Do not interrupt charging or discharge during battery conditioning.**

12.5 Viewing the Version Information

You may need to view the equipment version information during maintenance. The steps to enter the **【Version】** menu are as follows:

1. Swipe the touchscreen from top down → select **【Menu】** → select **【System】**.
2. Select **【Version】**.

In the **【Version】** menu, you can view the version information of the system software.

12.6 Viewing the History Record

Some critical operations will be saved as history records during the use of this equipment. You can view the total infused volume, rate and event information in the **【Review】** menu.

The steps to enter the history record menu are as follows:

1. Swipe the touchscreen from top down → select **【Menu】**.
2. Select **【Review】** → select **【History Record】**. When you only want to view the alarm records, you can select **【Alarm Event】** in **【Filter Setup】** menu.

NOTE:

- **Power failure of the equipment has no impact on the storage history.**
- **This equipment can store alarm records. The alarm records will be saved when the equipment is shut down, and the shutdown time will also be recorded.**
- **BioFusion S500 Vet can save at least 5,000 history records. When the capacity is reached, earlier events will be overwritten by later ones.**

12.7 Exporting the History Record

You can export history records with a USB flash disk. The methods as follows:

1. Insert the USB disk to the USB interface of the pump.
2. Swipe the touchscreen from top down → select **【Menu】** → select **【Review】** →

select 【**History Record**】.

3. Select 【**Export**】.

12.8 Disposing of the Equipment

The service life of this equipment is 10 years. After the service life expires, dispose of the equipment in line with local regulations.

CAUTION:

- **For the disposal of parts, batteries, packaging materials and accessories, follow local regulations regarding disposal of hospital wastes.**

Chapter 13 Care and Cleaning

This chapter mainly describes the cleaning and disinfection of the pump and the pole clamp.

13.1 Care and Cleaning Safety Information

CAUTION:

- **Use only the approved cleaners, disinfectants and methods listed in this chapter to clean and disinfect the equipment. Warranty does not cover damage caused by unapproved substances or methods.**
- **Do not mix disinfecting solutions, as hazardous gases may result.**
- **We make no claims regarding the efficacy of the listed chemicals or methods as a means for controlling infection. For the method to control infection, consult your hospital's infection control officer or epidemiologist.**
- **The responsible hospital or institution shall carry out all cleaning and disinfection procedures specified in this chapter.**
- **Turn off the equipment and unplug the power cord from the equipment before cleaning or disinfecting.**
- **Never immerse the equipment in liquids.**
- **Avoid contact of cleaners or disinfectants with metal parts and interfaces of the equipment to prevent corrosion.**
- **Do not pour or spray any liquid directly on the equipment or permit fluid to seep into the housing.**
- **If you spill liquid on the equipment, disconnect the power supply, dry the equipment, and contact your service personnel.**
- **Never use abrasive materials (such as steel wool or silver polish), or erosive cleaners (such as acetone or acetone-based cleaners) to clean the equipment.**
- **Dilute and use the cleaners or disinfectants according to the manufacturer's instructions.**
- **Check the equipment after cleaning and disinfecting. If there is any sign of aging or damage, stop using it.**

- **Do not sterilize accessories by high pressure or gas.**

13.2 Cleaning

Clean the equipment on a regular basis. The equipment should be cleaned more frequently in areas with serious environmental pollution or heavy sand storms. Please consult or understand the hospital's cleaning policy before cleaning. To clean the equipment, follow this procedure:

1. Dip a piece of soft cloth in water or 75% alcohol and squeeze the liquid out.
2. Wipe the display screen.
3. Wipe the surface of the equipment and avoid connectors and metal parts.
4. Remove the cleaner on the surfaces with a dry cloth and allow the equipment to dry in a ventilated and cool place.

CAUTION:

- **Any contact of cleaners or disinfectants with connectors or metal parts may cause corrosion.**

13.3 Disinfecting

Disinfect the equipment as required in your hospital's servicing schedule. Clean the equipment before disinfecting. Always dilute and use disinfectants according to the manufacturer's instructions. The following table lists the recommended disinfectants:

Name	Type	Manufacturer
Isopropanol, 70%	Liquid	-
Sodium hypochlorite, 0.5%	Liquid	-
Alcohol, 75%	Liquid	-
Hydrogen peroxide, 3%	Liquid	-

13.4 Sterilization

Sterilization is not allowed for this equipment and related products, unless otherwise indicated in the accompanying instructions for use.

13.5 Impact of Improper Cleaning

Using cleaners other than those recommended may have the following impact:

- Product discoloration
- Metal part corrosion
- Brittle and deformed wires, connectors, and equipment housing
- Reduced cable and leadwire life
- Equipment failure

Chapter 14 Other Recommended Accessories

WARNING:

- **Do not open the disposable or sterilized accessory package too early, so as not to cause the accessory to fail or become contaminated.**

CAUTION:

- **Use accessories we specified. Using other accessories may cause damage to the equipment or not meet the claimed specifications.**
- **Accessories listed in this chapter must be used in combination with the equipment. Before use, user should read the Manual of the equipment or consult us for confirming the fitness of the accessories with the equipment. Otherwise, the patient injury may occur.**
- **The accessories may not meet the performance specifications if stored or used outside the specified temperature and humidity ranges. If accessory performance is degraded due to aging or environmental conditions, contact your service personnel.**
- **Check the accessories and their packages for any sign of damage. Do not use them if any damage is detected.**
- **Please check the compatibility of the equipment and accessories before use. Incompatible accessories will cause performance deterioration or damage to the equipment.**
- **Use the accessories before the expiry date.**

Name	PN
Lithium battery	12-100-0033
AC power line	11-100-0005
Pole clamp	20-093-0001
Nurse call cable	11-093-0300

Name	PN
Monitor cable	11-093-0301
Handle	23-093-0001
Drop sensor	23-093-0002
Urine Monitor cable	11-096-0003

Appendix A Product Specifications

A.1 Safety Specifications

A.1.1 Classifications

This equipment is classified, according to IEC 60601-1:

Type of protection against electrical shock	Class I, equipment energized from an internal electrical power source
Degree of protection against electrical shock	Type CF applied part (with anti-defibrillation function)
Degree of protection against liquids	IP33
Degree of mobility	Portable
Mode of operation	Continuous operation

NOTE:

- **The equipment is not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.**
- **This equipment is portable, but cannot be carried by patients.**

A.1.2 Environmental Specifications

Items	Temperature (°C)	Relative Humidity (non-condensing)	Atmospheric Pressure (kPa)
Operating	5 ~ 40	15% ~ 95%	57.0 ~ 107.4
Storage and transportation	-20 ~ +60	10% ~ 95%	16.0 ~ 107.4

Note: The device is rated to operate at an altitude ≤4000m.

CAUTION:

- **The equipment must be used under the specified environmental specifications. Otherwise, the technical specifications stated in this Manual may not be met and may cause unforeseen consequences such as equipment damage. In case of change in the equipment performance due to aging or environmental conditions, please contact your service personnel.**

A.2 Power Supply Specifications

A.2.1 External Power Supply

Items	Input Voltage	Frequency	Input Current
AC input	100-240V	50/60Hz	0.43- 0.22A
DC input (from the Dock)	15VDC	/	1.7A

A.2.2 Battery

Type	Rechargeable lithium-ion, LIS03100121A, 11.1VDC, 3100mAh
Operating Time	The lithium battery can operate at least 8 hours (operating at a rate of @25.00 ml/h, under standard operating conditions*) The lithium battery can operate at least 3 hours (operating at a rate of @2350 ml/h, under standard operating conditions*)
Charge Time	≤4h when the pump is off; ≤8h when the pump is on
Shutdown Delay	At least 30 minutes after the first battery low alarm (operating at a rate of @25.00 ml/h, under standard operating conditions*)
* Standard operating conditions: Operating with a fully charged new battery at 20℃±2℃, screen brightness configured to 2, volume configured to 1, WIFI disabled, disconnected to drop sensor	

A.3 Physical Specifications

Component	Weight	Dimension (L×W×H)
Host	≤1.60kg (net weight, with battery, without accessories)	214mm × 153mm × 75mm

A.4 Hardware Specifications

A.4.1 Display

Screen Type	Screen Size	Resolution
Capacitive touchscreen	3.5 inches	800×480 pixels

A.4.2 Host LED

Alarm light	1 (red and yellow)
External power LED	1 (green)
Battery status indicator	1 (green and yellow)

A.4.3 Audio Indicator

Loudspeaker	Gives alarm tones (45 dB to 85 dB) Supports multi-level volume function Alarm tones comply with IEC 60601-1-8

A.4.4 Interface

AC power interface	1
Multi-functional interface	1
USB interface	1

A.4.5 Signal Output

Nurse call output

Output voltage range	High level: 3.3V~12V, open-leakage output, with external pull-up resistor; Low level: <0.5V, maximum input current is 10mA

Signal type	N.C., N.O., Pulse Output (optional)
Rise and drop time	<1 ms (external 5V, with pull-up resistor 4.7k)

A.5 Wireless Network

Protocol	IEEE 802.11 a/b/g/n/ac
Modulation mode	DSSS, OFDM, DBPSK, DQPSK, CCK, QAM
Operating frequency range	2.4GHz:2.412 ~ 2.484GHz 5GHz:4.915 ~5.925GHz
Data rate	IEEE802.11b: 1, 2, 5.5, 11Mbps IEEE802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54Mbps IEEE802.11n: up to 150Mbps-single IEEE802.11n: up to 300Mbps-2x2 MIMO IEEE802.11ac:up to 192.6Mbps (20MHz channel) IEEE802.11ac:up to 400Mbps (40MHz channel)
Transfer power	<20dBm (CE requirement: detection mode – RMS) <30dBm (FCC requirement: detection mode – PEAK)
Operating mode	Communicates with AP to receive and send data
Data security	Standard: WPA-PSK and WPA2-PSK Encryption: TKIP and AES
System capacity	Number of the pumps supported by a single AP: ≤16
Data transmission delay	Total data transmission delay time between the pump and the CMS is ≤8s
Delay time of network disconnection alarm	≤14s

A.6 Infusion Specifications

Infusion accuracy	Infusion rate accuracy: ≤ ±5% Bolus volume accuracy: ≤ ±5% or ±0.02 ml, whichever is greater KVO rate accuracy: ≤±5% Drop rate accuracy: ≤±10% Note: Test in accordance with IEC 60601-2-24
Set range of infusion rate /bolus	0.10ml/h ~ 2350ml/h Resolution:

rate	0.01 ml/h (0.10~99.99) ml/h 0.1 ml/h (100.0~999.9) ml/h 1 ml/h (1000 to 2350) ml/h
Set range of bolus volume	(0.10~99.99) ml
Occlusion pressure	15 levels selectable: (50, 150, 225, 300, 375, 450, 525, 600, 675, 750, 825, 900, 975, 1050, 1125) mmHg; Occlusion alarm error is: $50\ ^{+170}_{-45}\ mmHg$ for Level 1; ≤±145mmHg or ±20% for other levels, whichever is greater.
Max. infusion pressure	No greater than 1350mmHg
Single air bubble	7 levels available: (25, 50, 100, 200, 400, 600, 800) ul
Accumulated air bubble	7 levels available: (100, 200, 400, 500, 600, 800, 1000) ul reached by accumulated air in 15min
Maximum volume (under single fault conditions)	≤0.5ml
KVO rate	(0.10 ~ 30.00) ml/h Minimum resolution: 0.01ml/h
Infusion time set range	00:00:01~99:59:59 (h:min:sec), minimum resolution: 1s
VTBI set range	(0.10~9999.99) ml, minimum resolution: 0.01ml
Infused volume display range	(0.00~99999.99) ml, minimum resolution: 0.01ml
Range of drop rate	(1~400) dot/min
Weight	Set range: (0.1~499.0) kg Units available: kg, lb
Dose rate	Set range: 0.001~99999 Units available: X/min, X/h, X/24h, X/kg/min, X/kg/h, X/kg/24h, in which X represents ng, ug, mg, g, mU, U, kU, EU, mmol, mol, mcal, cal, kcal, and mEq

Drug Amt.	Set range: 0.001~99999 Units available: ng, ug, mg, g, mU, U, kU, EU, mmol, mol, mcal,cal, kcal, and mEq
Volume	Set range: (0.10~9999.99) ml
Conc.	Set range: 0.001~9999.99 Units available: ng/ml, ug/ml, mg/ml, g/ml, mU/ml, U/ml, kU/ml, EU/ml, mmol/ml, mol/ml, mcal/ml, cal/ml, kcal/ml, mEq/ml
Defibrillation Protection	Recovery time: <1s (after defibrillation)

WARNING:

- **The infusion accuracy and occlusion pressure detection are mainly affected by viscosity of liquids and disposables used (for example diameter, material, elasticity and needle).**

NOTE:

- **The infusion accuracy test and occlusion pressure test should be performed in accordance with IEC 60601-2-24 (test temperature: 20°C ± 2°C).**

A.8 Recommended Infusion Sets

The veterinary infusion pump supports infusion sets of common types for the user to choose. Only those that meet the standards can be used on this equipment. The recommended infusion sets are listed in this table:

Name	Type	Manufacturer
B.Braun Intrafix Primeline	Regular	B.Braun Melsungen AG

A.9 Occlusion Alarm Trigger Time and Possible Injected Dose

Rate (ml/h)	Alarm Trigger Time (hh:mm:ss)	
	Highest Occlusion Level	Lowest Occlusion Level
1.00	<02:17:00	<00:12:44

Rate (ml/h)	Alarm Trigger Time (hh:mm:ss)	
	Highest Occlusion Level	Lowest Occlusion Level
25.00	<00:05:00	<00:00:30

Test conditions for the above data:

- Infusion set brand: B.Braun
- Test temperature: 20°C ±2°C
- Infusion line length: 1 meter

Rate (ml/h)	Bolus Volume (ml)	
	Highest Occlusion Level	Lowest Occlusion Level
25.00	<0.2	<0.2

Test conditions for the above data:

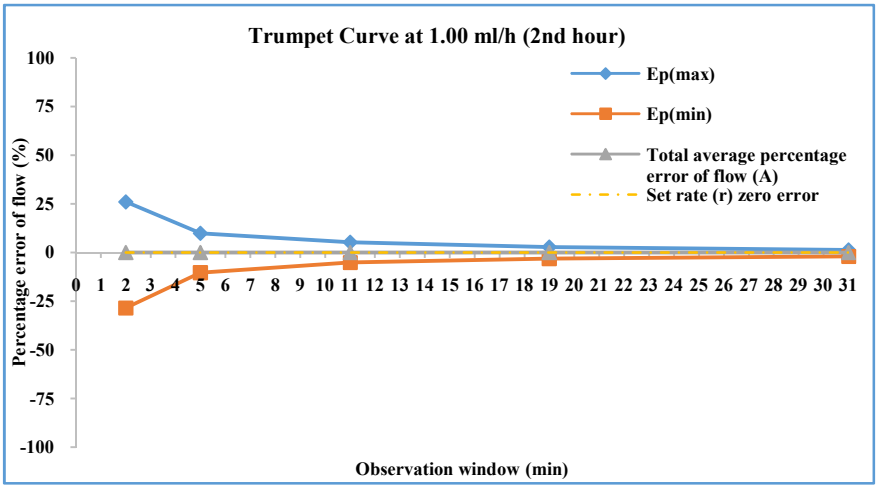
- Infusion set brand: B.Braun
- Test temperature: 20°C ±2°C
- Infusion line length: 1 meter

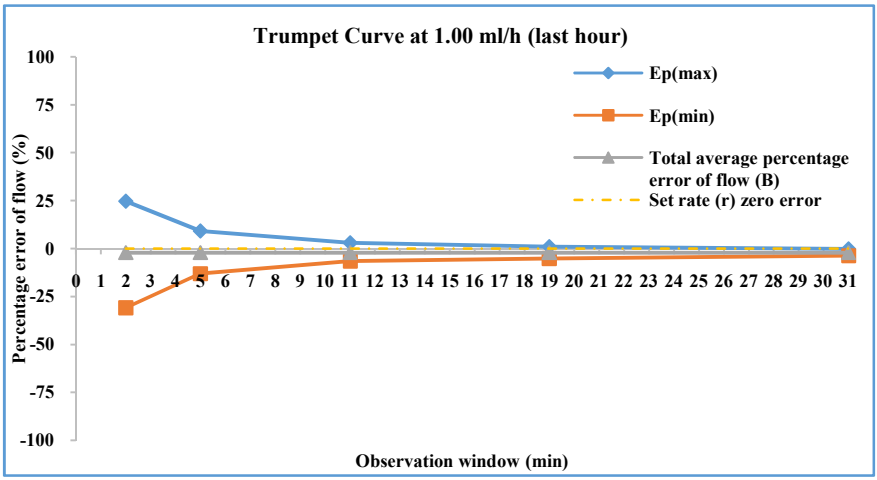
NOTE:

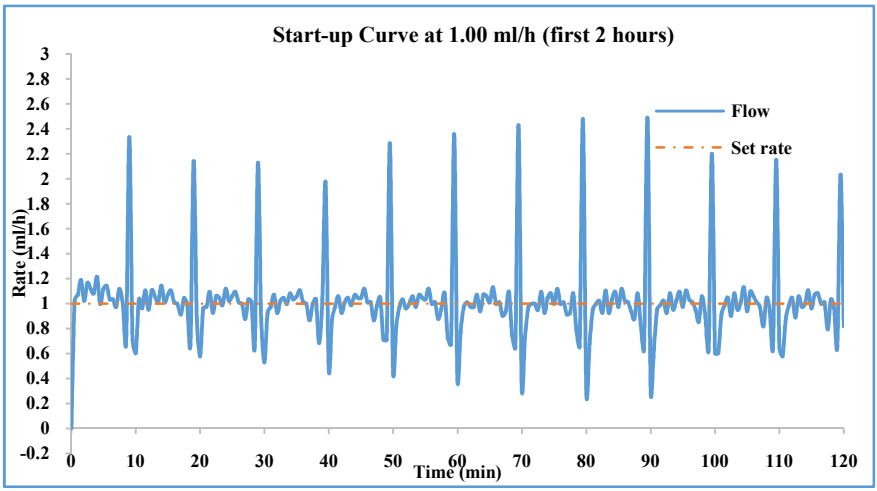
- **Occlusion alarm pressure, alarm delay time and bolus volume may vary depending on test conditions, temperature and tube length.**

A.10 Infusion Accuracy Graphs

A.10.1 Infusion Accuracy at 1.00 ml/h



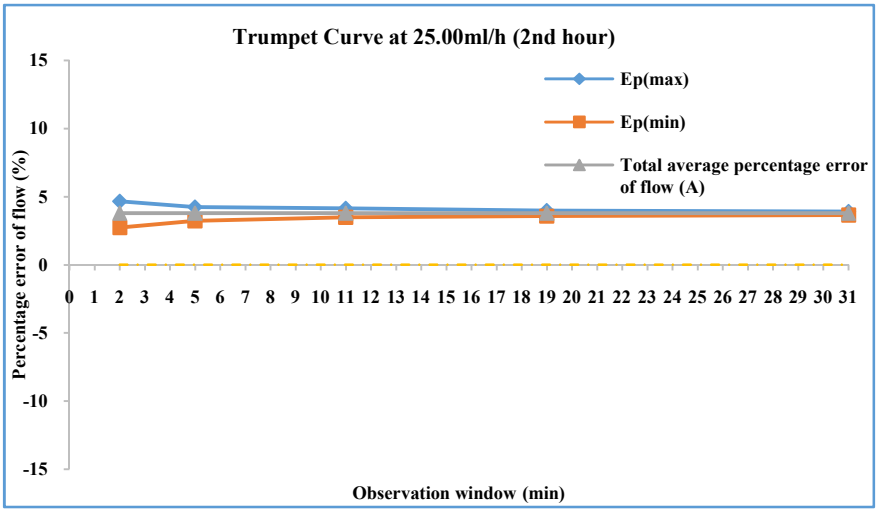


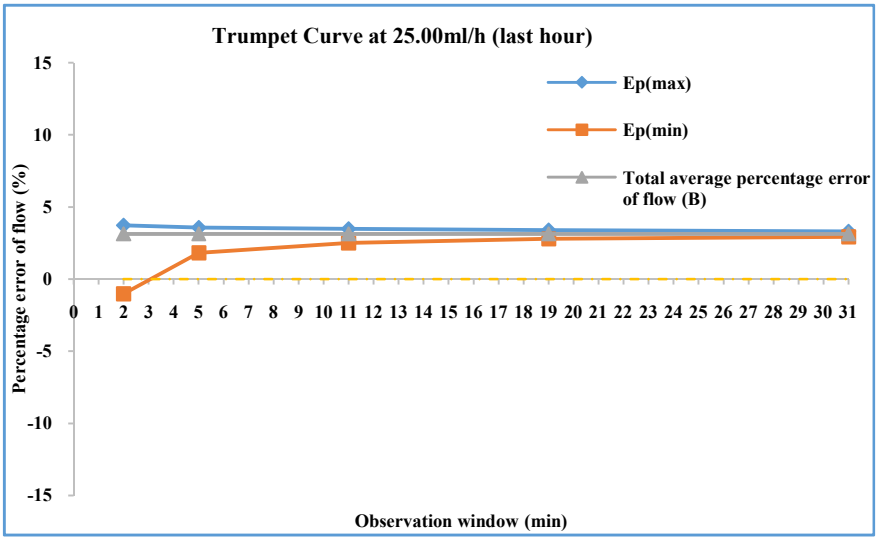


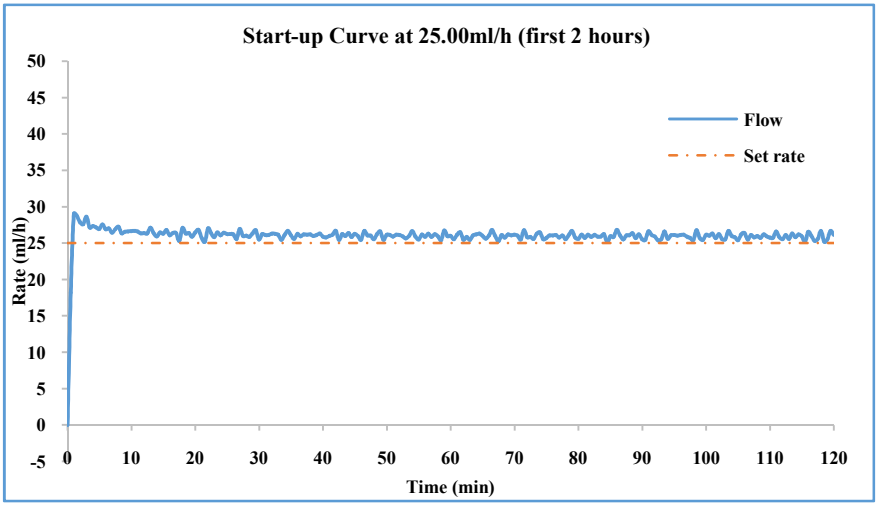
The above data are based on the following test conditions:

- Infusion set brand: B.Braun
- Test interval: △ t= 0.5min
- Sampling quantity of pump: 1
- Sampling quantity of infusion sets: 2

A.10.2 Infusion Accuracy at 25.00 ml/h







The above data are based on the following test conditions:

- Infusion set brand: B.Braun
- Test interval: △ t= 0.5min
- Sampling quantity of pump: 1
- Sampling quantity of infusion sets: 2

NOTE:

- **The above data only represents the laboratory test data.**
- **The infusion accuracy may be influenced by the environment (such as pressure, temperature, humidity, brightness, drop sensor location, and any infusion consumables used).**

Appendix B EMC and Radio Regulatory Compliance

B.1 EMC

CAUTION:

- **The veterinary infusion pump meets relevant requirements for electromagnetic compatibility of the IEC 60601-1-2 and IEC 60601-2-24 standards.**
- **User shall conduct installation and operation in accordance with the electromagnetic compliance information in the accompanying document.**

WARNING:

- **Use of this device adjacent to or stacked with other device should be avoided because it could result in improper operation. If such use is necessary, this device and the other device should be observed to verify that they are operating normally.**
- **The non-ME EQUIPMENT (e.g. ITE) that is a part of an ME SYSTEM may be disrupted by the electromagnetic interference of nearby equipment. It may be necessary to take mitigation measures, such as re-orienting or relocating the non-ME EQUIPMENT or shielding the location.**
- **Don't near active HF surgical equipment and the RF shielded room of an ME system for magnetic resonance imaging, where the intensity of EM disturbances is high.**
- **Use of accessories and cables other than those specified or provided by the manufacturer of this device could result in increased electromagnetic emissions or decreased electromagnetic immunity of this device and result in improper operation.**
- **Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30cm (12 inches) to any part of this device, including cables specified by the manufacturer. Otherwise, degradation of the performance of this device could result.**

NOTE:

- **The device needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided below.**
- **Other devices may affect this device even though they meet the requirements of CISPR.**
- **The emissions characteristics of this device make it suitable for use in industrial areas and hospitals (CISPR 11 and class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this device might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the device.**
- **If the essential performance is lost or degraded, it may be necessary to take mitigation measures, such as re-orienting or relocating the ME EQUIPMENT or ME SYSTEM or shielding the location or stopping using the pump system and contact the service personnel.**

Table B.1

No.	Name	Length of Cable (m)	If shielded (Y/N)	Remark
1	AC power cord	1.8	N	/
2	Drop sensor cable	2.4	N	/

If the equipment is intended for use in the electromagnetic environment specified in the Guidance and Declaration, it should be used in a safe manner and provided with the following basic performance:

- Infusion accuracy: ≤ ±5%
- Protection against UNINTENDED BOLUS volumes and occlusion
- Alarm

Table B.2

Guidance and Manufacturer's Declaration - Electromagnetic Emissions	
The veterinary infusion pump is intended for use in the electromagnetic environment as specified below, and the customer or user should ensure it is used in such an environment.	
Emission Test	**Compliance**
RF emissions CISPR 11	Group 1
RF emissions CISPR 11	Class A
Harmonic emissions IEC 61000-3-2	Not Applicable
Voltage fluctuations / flicker emissions IEC 61000-3-3	Not Applicable

Table B.3

Guidance and Manufacturer's Declaration - Electromagnetic Immunity		
The veterinary infusion pump is intended for use in the electromagnetic environment specified below, and the customer or user should ensure it is used in such an environment:		
Immunity Test	**IEC 60601-1-2 Test Level**	**Compliance Level**
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV contact ±2 kV, ±4 kV, ±8 kV, ±15 kV air	±8 kV contact ±2 kV, ±4 kV, ±8 kV, ±15 kV air
Electrical fast transient/burst IEC 61000-4-4	±2 kV power supply lines ±1 kV signal input/output 100 kHz repetition frequency	±2 kV power supply lines Not applicable 100 kHz repetition frequency
Surge IEC 61000-4-5	±0.5 kV, ±1 kV differential mode ±0.5 kV, ±1 kV, ±2 kV common mode	±0.5 kV, ±1 kV differential mode ±0.5 kV, ±1 kV, ±2 kV common mode
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	0 % UT; 0.5 cycle. At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°. 0 % UT; 1 cycle and 70 % UT; 25/30 cycles; Single phase: at 0°. 0 % UT; 250/300 cycle	0 % UT; 0.5 cycle. At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°. 0 % UT; 1 cycle and 70 % UT; 25/30 cycles; Single phase: at 0°. 0 % UT; 250/300 cycle

Power frequency magnetic field IEC 61000-4-8	30 A/m 50Hz/60Hz	30 A/m 50Hz and 60Hz
Conducted RF IEC 61000-4-6	3 V 0,15 MHz – 80 MHz 6 V in ISM bands between 0,15 MHz and 80 MHz 80 % AM at 1 kHz	3 V 0,15 MHz – 80 MHz 6 V in ISM bands between 0,15 MHz and 80 MHz 80 % AM at 1 kHz
Radiated RF IEC 61000-4-3	3 V/m 80 MHz – 2,7 GHz 80 % AM at 1 kHz	3 V/m 80 MHz – 2,7 GHz 80 % AM at 1 kHz
Note: U_T is the A.C. mains voltage prior to application of the test level.		

Table B.4

Guidance and manufacturer's declaration - electromagnetic Immunity						
Radiated RF IEC 61000-4-3 (Test specifications for ENCLOSURE PORT IMMUNITY to RF wireless communications equipment)	**Test Frequency (MHz)**	**Band (MHz)**	**Service**	**Modulation**	**IEC 60601-1-2 Test Level (V/m)**	**Compliance level (V/m)**
	385	380–390	TETR A 400	Pulse modulation 18 Hz	27	27
	450	430–470	GMRS 460, FRS 460	FM ± 5 kHz deviation 1 kHz sine	28	28
	710	704–787	LTE Band 13, 17	Pulse modulation 217 Hz	9	9
	745					
	780					
	810	800–960	GSM 800/900, TETRA 800, iDEN 820,	Pulse modulation 18 Hz	28	28
	870					
	930					

			CDMA 850, LTE Band 5			
	1720	1700–1990	GSM 1800; CDMA 1900; GSM 1900; DECT; LTE Band 1, 3, 4, 25; UMTS	Pulse modulation 217 Hz	28	28
	1845					
	1970					
	2450	2400–2570	Bluetooth, WLAN, 802.11 b/g/n, RFID 2450, LTE Band 7	Pulse modulation 217 Hz	28	28
	5240	5100–5800	WLAN 802.11 a/n	Pulse modulation 217 Hz	9	9
	5500					
	5785					

Table B.5

Guidance and manufacturer's declaration - electromagnetic Immunity				
Radiated RF IEC61000-4-39 (Test specifications for ENCLOSURE PORT IMMUNITY to proximity magnetic fields)	**Test Frequency**	**Modulation**	**IEC 60601-1-2 Test Level (A/m)**	**Compliance level (A/m)**
	30 kHz	CW	8	Not Applicable
	134,2 kHz	Pulse modulation 2.1 kHz	65	65
	13,56 MHz	Pulse modulation 50 kHz	7,5	7,5

B.2 Radio Regulatory Compliance

The radio devices used in this equipment complies with the essential requirements and other relevant provisions of the Radio Equipment Directive.

CAUTION:

- **Keep a distance of at least 20cm (8in.) away from the equipment when WIFI function is in use.**
- **WIFI communication may be affected by the electromagnetic environment, obstacles, and signal strength of the place where the equipment is located. Please confirm it is placed in a proper distance to ensure the communication stability and reliability.**

Appendix C Cybersecurity

This chapter describes the cybersecurity information of the pump.

C.1 Operating Environment

- Hardware environment:
  - The software of this equipment is only applied to the hardware platform of the BioFusion S500 Vet series veterinary infusion pump.
  - Screen: 3.5 inches.
- Network environment
  - Applied in LAN

C.2 Data Interface

The veterinary infusion pump provides multi-functional interface, USB interface and other external interfaces, and the pump can be connected with the veterinary infusion central monitoring system through WIFI.

The interface requirements are as follows:

- Serial port transmission protocol: enterprise self-encryption RS232 protocol;
- WIFI transmission protocol (optional): IEEE802.11a/b/g/n/ac;
- USB transmission protocol: standard USB2.0 protocol.

C.3 User Access Control

a) User identity authentication: After entering the authorization password, you can have set permission of the corresponding user type to prevent key parameters from being overwritten accidentally.

b) User types: medical staff, hospital's equipment maintenance personnel, manufacturer's maintenance personnel;

c) User authority:

   1) Authority of medical staff: enter the main interface automatically without password after starting up the equipment, operate the veterinary infusion pump directly and conduct common settings and operations according to the actual needs;

   2) Authority of hospital's equipment maintenance personnel: enter the maintenance menu by entering the hospital's maintenance password, and at

least have the authority to set the time and language;

3) Authority of manufacturer's maintenance personnel: enter the maintenance menu by entering the manufacturer's maintenance password, and at least have the authority to set the system calibration, in addition to the setting contents granted to the hospital's equipment maintenance personnel.

C.4 Installation information

The pump must install in the hospital’s dedicated closed network, and the hospital should ensure the security of the dedicated network to prevent virus attacks.

Hospitals that purchase the pumps with network connection function should be equipped with a network security team that have been received essential training related to cybersecurity knowledge.

C.5 Data backup (DTBK) and disaster recovery

There are backup and recovery mechanisms for configuration files of the pump. During pump startup, the system of the pump will check the validity of the configuration files. If the configuration files are invalid, the system restores to the latest configuration. When the system saves the configuration, in addition to the configuration for normal use, it also saves a backup file.

C.6 Cybersecurity upgrade

If user report cybersecurity failure or detect vulnerabilities that affect software security, should perform cybersecurity upgrade, which is performed by after-sales personnel authorized by the manufacturer.

Appendix D Abbreviations

Abbreviation	In Full
AC	Alternating Current
BOLUS	Bolus
CCU(CICU)	Cardiac Intensive Care Unit
CE	Conformite Europeenne
CISPR	International Special Committee on Radio Interference
CPU	Central Processing Unit
DC	Direct Current
Dock	Dock
DPS	Dynamic Pressure System
EEC	European Economic Community
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ICU	Intensive Care Unit
ID	Identification
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
ISO	International Organization for Standardization
IV	Intravenous
KVO	Keep vein open rate
LED	Light Emitting Diode
Max	Maximum
Min	Minimum
MRI	Magnetic Resonance Imaging
N/A	Not Applied
OR	Operating Room
SN	Serial Number
USB	Universal Serial Bus
VTBI	Volume To Be Infused
dot/min	dot/min

Appendix E Toxic and Harmful Substances or elements

Components		Lead Pb	Mercury Hg	Cadmium Cd	Chromium VI Cr (VI)	Polybrominated biphenyl PBB	Polybrominated diphenyl ethers PBDE
Host	Pump housing	○	○	○	○	○	○
	Key	○	○	○	○	○	○
	Label	○	○	○	○	○	○
	Pump hardware	○	○	○	○	○	○
	Internal connection wire	○	○	○	○	○	○
	PCBA	○	○	○	○	○	○
Display screen	Touch screen	○	○	○	○	○	○
Package	Packaging material	○	○	○	○	○	○
Universal	Connector	○	○	○	○	○	○
	Power cable	○	○	○	○	○	○
Battery	Lithium battery	○	○	○	○	○	○
Accessories	Accessories	○	○	○	○	○	○
Remarks	○: indicates that the content of the toxic/hazardous substance in all homogeneous materials of this component is below the limit stipulated by SJ/T 11363-2006. ×: indicates the content of the toxic and hazardous substance in at least one homogenous material of this component is beyond the limit stipulated in SJ/T11363-2006.						

Product Name: Veterinary Infusion Pump

Product Model: BioFusion S500 Vet

Manufacturer: Guangdong Biolight Meditech Co., Ltd.

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