HP-30 PRO Syringe Pump

Operation Manual

Before using the HP-30 PRO syringe pump, please read this Manual carefully and follow the safety precautions and operating instructions contained herein.

受控文件
2019-09-26

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- All installations, replacements, tests, modifications and repairs are conducted by technicians authorized to do so by MEDCAPTAIN.
- All replacement components and accessories are provided by MEDCAPTAIN.
- All maintenance service records are kept.

Version Information

V1.0

- Operation Manual: first edition
- Software: V1
- Issued on: March 2018

V1.1

- Modify information of European Authorized Representative
- Issued on: 2018-09

V2.0

- Revised some parameters.
- Software: V2
- Issued on: 2019.05

V2.1

- Changed the model and parameters of the built-in lithium battery.
- Issued on: 2019.09

After-Sales Service

Thanks for purchasing our syringe pump.

- MEDCAPTAIN provides limited warranty for the product. That is, we provide free after-sales services for the product within the warranty period. The specific warranty period is stipulated on the sales contract. For details, please contact your local distributor. However, a product damage or failure is not covered by the warranty if it is caused by:
  - Operation error;
  - Improper use;
  - Out-of-range grid voltage;
  - Force majeure such as natural disasters;
  - Replacement with or use of any component, accessory or consumable other than authorized by MEDCAPTAIN; or
  - Other damages/faults not caused by the product itself.
- After the warranty period expires, MEDCAPTAIN shall continue to provide paid maintenance service within the service life of the product.
- Feel free to contact us or your local distributor if you have any problem in using the product.

Contact our Customer Service Department:

After-sales service provider: MEDCAPTAIN MEDICAL TECHNOLOGY CO., LTD.

After-sales service address: 12th Floor, Baiwang Research Building, No.5158 Shahe West Road, Xili, Nanshan, 518055 Shenzhen, Guangdong, PEOPLE'S REPUBLIC OF CHINA

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Preface

Illustrations

All the illustrations provided in this operation manual are for your reference only. The settings or data on the illustrations may differ from the actual settings or data of the product.

Conventions

- *Italics: Indicates the quoted content.*
- **Boldface: Indicates the character string of the software or the button name.**
- User password: 1234

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1 Overview

1.1 Intended Use

This product is intended to be used in conjunction with the syringe to control the dose of liquid infused into the patient's body in clinical departments.

1.2 Contraindication

None.

1.3 Product Features

- The HP-30 PRO syringe pump of MEDCAPTAIN is a modular micro-volume single channel syringe pump. It is used to ensure constant infusion rate and accurate dosage during a longtime infusion.
- This syringe pump is applicable for continuous and accurate infusion of low-volume and high-concentration liquid and/or liquid drugs. For example, it is applicable for infusion of such drugs as chemotherapeutic agents, cardiovascular drugs, antineoplastic agents, parturifacient drugs, anticoagulant agents, and anesthetics.
- Automatic identification of 2 ml, 3 ml, 5 ml, 10 ml, 20 ml, 30 ml and 50/60 ml) disposable syringes.
- The maximum infusion rate can be set to 2200ml/h.
- The minimum increment of the infusion rate is 0.01ml/h.
- Three syringe installation methods are supported: manual installation, automatic installation, and auto- manual installation.
- Adopting high-end plastics, the pump shell is impact-resistant, durable, easy and safe to clean and disinfect.
- Modular plug-in structure design, facilitating combinations of multiple pumps.
- Monitoring of the all-course syringe displacement to ensure infusion safety.
- Screen lock function to prevent unexpected and undesired changes in the infusion therapy.
- Supporting the function of checking infusion parameter ranges to ensure infusion safety.
- 3-CPU 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 an exception in time.

Overview

- Dynamic monitoring of occlusion pressure and real-time display of tube pressure.
- Touch screen, providing a convenient and efficient man-machine interaction interface.
- Limit control function (see section 7.1.7).
- Dose Error Reduction System (DERS) of drug library.
- The syringe pump can be installed on a horizontal pole, vertical pole, or trolley.
- Relay infusion function can be implemented after multiple pumps are connected to an infusion workstation.
- Wi-Fi networking function, enabling connection to the infusion central monitoring system.
- Nurse call function.
- Supporting both 1D and 2D barcode scanning function after being connected to a barcode scanner.
- Supporting HL7 interface protocol.
- Supporting RS-232 communication protocol.

2 Safety

2.1 Warnings and Cautions

In this Manual, the precautions are classified by importance into warnings and cautions as defined below:

WARNING:

The precautions related to safety and effectiveness. Failure to follow them may cause personal injuries.

CAUTION:

The precautions related to guidance and suggestions. Failure to follow them may affect the normal use of the product.

Please read all warnings and cautions contained herein carefully.

WARNING:

- The syringe pump must be operated by or under the guidance of clinically trained and qualified technicians who have received a training related to the use of this device.
- Before use, power on the syringe pump, wait until the self-check is finished, and confirm that no error message is displayed. (For details about the error messages, see Chapter 8.)
- The syringe pump does not support an air bubble detection function. Before the infusion, ensure that no air bubbles exist in the infusion line.
- A lower infusion rate will result in a longer interval between the occlusion occurrence time and detection time, which will cause a long infusion pause, thereby causing insufficient dose. For this reason, verify that the infusion tube does not twist or knot especially when initiating a low-rate infusion.
- Do not use the syringe pump in a flammable environment.
- During infusion, the pressure in the syringe may rise in case of an occlusion caused by tube twisting, filter condensation, or puncture. In this case, excessive liquid may be infused into the patient's body after the occlusion is eliminated and therefore appropriate preventive measures must be taken.

- It is highly recommended that syringes of specified brands be used. If you use a syringe not specified by the manufacturer, the infusion accuracy and alarm function cannot be guaranteed.
- The syringe, tubing, catheters, and other medical parts used together with this syringe pump must all comply with local regulations. For relevant information, please contact your local distributor.
- If a user does not follow the requirement, procedure, warning or caution provided in this manual, an infusion exception may be incurred. This exception may cause insufficient dose, excessive dose, and even other potential risks.
- The use of the syringe pump should be monitored regularly by professional medical technicians.
- High-frequency surgical equipment, mobile phones, wireless devices, and defibrillators may cause interference on the syringe pump. Therefore, keep the syringe pump away from these devices when using the pump.
- Prevent other infusion systems or accessories from being connected to the patient's infusion tube. Otherwise, the infusion rate may change and air may be infused into the patient's body.
- To avoid the risk of electric shock, connect the syringe pump to only a power supply system using the provided protective grounded power cable.
- If a syringe of brands other than MEDCAPTAIN is used or the syringe parameters are not defined correctly, the infusion accuracy may be affected.
- The maximum temperature at the applied part of the pump may reach 41.3℃ after running continuously under the highest environment temperate at the highest infusion rate.
- When operating the pump or checking the pump's alarm system, stand in front of the pump, keep 1 m away from the pump.
- This syringe pump must not be used as an ambulatory device. Otherwise, unknown risks may be caused.
- Do not touch the syringe pump and patient simultaneously when operating the pump.
- The syringe pump does not have a patient connection circuit. Prevent the patient from touching the syringe pump.
- This syringe pump must not be used as an ambulatory device. Otherwise, unknown risks may be caused.

- Do not disassemble or try to repair the syringe pump. Otherwise, serious hazards may be incurred. The manufacturer and distributor shall not be responsible for any syringe pump that has been disassembled, modified or used for any purpose other than its intended purpose.
- If the syringe pump falls to the ground or it is affected by an external force, stop using the pump even if it appears normal. Contact your local distributor and have an inspection performed to judge whether the pump is operating properly.
- Do not service or maintain the syringe pump or its accessory when it is being used on a patient.
- Do not try to upgrade the syringe pump software. To upgrade the software, please contact your local distributor for help. The software upgrade must be executed by trained technicians. Otherwise, an error of the syringe pump may occur. After software upgrade, the syringe pump must be validated by trained technicians before use.
- The syringe pump or its accessories should be disposed of according to local laws and regulations or the hospital's regulations when it reaches the end of its service life. For details, contact your local distributor.
- Before powering off the syringe pump, ensure that the syringe is already removed. The syringe cannot be removed after the pump is powered off.

⚠CAUTION:

- When using an infusion stand for pump installation, ensure that the syringe pump is fixed tightly on the infusion stand and the infusion stand is stable.
- Do not touch the display by using sharp objects. Otherwise, the display may get damaged.
- Ensure that the syringe pump is placed beyond the reach of the patient and other unauthorized persons.
- Ensure that the battery is always installed in the syringe pump during use. Otherwise, the syringe pump will be shut down without triggering an alarm in case of an external power failure or interruption, which will cause risks.
- If the syringe pump fails to act as specified herein for unknown reason, power it off and report the conditions (including the syringe used, infusion rate, serial No. of the syringe pump, and liquid type) when the fault occurs to your local distributor or the after-sales service department of MEDCAPTAIN.
- Do not disassemble or reconstruct the syringe pump without permission.

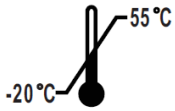
- Short circuit may occur if infusion liquid flows into the AC power socket or any USB socket. Before connecting the power cable, check if the connecting parts are dry. If any liquid splashes onto the syringe pump, use a dry cloth to dryit and contact local maintenance personnel to test it before use.
- The delay of the syringe pump's alarm system is no longer than 1.5s.
- The Defibrillation-proof type Cardiac Floating (CF) applied part of the syringe pump is the infusion catheter, infusion tube, PCA control button, and nurse call button.
- This product requires maintenance by authorized personnel. The authorized personnel can ask for such materials as the service manual and list of spare parts from the manufacturer.
- The delay time from onset of alarm condition to the point where representation of alarm condition leaves the signal output part is no longer than 3s.
- After the pump is exposed to a defibrillation voltage, the recovery time of the pump is shorter than 1s (the pump functions properly during exposure to the defibrillation voltage).

2.2 Symbol Description

Table 2-1 List of symbols

Symbol	Description
	CAUTION
	General warning sign
	Defibrillation-proof type CF applied part
IP33	Protected against solid foreign objects of 2.5 mm Ø and greater, Protected against spraying water.
	Manufacturer
	Date of manufacture
	Nurse call
	Non-ionizing electromagnetic radiation

Safety

Symbol	Description
	Alternating current
	Direct current
	Refer to instruction manual/booklet
	DISPOSAL: Do not dispose of this product as unsorted municipal waste. Separate collection of such waste for special treatment is necessary.
	This way up
	Fragile, handle with care
	Keep dry
	Keep away from sunlight
	Atmospheric pressure limitation
	Temperature limit
	Humidity limitation
	Stacking limit by number
	Authorized representative in the European Community

Symbol	Description
	Serial number
	CE Mark: conforms to essential requirements of the Medical Device Directive 93/42/EEC
Class I	Class-I equipment
	HOME button. Press this button to access the setting interface or return to the infusion preparation interface.
	ON/OFF button. Press this button to power on/off the pump.
	Protective earth.
	USB2.0 interface
	USB3. 0 interface
	RJ-45 network interface

3 Product Specifications

Name	Syringe pump
Model	HP-30 PRO
Dimensions	258 (W) x 75(H) x 152(D)mm
Weight	About 1.7kg (including the battery)
Operating Conditions	Temperature: 5 ℃~40 ℃ Humidity: 15%~95% RH, non-condensing Pressure altitude: 57.0~106.0kPa
Storage and Shipping Conditions	Temperature: -20 ℃~+55 ℃ Humidity: 10%~95% RH, non-condensing Pressure altitude: 22.0~107.4kPa
Service Life	10 years
Classification	1. Class I / Internally powered equipment; 2. Defibrillation-proof type CF applied part; 3. IP33; 4. Not sterilized; 5. Not category AP / APG equipment; 6. Mode of operation: continuous
Power Supply	AC power supply: 100-240V AC, 50/60Hz Input power: 45VA External DC power supply: 12 V DC Input current (DC): 2.5A Built-in lithium battery: 10.8V,3000mAh; model: 18650-3S1P Continuous operation duration of the lithium battery: not shorter than 10 hours (Test conditions: A 50ml syringe and a fully-charged brand new battery are used, screen brightness is adjusted to the lowest level, Wi-Fi is disabled, and the infusion rate is set to 5mL/h.) Charge time of the lithium battery: no longer than 4 hours (the pump is powered off during the charge) Charge mode of the lithium battery: The battery can be charged when AC or DC input is available. When no AC or DC power supply is available, the power supply

	mode of the syringe pump automatically switches to built-in battery mode.
Display Screen	3-inch LCD with a resistive touch screen Resolution: 480x320 pixels Angle of visibility: 80degrees in each direction
Indicator	Power indicator: yellow or green Alarm indicator: yellow or red Key backlight
Ports	● Micro USB2.0 port: Used to connect to the patient-controlled analgesia (PCA) controller. ● USB3.0 port: Used to connect to the nurse call button. ● USB2.0 port: Used to connect to the barcode scanner or infusion work station for communication through the RS-232protocol, and also used for DC power input. ● RJ45 network port: 10/100 Mbps self-adaptive Ethernet port. ● Wi-Fi network port: Used to communicate with the infusion workstation through the 802.11-b/g/n protocol.
Infusion Rate	0.10-60.00(ml/h) (2ml syringe) 0.10-90.00(ml/h) (3ml syringe) 0.10-150.0(ml/h) (5ml syringe) 0.10-600.0(ml/h) (10ml syringe) 0.10-1000(ml/h) (20ml syringe) 0.10-1200 (ml/h) (30ml syringe) 0.10-2200 (ml/h) (50/60ml syringe)
Minimum Increment of Infusion Rate	0.10~99.99ml/h (minimum increment: 0.01ml/h) 100.0~999.9ml/h (minimum increment: 0.1ml/h) 1000~2200ml/h (minimum increment: 1ml/h)
VTBI (Volume to be infused)	0.10~9999.99ml (minimum increment: 0.01ml)
Total Volume Display	0~9999.99ml (minimum increment: 0.01ml)
Time	00:00:01~99:59:59 (minimum increment: 1s)
Bolus Rate	0.10~60.00(ml/h)(2ml syringe)

	0.10~90.00(ml/h)(3ml syringe) 0.10~150.0(ml/h)(5ml syringe) 0.10~600.0(ml/h)(10ml syringe) 0.10~1000(ml/h)(20ml syringe) 0.10~1200(ml/h)(30ml syringe) 0.10~2200(ml/h)(50/60ml syringe)
Bolus VTBI	0.10~2.00ml(2ml syringe) (minimum increment: 0.01ml) 0.10~3.00ml(3ml syringe) (minimum increment: 0.01ml) 0.10~5.00ml(5ml syringe) (minimum increment: 0.01ml) 0.10~10.00ml(10ml syringe) (minimum increment: 0.01ml) 0.10~20.00ml(20ml syringe) (minimum increment: 0.01ml) 0.10~30.00ml(30ml syringe) (minimum increment: 0.01ml) 0.10~50.00ml(50ml/60ml syringe) (minimum increment: 0.01ml)
Anti-Bolus	Anti-bolus function, unintended bolus ≤ 0.2 ml
KVO Rate	0.10~5.00ml/h (minimum increment: 0.01ml/h)
Infusion Accuracy	Infusion inaccuracy ≤±2% Mechanical inaccuracy ≤±0.5%
Occlusion Level	2ml, 3ml, 5ml, 10ml, 20ml, or 30ml syringe: 50~1125mmHg, 15 levels are available for selection. 50/60ml syringe: 50~975mmHg, 13 levels are available for selection.
Compatible Syringe	Various brands of 2ml, 3ml, 5ml, 10ml, 20ml, 30ml, and 50 (60)ml syringes compliant with the *ISO 7886-1: Sterile hypodermic syringes for single use-Part 1: Syringes for manual use* and*ISO 7886-2: Sterile hypodermic syringes for single use-Part 2: Syringes for use with power-driven syringe pumps.*
Infusion Mode	Rate Mode, Time Mode, Weight Mode, Sequence Mode, Trapezia Mode, Micro Mode, LoadingDose Mode, TIVA Mode, and PCA Mode(Optional), Intermittent Mode
Drug Library	A maximum of 5,000 drug types can be stored.
Alarm Message	Infusion End, BAT Empty, Patient Side OCCL, Infusion End KVO Start, KVO End, Relay Failed, Syringe Empty, Holder Error, Drive Head ERR, Standby End, Infusion Near End, No Battery, No AC Power, BAT Low, Reminder Alarm, Syringe Near Empty, PCA 1h

	overrun, and PCA 4h overrun; Pre OCCL; Tube Off; Drive Head Position ERR
Special Functions	● Power supply mode switching: Automatically switches to battery mode in case of an AC/DC power failure and automatically switches to AC/DC power supply mode when the AC/DC power recovers from the failure. ● Permission management: Different permissions are assigned to allow or prohibit various operations, for example, changing or viewing data.
Networking Function	The syringe pump can be connected to the infusion central monitoring system through the wireless or wired networking function.
Date of Manufacture	See the product label.
Main Safety Standards	IEC 60601-1 Medical electrical equipment – Part 1: General requirements for basic safety and essential performance IEC 60601-2-24 Medical electrical equipment – Part 2-24: Particular requirements for the basic safety and essential performance of infusion pumps and controllers IEC60601-1-8Medical electrical equipment – Part 1-8: General requirements for basic safety and essential performance -Collateral standard: General requirements ,tests and guidance for alarm systems in medical electrical equipment and medical electrical systems IEC 60601-1-2 Medical electrical equipment – Part 1-2: General requirements for basic safety and essential performance –Collateral Standard : Electromagnetic disturbances –Requirements and tests

4 Product Description

4.1 Structural Composition

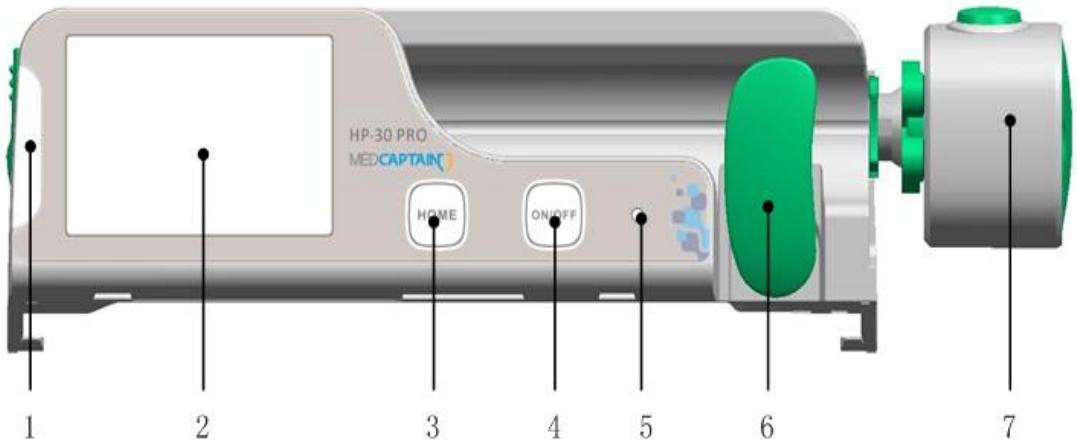
The syringe pump HP-30 PRO consists mainly of the pump shell, display and operating system, monitoring system, alarm system, motor drive system, drive module, power system, WIFI communication module (optional), handle and pole clamp. You can purchase such optional accessories separately as the nurse call button, barcode scanner and PCA control button.

4.2 Operating Principles

The motor is under the precise control of a three-processor structure. The mechanical transmission drives the syringe to perform the infusion. During infusion, all sensors are monitored in real time. The relevant sound and light alarm signals will be provided when necessary.

4.3 Main Unit

4.3.1 Front View



1–Alarm indicator 2– Touch display screen 3–**HOME** button

4 – **ON/OFF** button 5–Power indicator 6–Holder

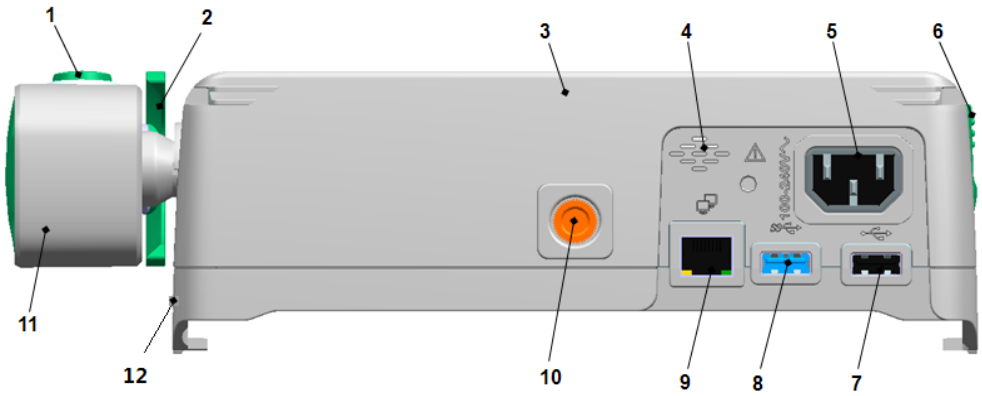
7 –Drive head

- Alarm indicator: Used to indicate the alarm level.
- **HOME** button: Main menu button.
  - When infusion is not started, you can press **HOME** to access the setting interface. On any setting interface, you can press **HOME** to return to the infusion preparation interface.

- During infusion, press **HOME** to switch the format of the infusion interface and zoom in the infusion rate displayed (three different sizes are available).

- **ON/OFF** button: Used to power on/off syringe pump. You can power on/off the syringe pump according to section 6.2/6.13. Alternatively, you can press and hold **ON/OFF** for 6s to power off the pump forcibly.
- Power indicator: Used to indicate the power status. In power-on state, the power indicator is steady green. In power-off state, the power indicator is steady yellow when external power is present.
- Holder: Used to clamp the syringe and identify the syringe size.
- Drive head: Used to fasten the syringe plunger and drive the syringe plunger to move.

4.3.2 Rear View



1–Clutch button	2–Syringe claw	3–Pump shell
4 –Loudspeaker	5–AC power socket	6–Combination clamp
7–USB2.0 port	8–USB3.0 port	9–RJ-45 network port
10 –Infusion stand retaining nut	11–Drive head	12 – Micro USB2.0 port

- Clutch button: Used to open or close the syringe claw and control the movement of the drive head.
- Syringe claw: Used to clamp the syringe plunger.
- Loudspeaker: Used to give the alarm sound during the infusion.
- AC power socket: Used to connect to an external AC power supply.
- Combination clamp: Used to lock/unlock the combination of multiple pumps or the handle.
- USB2.0 port: Used to connect to the barcode scanner or infusion workstation for communication through the RS-232 protocol, and also used for DC power input.

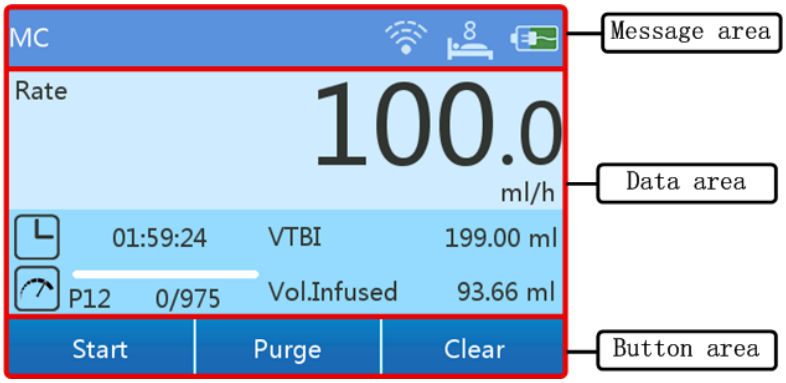
- USB3.0 port: Used to connect to the nurse call button.
- RJ45 network port: 10/100 Mbps self-adaptive Ethernet port.
- Infusion stand retaining nut: Used to fasten the pole clamp.
- Micro USB2.0 ports: Used to connect to the PCA control button.

⚠CAUTION:

- Do not insert accessories which are not specified by the manufacturer into the external inlets.
- Additional equipment connected to medical electrical equipment through the network/data coupling (USB or LAN port) must comply with the respective IEC or ISO standards (e.g. IEC 60950 for data processing equipment). Furthermore all configurations shall comply with the requirements for medical electrical systems (see IEC 60601-1-1 or clause 16 of the 3Ed. of IEC 60601-1, respectively).
- Anybody connecting additional equipment to medical electrical equipment configurations of a medical system is responsible that the system complies with the requirements for medical electrical systems. Attention is drawn to the fact that local laws take priority over the above mentioned requirements. In case of any doubt, consult your local distributor or the after-sales service department of the manufacturer.

4.3.3 Display Screen

The infusion preparation interface consists of three areas: message area, data area, and button area.



- Message area: Displays relevant icons listed in Table 4-1.
- Data area: Displays the current infusion rate and total volume infused or displays different infusion data based on different infusion modes.
- Button area: All buttons in this area are touch buttons, including Start, Purge, Clear, Stop, and Bolus.

Table 4-1 Description of the icons in the message area

Icon	Description	Icon	Description
	The pump is powered by the battery, and the battery level is sufficient.		The pump is powered by the battery, and the battery level is relatively sufficient.
	The pump is powered by the battery, and the battery level is relatively low.		The pump is powered by the battery, and the battery is empty.
	The pump is powered by an external power supply, and no battery is installed in the pump.		The pump is powered by an external power supply, the battery is being charged, and the battery level is relatively low.
	The pump is powered by an external power supply, the battery is being charged, and the battery is already fully charged.		Silent mode.
	Wired networking.		Wired networking is selected, but the connection is not successful.
	Wi-Fi signal strength.		Wireless networking is selected, but the connection is not successful.
	The screen is locked.		Bed No. “08” is the specific bed No.
	The pump is already connected to the infusion workstation.		The pump is already connected to the nurse call button.
	The USB3.0 port is connected to a peripheral device.		The pump is already connected to the PCA control button.

4.4 Accessories

Table 4-2 List of accessories

Accessory	Description	Part Number
Pole clamp	-	1202-00003-01
Handle	-	1404-00105-01
AC power cable	Europe Plug	1462-00004-01
	USA Plug	1462-00005-01
	UK Plug	1462-00006-01
	India Plug 250v 10a	1462-00010-01
	Brazil Plug	1462-00113-01
	South Africa Plug	1462-00114-01
	Israel Plug	1462-00188-01
	Swiss Plug	1462-00317-01
DC power cable	-	1203-00011-01
Lithium battery pack	11.34V@2900mAh	1457-00001-01
Nurse call button	MP-2	1202-00020-01
Barcode scanner	-	1203-00002-01
PCA control button	-	1202-00161-01
Syringe Anti Removal Cap and PCA Key	-	1404-00504-01

5 Installation Description

5.1 Environment Requirements

To ensure normal operation of the syringe pump, please ensure that the installation environment meets the following requirements:

- The installation platform should be stable.
- No large noise source or power supply interference exists.
- The environment must be dust-free if possible.
- No corrosive or flammable gas should be present.
- No flammable and explosive materials should be present.

5.2 Open Package Inspection

Before opening the package, please inspect the packaging box carefully. In case of any damage, please contact your local distributor immediately.

1. Take the syringe pump and accompanied accessories out of the packaging box.
2. Check whether the accessories in the packaging box are consistent with those on the packing list, and check whether there is any mechanical damage on the device or its accessory. In case of any doubts, please contact the local distributor immediately.

⚠CAUTION:

- Please retain the packaging box and packaging materials for future transportation and storage.

5.3 Connecting the Power Supply

Place the syringe pump in an environment meeting the requirements stipulated in section 5.1, and connect the pump to an external power supply with the AC power cable provided by the manufacturer.

⚠WARNING:

- Do not touch the power plug with wet hands. If any liquid or liquid residue exists on or around the power plug or power socket, remove this liquid or liquid residue before plugging in the device. Otherwise, an accident may occur.
- Use the power cable provided by the manufacturer to ensure that the device is properly grounded. If the device is not properly grounded, the safety performance cannot be guaranteed and an electric shock may occur.
- Do not install the syringe pump at a place where the power plug is difficult to be disconnected from the power socket.

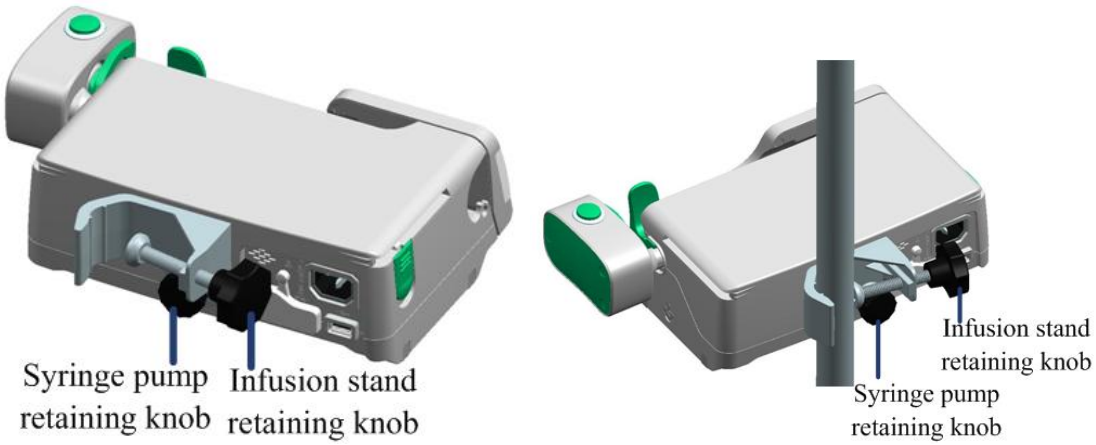
⚠CAUTION:

- The AC power cable must be firmly and fully inserted into the power socket.

5.4 Fastening the Syringe Pump onto the Infusion Stand

To fasten the syringe pump onto the infusion stand, perform the following steps:

1. Screw the syringe pump retaining knob clockwise to fasten the pole clamp to the syringe pump.
2. Insert the infusion stand pole into the pole clamp.
3. Screw the infusion stand retaining knob clockwise to fasten the syringe pump onto the infusion stand.



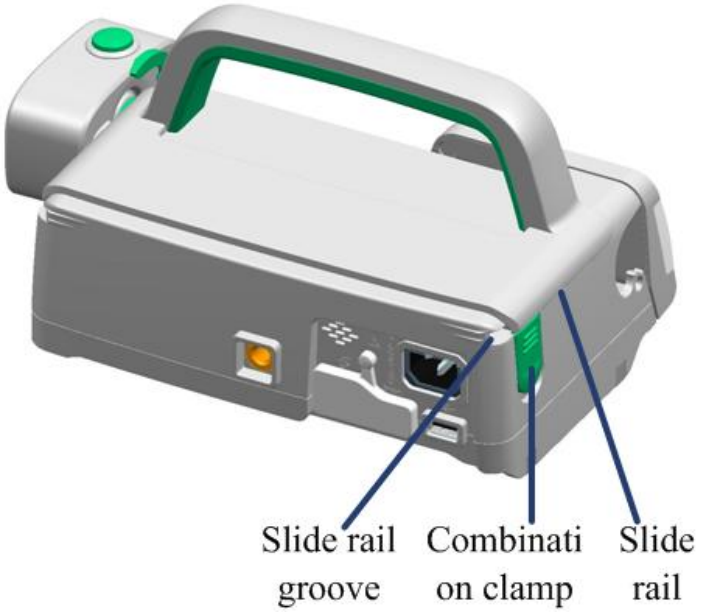
WARNING:

- Please evaluate and ensure the installation reliability, stability, and bearing capacity of the infusion stand. When the syringe pump and other devices are fastened to the infusion stand concurrently, please evaluate the center of gravity of the infusion stand and ensure that the infusion stand is steady.
- It is recommended that the diameter of the infusion pole range from 15 to 36 mm. An infusion stand with a diameter exceeding this range may cause unstable installation.

5.5 Connecting the Syringe Pump to the Handle

The syringe pump can be connected to the handle according to the following procedure to facilitate movement:

1. Align the slide rail of the handle with the slide rail groove of the syringe pump, and slide the handle forward until you hear a clicking sound to finish the installation.
2. To disconnect the handle from the syringe pump, press down the combination clamp, and push the handle backward until the handle is totally separated from the syringe pump.



5.6 Combining Multiple Pumps

Multiple HP-30 PRO syringe pumps can be combined. A syringe pump and an infusion pump can also be combined. To combine multiple pumps, for example, to combine two pumps, perform the following procedure:

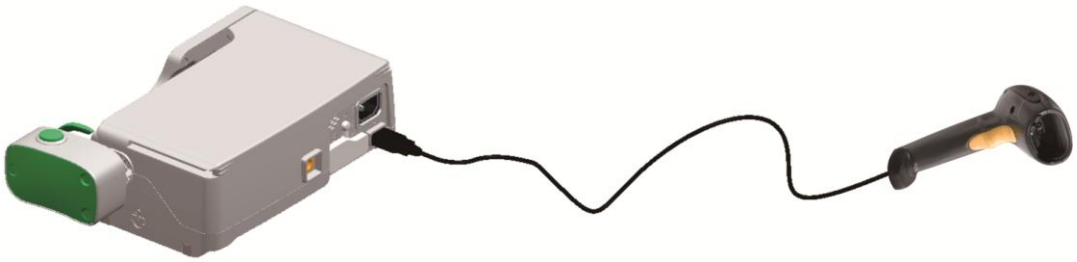
1. Align the slide rail at the bottom of the upper pump with the slide rail groove at the top of the lower pump, and slide the upper pump forward until the two pumps are aligned and you hear a clicking sound to finish the combination.
2. To separate the two pumps, press down the combination clamp of the lower pump, and push the upper pump backward until the two pumps are totally separated.

5.7 Connecting the Nurse Call Button (Optional)

The nurse call button can be used directly after being connected to the USB3.0 port of the syringe pump.

5.8 Connecting the Barcode Scanner (Optional)

The barcode scanner can be used directly after being connected to the USB2.0 port of the syringe pump.



5.9 Connecting the PCA Control Button (Optional)

The PCA control button can be used directly after being connected to the Micro USB2.0 port of the syringe pump. Syringe Anti Removal Cap and PCA Key (only specific to the 50ml syringe) can be used to lock the drive head and holder.

1. Slide the Syringe Anti Removal Cap over the drive head.

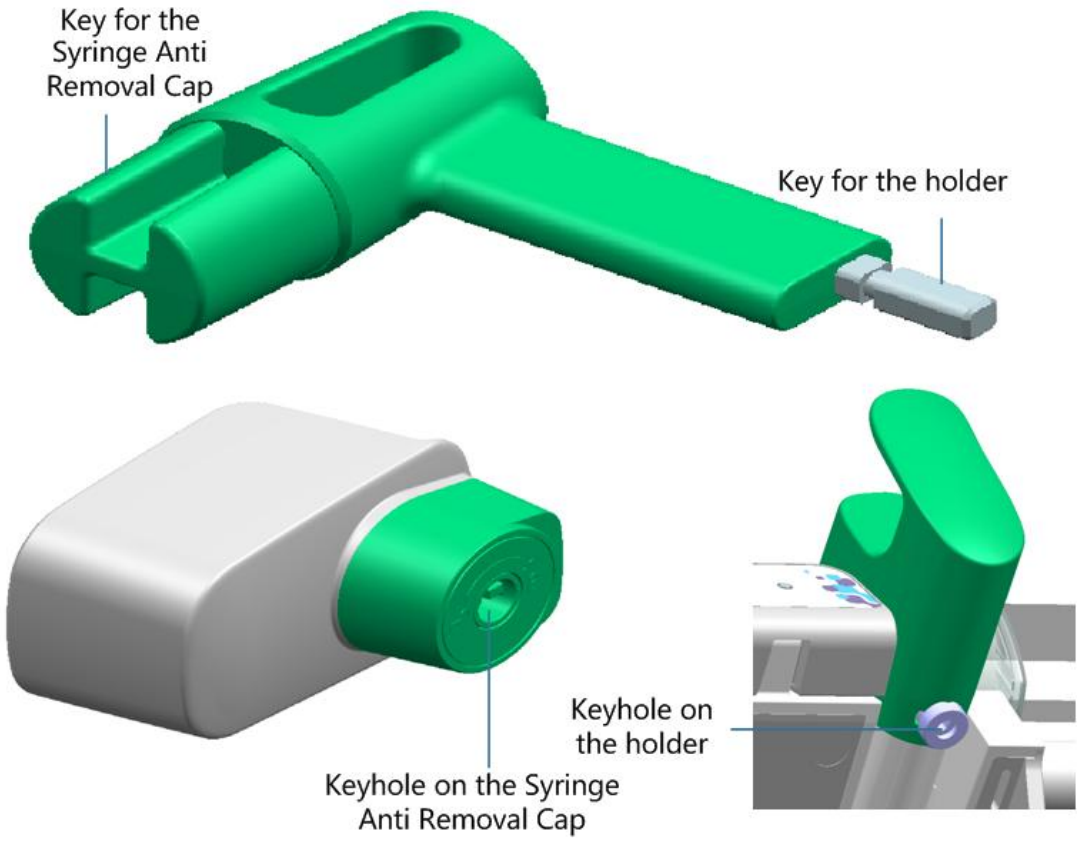
2. Insert the key into the keyhole on the Syringe Anti Removal Cap, and rotate the key clockwise for 180^{o} until you hear a click sound to lock the drive head.

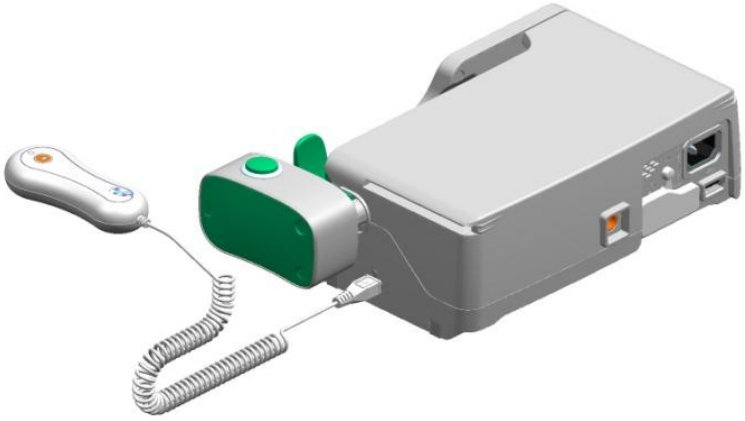
3. Insert the metal part of the key into the keyhole on the holder of the syringe pump, and rotate the key clockwise to lock the holder.

4. To unlock the drive head, insert the key into the keyhole on the Syringe Anti Removal Cap, and rotate the key anticlockwise for 180^{o} until you hear a click sound.

5. To unlock the holder, insert the metal part of the key into the keyhole on the holder of the syringe pump, and rotate the key anticlockwise.

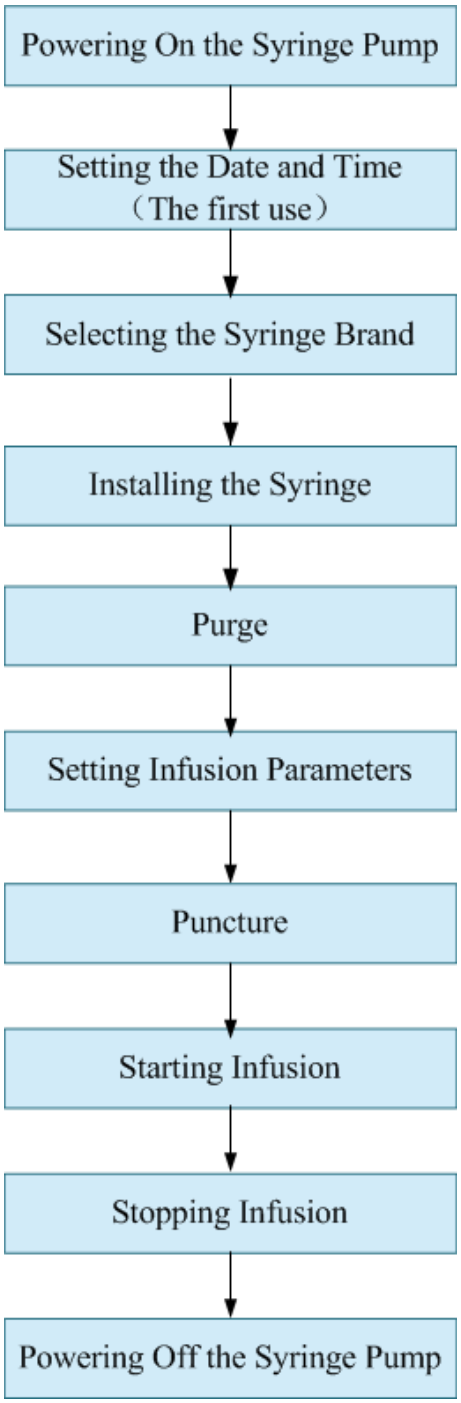
Installation Description





6 Operating Instructions

6.1 Infusion Process



See section 6.2.

See section 6.3.

See section 6.4.

See section 6.5.

See section 6.6.

See section 6.7.

See section 6.8.

See section 6.9.

See section 6.12.

See section 6.13.

6.2 Powering On the Syringe Pump

After syringe pump installation, power on the syringe pump according to the following steps:

1. Press the **ON/OFF** button.
2. The syringe pump performs a self-check.
   - ◆ The power indicator is steady green, indicating that the power indicator is normal.
   - ◆ The alarm indicator changes from red to yellow and then green, indicating that the alarm indicator is normal.
   - ◆ The system gives the “di-di-di” sound once, indicating that the loudspeaker is normal.
   - ◆ The system gives the “di-di” sound once, indicating that the beeper is normal.
   - ◆ If an exception is found during the self-check, corresponding information is displayed in the message area.
3. The infusion preparation interface is displayed after the self-check finished.

6.3 Setting the Date and Time

For correct historical records, please set the date and time before the first use of the syringe pump according to the following steps:

1. Press **HOME** to access the setting interface.
2. Choose **Local Set**>**Date& Time**.
3. Set the date format, date, time format, and time.

⚠CAUTION:

- In the case that the syringe pump has not been used for a long time or after battery replacement, the date and time may require resetting.

6.4 Selecting the Syringe Brand

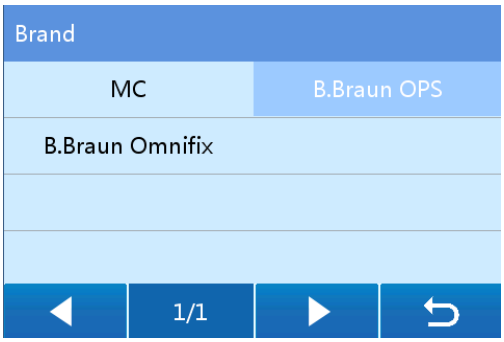
The following two methods are available for selecting the syringe brand.

Method 1:

1. On the infusion preparation interface, tap the data area where the syringe brand and size information is displayed to access the **Brand** interface.
2. Select the corresponding syringe brand.

Method 2:

1. Press **HOME** to access the setting interface.
2. Choose **Infusion Set**>**Brand**.



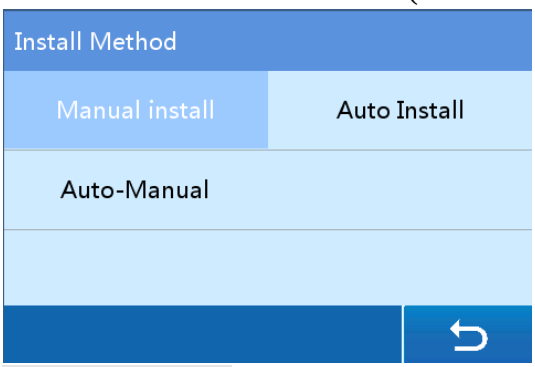
3. Select the corresponding syringe brand.

WARNING:

Please ensure that the syringe brand displayed is consistent with that actually used. Otherwise, the infusion accuracy and alarm function cannot be guaranteed.

6.5 Installing the Syringe

1. Press **HOME** to access the setting interface.
2. Choose **Infusion Set**>**Install Method**.
3. Select the installation method (manual installation or automatic installation).

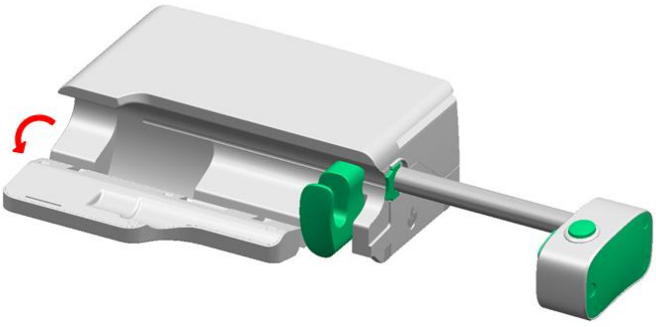


WARNING:

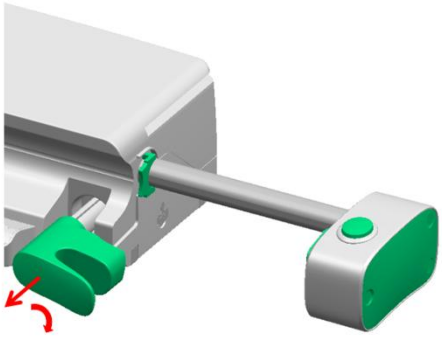
- Before installing the syringe, please power on the syringe pump.
- Check and ensure that no air bubble exists in the syringe.
- If the syringe is installed improperly, the infusion accuracy and alarm function cannot be guaranteed.

6.5.1 Manual Installation

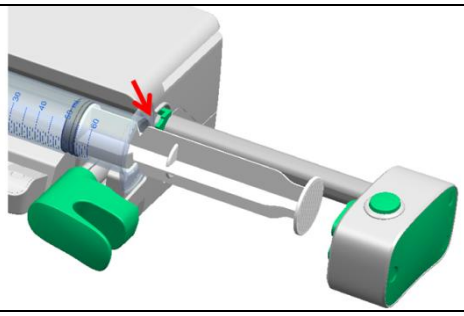
Step 1: Press and hold the clutch button, and move the drive head to the right.



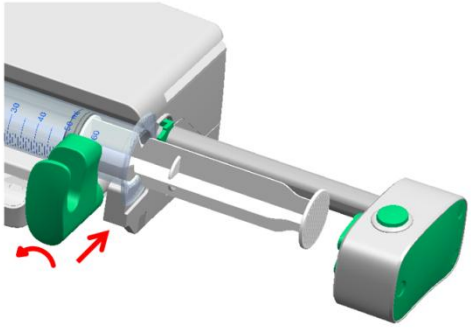
Step 2: Open the pump door.



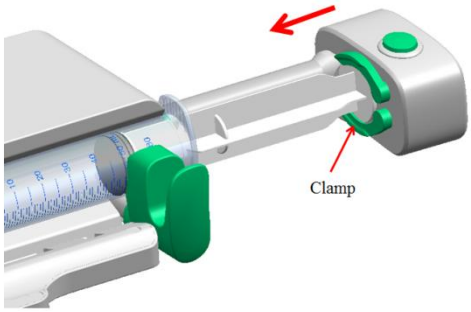
Step 3: Pull out the holder, and rotate it clockwise for over 90°.



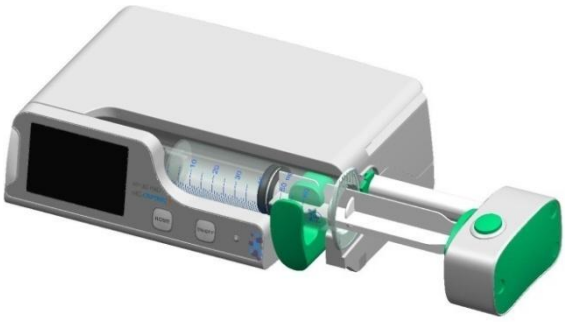
Step 4: Place the syringe in the syringe slot, and place the finger grips of the syringe in the syringe fixation.



Step 5: Rotate the holder anticlockwise for 90° and release the holder.

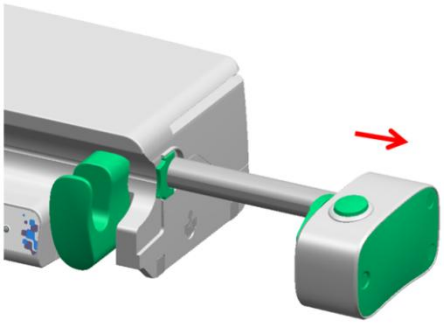


Step 6: Press and hold the clutch button, move the drive head to the left to withstand the syringe push-button, and release the clutch button.

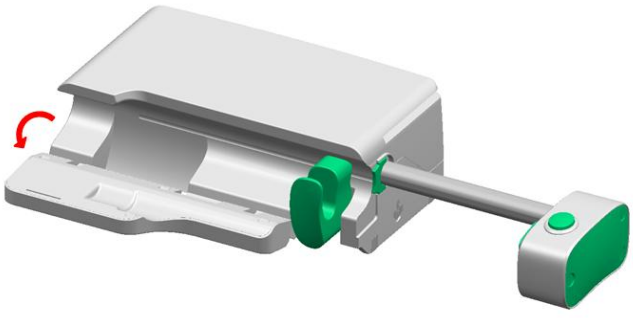


Step 7: Close the pump door.

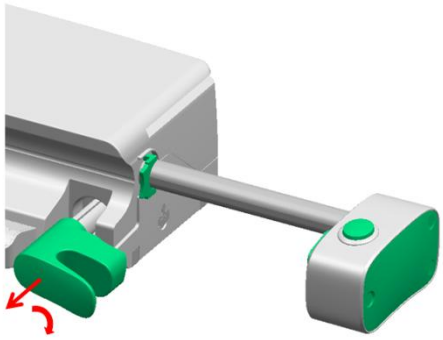
6.5.2 Auto-Manual Installation



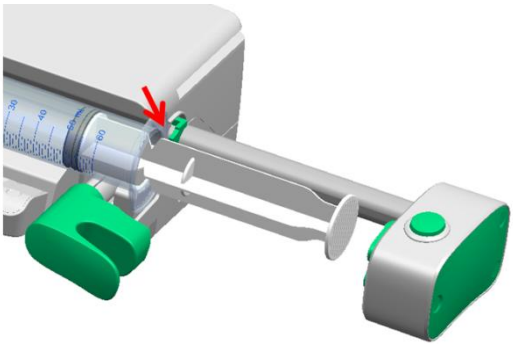
Step 1: Press and hold the clutch button, and move the drive head to the right.



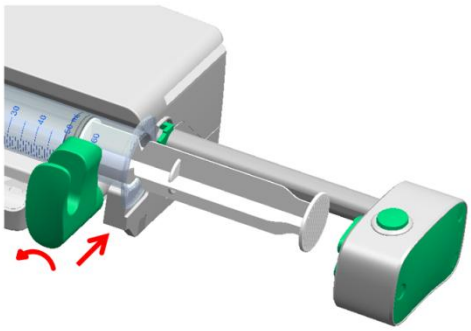
Step 2: Open the pump door.



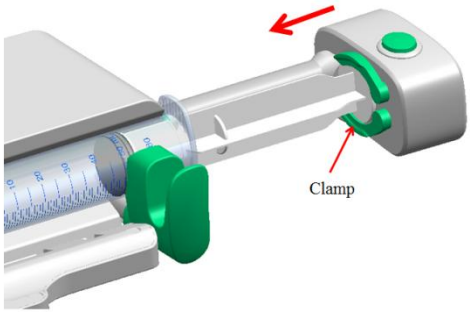
Step 3: Pull out the holder, and rotate it clockwise for over 90^{o}.



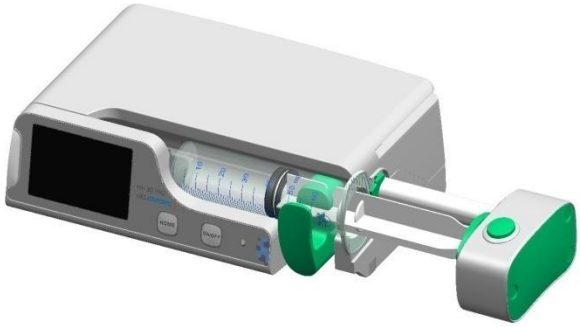
Step 4: Place the syringe in the syringe slot, and place the finger grips of the syringe in the syringe fixation.



Step 5: Rotate the holder anticlockwise for 90^{o} and release the holder.

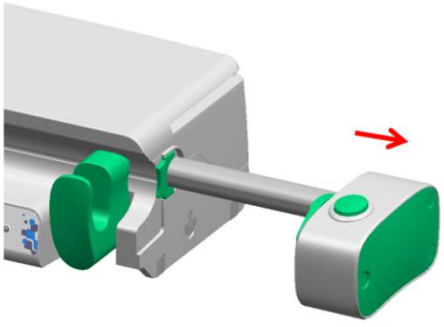


Step 6: The drive head automatically moves to the left until it withstands the syringe push-button, and the claw automatically clamps the syringe plunger.

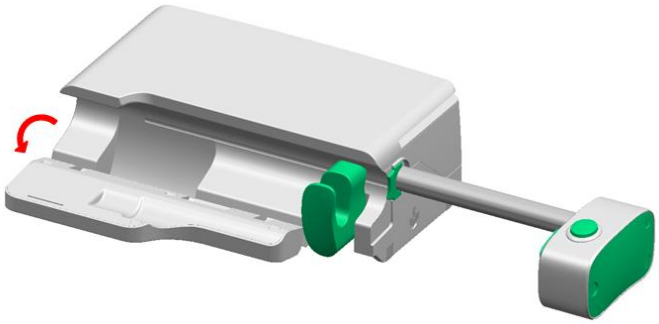


Step 7: Close the pump door.

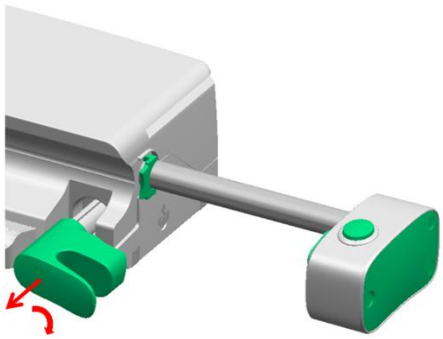
6.5.3 Automatic Installation



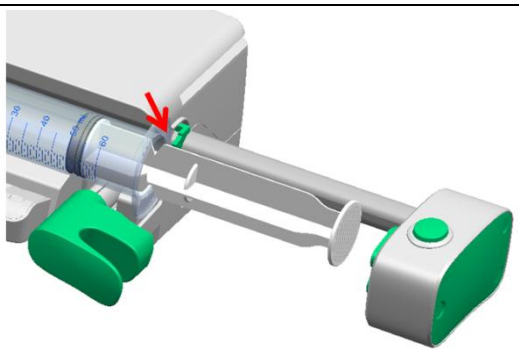
Step 1: Power on the syringe pump. The drive head automatically moves to the right.



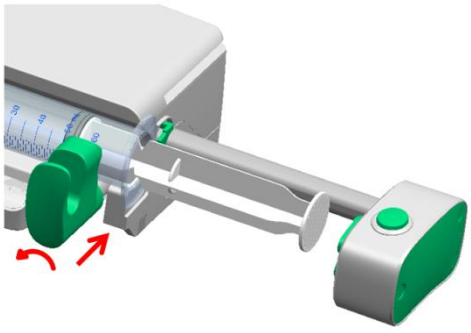
Step 2: Open the pump door.



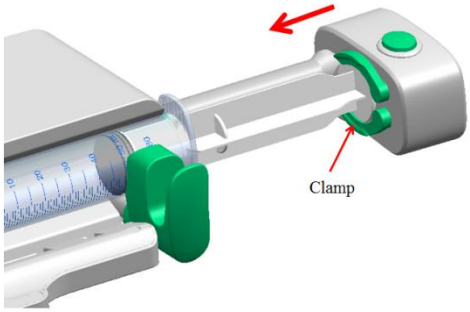
Step 3: Pull out the holder, and rotate it clockwise for over 90°.



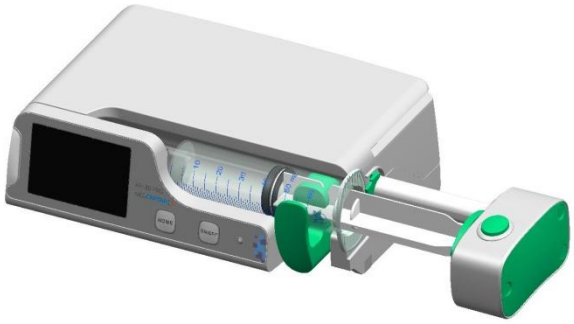
Step 4: Place the syringe in the syringe slot, and place the finger grips of the syringe in the syringe fixation.



Step 5: Rotate the holder anticlockwise for 90° and release the holder.



Step 6: The drive head automatically moves to the left until it withstands the syringe push-button, and the claw automatically clamps the syringe plunger.



Step 7: Close the pump door.

After installation of a syringe, connect the infusion tube to the nozzle of the syringe.

6.6 Purge

To prevent air bubbles from flowing into the blood together with the fluid to be infused, before the infusion, remove the air bubbles in the syringe and extension tube.

1. On the infusion preparation interface, tap the **Purge** button.
2. Tap **Confirm** for the syringe pump to purge quickly.
3. After ensuring that no air bubble exists in the syringe and extension tube, tap **Stop** to stop the purge.

⚠WARNING:

- Before performing the purge operation, ensure that the extension tube is not connected to the patient.
- The purge operation can be performed only when the infusion is not started.
- Stop the purge operation only after ensuring that liquid is delivered from the infusion needle.
- If no air bubble exists in the syringe and extension tube, the purge operation is not necessary.

⚠CAUTION:

- The default purge rate of the syringe pump is the maximum rate supported by the syringe. If a small infusion needle is used for infusion of high-viscosity liquid, an occlusion alarm may be triggered during a purge operation at high rate.

6.7 Setting Infusion Parameters

6.7.1 Selecting the Infusion Mode

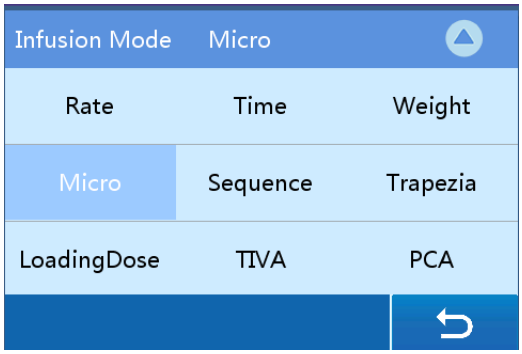
Two methods are available to select infusion mode:

Method 1:

1. Press **HOME** to access the setting interface.
2. Choose **Infusion Set**>**Infusion Mode**.
3. Tap  and select a desired mode.

Method 2:

1. On the infusion preparation interface, tap the infusion mode area in the data area to access the **Infusion Mode** interface.
2. Tap  and select a desired mode.
3. Set the parameters for the selected infusion mode. For details, see section 7.1.1.



6.7.2 Setting the Infusion Rate

If you have already set the infusion parameters according to section 6.7.1, you do not need to set again according to this section.

1. On the infusion preparation interface, tap the infusion rate area in the data area to access the infusion rate setting interface.
2. Input the desired infusion rate and tap **Confirm** to finish the setting.
3. On the infusion preparation interface, tap **Clear** to clear the data of the volume infused as required.

⚠CAUTION:

- To set the infusion rate in Sequence Mode, Trapezia Mode, LoadingDose Mode, TIVA Mode, or PCA Mode, you need to tap the infusion mode area in the data area on the infusion preparation interface to perform the setting.

- If the infusion rate exceeds the range after replacement with a syringe of another size, the pump automatically sets the infusion rate to the maximum valid supported by the new syringe.
- When a parameter is set to a value exceeding the setting range, the syringe pump gives a prompt tone.

6.8 Vena Puncture

Place the catheter in the vein according to the instructions of its manufacturer. Connect the IV tube to the catheter by means of the luer lock connector.

6.9 Starting Infusion

After the preceding operations are finished, tap the **Start** button on the infusion preparation interface for the syringe pump to start infusion at the preset infusion rate.

⚠CAUTION:

- Before starting the infusion, ensure that the values set on the syringe pump are the same as the values on the prescription (especially the position of the decimal point).
- After infusion starts, the total volume infused cannot be cleared.

6.10 Changing Infusion Rate During Infusion

1. During infusion, tap the right part of the area where the infusion rate is displayed to access the infusion rate setting interface, and input a new infusion rate value.
2. Tap **Confirm** for the syringe pump to return to the infusion interface and infuse at the new infusion rate. You can also tap **Cancel** to return to the infusion interface without changing the infusion rate.

⚠CAUTION:

- You are allowed to change the infusion rate during infusion only in Rate Mode, Time Mode, Weight Mode, and Micro Mode.
- If no operation is performed on the prompt interface or infusion rate setting interface for about 10s, the system automatically returns to the infusion preparation interface.

- After you change the infusion rate and confirm the change during the infusion, the pump infuses liquid at the new infusion rate.

6.11 Bolus

The syringe pump supports three bolus modes: manual bolus, semi-auto bolus, and automatic bolus.

Automatic bolus, semi-auto bolus, and manual bolus support infusion based on the bolus dose (only applicable to the weight mode and TIVA mode). Multiple bolus dose unit options are provided for selection.

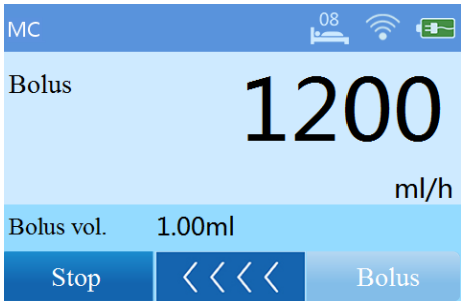
- If the dose rate unit contains x (x may be ng, ug, mg, g, IU, mIU, kIU, EU, mol, mmol, mcal, cal, kcal, and mEq) and the dose rate unit contains kg, the bolus volume unit has the following options for selection: x/kg, x, x/m^2, and ml.
- If the dose rate unit contains x (x may be ng, ug, mg, g, IU, mIU, kIU, EU, mol, mmol, mcal, cal, kcal, and mEq) and the dose rate unit does not contain kg, the bolus volume unit has the following options for selection: x and ml.

1. Press **HOME** to access the setting interface.
2. Choose **Infusion Set**>**Bolus Set**.
3. Select the bolus mode, and set the manual bolus limit, default bolus rate, and default bolus VTBI. Two bolus modes are available for selection: **Semi-Auto Bolus** and **Automatic Bolus**.

⚠CAUTION:

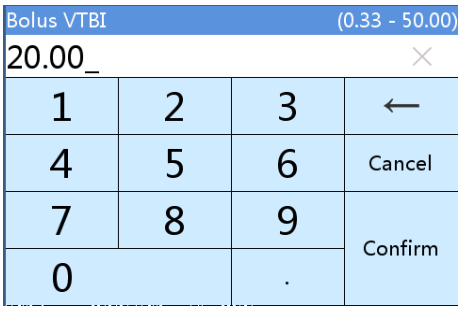
- The manual bolus mode does not need to be selected on a setting interface. During the infusion, you can tap and hold Bolus for 2s to enable the manual bolus function.
- The bolus volume is included in the total volume.
- By default, the manual bolus mode is enabled.
- After the default bolus rate is changed, the change will take effect for all the three bolus modes.
- After the default bolus volume is changed, the change will take effect for the semi-auto bolus mode and automatic bolus mode.
- After setting of the manual bolus limit, a manual bolus automatically stops when reaching the limit.

6.11.1 Manual Bolus



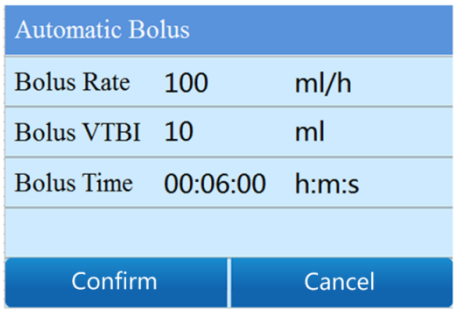
Manual bolus: During the infusion, tap and hold **Bolus** for 2s to start bolus. Keep on holding the button to continue bolus, and release the button to stop bolus. The pump automatically stops manual bolus when reaching the manual bolus limit even if the user keeps on holding the button.

6.11.2 Semi-Auto Bolus



Semi-auto bolus: During the infusion, tap **Bolus**, set **Bolus VTBI** on the displayed interface, and tap **Confirm** to start bolus. During the bolus process, you can tap **Stop Bolus** to stop the bolus or tap **Stop** to stop the infusion.

6.11.3 Automatic Bolus



Automatic bolus: During the infusion, tap **Bolus**, set **Bolus Rate** and **Bolus VTBI** on the displayed interface, and tap **Confirm** to start bolus. During the bolus process, you can tap **Stop Bolus** to stop the bolus or tap **Stop** to stop the infusion.

6.12 Stopping Infusion

During the infusion or when the infusion finishes, you can tap **Stop** to stop the infusion.

6.13 Powering Off the Syringe Pump

After you press the **ON/OFF** button, three buttons are displayed: **Power Off**, **Screen Lock**, and **Standby**.

- You can tap Power Off to power off the pump.
- You can also tap the Standby button to make the pump enter standby state. In addition, you can modify the standby time. After the standby time expires, the screen automatically displays the infusion preparation interface.
- You can also tap Screen Lock to lock the screen.

7 Syringe Pump Settings

Description of the icons on the display screen

	Used to turn to the previous page. Note: If the items of the same setting interface cannot be displayed on one page, these items will be displayed on different pages. In this case, this symbol appears.
	Used to turn to the next page.
	Used to indicate the No. of the current page.
	Used to return to the upper-level menu or previous operation.
	Drop-down menu button. You can tap this button to display all the infusion modes.
	Calculation button. You can tap this button to set the drug amount and volume for calculation of the drug concentration.

7.1 Infusion Set

Press **HOME** to access the setting interface, and tap **Infusion Set** to access the infusion setting interface. Then, you can set relevant items respectively according to sections 7.1.1~7.1.9.

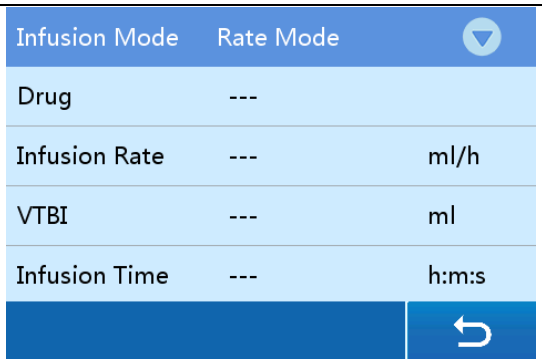
7.1.1 Infusion Mode

The syringe pump supports the following infusion modes: Rate Mode, Time Mode, Weight Mode, Micro Mode, Sequence Mode, Trapezia Mode, LoadingDose Mode, TIVA Mode, PCA Mode, and Intermittent Mode. The drugs for all the modes are selected from the drug library.

- Rate Mode

  In Rate Mode, the syringe infuses pump liquid at constant infusion rate and finishes the infusion when reaching the preset VTBI or time. Set **Drug**, **Infusion Rate**, **VTBI**, and **Infusion Time** for this mode and tap the return button.

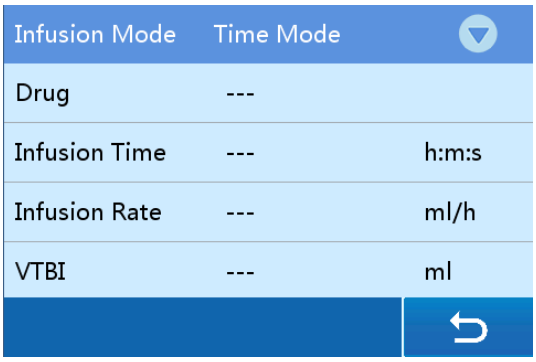
Syringe Pump Settings



Infusion Mode	Parameter	Range
Rate Mode	Infusion Rate	See the description about the **Infusion Rate** parameter in section 3.
	VTBI	0.10–9999.99 ml
	Infusion Time	0:00:01~99:59:59(h:m:s)
Note: **Infusion Rate=VTBI/Infusion Time**. After any two of the three parameters are specified, the value of the third parameter is calculated automatically according to this formula.		

- Time Mode

  In Time Mode, the syringe infuses pump liquid at constant infusion rate based on the infusion time set by the user and finishes the infusion when the preset infusion time expires. Set **Drug**, **Infusion Time**, **Infusion Rate**, and **VTBI** for this mode and tap the return button.



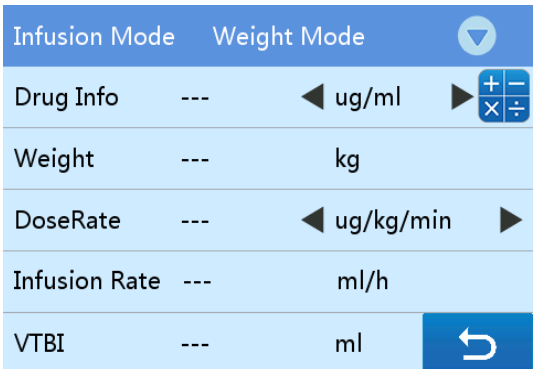
Infusion Mode	Parameter	Range
Time Mode	Infusion Time	00:00:01~99:59:59(h:m:s)
	Infusion Rate	See the description about the **Infusion Rate** parameter in section 3.
	VTBI	0.10–9999.99 ml

Syringe Pump Settings

Note: Infusion Time=VTBI/Infusion Rate. After any two of the three parameters are specified, the value of the third parameter is calculated automatically according to this formula.

- Weight Mode

In Weight Mode, the syringe pump calculates the infusion rate based on the patient's weight, infuses liquid at the calculated infusion rate, and finishes the infusion when reaching the preset VTBI. Set **Drug Info**, **DoseRate** (or **Infusion Rate**), **Weight**, and **VTBI** for automatic calculation of the rate, and then tap the return button.

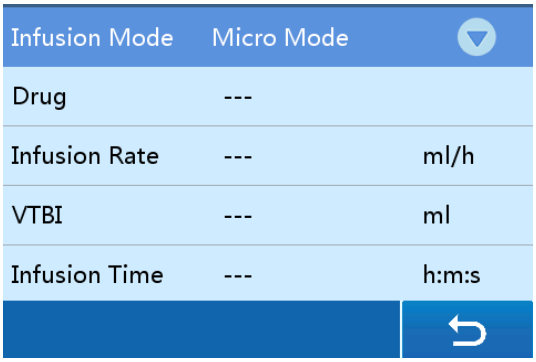


Infusion Mode	**Parameter**	**Range**
Weight Mode	Conc.	0.01~9999.99
	Concentration unit	ug/ml, mg/ml, g/ml, ng/ml, mIU/ml, IU/ml, kIU/ml, EU/ml, mol/ml, mmol/ml, mcal/ml, cal/ml, kcal/ml, mEq/ml
	Drug Amount	0.01~9999.99
	Drug amount unit	ug, mg, g, ng, mIU, IU, kIU, EU, mol, mmol, mcal, cal, kcal, mEq
	Volume	0.10~9999.99 ml
	Weight	0.1~300.0 kg
	Dose rate unit	x/min, x/kg/min, x/h, x/kg/h, x/24h, x/kg/24h, x/m^2/min, x/m^2/h, x/m^2/24h (x may be ng, ug, mg, g, mIU, IU, kIU, EU, mmol, mol, mcal, cal, kcal, and mEq)
	DoseRate	0.01~9999.99

Infusion Mode	Parameter	Range
	Infusion Rate	Automatic calculation
	VTBI	0.10–9999.99 ml
Notes: ● **Conc.**: This parameter can be directly input or obtained by calculation according to the following formula: **Conc.**=**Drug Amount**/**Volume**. ● **Infusion Rate**=[**DoseRate**(if the unit contains kg)/**Conc.**] x **Weight** ● **Infusion Rate**=**DoseRate**(if the unit does not contain kg)/**Conc.** ● **Time Left**=**VTBI**/**Infusion Rate**		

■ Micro Mode

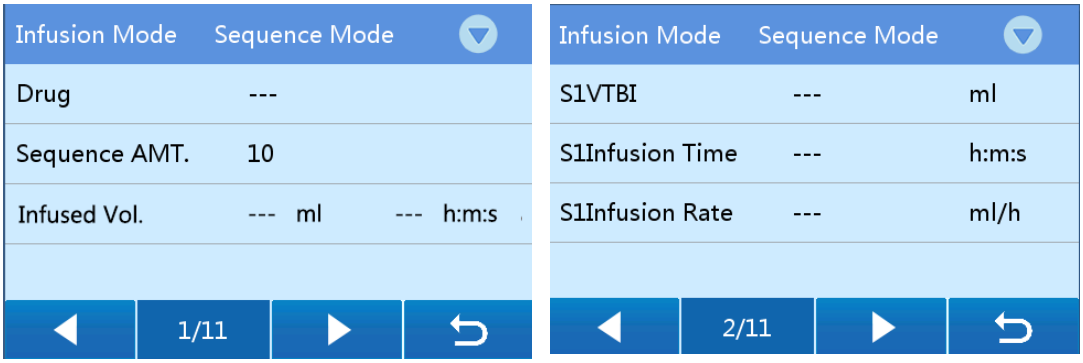
In Micro Mode, the infusion rate and VTBI setting ranges are limited. The syringe pump infuses liquid at constant infusion rate set by the user and finishes the infusion when reaching the preset VTBI or infusion time. Set **Drug**, **Infusion Rate**, **VTBI**, and **Infusion Time** for this mode and tap the return button.



Infusion Mode	Parameter	Range
Micro Mode	Infusion Rate	0.10-60.00(ml/h)(2ml syringe) 0.10-90.00(ml/h)(3ml syringe) 0.10-100.0(ml/h)(5ml, 10ml, 20ml, 30ml, 50/60ml syringe)
	VTBI	0.10–1000.00 ml
	Infusion Time	00:00:01~99:59:59(h:m:s)
Note: **Infusion Time**=**VTBI**/**Infusion Rate**. After any two of the three parameters are specified, the value of the third parameter is calculated automatically according to this formula.		

■ Sequence Mode

In Sequence Mode, the syringe pump successively infuses liquid based on various infusion sequences set for the pump. Different infusion rates and infusion time can be set for these infusion sequences. In sequence mode, when the infusion time set for an infusion sequence expires, the syringe pump starts infusion based on the next sequence. When all sequences are finished, the entire infusion is finished. Set **Drug** as well as **Infusion Rate** and **Infusion Time** for all the sequences, and then tap the return button.



Infusion Mode	**Parameter**	**Range**
Sequence mode	S*n*VTBI	0.10–9999.99 ml
	S*n*Infusion Time	00:00:01~99:59:59(h:m:s)
	S*n*Infusion Rate	See the description about the **Infusion Rate** parameter in section 3.
Notes: **VTBI**=**Infusion Rate** x **Infusion Time**. **Infused Vol.** is the sum total of the **VTBI** values respectively set for all the sequences. If only **Infusion Time** is set for a pump in the sequence, the infusion pauses during this infusion time. *n* is a digit (for example, 1, 2, 3…).		

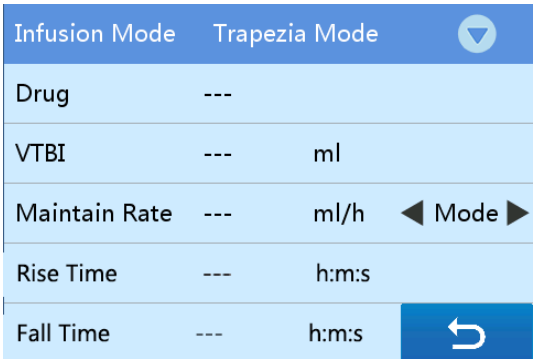
■ Trapezia Mode

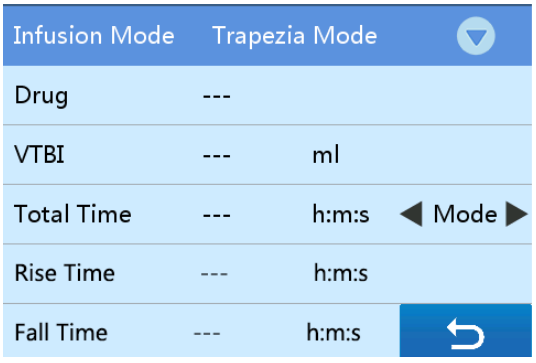
The Trapezia Mode includes two modes: Maintain Rate and Total Time. You can switch between the two modes by tapping the **Mode** button.

In Maintain Rate mode, the infusion rate gradually increases by 10% of the target maintain rate each time and reaches the target maintain rate after increase for 10 times within the preset rise time. Finally, the infusion rate gradually decreases

for 10 times until the infusion rate is 0 and the infusion is finished within the preset fall time.

In Total Time mode, the system automatically calculates the maintain rate based on the values of **VTBI**, **Total Time**, **RiseTime**, and **FallTime** set by the user. The infusion operation method in the Total Time mode is the same as that in the Maintain Rate mode. Set **Drug**, **VTBI**, **Maintain Rate** (or **Total Time**) for automatic calculation of the rate, and then tap the return button.



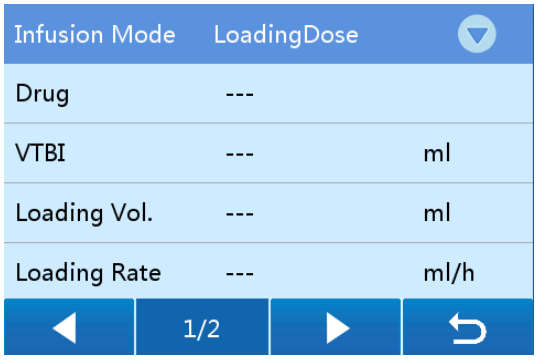


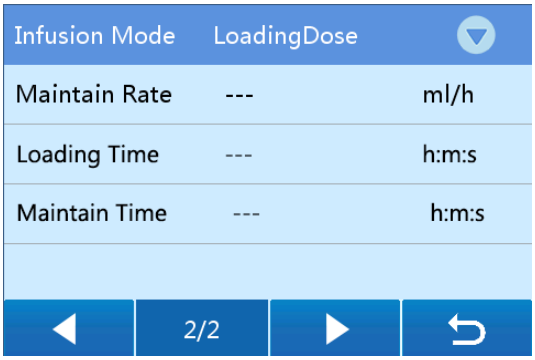
Infusion Mode	**Parameter**	**Range**
Trapezia Mode	VTBI	0.10–9999.99 ml
	Maintain Rate	See the description about the **Infusion Rate** parameter in section 3.
	Total Time	00:00:01~99:59:59(h:m:s)
Note: **Maintain Rate** = 2 x **VTBI**/(2 x **Total Time** - **RiseTime** - **FallTime**)		

■ LoadingDose Mode

The LoadingDose Mode includes two phases: loading phase and maintain phase. In loading phase, the syringe pump infuses liquid at the preset loading rate invariably and enters the maintain phase when reaching the preset loading volume. In maintain phase, the syringe pump infuses liquid at the preset maintain rate invariably and finishes the infusion when reaching the preset VTBI or loading volume. Set **Drug**, **VTBI**, **Loading Vol.**, **Loading Rate**, and **Maintain Rate**, and then tap the return button.

Syringe Pump Settings



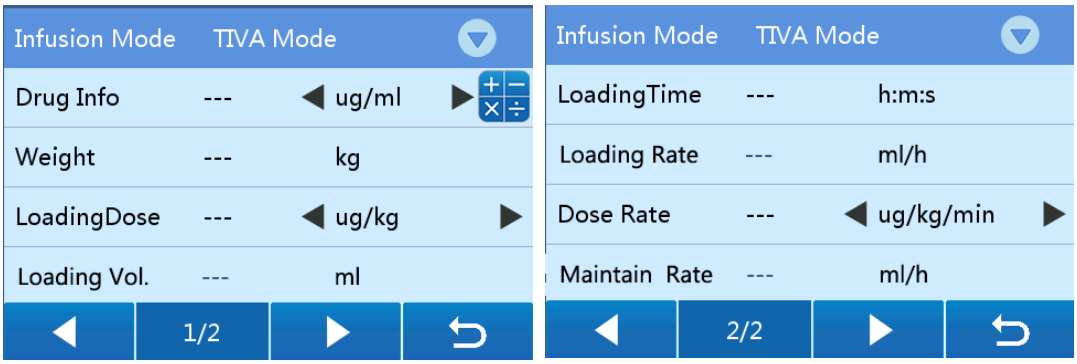


Infusion Mode	**Parameter**	**Range**
LoadingDose Mode	VTBI	0.10–9999.99 ml
	Loading Vol.	0.10–9999.99 ml
	Loading Rate	See the description about the **Infusion Rate** parameter in section 3.
	Maintain Rate	
	Loading Time	00:00:01~99:59:59(h:m:s)
	Maintain Time	00:00:01~99:59:59(h:m:s)
Notes: **Loading Vol.**=**LoadingTime** x **Loading Rate** **Maintain Time**=(**VTBI - Loading Vol.**)/**Maintain Rate**		

■ TIVA Mode

The TIVA Mode includes two phases: loading phase and maintain phase. In loading phase, the syringe pump infuses liquid at the calculated loading rate invariably and enters the maintain phase when reaching the loading volume. In maintain phase, the syringe pump infuses liquid at the maintain rate invariably until the user manually stops infusion or the syringe is empty. Set **Drug**, **Conc.**, **Weight**, and **LoadingTime**. Set any one parameter of **LoadingDose**, **Loading Vol.**, and **Loading Rate** for automatic calculation of the other two parameters. Set any one of **Dose Rate** and **Maintain Rate** for automatic calculation of the other one. Then, tap the return button, and then tap the return button.

Syringe Pump Settings



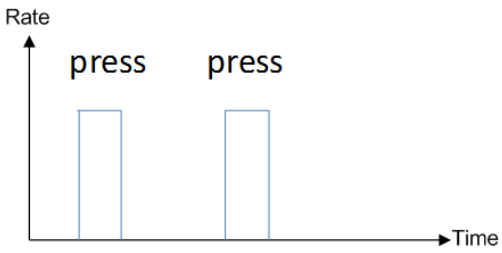
Infusion Mode	**Parameter**	**Range**
TIVA Mode	Conc.	0.01~9999.99
	Concentration unit	ug/ml, mg/ml, g/ml, ng/ml, mIU/ml, IU/ml, kIU/ml, EU/ml, mol/ml, mmol/ml, mcal/ml, cal/ml, kcal/ml, mEq/ml
	Drug Amount	0.01~9999.99
	Drug amount unit	ug, mg, g, ng, mIU, IU, kIU, EU, mol, mmol, mcal, cal, kcal, mEq
	Volume	0.10~9999.99 ml
	Weight	0.1~300.0 kg
	LoadingDose	0.01~9999.99
	DoseUnit	ug/kg, mg/kg, g/kg, ng/kg, mIU/kg, IU/kg, kIU/kg, EU/kg, mmol/kg, mol/kg, mcal/kg, cal/kg, kcal/kg, mEq/kg
	LoadingTime	00:00:01~99:59:59(h:m:s)
	Dose Rate	0.01~9999.99
	Dose rate unit	x/min, x/kg/min, x/h, x/kg/h, x/24h, x/kg/24h, x/m^2/min, x/m^2/h, x/m^2/24h (x may be ng, ug, mg, g, mIU, IU, kIU, EU, mmol, mol, mcal, cal, kcal, and mEq)
Notes: **Loading Vol.**=**LoadingDose** x **Weight/Conc.** **Loading Rate**=**Loading Vol./LoadingTime** **Maintain Rate**=**Dose Rate**(if the unit contains kg) x **Weight/Conc.** **Maintain Rate**=**Dose Rate**(if the unit does not contain kg)**/Conc.**		

■ PCA Mode

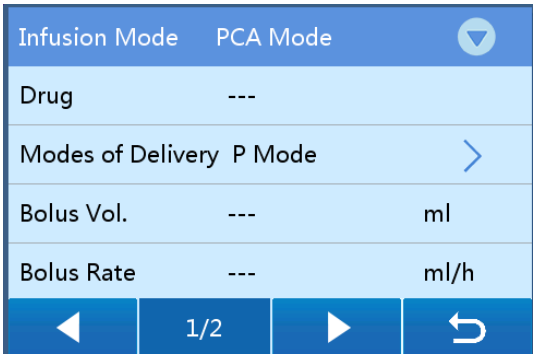
The PCA Mode includes three infusion modes: P Mode, CP Mode, and LCP Mode.

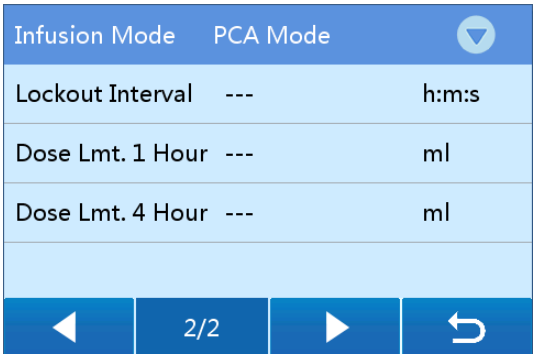
P Mode:

In P Mode, the syringe pump infuses liquid at the preset bolus rate invariably and stops infusion when reaching the bolus volume, as shown in the following figure.



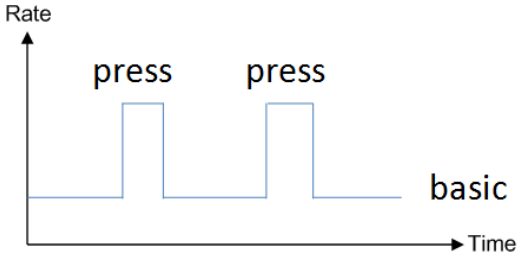
Setting interface:



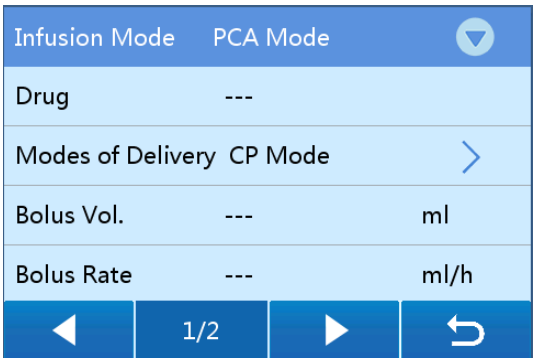


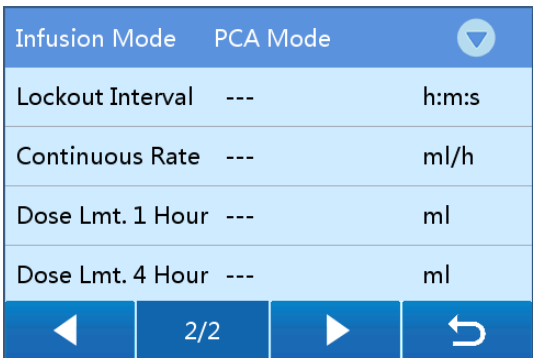
CP (Continuous infusion volume + PCA) mode:

In CP mode, the syringe pump infuses liquid at the continuous rate invariably. When the PCA control button is pressed as required, the syringe pump infuses liquid at the preset bolus rate invariably. After reaching the bolus volume, the syringe pump continues the infusion at the continuous rate until the total infusion volume reaches the value of **Dose Lmt. 1 Hour** or **Dose Lmt. 4 Hour**, until the user manually stops the infusion, or until the syringe is empty, as shown in the following figure.



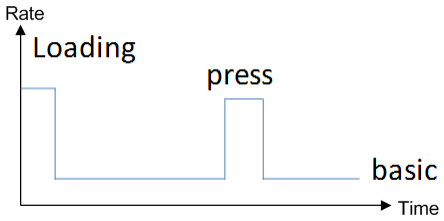
Setting interface:



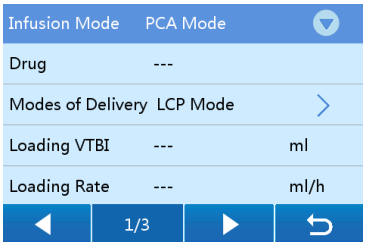


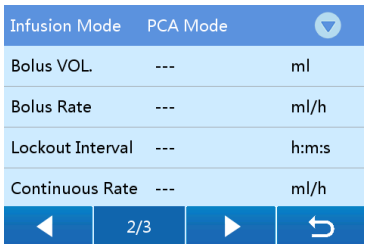
LCP (Loading dose + Continuous infusion volume + PCA) mode:

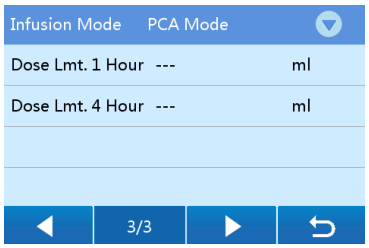
In LCP mode, the syringe pump infuses liquid at the preset loading rate invariably and starts to infuse liquid at the continuous rate when reaching the loading volume. When the PCA control button is pressed as required, the syringe pump infuses liquid at the preset bolus rate invariably. After reaching the bolus volume, the syringe pump continues the infusion at the continuous rate until the total infusion volume reaches the value of **Dose Lmt. 1 Hour** or **Dose Lmt. 4 Hour**, until the user manually stops the infusion, or until the syringe is empty, as shown in the following figure.



Setting interface:







Infusion Mode	**Parameter**	**Range**
PCA Mode	Modes of Delivery	**P Mode**, **CP Mode**, or **LCP Mode**
	Bolus VOL.	0.10~9999.99 ml
	Bolus Rate	See the description about the **Infusion Rate** parameter in section 3.
	Lockout Interval	00:00:01~99:59:59(h:m:s)
	Dose Lmt. 1 Hour	0.10~9999.99 ml

Syringe Pump Settings

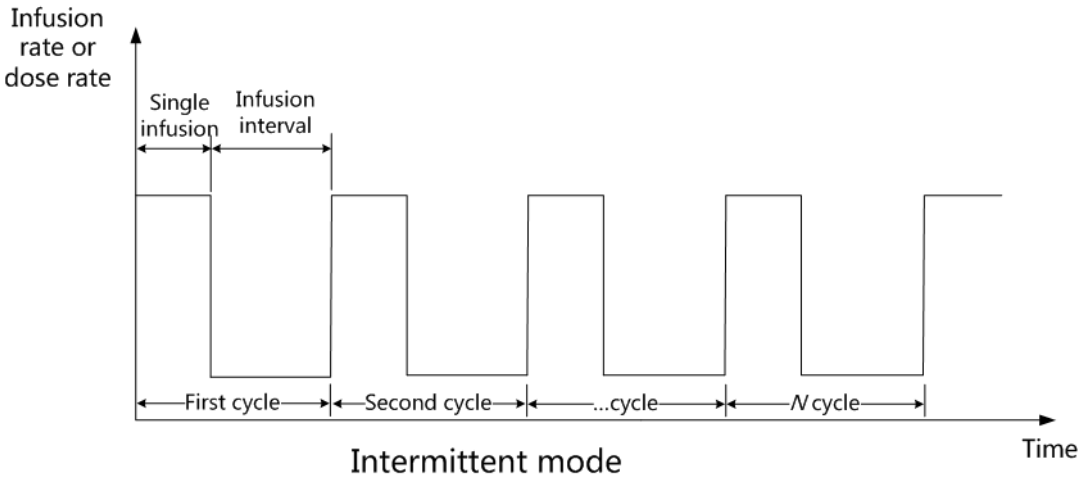
Infusion Mode	Parameter	Range
	Dose Lmt. 4 Hour	0.10~9999.99 ml
	Continuous Rate	See the description about the **Infusion Rate** parameter in section 3.
	Loading VTBI	0.10~9999.99 ml
	Loading Rate	See the description about the **Infusion Rate** parameter in section 3.
Notes: Lockout Interval indicates the interval of pressing the PCA control button twice in a row. **Dose Lmt. 1 Hour** or **Dose Lmt. 4 Hour** indicates the sum total of the bolus volume, loading volume, and continuous volume.		

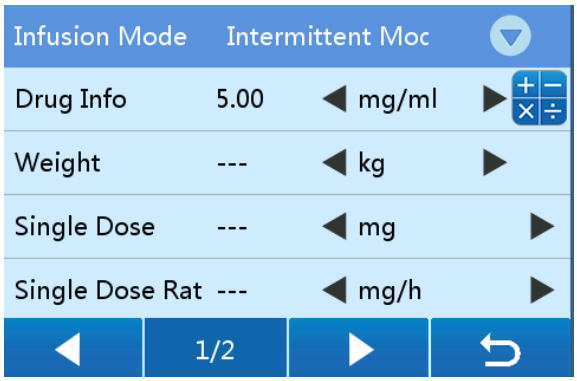
⚠CAUTION:

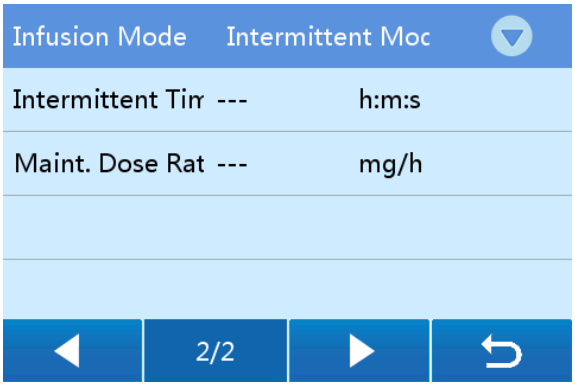
- Only the patient in normal mental state and with clear consciousness is allowed to use the PCA function.
- It is recommended that the doctor should evaluate whether to allow the patient to use the PCA function independently.
- The doctor must train the patient how to use the PCA function. Only qualified patients are allowed to use the PCA function independently.
- Before pressing the PCA control button, ensure that the PCA control button is properly connected to the syringe pump, the PCA control button functions properly, and the syringe pump is in PCA infusion mode.
- It is highly recommended that **Dose Lmt. 1 Hour** and **Dose Lmt.** be set before using the PCA function.
- During infusion in PCA mode, professional medical personnel must monitor the patient conditions at regular intervals.
- All the infusion modes support the drug library. The manufacturer does not provide the drug parameters in the drug library.

- Intermittent Mode

  Set **Conc.**, **Weight**, **Bolus Rate** (**Single Dose Rate**), **Bolus Vol.** (**Single Dose**), **Intermittent Time**, and **Continuous Rate** (**Maint Dose Rate**). If the unit m^2 is selected for the weight, the dose rate is calculated based on the body surface area (BSA), **Bolus Rate** changes to **Single Dose Rate**, **Bolus Vol.** changes to **Single Dose**, and **Continuous Rate** changes to **Maint Dose Rate**.







Infusion Mode	Parameter	Range
Intermittent Mode	Conc.	0.01~9999.99
	Concentration unit	ug/ml, mg/ml, g/ml, ng/ml, mIU/ml, IU/ml, kIU/ml, EU/ml, mol/ml, mmol/ml, mcal/ml, cal/ml, kcal/ml, mEq/ml
	Drug Amount	0.01~9999.99
	Drug amount unit	ug, mg, g, ng, mIU, IU, kIU, EU, mol, mmol, mcal, cal, kcal, mEq
	Volume	0.10~9999.99 ml

Infusion Mode	Parameter	Range
	Weight	0.1~300.0 kg
	BSA	Automatic calculation
	Height	1.0~300.0 cm
	BSA Formulas	Stevenson's or Dubios
	Single Dose	0.01~9999.99
	Single Dose Rate	0.01~9999.99
	Dose Rate Unit	x/min, x/kg/min, x/h, x/kg/h, x/24h, x/kg/24h, x/m^2/min, x/m^2/h, x/m^2/24h (x may be ng, ug, mg, g, mIU, IU, kIU, EU, mmol, mol, mcal, cal, kcal, and mEq)
	Bolus Vol.	HP-30: 0.10~9999.99 ml HP-30 Neo: 0.01~9999.99 ml
	Bolus Rate	See the description about the **Infusion Rate** parameter in section 3.
	Intermittent Time	00:00:01~99:59:59(h:m:s)
	Maint Dose Rate	0.01~9999.99
	Continuous Rate	See the description about the **Infusion Rate** parameter in section 3.

Notes:

- **Bolus Rate**=[**Single Dose Rate** (if the unit contains kg)/**Conc.**] x **Weight**
- **Bolus Rate**=**Single Dose Rate** (if the unit does not contain kg)/**Conc.**
- **Continuous Rate**=[**Maint Dose Rate** (if the unit contains kg)/**Conc.**] x **Weight**
- **Continuous Rate**=**Maint Dose Rate** (if the unit does not contain kg)/**Conc.**

7.1.2 Brand

The syringe pump allows you to select the brand of the syringe. You are recommended to use the built-in syringe brands, that is, MC (MEDCAPTAIN) and B.Braun.

List of recommended syringes

Brand	Size
MC	2 ml, 3 ml, 5 ml, 10 ml, 20 ml, 30 ml or50/60 ml
B. Braun Omnifix	2 ml, 3 ml, 5 ml, 10 ml, 20 ml, 30 ml or 50/60 ml
B.Braun OPS	20 ml or 50/60 ml

⚠CAUTION:

- To add a syringe of other brand, you are strongly recommended to contact your local distributor. Professional staff of the local distributor will conduct setting and test to ensure the infusion accuracy.
- If you want to set the syringe on your own, please contact your local distributor to ask for the setting method.
- 30 brands of syringe can be built in the syringe pump. Each syringe brand includes 7 different sizes of syringe.

7.1.3 Bolus Set

Three bolus modes are available. For the detailed description of the three bolus modes, see section 6.11.

7.1.4 OCCL Level

15 occlusion levels are available for selection to meet various clinical demands. Set the occlusion level, as shown in the following figure. For the relationship between the occlusion level and pressure, see Table 7-1.

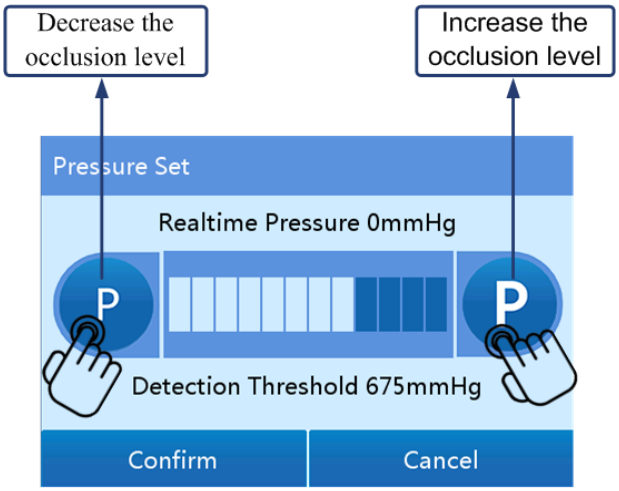


Table 7-1 Relationship between the occlusion level and pressure

Occlusion Level	Display	Intensity of Pressure			
		mmHg	Kpa	bar	psi
1	P1	50	6.7	0.067	0.97
2	P2	150	20	0.200	2.90
3	P3	225	30	0.300	4.35

4	P4	300	40	0.400	5.80
5	P5	375	50	0.500	7.25
6	P6	450	60	0.600	8.70
7	P7	525	70	0.700	10.15
8	P8	600	80	0.800	11.60
9	P9	675	90	0.900	13.05
10	P10	750	100	1.00	14.50
11	P11	825	110	1.10	15.95
12	P12	900	120	1.20	17.40
13	P13	975	130	1.30	18.85
14	P14	1050	140	1.40	20.30
15	P15	1125	150	1.50	21.75

A 50/60ml syringe is not applicable for the occlusion levels P14 and P15.

Occlusion alarm inaccuracy of the syringe pump at occlusion level P1 is 50^{+170}_{-45}mmHg, and occlusion alarm inaccuracy of the syringe pump at other occlusion levels ≤±145mmHg.

⚠CAUTION:

- In order not to infuse extra volume into the patient's body after the occlusion alarm is eliminated, the motor automatically and reversely rotates to release the tube pressure in case of an occlusion alarm (anti-bolus function).
- If the occlusion level is set to a low level and high-viscosity solution is selected for infusion, an occlusion alarm may be reported even if there is no occlusion in the tube. Carefully observe the dynamic occlusion pressure in the data area on the infusion preparation interface, and adjust the occlusion level to a higher level as required.
- If the occlusion level is set to a high level, the occlusion alarm is triggered only when a relatively high pressure is accumulated in the tube. Please ensure that the infusion tube is firmly connected to the syringe.
- An occlusion alarm may be triggered when a small intravenous needle is used for infusion of high-viscosity liquid at high infusion rate. In this case, set the occlusion level to a higher level or reduce the infusion rate.
- The HP-30 PRO syringe pump may not generate an infusion pressure that exceeds the maximum occlusion level (1125+145mmHg).

7.1.5 KVO set

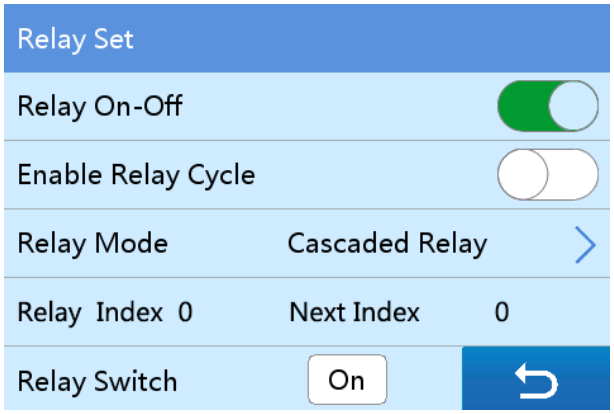
KVO stands for Keep Vein Open. After finishing an infusion task for which VTBI is set, the syringe pump continues the infusion at the preset KVO rate to avoid blood return and vascular occlusion.

- KVO function switch: Used to enable or disable the KVO function.
- **KVO Mode**: **KVO Rate** and **Adaptive KVO**. On the **KVO Rate** interface, you can set the constant KVO rate. On the **Adaptive KVO** interface, you can set a corresponding KVO rate based on each infusion rate range. After entering the KVO mode, the syringe pump automatically matches a KVO rate.
- Setting range of **KVO Rate**: 0.10~5.00ml/h (minimum increment: 0.01ml/h).

7.1.6 Relay Set

Set the relay after inserting the syringe pump into the infusion workstation. The pumps in the infusion workstation infuse liquid in sequence according to the relay setting.

- **Relay On-Off**: Used to control whether the pump is allowed to participate in the relay infusion. Relay setting parameters are visible only if the relay function is enabled.
- **Enable Relay Cycle**: Used to control whether the current relay mode is circular relay.
- **Relay Mode**: Includes **Cascaded Relay** and **Custom Relay**.
  - In cascaded relay mode, the pumps start infusion successively according to the slot sequence. Circular relay is supported in cascaded relay mode.
  - In custom relay mode, the pumps start infusion successively according to the sequence set by the user. Circular relay is not supported in custom relay mode.
- **Relay Index**: The default value is the slot No.
- **Next Index**: The sequence No. of the pump that will start infusion after the current pump finishes infusion.
- **Relay Switch**: After you tap the **On** button, the relay function is enabled for all the pumps in the infusion workstation.



⚠CAUTION:

- The **Relay Set** interface is activated after a pump is inserted into the infusion workstation.
- If **Relay Index** of the syringe pump is not **0**, the syringe pump already enters the relay mode.
- If **Next Index** is 0, the current relay is finished.

7.1.7 Limit Control

After the limit control function is enabled, parameter settings are limited for all infusion modes. In addition, you can set the upper infusion rate limit and upper VTBI limit.

Turn on/off the limit control function by tapping  or  in the **Limit Control** line.

- Upper limit range of the infusion rate: 0.10~2200ml/h
- Upper limit range of the VTBI: 0.10~9999.99ml

7.1.8 Alarm Advance

Users are allowed to set the time of reporting an alarm before the infusion is near finished. The adjustable range is 1~240min, and the default value is 3min.

7.1.9 Recent Therapy

The recent 20 therapies can be recorded. You can tap a relevant therapy record to view its details. After selecting a certain therapy record, you can tap **Confirm** to return to the infusion preparation interface and then tap **Start** to start infusing liquid based on the parameters of the selected therapy.

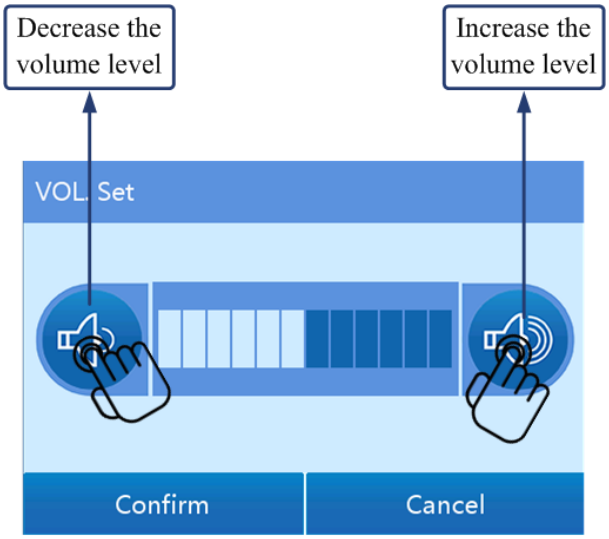
7.2 Local Set

Press **HOME** to access the setting interface, and tap **Local Set** to access the local setting interface. Then, you can set relevant items respectively according to sections 7.2.1~7.2.10.

7.2.1 VOL. Set

You can set the volume after inputting the user password.

Twelve volume levels are available for selection. You can set the volume level according to the following figure. This volume level will be the level of the alarm sound.



⚠CAUTION:

- Do not set the alarm volume lower than the ambient noise to ensure the alarm could be recognized correctly.
- The alarm system may not function if alarm parameters are set to extreme values. Check the alarm limits based on clinical condition.

7.2.2 Display Set

- 10 brightness levels are available for selection.

7.2.3 Night mode

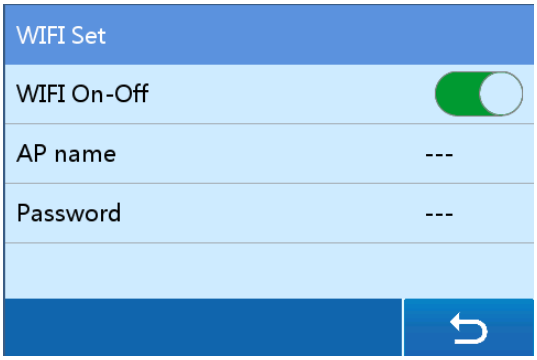
You can set the start time, end time, alarm volume, and brightness for the night mode. Within the night mode time, the syringe pump displays content at the preset brightness level and reports an alarm at the preset volume level.

- **Night mode**: Allows you to enable or disable the night mode.
- **VOL. Set**: For the detailed setting method, see section 7.2.1.
- **Display Set**: 10 brightness levels are available for selection.
- **Start Time** and **End Time**: The default start time is **22:00:00** and the default end time is **07:00:00**.

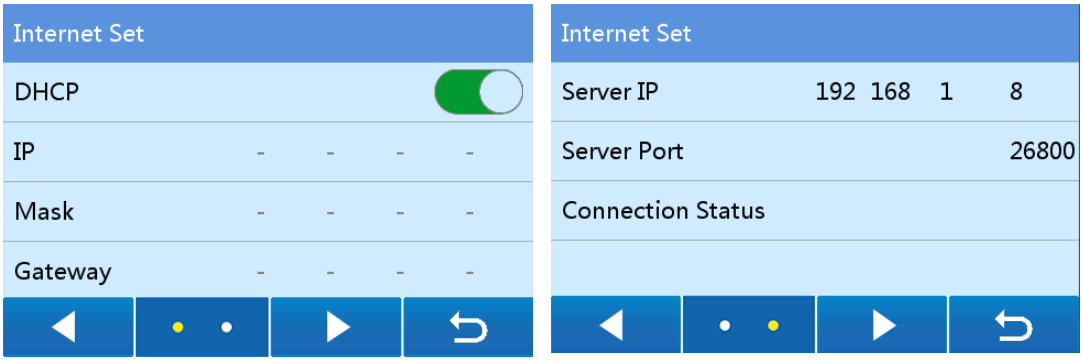
7.2.4 Communication Set

The HP-30 PRO syringe pump can be equipped with a wireless module for connection to the infusion central monitoring system in wireless mode.

- **Info Channel**: **Local WLAN**, **Station WLAN**, **Local LAN**, and **Station LAN** are available for selection.
  - Select Local WLAN when the syringe pump is connected to the infusion central monitoring system in wireless mode.
  - Select **Station WLAN** when the syringe pump is inserted into the infusion workstation and connected to the infusion central monitoring system in wireless mode.
  - Select **Local LAN** when the syringe pump is connected to the infusion central monitoring system in wired mode.
  - Select **Station LAN** when the syringe pump is inserted into the infusion workstation and connected to the infusion central monitoring system in wired mode.
- **Local Comm. Set**: When **Local WLAN** or **Local LAN** is selected, the parameters must be set, including **WIFI Set, Internet Set** and **LAN On-Off**.
  - **WIFI Set**: The parameters on this interface must be set when wireless networking mode is selected. It allows you to specify the wireless network to which both the infusion pump and infusion central monitoring system are connected. Three parameters need to be set: **WIFI On-Off**, **AP name**, and **Password**.



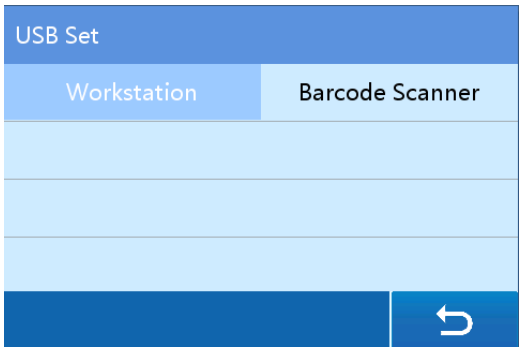
- **Internet Set**: The parameters on this interface must be set no matter wireless or wired networking mode is selected. It allows you to specify the network information of the infusion central monitoring system. After the DHCP function is enabled, the syringe pump automatically connects to the network. After the DHCP function is disabled, you need to set the following parameters for manual connection to the network: **IP**, **Mask**, **Gateway**, **Server IP**, and **Server Port**.



- **Station comm. Set**: This parameter (including **WIFI Set**, **Internet Set**, and **LAN On-Off**) needs to be set if the syringe pump is inserted into the infusion workstation and **Station WLAN** or **Station LAN** is selected. After parameter setting, the settings on all the pumps connected to the infusion workstation are modified synchronously.
  - **WIFI Set**: Allows you to specify the wireless network to which both the infusion workstation and infusion central monitoring system are connected. Three parameters need to be set: **WIFI On-Off**, **AP name**, and **Password**.
  - **Internet Set**: Network information of the infusion central monitoring system. After the DHCP function is enabled, the syringe pump automatically connects to the network. After the DHCP function is

disabled, you need to set the following parameters for manual connection to the network: **IP**, **Mask**, **Gateway**, **Server IP**, and **Server Port**.

- **USB Set**: Used for selection of the communication object: infusion workstation or barcode scanner. If the syringe pump is inserted into the infusion workstation, select **Workstation**. If the USB2.0 interface is connected to the barcode scanner, select **Barcode Scanner**.



7.2.5 Protect Set

The syringe pump allows you to enable/disable the screen lock function, set the lock time, set an unlock password or not, and set the no-operation reminder time.

- **Auto Lock**: Allows you to set the time during which no operation is performed and consequently the screen automatically locks. The following options are available for selection: **15s**, **30s**, **1min**, **2min**, **5min**, **10min**, **30min**, and **Never**. If **Never** is selected, the screen will not lock automatically.
- **Password On-Off**: Allows you to determine whether the user password is required for screen unlock. You do not need to input the user password for screen unlock if this switch is turned off.
- **No-operation Reminder time**: Allows you to set the time during which no operation is performed and consequently the reminder alarm is reported. The value ranges from 1 to 10min.
- **Button On-off**: Allows you to enable button-based screen unlock. After this switch is turned on, the locked screen can only be unlocked by pressing a physical button (**ON/OFF** or **HOME**).

7.2.6 Dept. Collection

To set the mode collection, brand collection, and drug collection, you must input the user password.

- **Mode Collection**: Allows you to define the common infusion modes by selection (by default, all the infusion modes are selected). After that, the user-defined infusion modes will be displayed in the drop-down menu on the **Infusion Mode** interface for selection.
- **Brand Collection**: Allows you to define the common brands by selection. After that, only the user-defined brands are displayed on the **Brand** interface for selection.
- **Drug Collection**: Allows you to define the common drugs by selection. After that, only the user-defined drugs are displayed on the **Infusion Mode** interface for selection.

7.2.7 Pressure Unit

Four pressure units are available for selection: mmHg, psi, kPa, and bar. Any of them can be automatically converted into another unit.

7.2.8 Date& Time

You can set the date format, date, time format, and time. After the setting, the system records historical events and alarm information based on the new date and time.

- **Select Date Format**: **Y-M-D**, **D-M-Y**, and **M-D-Y** are available for selection.
- **Date Set**: Allows you to set the exact date based on the selected date format.
- **Time format**: **24h** and **12h** are available for selection. **24h** is selected by default.
- **Time Set**: Allows you to set the exact time based on the selected time format.

7.2.9 Maintenance

System maintenance items include: **Language Select**, **Factory Reset**, **Brand Maintenance**, **Device Cali.**, **Version Info**, and etc.

⚠CAUTION:

- System maintenance must be conducted by professional staff of the local distributor to ensure the stability and accuracy of the syringe pump.

7.2.10 Alarm Set

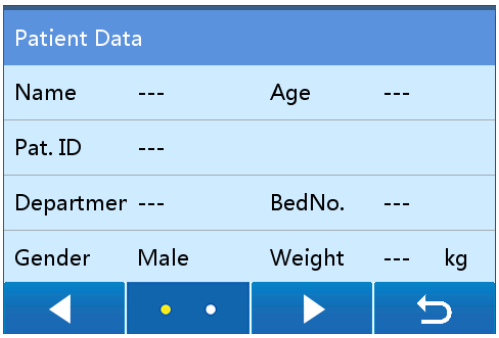
- The alarm settings include settings of the following alarms: Reminder Alarm, Near Finished, Pre OCCL, and Tube Off.
- The Reminder Alarm provides two alarm levels for selection: Low and Middle. The default level of this alarm is Low.
- The Near Finished alarm provides two alarm levels for selection: Low and Middle. The default level of this alarm is Low.
- The Pre OCCL alarm can be enabled or disabled as required.
- The Tube Off alarm can be enabled or disabled as required.

⚠CAUTION:

- Alarm settings must be performed by professional technicians of the local distributor to ensure the alarm system priority.

7.3 Patient File

1. Press **HOME** to access the setting interface.
2. Tap Patient File to access the **Patient Data** Interface.
3. Set the following parameters: **Name**, **Age**, **Pat. ID**, **Department**, **BedNo.**, **Gender**, **Weight**, **Height**, **BMI**, and **Intraday Rx**.



7.4 History

You can view the alarm messages, operation records and PCA records. The **Alarm Message** interface displays the historical alarm messages and the alarm time, including messages of three levels: high, middle, and low. The **Operation Record** interface displays the historical operation information. Table 7-3 lists the recorded historical events. The **PCA Record** interface records the historical PCA infusion information, including the valid number of times of pressing the PCA control button,

total number of times of pressing the PCA control button, infusion volume, start time, and end time.

Table 7-3 Historical events

Event	Recorded Information
Power on	Occurrence time
Power off	Occurrence time
Standby	Occurrence time and standby time
Exit Standby	Occurrence time and actual standby time
Start	Occurrence time, infusion rate, and VTBI
Stop	Occurrence time, rate, and volume infused
Start purge	Occurrence time, purge rate, and volume infused
Stop purge	Occurrence time, purge rate, and purge volume
Start bolus	Occurrence time, bolus rate, and bolus mode, and bolus VTBI
Stop bolus	Occurrence time, bolus rate, and bolus volume
KVO	Occurrence time and KVO rate
KVO stop	Occurrence time, KVO rate, and KVO time
Change infusion rate	Occurrence time, infusion rate before change, and infusion rate after change

⚠CAUTION:

- If both the external power supply and internal power supply of the syringe pump are faulty, the alarm logs are automatically stored in the internal storage. The alarm logs will not be affected by the power failure time. When the power supply recovers from the fault, the system automatically loads the alarm logs.
- After the syringe pump is powered off, the historical records can be stored for up to 10 years.
- A maximum of 3,000 historical events can be stored by the syringe pump for playback. When the number of events stored on the syringe pump exceeds 3000, the earliest event is automatically replaced.
- The alarm system cannot be powered off separately. It can only be powered off by powering off the syringe pump. In addition, the power-off time is presented in the historical records.

7.5 Drug Library

The syringe pump provides the drug library function. At least 5000 drug types can be stored in the drug library to facilitate direct drug selection for users. The drug library supports both hard limits and soft limits. That is, a drug parameter cannot be set to a value exceeding the hard limits. If a drug parameter is set to a value exceeding the soft limits but this value does not exceed the hard limits, the syringe pump gives a prompt but the infusion can still be started. To configure the drug parameters (for example, the default drug concentration, the infusion rate, hard limits, and soft limits), contact the local distributor or the after-sales service department of the manufacturer.

7.6 View Window

In TIVA mode, the parameters of several types of drug can be observed during the infusion. Press **HOME** to access the setting interface, and choose **Infusion Setting** > **Infusion Mode** > **TIVA Mode**. If the drug type is set to view-window drug, the parameters during infusion can be viewed. After setting parameters, start the infusion. Then, you can press **HOME** to view the current concentration parameter, press **HOME** again to view the concentration variation curve, and press **HOME** once more to return to the infusion interface.

7.7 Connecting to the Infusion Central Monitoring System (Optional)

The syringe pump can be connected to the infusion central monitoring system through Wi-Fi. After that, the operating state of the syringe pump can be obtained through the infusion central monitoring system remotely. In addition, the infusion central monitoring system updates the patient information to the syringe pump and delivers the prescription to the infusion workstation, and the infusion workstation updates the prescription to the syringe pump for the syringe pump to execute infusion according to the prescription.

7.7.1 Prescription

After inserting the syringe pump into the infusion workstation, connect the syringe pump to the infusion central monitoring system according to section 7.2.4. After that, the infusion central monitoring system can deliver the prescription to the syringe pump and update the patient information on it to the syringe pump. The patient information and prescription information can be viewed on the **Patient Data** interface.

⚠CAUTION:

- After the infusion central monitoring system delivers the prescription to the syringe pump, confirm that the prescription on the syringe pump is consistent with the actual prescription and then start the infusion.
- After inserting the syringe pump into the infusion workstation, the infusion central monitoring system delivers prescription to the syringe pump through the infusion workstation.
- The syringe pump cannot be operated through the infusion central monitoring system.

7.8 Nurse Call (Optional)

After a patient presses the nurse call button at the bedside, the syringe pump gives a sound prompt, and the nurse can go and nurse the patient in time.

7.9 Barcode Scanner (Optional)

You can scan the patient data (such as patient ID, name, age, gender, weight, height, department, and bed No.) and follow the system instructions to update the patient data on the syringe pump after the syringe pump is connected to the barcode scanner. The barcode scanner supports scanning of a barcode generated by using a character string consisting of up to 18 characters.

8 Alarms and Faults

8.1 Alarm Levels

The syringe pump provides users with a variety of status information about itself and its infusion process. If any abnormality is detected, the syringe pump reports an alarm and informs users in the form of sound, light, and character.

All the alarms on this pump are the technical alarm.

- The syringe pump will provide status information related to infusion and the syringe pump itself. In case of any fault, the syringe pump will trigger a relevant alarm with corresponding alarm sound and alarm indicator.
- By fault importance, alarm is classified into three levels from safety perspective: low priority alarm, medium priority alarm and high priority alarm. See Table 8-1 for the relations between alarm level and alarm sound/indicator. The alarm volume ranges from 45dB to 85dB. All the alarms listed in Table 8-2 are technical alarms.

Table 8-1 Relations between Alarm Level and Alarm Sound/Indicator

Alarm Level	Alarm Sound	Alarm Indicator
Low priority alarm	“Di-Di-Di”, repeating at a 18s interval	Steady yellow
Medium priority alarm	“Di-Di-Di”, repeating at a 12s interval	Flash in yellow
High priority alarm	“Di-Di-Di—Di-Di—Di-Di-Di—Di-Di”, repeating at a 3s interval	Flash in red

- Tap **Silent** to silence the alarm. If such alarm still exists, the alarm sound will be resumed 2min later.

⚠CAUTION:

- The setting of the alarm will be saved when the power is cut. When the pump restarts from a power failure situation, the alarm setting will be reloaded to the system and remains the same as it was before the power failure.

8.2 Alarms and Elimination Methods

Table 8-2 Alarm message, alarm level, fault cause, and troubleshooting

Alarms and Faults

Alarm Message	Alarm Level	Causes	Troubleshooting
No AC Power	Low	No external AC or DC power	Connect the external AC or DC power immediately.
No Battery	Low	Built-in battery failure or no built-in battery	Install the battery.
BAT Low	Low	Low battery power	Connect the external AC or DC power immediately.
BAT Empty	High	Out of battery power	Connect the external AC or DC power immediately.
Infusion End	High	The preset VTBI or infusion time is reached.	Tap **Stop** to eliminate the alarm.
Infusion Near End	Low	The infusion will be completed in the alarm time.	Wait until the infusion is completed.
Infusion End KVO Start	High	The preset VTBI or infusion time is reached and the KVO process is started.	Tap **Stop** to eliminate the alarm.
KVO End	High	The KVO process is started and maintained for 30min.	Tap **Stop** to eliminate the alarm.
Pre OCCL	Medium	The occlusion pressure reaches 70% of the occlusion level setting value.	Release the pressure to eliminate the alarm.
Patient Side OCCL	High	1. The syringe line is occluded. 2.A low occlusion level is set for high-viscosity solution infusion. 3. The system will auto reduce the volume when an occlusion occurs.	Tap **Stop** to eliminate the alarm. Identify and remove the occlusion cause and resume the infusion.

Alarms and Faults

Alarm Message	**Alarm Level**	**Causes**	**Troubleshooting**
Standby End	Medium	The standby time is out.	Tap **Cancel** to exit the standby state.
Reminder Alarm	Low	No button operation is performed in 2min after the syringe is installed.	Tap any button to eliminate the alarm.
Relay Failed	High	The communication is interrupted in the relay process or any external interference causes relay sequence failure.	Tap **Stop** to eliminate the alarm. Enable the local relay again.
PCA 1h overrun	High	The total volume goes beyond the 1h dose limit in PCA mode.	Tap **Stop** to eliminate the alarm.
PCA 4h overrun	High	The total volume goes beyond the 4h dose limit in PCA mode.	Tap **Stop** to eliminate the alarm.
Syringe Near Empty	Low	The syringe will become empty in 3min.	Wait until the syringe becomes empty.
Syringe Empty	High	The syringe becomes empty	Tap **Stop** to eliminate the alarm.
Holder ERR	High	The holder is pulled during infusion.	Tap **Stop** to eliminate the alarm. Follow the system instructions to reinstall the syringe.
Drive Head ERR	High	The clutch on the drive head is pressed or the syringe claw error during infusion.	Tap **Stop** to eliminate the alarm. Follow the system instructions to reinstall the syringe.
Tube off (only 20, 30, 50/60 ml syringe)	Medium	The occlusion pressure detected during the infusion decreases for over 90mmHg suddenly.	Check whether the tube falls off. If yes, reinstall it. If no, tap **Stop** to eliminate the alarm and continue the infusion.

Alarm Message	Alarm Level	Causes	Troubleshooting
Drive Head Position ERR	High	The drive head position is abnormal during infusion.	Contact the local distributor for handling.

8.3 Faults and Troubleshooting

Trouble Code	Alarm Level	Causes	Troubleshooting
ERR XXX	High	System error	Record the fault information, power off the syringe pump and contact your local distributor.

⚠CAUTION:

- In ERR XXX, “XXX” refers to a numeric string. ERR XXX can be ERR 001, ERR 002, etc.

9 Cleaning and Disinfection

It is highly recommended that the materials and methods listed in this chapter be used for cleaning and disinfection of the device. If other materials or methods are used, the device may be damaged or its service life may be shortened.

⚠CAUTION:

- In case of any doubts about the use of the detergent or disinfectant, please consult the local distributor.
- Please dispose of the wastes generated after the cleaning and disinfection according to the relevant regulations of the local hospital.

9.1 Preparations

1. Before the cleaning and disinfection, disconnect the device from the patient.
2. Power off the device and disconnect the device from the AC or DC power supply.
3. Remove the infusion consumable and accessories (for example, drop sensor and barcode scanner) connected to the pump.
4. Wear a pair of rubber gloves and a gauze mask to prevent contaminants from splashing onto your skin during the cleaning and disinfection.
5. You are not allowed to disassemble this device for cleaning and disinfection. To disassemble this device for further cleaning and disinfection, please contact the local distributor.
6. Prepare several pieces of soft medical gauze, a detergent container, and a disinfectant container.

9.2 Cleaning

⚠WARNING:

- Do not immerse the device in the detergent solution.
- Prevent the solution from seeping into the device.
- Do not use halogenated solvent, petroleum-based solvents, glass cleaner, acetone, or other irritant detergents.
- Only manual cleaning is allowed to be adopted for this device. Do not adopt the automatic cleaning mode for this device.

Cleaning procedure:

1. Completely immerse a piece of soft medical gauze in neutral or slightly alkaline detergent solution, wring out the gauze, and then use the gauze to wipe the device surface.
2. Wipe all the surfaces of the device in sequence until all the contaminants are removed from the device surface.
3. Ensure that all the edges and corners of the device are completely cleaned.
4. After the cleaning, use a piece of dry medical gauze to remove the residual detergent solution.

The following table lists the detergents recommended for the device.

Table 9-1 Recommended detergents

Detergent Name	Cleaning Method
Clean water	Wipe
Soapy water (pH value: 7.0~10.5)	Wipe

9.3 Disinfection

WARNING:

- Do not immerse the device in the disinfectant solution.
- Prevent the solution from seeping into the device.
- Use the disinfectant according to its operation manual.
- Do not autoclave the device.
- Only manual disinfection is allowed to be adopted for this device. Do not adopt the automatic disinfection mode for this device.

Disinfection procedure:

1. Before the disinfection, clean the device according to the method provided in section 9.2.
2. Completely immerse a piece of soft medical gauze in the intermediate-efficiency or high-efficiency disinfectant solution, wring out the gauze, and then use the gauze to wipe the device surface.

3. Wipe all the surfaces of the device in sequence. For the contact time of the disinfectant, see the operation manual of the disinfectant.
4. Ensure that all the edges and corners of the device are completely disinfected.
5. After the disinfection, immerse another piece of soft medical gauze in clean water, wring out the gauze, and then use the gauze to wipe the device surface for removing the residual disinfectant solution.

The following table lists the disinfectants recommended for the device and the required contact time for the disinfection.

Table 9-2 Recommended disinfectant solutions

Disinfectant Solution Name	Contact Time	Disinfection Method
75% alcohol	3min	Wipe
70% isopropanol	3min	Wipe
0.2% quaternary ammonium salt	20min	Wipe
3% hydrogen peroxide	30min	Wipe

9.4 Air Drying and Transportation

WARNING:

- Do not dry the device by using a drying machine or similar products.
- Connect the device to the power supply again after the device is completely dry.

1. After cleaning and disinfection, place the device in a shady, cool, and ventilated environment for air drying.
2. If you are not going to use the device soon after air drying, place the device in its original package for storage and transportation.

10 Maintenance

10.1 Regular Maintenance

10.1.1 Maintenance Plan

To ensure safe use and lengthen the service life of the syringe pump, please conduct regular maintenance and check. Table 10-1 lists the maintenance plan.

Table 10-1 Maintenance plan

Maintenance Item	**Frequency**	**Operator**	**Maintenance Method**
Appearance check	Before each use	User	See section 10.1.2.
Power cable check	Before each use	User	See section 10.1.3.
Infusion accuracy check	Every two years	Distributor/Hospital engineer	See section 10.1.4.
Alarm check	Every two years	Distributor/Hospital engineer	See section 10.1.5.
Built-in battery check	Every two years	Distributor/Hospital engineer	See section 10.2.2.
Electrical safety test	Every two years	Distributor/Hospital engineer	See section 10.1.6.

10.1.2 Appearance Check

- Appearance check: Check that no crack or damage exists.
- Button operation: Check that the buttons can be smoothly pressed and function properly.
- Check that all the sealing parts and the installation of the syringe pump are normal and no crack exists on any materials.

10.1.3 Power Cable Check

- Check the appearance of the power cable. If a surface damage or poor contact between plug and socket is found, contact the distributor for replacement in time.
- If the AC/DC power indicator is not illuminated after the syringe pump is connected to an AC/DC power supply or the syringe pump cannot be started, contact the distributor for maintenance in time.

10.1.4 Infusion Accuracy Check

Check the infusion volume using a measuring cylinder and stopwatch.

The check conditions are as follows:

Syringe	**Infusion Rate**	**Infusion Time**	**Liquid Volume in the Measuring Cylinder**
B.Braun50ml	60ml/h	10min	9.8-10.2ml

If the liquid volume actually infused does not fall within the range in the **Liquid Volume in Measuring Cylinder** column, contact the distributor for syringe pump accuracy calibration.

10.1.5 Alarm Check

- During startup, the syringe pump automatically checks the alarm system. The operator can judge whether the alarm system works properly based on the following description. If an exception is found, stop using the syringe pump and contact the local distributor for repair.

  Loudspeaker: alarm sound prompt (di_di_di)

  Alarm indicator: The color of the alarm indicator changes from red to yellow and then green.

  Beeper: prompt tone (di_di)

- Holder error

  Pull up the syringe holder during the infusion, and check the content displayed on the screen and the alarm sound.

- Drive head error

  Press the clutch button during the infusion, and check the content displayed on the screen and the alarm sound.

- Occlusion alarm

The check conditions are as follows:

Syringe	Infusion Rate	Occlusion Level	Alarm Time
B.Braun50ml	25ml/h	P2	Within 1min

10.1.6 Electrical Safety Test

To ensure safety, please conduct a dielectric strength test, leakage current test, and ground impedance test according to the method stipulated in IEC60601-1.

10.2 Battery Maintenance

10.2.1 Battery Overview

The HP-30 PRO syringe pump is equipped with a built-in battery to ensure normal operation of the pump in case of an external power failure. The battery starts to be charged when the pump is connected to an external power supply. In case of a sudden power failure, the system automatically switches to the battery supply mode without interrupting the operation of the syringe pump. If the external power supply recovers from the failure before the built-in battery is depleted, the system automatically switches from battery supply mode to external power supply mode to ensure uninterrupted operation of the syringe pump.

WARNING:

- If you have any doubts about the integrity or wire of the protective earth, unplug the device for the battery to power the device.
- Battery ageing is an inherent characteristic of the battery. To ensure the operation safety of the syringe pump, please contact the distributor for battery replacement after the built-in battery has been used for 2 years.
- Improper use of the battery may shorten the service life of the battery.
- In case of external power failure, the built-in battery starts operation and the yellow indicator illuminates with a short alarm sound.
- Use the AC power to charge the battery only. If you use 12 V DC power to charge the battery, the battery cannot be fully charged (the battery can at most be charged to 50% of its full capacity).
- The battery must be replaced by trained technicians. Otherwise, a danger may be caused.
- Do not disassemble, short circuit, or throw the battery into fire to avoid the danger caused by linkage or explosion.

10.2.2 Using the Battery

- Before using the pump for the first time or using the pump after the pump is not used for a long time

  Before using the syringe pump for the first time, charge the built-in battery. Power off the pump and connect it to an external power supply for at least 10 hours until the battery is fully charged. After that, you are allowed to use the pump.

- Battery optimization
  1. Disconnect the syringe pump from the patient, stop the infusion, and power off the pump.
  2. Connect the syringe pump to an AC power supply to charge the battery for over 10 hours uninterruptedly.
  3. Disconnect the syringe pump from the AC power supply, power on the pump, start infusion at 5mL/h, and wait until the battery is depleted.
  4. Connect the syringe pump to the AC power supply again to charge the battery for over 10 hours uninterruptedly.

⚠ **CAUTION:**

- Before using the built-in battery, check the battery to ensure that sufficient power is available. Recharge the battery if required.
- The low battery alarm will be triggered in case of low battery. You can tap **Silent** to silence the alarm. However, the alarm sound will be given again 2 min later. When a low battery alarm is reported, please connect the pump to an external power supply. The infusion cannot be started if the pump only has little remaining capacity.
- The syringe pump is powered off 3 minutes before the battery power is exhausted.
- The actual operation duration of the battery is relevant to the room temperature, infusion rate, and external communication.

10.2.3 Inspecting the Battery

To ensure the battery performance, you must perform regular maintenance for the battery. The method is as follows:

1. Disconnect the syringe pump from the patient, stop the infusion, and power off the pump.
2. Connect the syringe pump to the AC power supply and recharge the battery for over 10 hours.
3. Disconnect the syringe pump from the external power supply, and power on the pump.
4. Install a 50ml syringe.
5. Set the infusion rate to 5ml/h, and start the infusion. Record the start time.

6. Make the syringe pump operates continuously until it stops due to low battery. Record the end time.
   - If the infusion lasts for 8 hours or longer, the battery is in good condition.
   - If the infusion lasts for 3 to 4 hours, the battery is close to the end of its service life.
   - If the infusion lasts for less than 3 hours, the battery has reached the end of its service life. In this case, the battery must be replaced. **You are advised to contact the distributor for battery replacement.**

After battery status check is completed, recharge the battery for next use.

⚠**CAUTION:**

- Please check and replace the battery at regular intervals.
- The battery is allowed to be replaced only when the syringe pump is not in use.

10.3 Storage

- Avoid water spill.
- Do not store the syringe pump in a hot and humid place.
- Store the syringe pump far away from excessive vibration, dust, and corrosive gas.
- Store the syringe pump out of direct sunlight and ultraviolet ray to avoid color fading.

10.4 Transportation

The syringe pump is allowed to be transported using a common vehicle, but it must be protected from the drastic impact, vibration, and rain and snow splash during the transportation. In addition, the syringe pump must be transported in accordance with the requirements specified in the order contract.

10.5 Environmental Protection and Recycling

Contact your local distributor to recycle the retired syringe pump, or otherwise dispose of it and its battery in accordance with the local laws and regulations.

11 Product Characteristics

The following test is performed in accordance with the IEC60601-2-24:2012 standard. It is used to observe the infusion accuracy and the occlusion response. (For detailed test conditions, see the IEC60601-2-24:2012 standard.)

⚠ **CAUTION:**

- The infusion accuracy and the occlusion response may be affected by the use conditions including the pressure, temperature, humidity, syringe, and infusion tube.
- The infusion accuracy does not reflect the clinical standards, for example, patients' age and weight and medicine taken.
- The experiment data only represents the measurement data in the lab.
- The maximum infusion volume inaccuracy of the syringe pump is ±12% in a single fault condition.

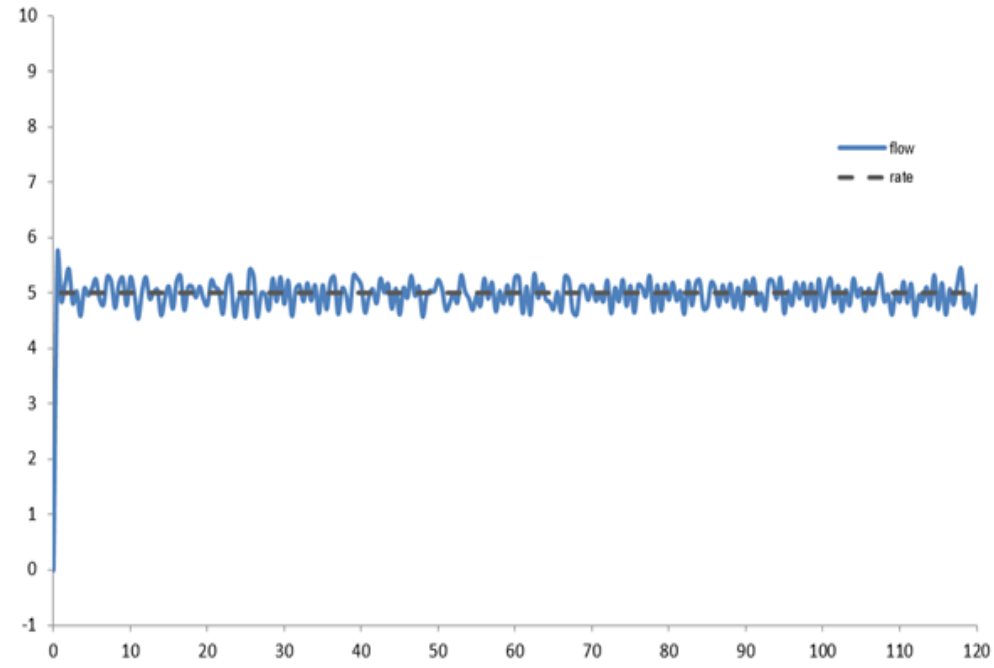
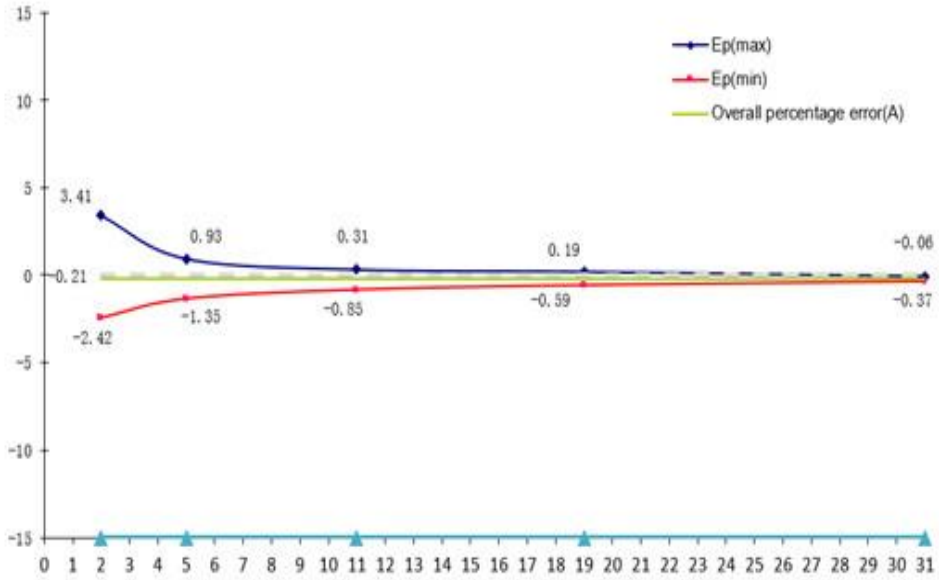
11.1 Infusion Accuracy Characteristics

Start-up graph and Trumpet curves show the characteristics of the syringe pump after the infusion begins and the changes of the infusion status after the syringe pump reaches a normal infusion rate.

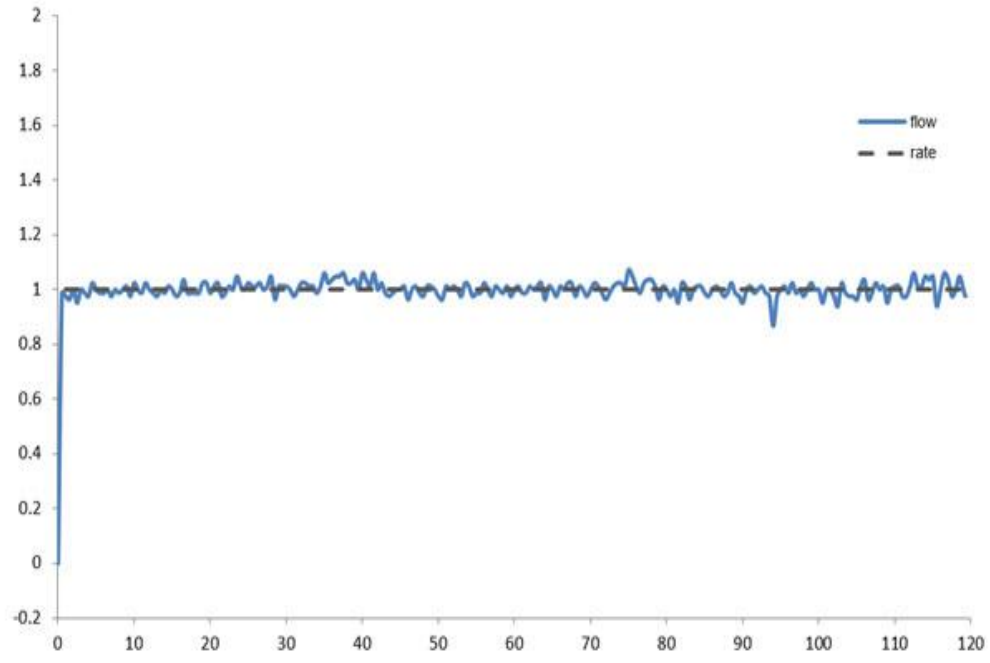
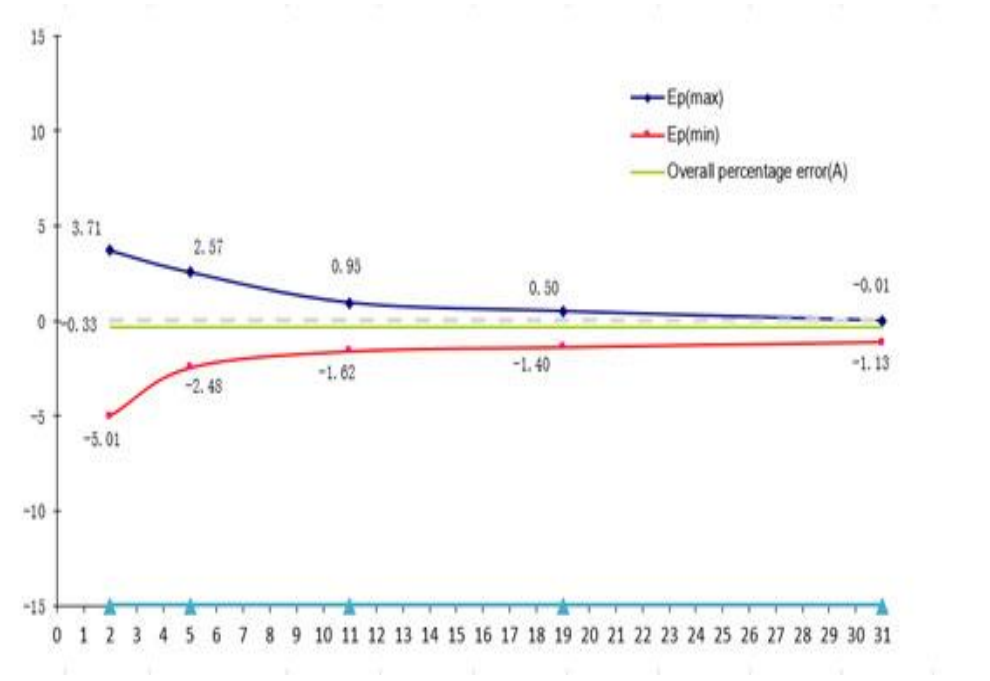
The following test method is performed in accordance with the method mentioned in chapter 201.12.1.102 of the standard IEC 60601-2-24:2012 (Please check above chapter for further details.).

- Accuracy test conditions:
  - Temperature: 21 ℃ ;
  - Relative humidity:60%;
  - Syringe brand: MC(50/60ml), B.Braun OPS (50/60 ml), B.Braun Omnifix(50/60 ml); 4 sets each.
  - Syringe pump: 1 set
  - Sampling interval: 0.5min
  - Test Period: 120min

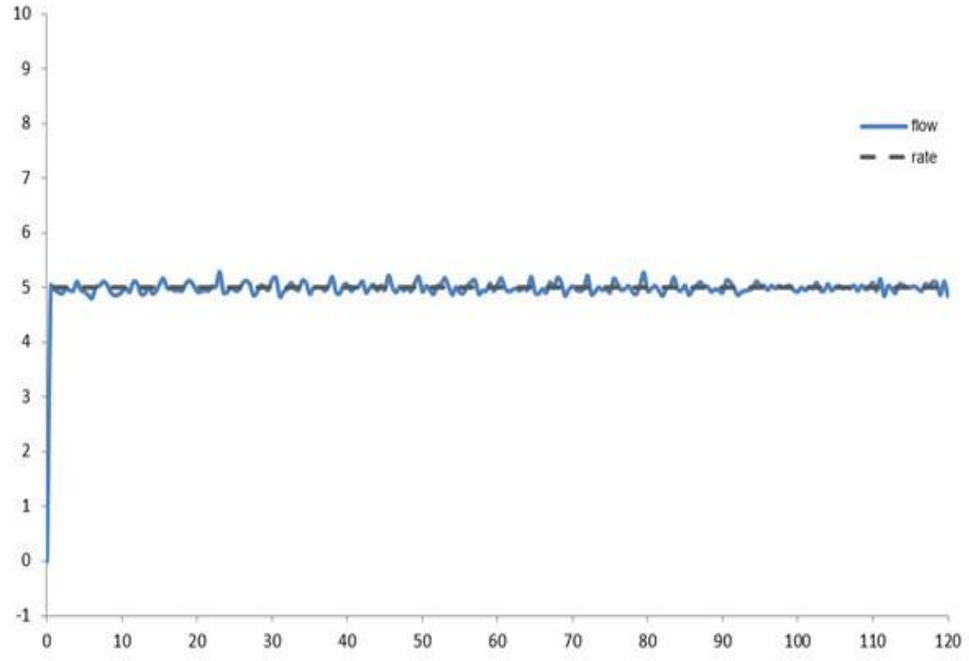
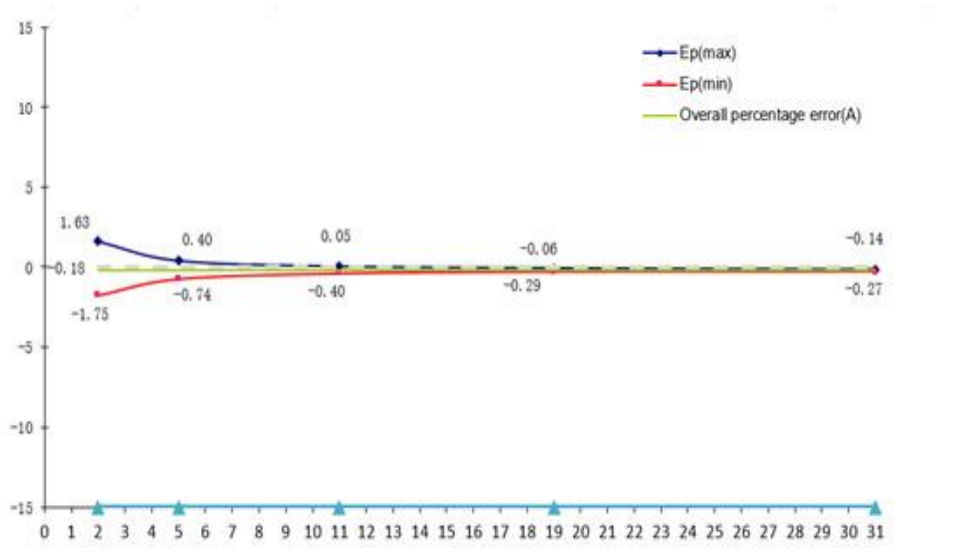
Table 11-1Accuracy test result

Start-up graph of B.Braun OPS (50/60 ml) @5ml/h

Trumpet curve of B.Braun OPS (50/60 ml) @ 5ml/h


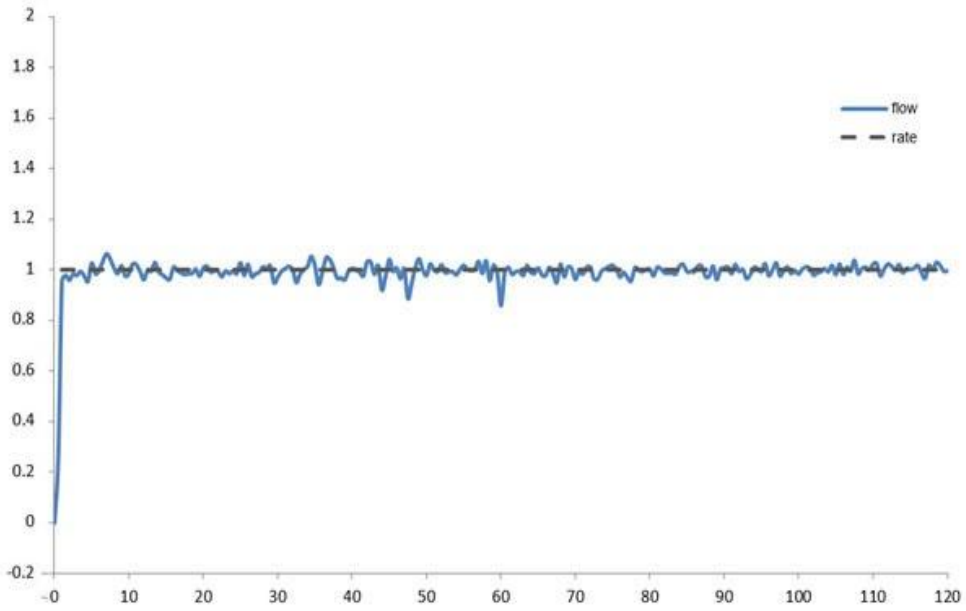
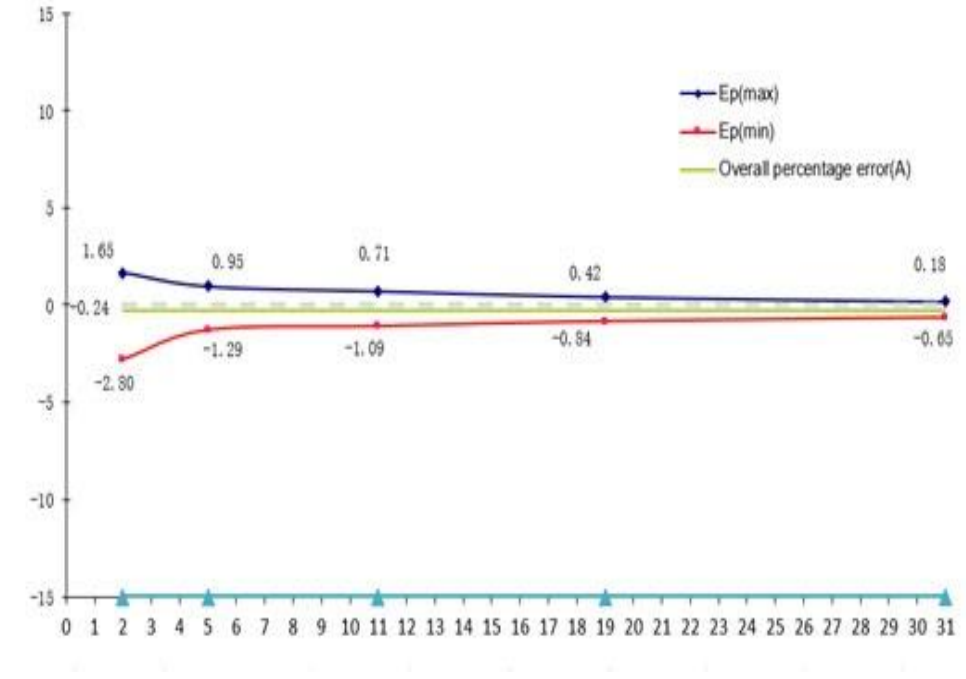
Product Characteristics

Start-up graph of B.Braun OPS (50/60 ml) @1ml/h

Trumpet curve of B.Braun OPS (50/60 ml) @1ml/h


Product Characteristics

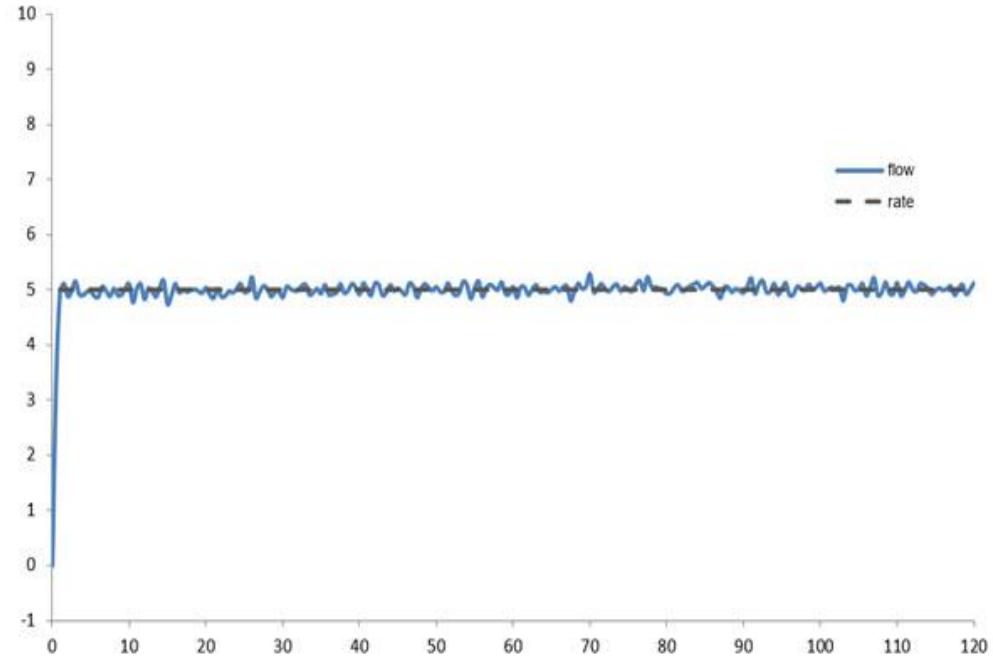
Start-up graph of B.BraunOmnifix (50/60 ml) @5ml/h

Trumpet curve of B.BraunOmnifix (50/60 ml) @ 5ml/h


Product Characteristics

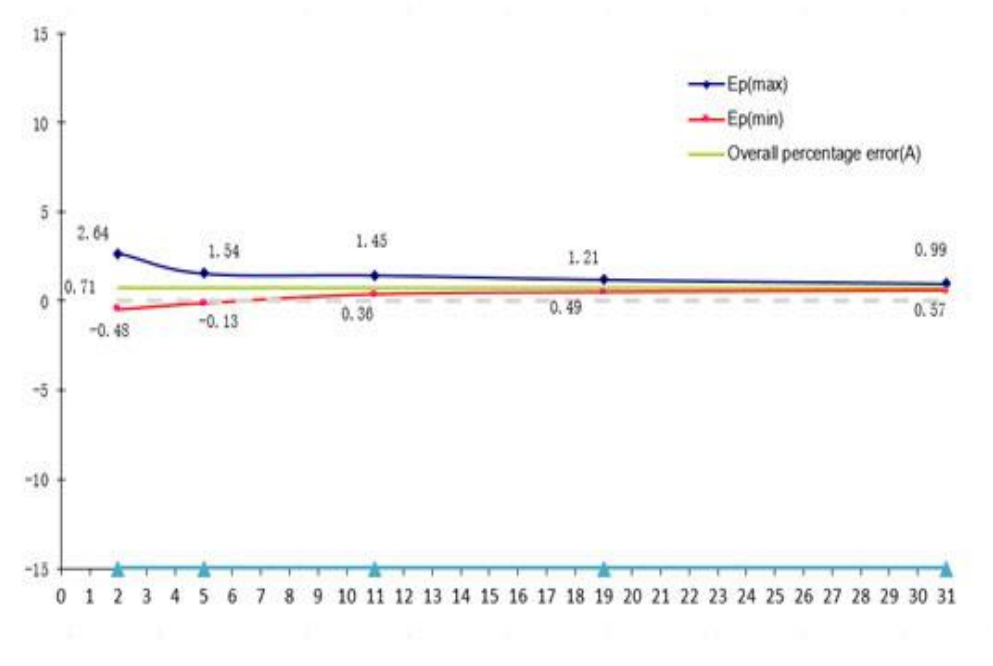
Start-up graph of B.Braun Omnifix (50/60 ml) @1ml/h

Trumpet curve of B.BraunOmnifix (50/60 ml) @1ml/h


Product Characteristics

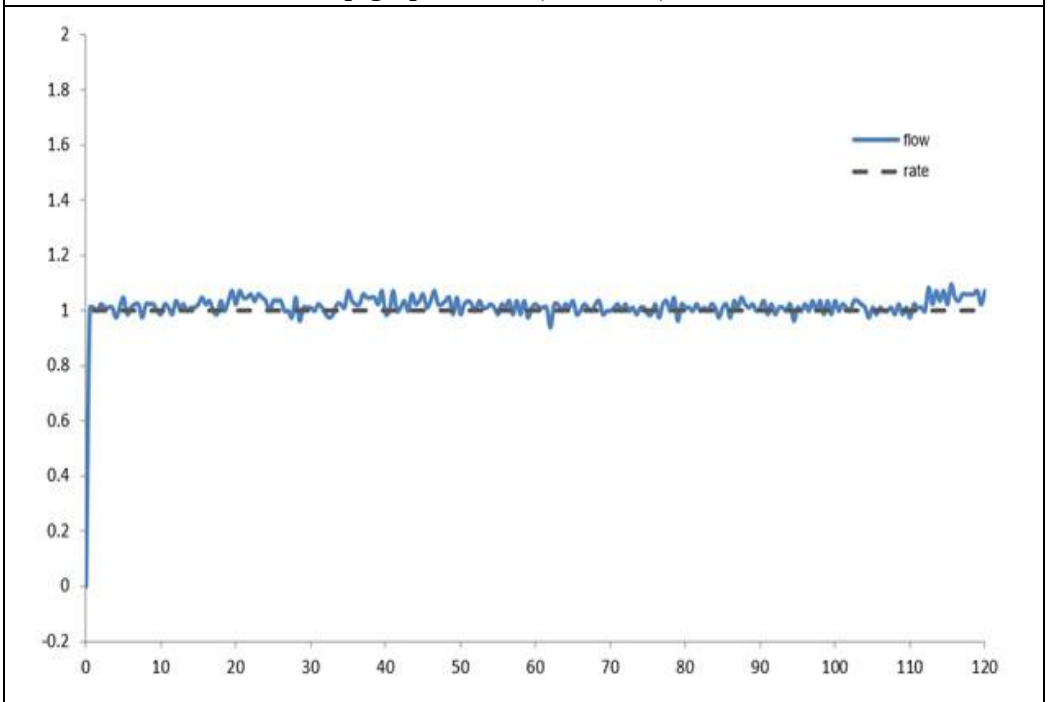
Start-up graph of MC (50/60 ml) @ 5ml/h



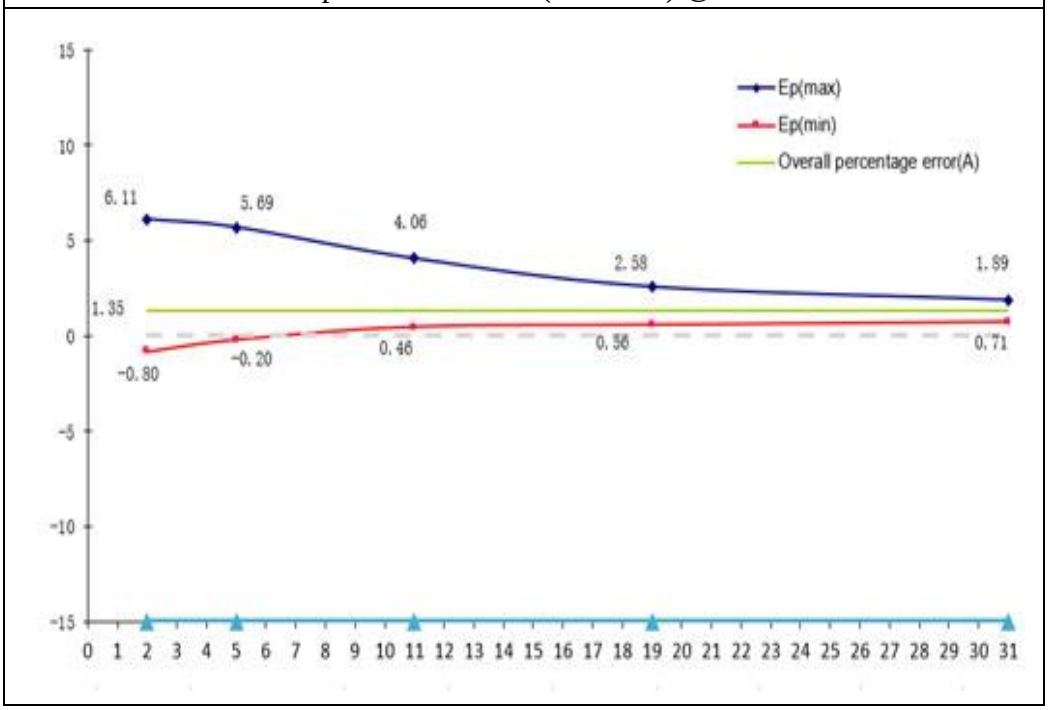
Trumpet curve of MC (50/60 ml) @ 5ml/h



Start-up graph of MC(50/60 ml) @ 1ml/h



Trumpet curve of MC (50/60 ml) @ 1ml/h



11.2 Occlusion Response Characteristics

The occlusion characteristics are reflected by the longest delay time to start an alarm and performance of unintended bolus.

Product Characteristics

The following test method is in accordance with the method mentioned in chapter 201.12.4.4.104 of the standard IEC 60601-2-24:2012 (Please check above chapter for further details.)

Occlusion test conditions:

- Temperature: 21℃ ;
- Relative humidity: 65%;
- Syringebrand: MC(50/60 ml and 30 ml); 1 set
- Length of the infusion tube: 1m

Table 11-2 Occlusion Level, Alarm Delay Time and Unintended Bolus under the rate of 5ml/h (50 ml)

Infusion Rate	Occlusion pressure Level	Occlusion Pressure (mmHg)	Occlusion Alarm Time (hh:mm:ss)	Unintended Bolus (ml)
5 ml/h	P1	50	00:01:46	0.05
	P13	975	00:12:20	0.13

Table 11-3 Occlusion Level and Alarm Delay Time under the rate of 1ml/h (50 ml)

Infusion Rate	Occlusion Pressure Level	Occlusion Pressure(mmHg)	Occlusion Alarm Time (hh:mm:ss)
1ml/h	P1	50	00:07:59
	P13	975	01:10:06

Table 11-4 Occlusion Level and Alarm Delay Time under the rate of 0.1ml/h (50 ml)

Infusion Rate	Occlusion pressure Level	Occlusion Pressure (mmHg)	Occlusion Alarm Time (hh:mm:ss)
0.1ml/h	P1	50	1:45:17
	P13	975	12:53:19

Table 11-5 Occlusion Level, Alarm Delay Time and Unintended Bolus under the rate of 5ml/h (30 ml)

Infusion Rate	Occlusion pressure Level	Occlusion Pressure (mmHg)	Occlusion Alarm Time (hh:mm:ss)	Unintended Bolus (ml)
5 ml/h	P1	50	00:01:28	0.06
	P15	1125	00:09:29	0.12

Table 11-6 Occlusion Level and Alarm Delay Time under the rate of 1ml/h (30 ml)

Infusion Rate	Occlusion Pressure Level	Occlusion Pressure(mmHg)	Occlusion Alarm Time (hh:mm:ss)
1ml/h	P1	50	00:07:10
	P15	1125	00:47:12

Table 11-7 Occlusion Level and Alarm Delay Time under the rate of 0.1ml/h (30 ml)

Infusion Rate	Occlusion pressure Level	Occlusion Pressure (mmHg)	Occlusion Alarm Time (hh:mm:ss)
0.1ml/h	P1	50	1:35:19
	P15	1125	10:29:56

⚠ **CAUTION:**

Unit Conversions

Physical Variable	Unit	Unit Conversion
Pressure	kPa	1kPa=7.5mmHg
	psi	1psi=51.724mmHg
	bar	1bar=750mmHg

Appendix A Electromagnetic Compatibility (EMC)

⚠ **CAUTION:**

- TheHP-30 PRO Syringe Pump complies with EMC standard IEC60601-1-2:2014 and IEC60601-2-24:2012.
- Users must install and use theHP-30 PRO Syringe Pump based on the EMC information provided in the accompanying document.
- Portable and mobile RF (Radio-Frequency) communication devices may affect the performance of the HP-30 PRO Syringe Pump. Avoid strong electromagnetic interference during the use, for example, stay away from mobile phones and microwave ovens.
- For the declaration of emissions CLASS and group and Immunity level, please see the Appendix.
- The HP-30 PRO Syringe Pump is suitable for Professional healthcare facilities environment, e.g. hospitals except for near active HF surgical equipment and the RF shielded room of an ME SYSTEM for magnetic resonance imaging, where the intensity of electromagnetic disturbances is high. Due to conducted interference and radiated interference, it may be difficult to ensure electromagnetic compatibility in other environments.
- The key performance of HP-30 PRO Syringe Pump includes accuracy, unintended bolus volumes and occlusion, and the High Priority alarm signals, if the key performance is lost or degraded due to EM DISTURBANCES, the HP-30 PRO Syringe Pump may cause patient hazard.
- To assure that the HP-30 PRO Syringe Pump remains safe with regard to electromagnetic disturbances throughout the expected service life:
  - Conduct periodic maintenance based on the recommended maintenance/service interval and method provided in the operation manual.
  - After each maintenance, ensure that the internal structure, shielding system, and grounding system of the device remain complete and effective.
- The Emissions characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this equipment 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 equipment.

WARNING:

- Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally.
- Only the following cables provided by the manufacturer are allowed to be used to meet the electromagnetic emission and anti-interference requirements.

  Cable Information:

No.	Cable Name	Length(m)	Shielded
1	Power cord	2.5	No
2	Barcode scanner cable	2.2	No
3	Nurse call cable	2.8	No
4	PCA control cable	2.8	No
5	Cable from filter to electrical connection port	0.45	No
6	Cable from filter to USB port	1.35	No

- Use of accessories, transducers and cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.
- Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the HP-30 PRO Syringe Pump, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.

  RF Parameters:

Item	Description
Working band	2.412GHz-2.484GHz
Transmitting power	<20dBm

Appendix A

Guidance and manufacturer's declaration – electromagnetic emissions		
The HP-30 PRO Syringe Pump is intended for use in the electromagnetic environment specified below. The customer or the user of the HP-30 PRO Syringe Pump should assure that it is used in such an environment.		
Emission test	Compliance	Electromagnetic environment – guidance
RF emission CISPR 11	Group 1	The HP-30 PRO Syringe Pump uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
Radio-frequency emission CISPR 11	Class A	The HP-30 PRO Syringe Pump is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emission IEC61000-3-2	Class A	
Voltage fluctuation and flashing IEC 61000-3-3	Complies	

Guidance and manufacturer's declaration – electromagnetic immunity			
The HP-30 PRO Syringe Pump is intended for use in the electromagnetic environment specified below. The customer or the user of the HP-30 PRO Syringe Pump should assure that it is used in such an environment.			
IMMUNITY test	IEC60601 test level	Compliance level	Electromagnetic environment –guidance
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	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient (EFT)	±2 kV 100KHz AC power cable ±2 kV 100KHz	±2 kV 100KHz AC power cable	Mains power quality should be that of a typical commercial or hospital environment.

IEC61000-4-4	DC power cable(>3m) ±1 kV 100KHz SIP/SOP cable(>3m)		
Surge IEC 61000-4-5	±0.5 kV, ±1 kV Line-to-line ±0.5 kV, ±1 kV, ±2 kV Line-to-ground AC power cable DC power cable(>3m) ±2 kV Line-to-ground SIP/SOP outdoor cable	±0.5 kV, ±1 kV Line-to-line ±0.5 kV, ±1 kV, ±2 kV Line-to-ground AC power cable	
The voltage dips, and interruptions IEC 61000-4-11	0% 0.5 cycle At 0 º, 45 º, 90 º, 135 º, 180 º, 225 º, 270 ºand 315 º; 0% 1 cycle And 70% 25/30 cycles Single phase: at 0 º 0% 300 cycle	0% 0.5 cycle At 0 º, 45 º, 90 º, 135 º, 180 º,225 º, 270 ºand 315 º; 0% 1 cycle And 70% 25/30 cycles Single phase: at 0 º 0% 300 cycle	Mains power quality should be that of a typical commercial or hospital environment. If the user of the HP-30 PRO Syringe Pump requires continued operation during power mains interruptions, it is recommended that the HP-30 PRO Syringe Pump be powered from an uninterruptible power supply or a battery.
Power frequency magnetic fields (50/60Hz)(PFMF) IEC 61000-4-8	30 A/m50 Hz or 60 Hz	30 A/m50 Hz or 60 Hz	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment
NOTE UT is the a.c. mains voltage prior to application of the test level.			

Appendix A

<table>
<tr><td colspan="4">Guidance and manufacturer’s declaration – electromagnetic immunity</td></tr>
<tr><td colspan="4">The HP-30 PRO Syringe Pump is intended for use in the electromagnetic environment specified below. The customer or the user of the HP-30 PRO Syringe Pump should assure that it is used in such an environment.</td></tr>
<tr><td>Immunity Test</td><td>IEC 60601 Test level</td><td>Compliance level</td><td>Electromagnetic environment –guidance</td></tr>
<tr><td>Conducted RF IEC61000-4-6</td><td>3 Vrms
150 kHz to 80MHz;

6 Vrms in ISM bands[a] Between 0.15MHz and 80 MHz;
80% AM at 1 kHz</td><td>3 Vrms
150 kHz to 80MHz;
6 Vrms in ISM bands Between 0.15MHz and 80 MHz;
80% AM at 1 kHz</td><td>Portable and mobile RF communications equipment should be used no closer to any part of theHP-30 PRO Syringe Pump, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.
Recommended separation distance
$d = 1.2\sqrt{P}$
$d = 1.2\sqrt{P}$</td></tr>
<tr><td>Radiated RF IEC61000-4-3</td><td>3 V/m
80 MHz – 2.7 GHz;
80% AM at 1 kHz
27V/m:380-390MHz;
28V/m:430-470MHz;
9V/m:704-787MHz;
28V/m:800-</td><td>3 V/m
80 MHz – 2.7 GHz;
80% AM at 1 kHz
27V/m:380-390MHz;
28V/m:430-470MHz;
9V/m:704-787MHz;
28V/m:800-</td><td>$d = 1.2\sqrt{P}$ 80M~800MHz
$d = 2.3\sqrt{P}$ 800M~2.7GHz
where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m)[b].
Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey[c], should be less than the compliance level in each frequency range.[d]
Interference may occur in the vicinity of</td></tr>
</table>

Appendix A

	960MHz; 28V/m:1700-1990MHz; 28V/m:2400-2570MHz; 9V/m:5100-5800MHz;	960MHz; 28V/m:1700-1990MHz; 28V/m:2400-2570MHz; 9V/m:5100-5800MHz;	equipment marked with the following symbol: 

NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

a The ISM (industrial, scientific and medical) bands between 150 kHz and 80 MHz are 6,765 MHz to 6,795 MHz; 13,553 MHz to 13,567 MHz; 26,957 MHz to 27,283 MHz; and 40,66 MHz to 40,70 MHz.

b The compliance levels in the ISM frequency bands between 150 kHz and 80 MHz and in the frequency range 80 MHz to 2,7 GHz are intended to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas. For this reason, an additional factor of 10/3 has been incorporated into the formulae used in calculating the recommended separation distance for transmitters in these frequency ranges.

c Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which theHP-30 PRO Syringe Pump is used exceeds the applicable RF compliance level above, the HP-30 PRO Syringe Pump should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the HP-30 PRO Syringe Pump.

d Over the frequency range 150 kHz to 80 MHz, field strengths should be less than [3] V/m

Appendix A

Recommended separation distances between portable and mobile RF communications equipment and the HP-30 PRO Syringe Pump

The HP-30 PRO Syringe Pump is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the HP-30 PRO Syringe Pump can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the HP-30 PRO Syringe Pump as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m			
	150 kHz to 80 MHz outside ISM bands $d = 1.2\sqrt{P}$	150 kHz to 80 MHz in ISM bands $d = 1.2\sqrt{P}$	80M~800MHz $d = 1.2\sqrt{P}$	800M~2.7GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.12	0.23
0.1	0.38	0.38	0.38	0.73
1	1.2	1.2	1.2	2.3
10	3.8	3.8	3.8	7.3
100	12	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance din meters (m) can be determined using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 The ISM (industrial, scientific and medical) bands between 150 kHz and 80 MHz are 6,765 MHz to 6,795 MHz; 13,553 MHz to 13,567 MHz; 26,957 MHz to 27,283 MHz; and 40,66 MHz to 40,70 MHz.

NOTE 3 An additional factor of 10/3 has been incorporated into the formulae used in calculating the recommended separation distance for transmitters in the ISM frequency bands between 150 kHz and 80 MHz and in the frequency range 80 MHz to 2,7 GHz to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas.

NOTE 4 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Appendix B

Appendix B Default Factory Settings

This section lists some default factory settings of the syringe pump. Users are allowed to modify some parameters and restore to default factory settings as required.

Parameters

Parameter	Default Factory Setting
KVO	On
KVO Rate	3.00ml/h
Adaptive KVO	(Infusion rate >10ml/h), default value: 3ml/h
	(Infusion rate ≤10ml/h), default value: 1ml/h
	(Infusion rate ≤1ml/h), default value: 0.1ml/h
Pressure Unit	mmHg
OCCL Level	525mmHg
Alarm Advance	3min
Auto Lock	Never
No-operation Reminder time	2min
Purge Vol. (automatic)	2ml
Standby Time	24:00:00
VOL. Set	Level 3
Brightness Set	Level 5
Color Set	Navy blue
Start time of night mode	22:00
End time of night mode	07:00
Relay On-off	Off
Enable Relay Cycle	Off
Relay Mode	Cascaded Relay

System time

System Time and Date	Default Factory Setting
Time	00:00:00
Date	2014-1-1
Time format	24h
Date format	Y-M-D

MEDCAPTAIN MEDICAL TECHNOLOGY CO., LTD.

Manufacturer: MEDCAPTAIN MEDICAL TECHNOLOGY CO., LTD.
Address of manufacturer: 12th Floor, Baiwang Research Building, No.5158 Shahe West Road, Xili, Nanshan, 518055 Shenzhen, Guangdong, PEOPLE'S REPUBLIC OF CHINA
Production address: 1-4 Floor, 11th Factory Building, Nangang 1st Industrial Park, Songbai Road, Xili, Nanshan, 518055 Shenzhen, Guangdong, PEOPLE'S REPUBLIC OF CHINA
EU- Representative name: Shanghai International Holding Corp. GmbH (Europe)
EU- Representative address: Eiffestrasse 80, 20537 Hamburg, Germany
Fax: +86-755-26001651
Postal code: 518055
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CE 0123