Syringe Pump
Model：SK-500II
Instruction Manual

Shenzhen Shenke Medical Instrument

Technical Development Co., Ltd.

Please read the manual before using the product；
Please keep the manual for reference！

Limited Guarantee

1. SK-500II syringe pump is delicately made of top-quality components.
2. Shenzhen Shenke Medical Instrument Technical Development Co., Ltd. guarantees that the product will not have any defect in material or technology within 12 months from the purchasing date.
3. The company's liability and the agents authorized by Shenzhen Shenke Medical Instrument Technical Development Co., Ltd. under this limited guarantee should be restrictive under the operation privilege of Shenzhen Shenke Medical Instrument Technical development Co., Ltd.—undertaking the maintenance and replacement of syringe pump under the circumstance that it has defect in material and technology through inspection. The maintenance and replacement of any products based on this limited guarantee should not exceed the time limit of the above limited guarantee.
4. All the maintenance based on the limited guarantee should be undertaken by qualified and trained people. When syringe pump is found defective within the time limit of the limited guarantee, the purchaser should notify Shenzhen Shenke Medical Instrument Technical Development Co., Ltd. or the authorized agents within 30 days to find the product's defects.
5. The defective syringe pump should be sent directly to Shenzhen Shenke Medical Instrument Technical Development Co., Ltd. or the authorized agents for the purpose of inspection, repair or replacement of syringe pump. The postage should be borne by the purchaser.
6. The products mailed back to Shenzhen Shenke Medical Instrument Technical Development Co., Ltd. or its agents should be appropriately packed in transportation packing box with instruction manual of Shenzhen Shenke Medical Instrument Technical Development Co., Ltd. Inappropriate packing will cause severe damage to syringe pump which should be borne by purchaser.
7. The limited guarantee of Shenzhen Shenke Medical Instrument Technical Development Co., Ltd. does not apply to product's damage or defects resulted from the following causes: mechanism damage and incorrect installation caused completely or partially by neglect of duty, liquor feeding, falling of syringe pump, false use and abuse; reconstruction of syringe pump by any unprofessional, disqualified or untrained people; damage due to incorrect packing when the defective unit is mailed to Shenzhen Shenke Medical Instrument Technical Development Co., Ltd. and its agents.
8. Shenzhen Shenke Medical Instrument Technical Development Co., Ltd. or its agents reserve the rights to issue the products inspection invoice to purchasers, provided they are not able to confirm the matter after inspection.
9. This limited guarantee is the only complete guarantee related to the products of Shenzhen Shenke Medical Instrument Technical Development Co. Ltd. It does not include the usage or process guarantee of whatever natural condition, wherever it is placed, and in legal, commercial or any other kind of activities. It guarantees but by no means confines its guarantee to the product's mechanical function and its adaptation to special purposes. Purchasers should clearly agree that the compensation will be paid only under this limited guarantee and that they should respect the announcement under this limited guarantee

Contents

1. Basic Introduction

1.1 Product introduction:

SK-500II syringe pump is a combination of microelectronic technology and modern nursing, an important outcome of microcomputer applied to clinical nursing. It can control the injection rate and total volume precisely and continuously over long hours on a large scale, which completely meets the various requirements of modern clinical treatment on different occasions and is now widely used in hospitals.

SK-500II syringe pump is an economical product of intellectualization, collectivization and hi-tech which can be used in all clinics or wards, thus promoting the previously single pump intravenous syringe control to mass control. The patients' injection situation and alarm information (e.g. injection completion, pipe occlusion) can all be seen at the nurse's station. This greatly improves the medical nursing quality, reduces the nurse's workload, and ensures the patient's nursing safety.

SK-500II syringe pump is a non portable device, which needs to be fixed for use.

1.2 Application scope:
It is used in hospitals where patients need intravenous injection at steady speed or continuous and precise injection.

1.3 Safety precaution:
1. Unqualified and untrained people are not allowed to operate the machine.
2. Precautions for installing the machine.
   ① Place the pump in dry place.
   ② Do not place the pump in places where atmosphere pressure, temperature, humidity, sunshine, dust, salt and ion air may bring damage to the pump.
   ③ Pay attention to the safety of the machine, avoiding drop, vibration or bump the pump (including in the process of transportation).
   ④ Do not use the pump in the place which keeps chemical medicine or gives out poisonous gas.
   ⑤ Pay attention to the frequency of voltage and allowable current of voltage.
   ⑥ Make sure there is no high frequency cacophony maker, medical equipment or cell phone etc. near the pump.
3. Precautions before using the machine:
   ① Make sure the power cord is safely and correctly connected.
   ② Make sure the ON-OFF function and operation of the pump is ok.
   ③ Make sure there is no high frequency cacophony maker, medical equipment or cell phone etc. near the pump.
   ④ Inspect the patient's vein passage has been established.
4. Precautions during operation
   ① Do not exceed the time of diagnosis and cure.
   ② To supervise continuously if the machine and patients are normal.
   ③ When detecting anything abnormal with the machine or patients, consider the patient's safety first, then stop injection and take proper action.

5. Precautions after finishing using the machine

① Turn off the power and pull out the power cord as per requirement.

② Clean the pump before storing it for convenient use next time.

6. Warning: using improper injector may cause injection pipe crack.

7. Warning: when using Non national standard injector or setting injector parameters incorrect, the accuracy won't be maintained and the discrepancy may reach 5% or above.

8. Warning: the used pipeline shall not be installed on other infusion devices to avoid potential risk.

9. Warning: Do not use cell phone or other high radiation devices away from the syringe pump within 0.5m.

10. Warning: The pump won't inspect the air bubble, make sure that there is no air bubble in the injector before using.

11. Warning: Stop using the machine when there is alarm.

12. Warning: Do not use the syringe pump in places of flammability.

1.4 Product functions and features

(1) Precise control of injection rate.

(2) Precise control of injection volume.

(3) Smooth flow, no pulsant.

(4) Warning information about injection completion, near completion, occlusion, low battery, injector abnormal, control abnormal;

(5) Intellectualized control of injection.

1.5 Technical parameters

Product type	SK-500II
Maximum injection rate	1500ml/h (Different injectors have different maximum rate.)
Range of flow rate	5ml injector: 0.1-100ml/h 10ml injector: 0.1-200ml/h 20ml injector: 0.1-400ml/h 30ml injector: 0.1-600ml/h 50ml injector: 0.1-1500ml/h
Injection increment	0.1ml/h
Bolus rate	5ml injector: 100ml/h 10ml injector: 200ml/h 20ml injector: 400ml/h 30ml injector: 400-600ml/h 50ml injector: 400-1500ml/h
Injection mode selection	1. Rate mode 2. Time mode 3. Body Weight mode
Rate mode	Speed: 0.1-1500ml/h (maximum value depends on the injector specifications)
Time mode	Time:1~2000 minutes Accumulated injection volume: 0.1-999.9ml
Body Weight mode	Weight: 0.1~300.0kg Drug: 0.1~999.9(mg) Volume: 0.1~999.9ml Dose: 0.1 ~ 9999.9(restricted to unit, drug, solution, weight and injector specification).

	Unit: mg/kg/h, ug/kg/min
KVO rate	Adjustable range: 0.1ml/h～5.0ml/h (begin the KVO function under the occlusion situation) ; pressing STOP key to cancel the KVO function when it is unnecessary in use.
IP grade	IPX1
Injection pressure	The maximum pressure is 0.3Mpa, Occlusion alarm pressure value is 40kPa～160kPa when pressure value is minimum, injection rate is 25ml/h, the longest alarm time is 10 minutes. When pressure value is minimum, injection rate is 5ml/h, the longest alarm time is 10 minutes.
Preset volume	0.1ml-9999.9ml
Preset time	0~99 hours, 0~59 minutes
Accumulated injection volume	0.1ml-9999.9ml
Accuracy	±3％
Power supply	AC 100～240V，50/60Hz
Battery	Rechargeable lithium polymer battery, 7.4 V, 1600mAh.
Maximum power consumption	25VA, running more than 4 hours at the rate of 25ml/h after being fully charged.
Battery charge	When syringe pump is connected to AC power, the battery will automatically recharge. (about 8～14 hours to recharge fully.)
Fuses	T2AL250V～
Displayed information	Flow rate; accumulated injection volume; injector specification; battery capacity; bed No.; AC power indicator, operation indication, etc.
State indication information	Stop, inject, bolus, KVO (stop flashing, the other indicators flash by turns.)
Alarm information	near completion, Over, occlusion, low battery, abnormal 1 (communications failure), abnormal 2 (pump stuck), abnormal 3 (wrong parameter), volume limited alarm, no AC power
Maximum size of the outer shell	380mm×190mm×180m（length×width×height）,
Maximum weight	＜3.0kg
Classification	ClassⅡ, Type BF
Shell material	ABS plastic
Operating conditions	Environment temperature 5℃~40℃，air pressure 80kPa ~106kPa，relative humidity ≤80%
Storage conditions	Environment temperature -40℃~55℃，air pressure 50kPa~106kPa，relative humidity ≤95%
Applicable syringes	5ml、10 ml、20 ml、30ml、50 ml syringes
Electrical safety	In accordance with the stipulation of IEC60601-1

1.6 System structures

SK-500II syringe pump contains the following components:

1. The microcomputer system: the "brain" of the whole system, giving intellectualized control and management over the whole system and processing the detected signals. The two single-chip Micyoco (SCM) systems are used for mutual backup copy and supervision. When one SCM goes wrong, the other one will give an immediate warning signal and cut the power of the host computer, which will then stop completely, thus ensuring patient's safety.

2. The pump device: the "heart" of the whole system and the main driving force of the injection. Driven by stepper motor, the lead screw moves the injection piston forward.

3. The inspection device: various kinds of sensors, such as displacement sensor (detecting liquid flow rate and flow volume), pressure sensor (detecting pipe occlusion), etc. They can give corresponding signals which will, after being magnified, be sent over to the computer for signaql processing. Then the inspection device can operate correspondingly with the control instruction educed from the processing.

4. The alarm device: after the signal given by the sensor is processed by the microcomputer, an alarm control signal will be educed, which will be responded by the alarm device to arouse people's attention for right treatment. There are mainly two kinds of alarms: photoelectric alarm (LBD) and sound alarm (loudspeaker and buzzer).

5. The input and display device: input part in charge of various injection parameters, such as injection volume and injection rate. It displays various parameters and the current operation progress. LCD displayer.

6. The chargeable battery: this part is to provide the power for the pump when there is no AC power.
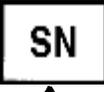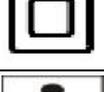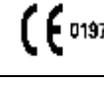
1.7 Explanation of Symbols on the Label

1. Product label pattern (pasted on the shell of the pump):

2. Label Mark

Mark	Description
LOT	Production batch No.
SN	Serial Number
⚠	Caution! Consult user manual
▣	Class II equipment
🕴	Type BF applied part
IPX1	Protection against vertically falling water drops
⌧	It indicates that the equipment should be sent to the special agencies according to local regulation for separate collection after its useful life.
⋈	Date of production
▰	Manufacturer
CE 0197	CE mark
∼	Alternating current
EC REP	European Representative

3. Standard configuration in the packaging case
  ① Syringe pump   one set
  ② AC power cord   one pc
  ③ Introduction manual   one pc
  ④ Pole clamp   one pc
  ⑤ Certificate of approval   one pc
  ⑥ Maintenance card   one pc

※ Please contact the sales agent or the manufacturer if there are components above mentioned missing when you open the packaging.

1.8 Panel instruction
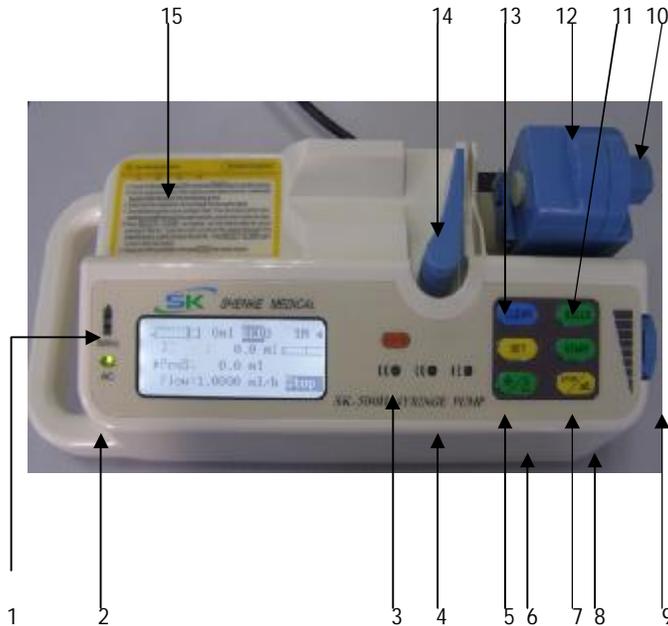
| No.	Description	Function
1	Battery capacity indicator light	Flashing when there is no AC power connection.
2	AC power indicator light	AC indicator light is on when using AC power.
3	Red alarm light	Flashing when there is alarm signals.
4	Operation indicator light	After the injection begins, the three lights flash alternately from left to right. When the injection is over, all the three lights are off.
5	SET key	In the 'STOP' condition, press the key to enter or quit the modes selection interface.
6	POWER key	Turn on the pump: Press this key for about 2 seconds. Turn off the pump: Press this key for about 3 seconds. Night vision function: Press this key for about 5 seconds to open or close this function after turning on the pump.
7	START key	Start injection after the installation and parameters setting.
8	STOP /CLEAR	Press the key to stop injection and silence the alarm at the same time.
9	Knob	Knob is used to adjust the parameters and cursor. Press the knob to clear the alarm for 2 minutes and confirm the value newly set.
10	Clutch button	Keep pressing the button to move the piston freely. When unfastening the button, the clutch will gear,

		and can only be moved by the engine.
11	BOLUS key	Keep pressing this key during injection, the machine will inject at the maximum rate, back to original speed after releasing this key. On settings menu screen, press "BOLUS" can lock or unlock the syringes parameters. The Start-up default is in locked condition, and the syringes parameters can not be set in the condition.
12	Piston	Push the piston of the syringe.
13	CLEAR key	In STOP condition, press the key to clear the accumulated volume. On settings menu screen, all the syringes parameters will be cleared when press STOP key in the unlock condition. Then the syringes can not be acknowledged, and we have to reset the syringes parameters.
14	Injector pressure lever	It holds back the syringe to avoid syringe dropping.
15	Quick Help	Guidelines
	SET+ CLEAR	In STOP condition, press the key to enter or quit the main menu.
	SET+STOP	In STOP condition, press the key to enter or quit the sensor screen.
	Cursor	Flashing display, without the cursor display when it is running.,

1.9 Battery charge

1. As shown in diagram 1, after the pump is connected to the AC power and turned on, the AC indicator light is on and the battery begins to charge automatically. When the battery is fully charged, it will stop charge automatically.

2. As shown in diagram 2, the AC indicator light will be off if the AC power is disconnected. And the battery indicator light is flashing, which means the syringe pump is using the battery capacity. The syringe pump will issue a warning sound to alert the user to charge the battery when the battery power shortage.

※ It is need 8～14 hours to charge the battery fully after its power is used up.
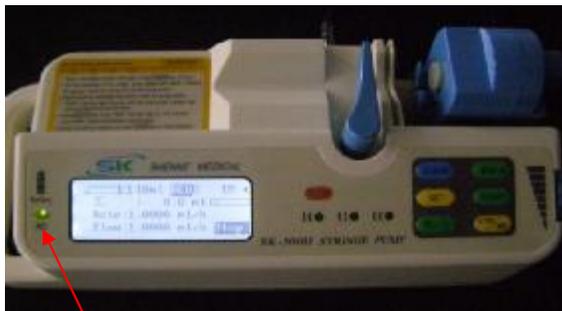
Indicator light is flashing，means the battery is using.

The AC indicator light is on and the battery begins to charge automatically

Display the battery capacity

Diagram 1

Diagram 2

1.10 Machine installation

1. The syringe pump is used at the general level of the position
2. Make sure the screw aims at the central thread hole of the under shell, then rotate the screw to fix the anchorage clip on the syringe pump.

the screw aims at the central thread hole, then rotate the screw to fix the anchorage clip

3. Check the stability of the IV stand.
4. Rotate the other screw on the anchorage clip to make sure the syringe fixed on the IV stand.
Setting of Menu Parameters

Rotate the other screw, make sure the syringe fixed on the IV stand

2. Setting Parameters

2.1 Setting menu parameters

Under stop condition, press "clear+set" keys to enter the Menu Parameters setting screen. Press "clear+set" keys again to go back to the original screen. As shown in diagram 3 and diagram 4.
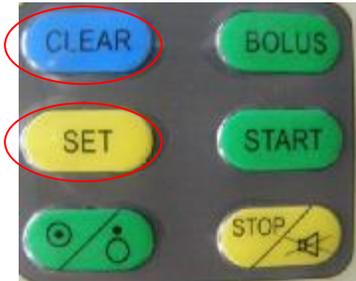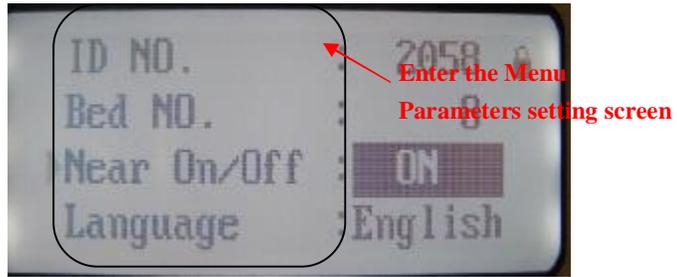

Diagram 3

Enter the Menu Parameters setting screen

Diagram 4

The parameters need to be set on Settings menu screen as table 1:

Table 1

The parameter selected	Suggested parameter value.
5ml injector	37.5 (set in unlock state) (Save setting value after shut down)
10ml injector	55.4 (set in unlock state) (Save setting value after shut down)
20ml injector	61.2 (set in unlock state) (Save setting value after shut down)
30ml injector	68.3 (set in unlock state) (Save setting value after shut down)
50ml injector	75.7 (set in unlock state) (Save setting value after shut down)
Basic occlusion value	0.1Mpa (Save setting value after shut down)
KVO speed	0.1~5.0, default value: 0.1, Select OFF function to close KVO
ID No. setting	The after four-digit of the Machine Serial No. (Save setting value after shut down)
Bed No.	The No. of the bed the machine placed. (Save setting value after shut down)
Near completion alarm	ON (Save setting value after shut down)
English/Chinese	Chinese (Save setting value after shut down)

※ The setting value can be saved for more than 6 months.

1. Menu Parameters Explanation:

①.5~50 syringe: This parameter is the length of the injector, unit is mm. Specific measurement can be found in the behind operational guidelines, [3.4 'change syringe suppliers' second step].

②.Basic occlusion value: 0.04~0.16Mpa. Default value 0.1. This value decides the occlusion alarm sensitivity of different syringes.

③.KVO speed: the adjustable range is 0.1~5.0ml/h, the default value is 0.1ml/h. It enters into KVO state in the course of occlusion after running. Set the value to "OFF" to close KVO function.

④.ID No. setting: The value is the after four-digit of the machine Serial No. in order to identify each single machine. The adjustable range is 0~9999.

⑤.Bed No: This value is the No. of the bed in which the machine is placed. The range is 0~999. When no alarm, the bed No. is displayed at the first line of the main screen and is disappeared when alarming.

⑥.Near completion alarm: Can set 'turn on' or 'turn off' the function. There is alarm when near completion while this function is turned on otherwise there is no alarm.

⑦.Language selection: English or Chinese can be selected.

2. Setting Parameters Operation Explanation

Turn the knob after entering into the setting menu screen, different parameters can be choose as shown in diagram 5. There is a lock-like 'icon' in the upper right of LCD as shown in Figure 5, and it is locked by default status after each time of turn on. In the state we can not set the five parameters of "5 ml syringes" "10 ml syringes" "20 ml syringes" "30 ml syringes" "50 ml Syringe". On settings menu screen, press "BOLUS" key in lock condition to enter into unlock state, then we can set the syringe parameters. And we also can press "BOLUS" in unlock state to enter into lock condition.

Change the parameters value of shown in diagram 5: Turn the knob to adjust the cursor to the parameters needed to be set, and then press the knob to let the parameters anti-marked. Then turn the knob again to adjust the parameters value, at last press the knob to confirm the final parameters and save. After all settings, press "Clear" + "Set" to go back to the stop condition.
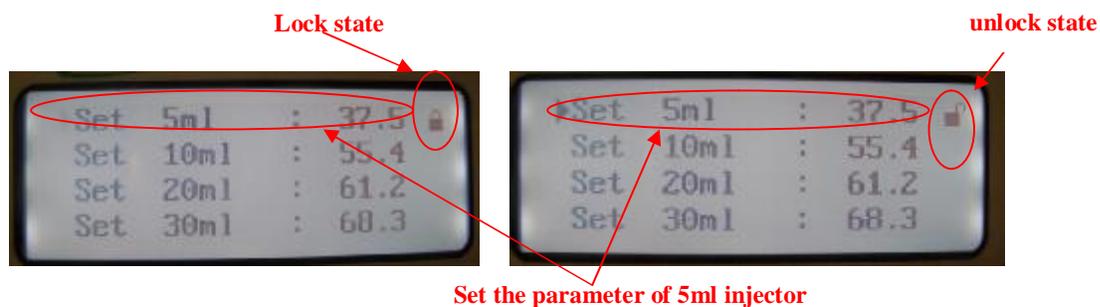

Diagram 5

3. The course of verification basic occlusion value is as follows:

① The default benchmark occlusion value is 0.1 Mpa, and the adjustable range is 0.04 ~ 0.16 Mpa. Set benchmark occlusion value to 0.1 Mp

② Prepare a new 10ml syringe with weak resistance, a manometer and a connecting pipe.

③ Fill the 10ml syringe with liquid and install it to the pump. Connect the pump and manometer

well with the connecting pipe.

④ Press 'start' key to begin the injection, press 'SET+STOP' to enter the pressure value preview interface[diagram 6]. Observe the manometer, when the value reaches 0.1 ± 0.02Mpa, the syringe pump should give an alarm for occlusion, and the pressure value shows 1.8kg. If it is not alarming when the value reaches 0.1 ± 0.02Mpa, the potentiometer value needs to be re-adjusted so that it can alarm of occlusion when the manometer value reaches 0.1 ± 0.02Mpa.

Diagram 6

2.2 Setting mode parameters

Under the "stop" condition, press 'SET' key to enter the mode parameter setting interface [diagram 7]. Turn the coder and use the cursor to point to the parameter need to be set, then press adjusting knob, turn the coder to set, press the adjusting knob again to save the parameter newly set.
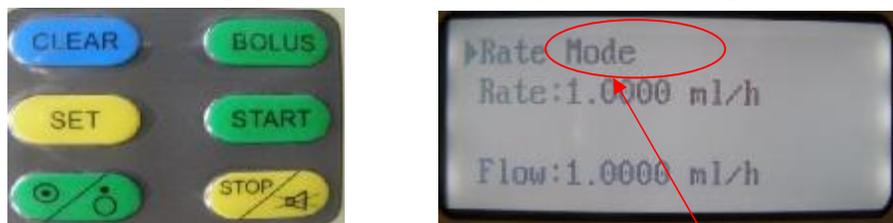
After you have changed the injection node, you have to change the parameters too.

Diagram 7

The parameter need to be set is different due to different selected mode [diagram 2].

Parameter value	Parameter need to be set	remark
Rate mode	speed	Mode 1 on the main menu
Time mode	time	Mode 2 on the main menu
	fluid volume	
Weight mode	weight	Mode 3 on the main menu
	drug	
	fluid volume	
	dose	
	mg/kg/h or ug/kg/h	

※ The rate displayed in last line of the parameter setting interface is the value calculated automatically by the syringe pump, can not be set).

※ Weight model speed conversion:

mg / kg / h   flow rate = dose*weight* fluid volume ÷drug

ug / kg / min   flow rate = 60 *dose*weight* fluid volume ÷drug ÷ 1000

2.3 Setting parameters under 'stop' condition

Under the 'stop' condition, turn the coder to display the parameters that can be adjusted. Turn the adjusting knob and use the cursor to point to the parameter need to be set, then press adjusting knob, turn the coder to set, press the adjusting knob again to save the parameter newly set.
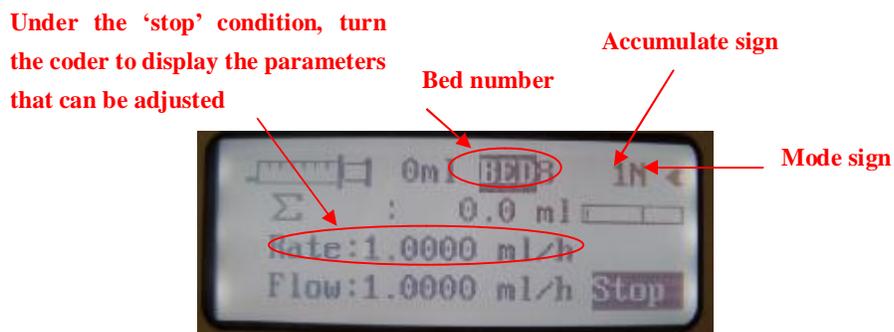

Under the 'stop' condition, turn the coder to display the parameters that can be adjusted

Bed number

Accumulate sign

Mode sign

Diagram 8

Parameter	Explanation	Remark
Speed	Unit is different under different mode.	Display injection time under time mode, will not display speed.
Preset	'0' stands for off, turn on the preset function when it is not '0'.	Both can not be set under time mode. Display the first finished preset value first. Close the first preset value when it is finished and the second one is on.
Timing	Timing function is off when both hour and minute parameters are closed.	
Drug	Two kinds of drugs: penicillin, vancomycin.	(Save setting value after shut down)
Bolus rate	The bolus rate of 5、10、20ml syringes are 100、200、400ml/h，the bolus rate of 30 syringe is 400～600ml/h and the bolus rate of 50ml syringe is 400-1500ml/h.	(Save setting value after shut down)

Attention: After setting the preset volume separately, preset sign turns to 'P'. After setting the timing separately, preset sign turns to 'T'. After setting both preset volume and timing, display the first finished preset value first. Press the stop key, the first preset value turns to '0' and the second preset value begins to run. It displays 'N' when both preset volume and timing are '0' (close function). Under the weight mode, the speed is calculated to rate with some parameters, such as kg, weight etc.

2.4 View volume limited and timing operation in running condition

During injection process, turn the adjusting knob, the marked place displaying the injection volume

will show preset volume, timing information and total amount of drug (mg).

Diagram 9

2.5 View transducer value

Under the interface of main menu (operation or stop condition), mode parameter setting, menu function, press 'SET+STOP' keys to enter the sensor value interface to check long potentiometer value, short potentiometer value, pressure sensor value and battery capacity value. Press 'SET+STOP' keys to turn back to the original interface.

Diagram 10

2.6 Other operation

1. Run: press STOP key to begin injection after setting parameters in stop condition or mode parameter interface.
2. Bolus function: keep pressing the BOLUS key during injection, the machine will inject at the maximum rate, back to original speed after releasing the bolus key.
3. Stop: press the STOP key under main menu or sensor value to check the interface.
4. Clear accumulation: clear accumulation by pressing CLEAR key in stop condition.
5. Turn on/off the pump: press the POWER key for two seconds when the pump is off to turn on the syringe pump. When the pump is on, keep pressing the 'power' key for 3-5 seconds and then release after hearing 3 sounds, then it is off.
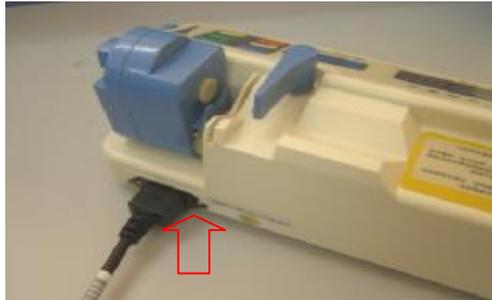6. Night vision operation: keep pressing POWER key until hearing a sound, the night vision situation changes.

3. Operation Instruction

3.1 Basic operation steps

Step 1   Power connection

Attention: Insert the power cord into the power supply (50/60 HZ, AC 100 V～240V).

Diagram 11

Diagram 11 Connect the power cord as shown in Diagram 11

Step 2   Turn the power on

**The light is on, it means that the pump is in the state of charge.**

Diagram 12   **Diagram 13**

Turn on the power, the syringe pump will display version information and ID No. etc. as shown in Diagram 12。

Step 3   Install the syringe

Install the syringe as shown in Diagram 3:

(1) Press STOP key;

(2) Press clutch button, drag piston to the suitable place;

(3) Before the installation, manually exhaust the air inside the syringe and then put the syringe on the installation mounting groove;

(4) Pull the piston to the place where the syringe can be connected and then loosen the clutch;

(5) Turn the compression strut of the syringe around 90° and then let go of it. When the compression strut compresses the syringe, the indicator light corresponding with the type of syringe will be on.

the suitable place

Turn the compression strut of the
syringe around 90° and then let go of it

right   wrong

Syringe butt close to the Pistons
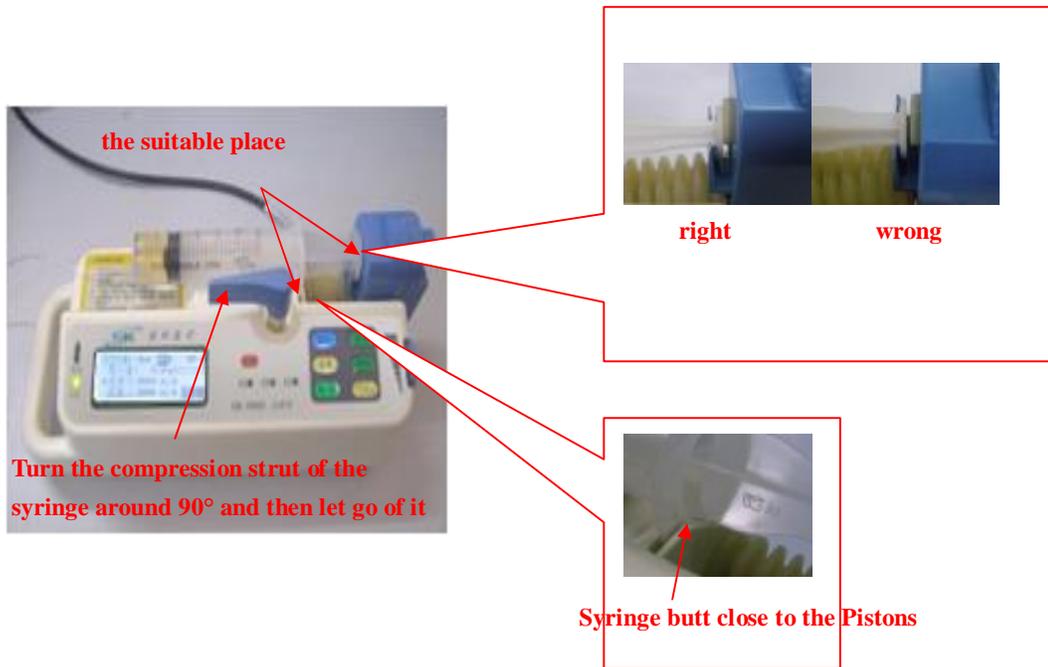
Diagram 14

The compression strut should cling to the syringe

The LCD displays the specification of injector

Diagram 15

Step 4   Select the injection mode and adjust the speed

(1) Press STOP key once.

(2) Press SET key to enter mode parameter setting interface, select the corresponding injection mode and set corresponding parameters.

(3) Do not use the mode parameter setting but use the default rate mode. Adjust the speed in 'STOP' interface, turn the knob until the value reaches the requirement (diagram 4).

Diagram 16

Step 5   Clear accumulation

(1) Make sure the pump is in stop condition

(2) Press" CLEAR" key to eliminate the accumulated volume.

Diagram 17

Note: accumulation number can be observable only in injection condition and be eliminated only in stop condition.

Step 6   Start the injection

(1) Confirm the installation and the numerical value setting, and make sure the corresponding syringe indicator light is on.

(2) Press START key, the syringe pump starts working. The right below side of the screen displays the 'injection' condition.

Attention: If the accumulated injection volume is not needed, press CLEAR key before pressing START key to let the former accumulated volume return to "0".

The faster the indicator light flashes the quicker of the injection rate.

Step 7   Operation

During the operation process, The 3 operation indicator lights will flash alternately from left to right. Press SET + STOP keys to enter the sensor value checking interface to check the long potentiometer value, short potentiometer value, pressure sensor value and power value. Press SET + STOP key and return to the original interface.

Keep pressing the BOLUS key during injection, the machine will inject at the maximum rate, back to original speed after releasing this key.

Diagram 18

Step 8   Injection completion

(1) When the injection is near completion, the alarm indicator light flashes and LCD screen displays 'NEAR' to remind the user that the injection will complete soon.

Attention: press the knob to stop alarm but it sounds again in two minutes.

(2) When the injection is finished, the pump stops operations and in the meanwhile the indicator light flashes. LCD displays "COMPLETION" to remind the user that the injection is finished.

Attention: press the knob to stop alarm. It will sound again after two minutes.

LCD displays the alarm message   Press knob to eliminate the alarm

Alarm indicator

Diagram 19   **Diagram 20**

Step 9   Turn off the power

Press "POWER" for 3-5 seconds and then release it, the machine is power off.

Diagram 21

3.2 Start Bolus

During the injection process, if you need a moment of faster injection, you can start bolus function by keep pressing the BOLUS key as shown in diagram 22, the pump shall begin injection at the fastest rate. It will go back to the original rate after releasing BOLUS key.

Attention: Bolus dose not influence alarm function.

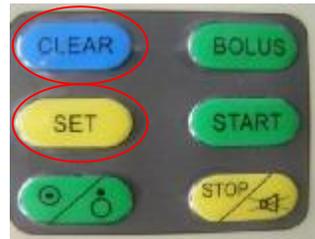The bolus rate depends on the size of syringe as shown in diagram.

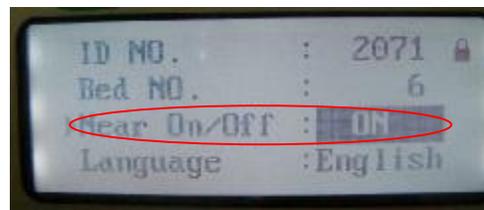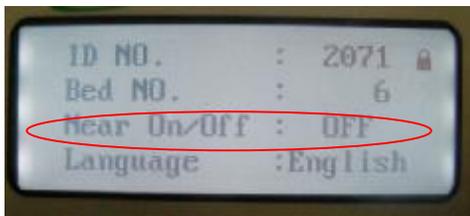| Size of syringes	Bolus rate
5 ml	100 ml/h
10 ml	200 ml/h
20 ml	400 ml/h
30 ml	400~600 ml/h
50 ml	400~1500 ml/h
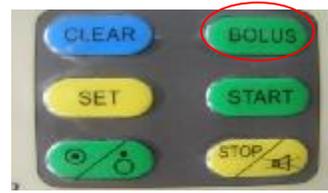
Diagram 22

3.3 Start / stop near completion alarm function

(1) In stop condition press both "CLEAR" and "SET" keys to enter into the menu parameters setting interface.

Diagram 23

(2) Turn the knob until it point at "NEAR COMPLETION". Set the required value and save it.

Diagram 24

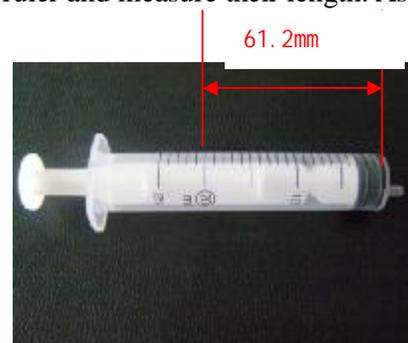## 3.4 Replace injector suppliers

Step (1) prepare new syringe of new brand, one for each (5ml, 10ml, 20ml, 30ml and 50ml)

Step (2) measure the length of syringes

1. Put the syringes (diagram 25) at the calibration ruler and measure their length. As shown in diagram 26 that the length is 61.2mm
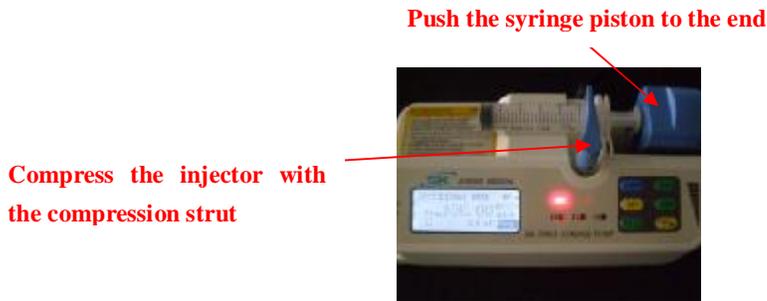

Diagram 25   **Diagram 26**

Step (3) Install the injector

    1. Push the syringe piston to the end, and install it according to normal operation. (diagram 27)

Diagram 27

Step (4) set syringe parameters

    1. Stop condition, press 'CLEAR' and 'SET' keys together to enter into menu parameters interface (diagram 28).

Diagram 28

    2. The length parameters are in LOCK condition now (diagram 29) and parameters can not be adjusted. Press 'BOLUS' key to unlock the pump (diagram 30) and set the parameters. Press "BOLUS" key once again to save and lock the interface menu.

      ATTENTION: ①. Syringe parameters are in LOCK condition when the pump is on and parameters can only be set in UNLOCK condition.

               ②. Syringe parameters refer to syringes of 5ml, 10ml, 20ml, 30ml and 50ml. 'LOCK' and 'UNLOCK' can only be effective to the five parameters.
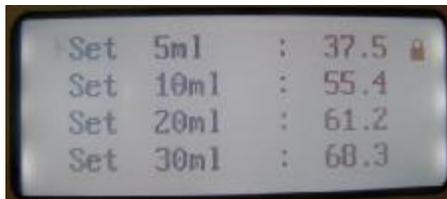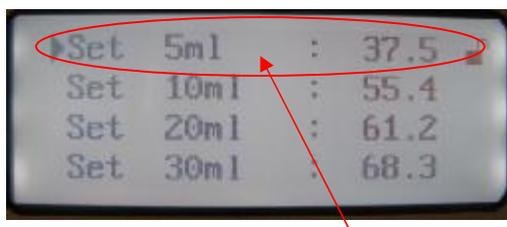

            Diagram 29   **Diagram 30**

    3. Setting parameters for 5ml injector: on parameters setup interface menu, directed by rotary knob, the cursor points to settings "5ml injector", press the knob, the values are in the setting status (refer to Diagram 31) , adjusting the values by rotating the knob, making the values turn to the injector's length value shown in the first measuring step. Finally, press the knob to save the settings. The parameters of 5ml injector have been set up.

The parameters of 5ml injector

Diagram 31

4．Setting injector parameters for 10ml、20ml、30ml、50ml are similar to the process of setting 5ml injector: Selecting 10ml、20ml、30ml、50ml injector parameters separately, repeating the above mentioned Step Two and Step Four, entering parameters setup interface menu, directing by rotary knob, the cursor points to "10ml injector"、"20ml injector"、"30ml injector" and "50ml injector" respectively, pressing the knob, the values are in the setting status (refer to Diagram 31), rotating the knob again, adjusting the values to the corresponding injectors length value in the measuring process, Finally, press the knob to save the settings. 'Locked' the interface menu after all the parameters have been set, preventing parameters changed by misusing.
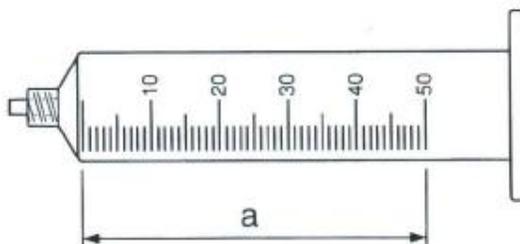
※ We test and set the parameters under the brand of "double dove". If you use other brands of syringe pipe, please reset the injector parameters.

5. Syringe pumps use disposable injector "double dove" for regulation. Injectors, which up to the National Standard such as 5ml、10ml、20ml、30ml、50ml can be used with this pump. Before using injectors of non- "double dove" in line with National Standard, please reset the injector parameters by referring to this instruction manual. Injectors that are not confirming to the national standards or incorrect parameter setting will affect the injector accuracy.

	5ml	10ml	20ml	30ml	50ml
Double Dove	√	√	√	√	√

	Sizes for Reference a（mm）				
	5ml	10ml	20ml	30ml	50ml
Double Dove	37.5	55.4	61.2	68.3	75.7

※a：Length between calibration tail of 0ml injector to the real size

3.5 Clear injector parameter, reset injector parameter

Only plastic injectors or glass injectors under the same brand can be used.

We test and set the parameters of the machine under the brand of "double dove", if glass injectors or other plastic injectors are needed, pressing CLEAR + SET keys together to enter into the parameters setup interface menu, then press BOLUS key for unlocking, under this status, press CLEAR key, then all injector parameters been eliminated. Installing required injector, setting parameters as per 〖3.4 replacing injector manufacturer〗 steps, after all parameters been setup, press BOLUS key for locking. (Note: Make sure press BOLUS key at the very begging, under unlocking status, press CLEAR key, all injector parameters will be eliminated), and then press SET + CLEAR keys together back to the main screen.

### 3.6 Adjust occlusion sensitivity

1．〖refer to Diagram32〗In stop status menu, pressing CLEAR + SET keys together, the syringe pump will enter into parameters setup interface menu.

Diagram32

2．Directing by rotary knob, the cursor points to settings 'basic occlusion value' , adjusting the basic occlusion value and press the knob to save the settings 〖refer to Diagram 33〗. The lower the basic occlusion value is, the higher the alarm sensibility it has.
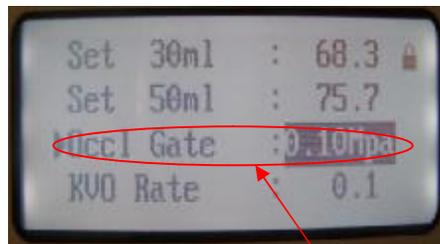
basic occlusion value

Diagram33

4. Maintenance and Storage

4.1 Machine maintenance

1．Keep the machine clean. Use a piece of cloth to wipe the syringe pump clean when any liquid drops on the pump.

2. Special attention must be paid when cleaning the syringe pump. Use a tampon moistened with 75% of alcohol to wipe the outer shell.

3．Make sure the power supply and AC power connection of the syringe pump are cut off.

4．Do not clean the syringe pump by using xylene, acetone or similar menstruum to avoid outer shell disrepair.

The above mentioned operation is just for guidance. More proper methods should be used for sanitizing effect inspection.

4.2 Transport and Storage

Transport and Storage under environmental temperature: -40℃～55℃，air pressure: 50 kPa～106kPa，relative humidity: ≤95%.

4.3 Preventive testing

1. Inspection of injection rate

Use the measuring bucket for testing injection volume every six months.

2．Battery Inspection

- Batteries belong to expendables. Replacing of battery needed when they are used up. If replacing batteries are required, please contact its distributor or the manufacturer. Model: Lithium Polymer battery （7.4V，1600mAh）.

- Using the battery every month till its depletion and the power of the pump turns off automatically for insuring battery performance and prolonging its life. After battery depletion, recharge 8～14 hours for next use.

- The following inspection need to be taken every six months.
  - （1） Connect to AC power, about 8 hours for recharging.
  - （2） Turn on the syringe pump and install 50ml injector.
  - （3） Set up injection rate: 25ml/h and start syringe.
  - （4） Continuous operation of the syringe pump till it turns off based on low battery.

    If the syringe pump takes 90 minutes or even longer time from starting injection to shutdown, the battery is in good condition.

    If the syringe pump takes 45-90 minutes from starting injection to shutdown, the battery life close to its end.

    If the syringe pump takes less than 45 minutes from start injection to shutdown, the battery is up to its end and recharge of battery is required.
  - （5） After battery inspection, recharge the battery again for usage next time.

3．Routine Maintenance

intervening time	Routine maintenance procedures
According to hospital policy	Thoroughly cleaning of syringe pump shell is required before or after long period of storage.
At least once a year for inspection	1．Inspection of AC power cord and wires.

4.4 Environmental protection
    The service life of the products is 3 years. Machines over its life should be discarded, please contact the manufacturer or distributor for more relevant information.
    1. SK-500II syringe pumps that are no longer in use could be delivered to its distributors or manufacturer for proper recycling.
    2. Used Lithium Polymer batteries could be delivered to its distributors or manufacturers for handling, or handling it as per applicable laws and regulations.
    At least once a year for the Detection
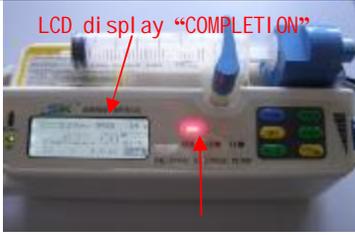   (Please refer to the parts to identify technical service manuals)

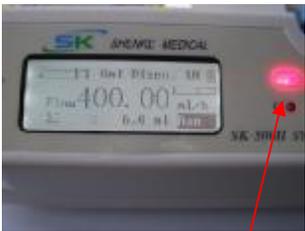# 5. Electromagnetic Compatibility and Interference

This pump has a function to prevent external interference, including high-intensity radio frequency radiation, magnetic field and static. Users should avoid the use of the mobile phone within 0.5 meters from the machines.

This pump is quite low in electromagnetic frequency, which will not interfere the surrounding electronic equipments. However, the pump will cause a certain amount of electromagnetic radiation, which is within the requirement of IEC/EN 60601-1-2 and IEC/EN60601-2-24. If the pump interferes with other equipment, measures must be taken to reduce this kind of interaction, such as the relocation of the two instruments.

6. Alarm and Solutions

6.1 Common alarm indication and solutions

Description	Display	Reason	Solution
Injection near completion		The injector will be emptied	1.press the knob to cancel the alarm(the alarm will ring again after two minutes) 2. Press STOP key to stop the syringe pump and cancel the alarm.
Injection completion		The injector has been emptied	1. Press the knob to cancel the alarm(the alarm will ring again after two minutes) 2. Press STOP key to stop the syringe pump and cancel the alarm.
Occlusion alarm		1. Syringe loop occlusion 2. The occlusion sensitivity value of the syringe pump is not properly set. 3. Syringe pump sensor has some problem	Solution for No.1 : Press STOP key to stop the syringe pump and cancel the alarm, eliminate injection loop occlusion, then press the START key to inject once again. Solution for No.2: Refer to this manual page 13 『3.6 adjust sensitivity value』 Solution for No.3: Ask the manufacturer to inspect and repair it
Low battery capacity		1. Too low battery 2. Battery aging or something wrong with the battery charge circuit	Solution for No.1: Connect to AC power supply to charge the battery Solution for No.2: Contact manufacturer or agent to maintain.
Alarm for no AC power supply		1. No AC power supply for the syringe pump. 2. Something wrong with the power supply circuit of syringe pump.	Solution for No.1: Check if the power cord is not plugged in or not properly plugged in. Solution for No.2: Contact manufacturer or agent to maintain.

Alarm for installation error	**Alarm indicator flicker**	1. The injector fall off or is not installed well. 2. The parameter is setting incorrect. 3. Something wrong with the sensor of syringe pump	Solution for No.1： Reinstall the injector Solution for No.2： Refer to this manual page12 『3.5 change the injector supplier』 set the parameter again Solution for No.3： Contact manufacturer or agent to maintain.
Alarm for abnormal control	**LCD diplay " WRONG 1 "** **"abnormal 2" "abnormal 3"**	1. Something wrong with the CPU data communication setting 2. the operation of Electric Machines is wrong 3. check the parameter incorrectly	Solution for No.1： Contact manufacturer or agent to maintain. Solution for No.2： Contact manufacturer or agent to maintain. Solution for No.3： Reset all of the parameter

6.2 Common problems and solutions

Description	Result	Cause	Solutions
Press START key but the light for LED operation is not on.	The syringe pump does not work.	The syringe is not properly installed. The syringe specification parameter is not rightly set.	Reinstall the syringe. Check if the right indicator light is on. Or reset the syringe specification.
Turn the knob but the speed of syringe does not change.	The speed of syringe pump does not change.	The syringe pump cannot be set during operation.	Press STOP key to stop the syringe pump. Turn the knob to get the needed value and press the knob to save the value.
Battery used up.	The syringe pump will turn off if not connected to AC power.	Battery used up. The syringe pump can not be used before it is connected to A.C. electric supply.	Connect the syringe pump to A.C. power supply before operation.
The occlusion alarm signal sounds soon after the syringe pump starts operation.	The occlusion light is on and the syringe pump stops.	The occlusion sensitivity value of the syringe pump is not properly set.	Reset the occlusion sensitivity value.
Install the injector falsely	The indicator light of the corresponding injector is not on	The compressed strut is not tightly pressed on the injector. Or the injector specification is not rightly set.	Pull the compressed strut of the injector up, reinstall the injector and press it onto the injector tightly. Or reset the injector's specification.

6.3 Maintenance service

Attention:

1. If there is any untreatable fault or question, please stop using the use and contact the authorized maintenance station or contact the manufacturer directly.

2. The unauthorized person has no right to repair this product; otherwise our company will take no responsibility.