

BS-COL-P5

30W CO₂ LASER SURGICAL SYSTEM

Operation & Service Manual



This manual includes some general warnings that you have to pay special attention to when you operate the system.

Please read this manual carefully and understand thoroughly before you operate this system.

This manual should always accompany the system, and its location must be known to all personnel operating the system.



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Safety Guidelines

The following information is provided for the correct utilization of CO₂ laser surgical system. The information includes not only the accident protection regulations the products comply with, but also the effective precautions regarding proper use of the products.

The safety regulations that BS-COL series CO₂ laser surgical system comply with can be grouped under 3 categories

- 1. Electric safety regulation**
- 2. Laser radiation safety regulation**
- 3. Electromagnetic radiation safety regulation**

These safety regulations comply with the following standards set by IEC:

IEC 60601-1

Medical electrical equipment part 1: General requirements for safety

IEC 60601-1-2

Medical electrical equipment part 1-2: General requirements for basic safety and essential performance –Collateral Standard: Electromagnetic compatibility– Requirements and tests

IEC 60601-1-4

Medical electrical equipment part 1-4: General requirements for safety– Collateral Standard: Programmable electrical medical systems

IEC 60602-2-22

Medical electrical equipment Part 2-22: Particular requirements for the safety of diagnostic and therapeutic laser equipment

IEC 60825-1

Safety of laser products Part 1: Equipment classification requirements and user's guide

Although BS-COL series CO₂ laser surgical systems are designed according to accident prevention regulations, only a proper and careful use can guarantee safety. For effective precautions, please refer to chapter 3.4.7 and 9 in operator's manual.

The EMC performance of this system has been evaluated and is in compliance with EN60601-1-2. Better use this system in an environment free of strong electromagnetic field.



Preface

The BS-COL CO₂ laser surgical system is an intelligent laser treatment instrument. This product is featured by compact structure, beautiful appearance, reliable performance, convenient operation and perfect safety. The technical specifications of the product have achieved the advanced international standard.

The instrument can be applied to general surgery, gynecology, otolaryngology, dermatology and cosmetology etc for different treatment such as cutting, vaporizing, cauterizing and solidifying. It can be used in ward and private clinics for its portability and compactness.

WARNING

This instrument generates high voltages and laser radiation within the cabinet. Operators must pay much attention to safety during operation. Operation safety instructions are specified in this manual. Any improper use, adjustment or maintenance may cause laser radiation hazards or high-voltage electric shock.

Operating Instructions Manual



1. Operation principle of the system

1.1. Principle of CO₂ laser surgical system

The CO₂ laser, with a specific wavelength of 10.6μm can be absorbed by human body tissue (no matter what color the skin is) almost by 100%, with the laser slightly passing through the skin. It is the heat and electromagnetic effect of the laser that people use to conduct non-blood or less-blood cutting, cauterizing, gasification and accurate microsurgery. Most optical knives use CO₂ laser source.

The CO₂ Laser system could not be used for internal vascular surgery.

1.2. System description

The BS-COL-P5 CO₂ laser surgical system is the latest microprocessor-controlled instrument based on a sealed-off CO₂ laser providing up to 30W output power on body tissue. It is easy and safe to operate.

1.3. Main cabinet

- 1.CO₂ laser and compound light source
- 2.Switch source with high voltage and constant current
- 3.Main control panel
- 4.Cooling system
- 5.Footswitch
- 6.Articulated arm

1.3.1 CO₂ laser and compound light source

Sealed-off laser is selected. The active medium is a mixture of CO₂ and other compound gases. The compound light consists of sealed-off CO₂ laser tube, light intensity detector, diode laser and beam combiner. The beam combiner combines CO₂ laser beam and beam diode laser beam coaxially and guides them into the articulated arm beam delivery system.

1.3.2 Switch source with high voltage and constant current

The instrument is equipped with a switching-mode power supply which converts input voltage to the high voltage required for laser emission. Compared with traditional source, it has a series of advantages, such as small volume, high efficiency and safety while increasing voltage.

Operating Instructions Manual



1.3.3 Main control panel

The microprocessor-based main panel is used to control all functions by touching the thin film switch. Time and power are displayed digitally, which is clear and accurate.

1.3.4 Laser cooling system

The laser cooling system is a closed circulating loop. The coolant (distilled water or ion water) is circulated by a pump.

1.3.5 Footswitch

A footswitch is used to control laser output. When the footswitch is pressed, the shutter opens and laser emits from the articulated arm.

1.3.6 Articulated arm

The laser beam delivery system consists of light-weight, spring- balanced, 7-joint articulated arm. The working radius of the articulated arm at full extension is 110cm.

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2. Name of the components



1. Handpieces

2. Keyswitch

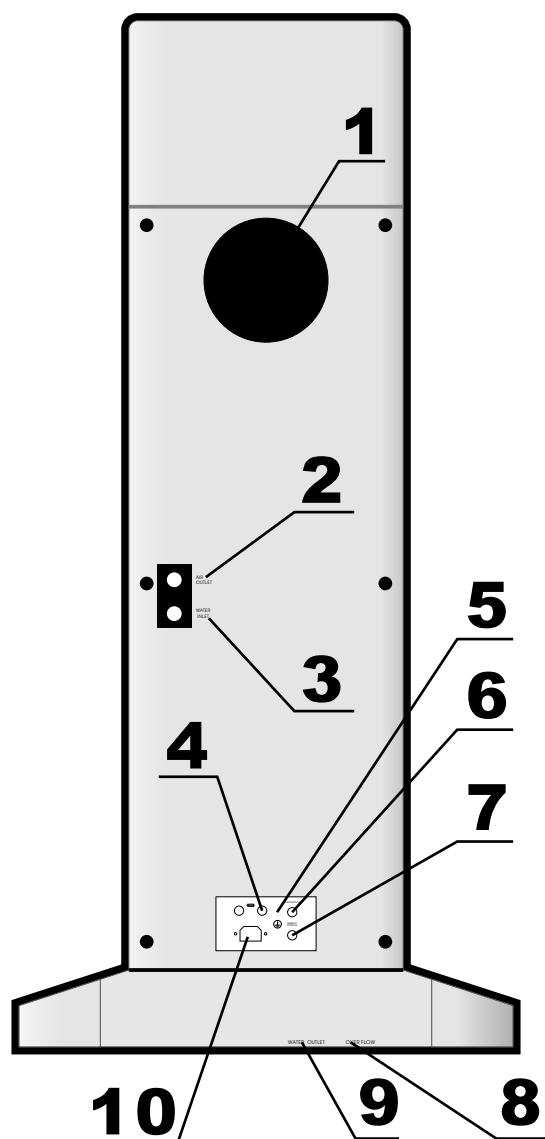
3. Articulated arm

**4. Emergency stop
switch**

5. LCD control panel

Front View

Operating Instructions Manual



1. Fan

2. Air outlet

3. Water inlet

4. Fuse Holder

5. Grounded Pole

**6. Footswitch
Socket**

**7. Remote Control
Socket**

8. Over Flow

9. Water Outlet

10. Power Socket

Reverse View

Operating Instructions Manual



3. Pre-startup preparations

3.1. Unpacking and inspection

After unpacking, please check to ensure that the instrument is not seriously damaged, circuit lines are well connected and accessories are available (see accessories list)

3.2. Installing articulated arm

The articulated arm is connected with the system by fixed ring, please find the following Front View.

Notice: The fixed ring should be screwed down in order to avoid the laser beam deviated.

3.3. Pouring coolant

A. Watering:

Unscrew the water inlet and air outlet orifice, add the water into water inlet orifice by funnel until the water is full. After watering, screw down the cap screw of both orifices.

B. Water Release (use for special purpose):

Unscrew the air outlet and water outlet , the water will flow out of the water outlet. After that, screw down the cap screw of both orifices.

Please find attached picture for WATER INLET, AIR OUTLET, WATER OUTLET)

Never turn on power when the tank is empty.

Cooling water must be used with purified water or distilled water

3.4. Checking power voltage

Ensure that the power voltage complies with the requirement of the instrument. Socket is in working order.

3.5. Connecting power cable

Plug the two terminals of the power cable into the power input socket and the power socket. (Make sure the ground socket is in working order.)

3.6. Footswitch connection

Plug the footswitch cable into the socket on the rear part of the instrument. Push in alignment of the notch until a tone is heard which means a successful lockup.

Operating Instructions Manual



3.7. Temporary start

After several minutes of trial operation of the instrument, cut off the power supply temporarily.

Operating Instructions Manual



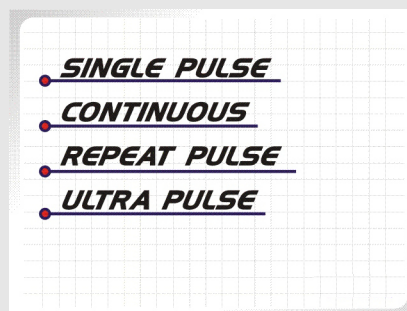
4. Installation. Alignment and operation procedures

4.1 Power On

Turning the switch key and power on the system while cooling system is working on, the screen will enter into main menu after 8 seconds when LCD screen is on, and the up right LED light will be in green.

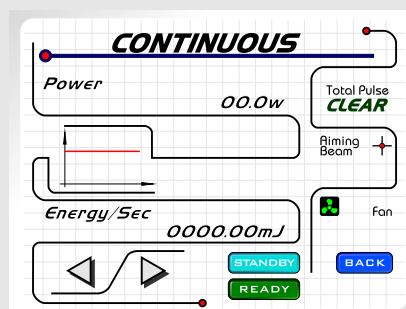
4.2 Opreating & Setting

The main menu will dispaly 4 opearting modes, press the mode name you want to select:



1. Continuous

Press “Continuous” on the main menu and enter into “Continuous” Setting Menu, Press “Power” button and the power value (like 0.5w) will turn to Yellow, then you could press ◀ or ▶ to adjust what the treatment needs. The laser beam will be outputting continuously when pressing the footswitch.

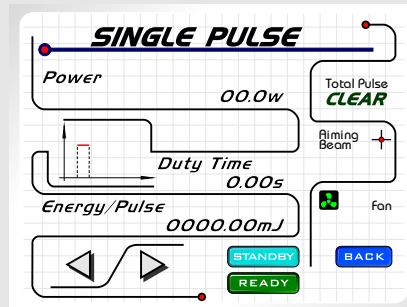


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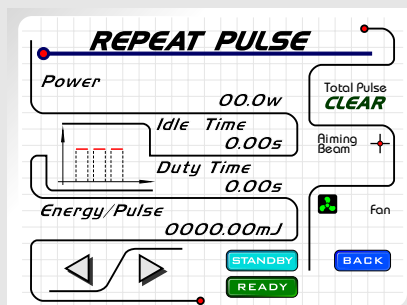
2. Single Pulse

Press “Single Pulse” on the main menu and enter into “Single Pulse” Setting Menu, Press “Power” button and the power value (like 0.5w) will turn to Yellow, then you could press ◀ or ▶ to adjust what the treatment needs. The laser beam will be outputting continuously when pressing the footswitch.



3. Repeat Pulse

Press “Repeat Pulse” on the main menu and enter into “Repeat Pulse” Setting Menu, Press “Power” button and the power value (like 0.5w) will turn to Yellow, then you could press ◀ or ▶ to adjust what the treatment needs. The same manner to adjust “Idle Times” and “Duty Time”. The laser beam will be outputting continuously when pressing the footswitch.

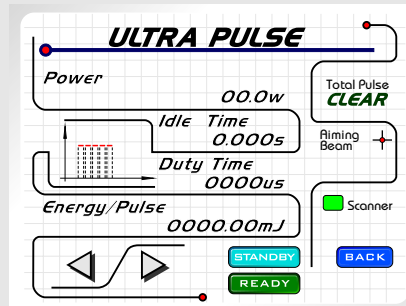


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4. Ultra Pulse

Press “Ultra Pulse” on the main menu and enter into “Ultra Pulse” Setting Menu, Press “Power” button and the power value (like 0.5w) will turn to Yellow, then you could press ◀ or ▶ to adjust what the treatment needs. The same manner to adjust “Idle Times”. The laser beam will be outputting continuously when pressing the footswitch.



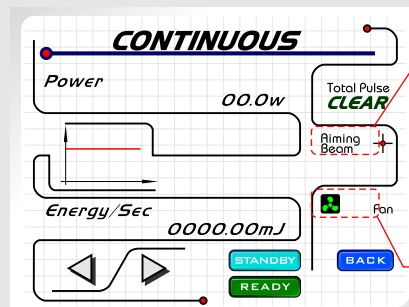
4.3 Laser Beam Outputting

After the parameter is setting like chapter 4.2, press “Ready” button and make the system to ready status, the LED light will flash yellow. When pressing foot switch, the system will be humming and the laser will be emitting after 2 secs with the LED light in yellow.

4.4 Additional Adjustment

Both aiming beam and fan can be adjusted on each mode setting menu.

For Instance: on “Continuous Setting Menu”



Press “Aiming Beam” Button and press ◀ or ▶ to adjust broghtness.

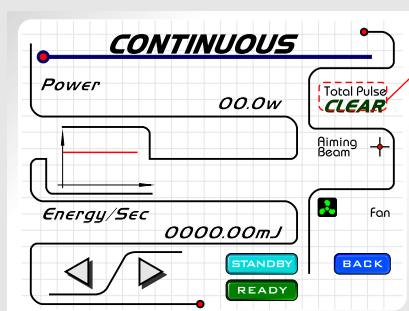
Press “Fan” Button and press ◀ or ▶ to adjust power of fan.

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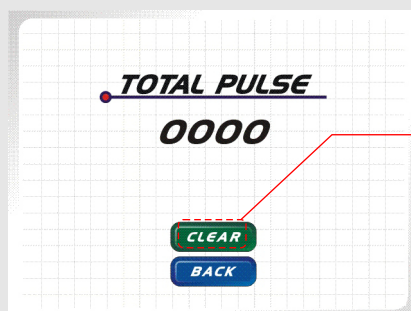


4.5 Clear

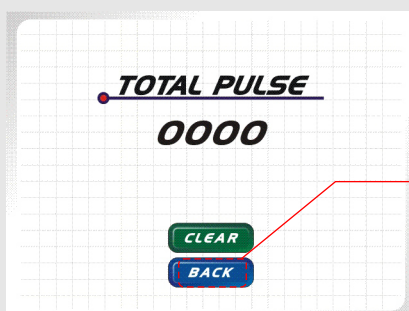
The working time can be cleared like the following:
For Instance: on “Continuous Pulse Setting Menu”



Press “Total Pulse Clear”
button to “Clear” menu



Then press “Clear” to zero



Press “Back” to “Continuous
Pulse Setting Menu”.

Operating Instructions Manual



5. Protection and Alarm

5.1 Indication of coolant circulation

When the water pump begins to work shortly after the power is turned on, the coolant doesn't circulate normally, with the indicator flashing and the buzzer beeping. After the coolant circulates normally and the warning device, which will alarm in case of no water, is connected, the alarm stops beeping..

5.2 Overheat protection

Prevent the instrument from being overheated: when the temperature of the circulating water is higher than 40°C, the indicator will flash and the buzzer will beep. Before normal operation is restored, cut off power supply and wait till the temperature of cooling water goes down below 25°C. Then restart the instrument. In case of the two aforesaid alarming states, if the footswitch is pressed, laser will not emit.

After 15 minutes continuous working or temperature alarm, it needs to power off the system for 30 minutes and make the system cool.

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6. Pilot beam

In view of the invisibility of the 10.6um CO₂ laser, a visible red diode laser emitting coaxially with CO₂ laser is provided to help the operator locate laser beam conveniently. Before each treatment, please test if the laser beam is doubling with the aiming beam, by setting of 1W on continuous output. If there has been misalignment, please ask the technician for calibration.

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7. Precautions

- 7.1** Never let the laser beam be directed to human eyes or healthy skin.
- 7.2** To prevent human eyes or skin from being hurt by the reflection of laser light, never allow the laser beam, be directed to any smooth reflective surface, such as stainless steel device surface, mirror surface, etc.
- 7.3** If 75%, alcohol is used to clean or sterilize relevant part of the instrument, don't use the instrument till the alcohol vaporizes. Never operate the instrument in the presence of flammable anesthetics.
- 7.4** In order to prevent the focus lens of the handpiece from being polluted and to keep a clear view of the surgical area, a smoke evacuator is recommended to the operator. The handpiece and focus lens must be cleaned every 3 months.
- 7.5** The laser beam generated by this instrument is hazardous to eyes in the area within 35m from the instrument (when someone is staring directly at the laser) operators must use safety eyewears proti when operating.
- 7.6** This instrument generates high voltages inside. No attempt should be made by non-professional to open the cabinet of the instrument to avoid electric shock resk.
- 7.7** If the instrument gives out abnormal smell or sound, stop operation at once. Cut off the power first before any inspection.
- The laser tube in made of glass. Handle with care to avoid damage.**

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- 7.8** Keep the instrument in an environment with the temperature between 1°C~50°C and the relative humidity between 10%~80%.
- 7.9** Empty the water tank before transportation to prevent the laser tube from being frozen to break.
- 7.10** Don't leave around laser tube and the instrument recklessly when their service lives end. Recycle according to the local environment protection regulations.
- 7.11** To avoid improper use of the instrument, remove the key from the keyswitch and keep it properly when the instrument is not in use. The instrument generates high voltages within the power supply and laser tube. Please refer to professional personnel for maintenance to avoid electric shock.
- 7.12** Operation room should be equipped with a dust or fume exhauster, because the dust arising during operations may be mixed with biological tissue particles.

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8. Maintenance

The instrument generates high voltages within power supply and laser tube. Refer to professional personnel for maintenance to avoid electric shock.

8.2 Lens cleaning

The output power may drop slightly after the instrument has been put into use for half a year. This may be caused by the stained focus lens of the handpiece. Wipe the lens gently with moistened cotton ball once or twice. Be sure not to damage the lens.

8.3 Cabinet cleaning

If there is dirt on the cabinet, wipe gently with moistened cotton cloth and some detergent or toothpaste. Don't use over-wet cloth in case the water leaks into the inner part of the instrument, causing short circuit and damage. Please refer to chapter 9 for precautions.

8.4 Power calibration

The practical laser output power and the preset panel power must be calibrated each year with standard laser power meter within validity period by trained professional personnel.

8.5 Fuse replacement

Open the fuse holder with a screwdriver and remove the original fuse. Before replacement, check and ensure the new fuse is identical in type and specification to the original one (5A) to avoid damage arising from unfit fuses.

8.6 Handpiece sterilization

Handpiece must be sterilized after use. Refer to chapter 8.3 for details.

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9. Accessories

Operator's manual and service manual	1copy
Articulated arm	1pc
Footswitch	1pc
Interlock key	2pcs
Fuse	Ø5x20 2pcs(5A, spare parts)
Handpieces (see table below)	

Operating Instructions Manual



Standard Handpieces

DWG NO.	FIGURE
DT-01	
DT-02	
DT-03	
DT-04	
DT-05	

Handpieces By Customer Order

DWG NO.	FIGURE
DT-06	
DT-07	
DT-08	
DT-09	
DT-10	

For each use. Please clean and sterilize the handpiece by 75% surgical alcohol.

Notice: The surgical alcohol must be volatilized before use.



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10. Troubleshooting Guide

Please refer to professional personnel for maintenance

SYMPTOMS	POSSIBLE CAUSES	ACTIONS
After the main power is on, the panel does not light, the water pump does not work either, (when the water pump works, there are slight vibration and sound.)	The power plug has not been properly plugged. The emergency stop switch is pressed down.	Check the two plugs at the two ends of the power cable. Replug properly turn the red mushroom-shaped button of the emergency key in the indicated direction to have the emergency key connected.
No laser beam emits out though the instrument seems running normally.	The plug of the footswitch is not properly inserted. The setting of the control panel isn't suitable. When the instrument is used for the first time, after water is filled the cover is not closed tightly. The interlock keys are not pressed down. The joint of the articulated arm is loosened.	Insert the plug of footswitch tightly according to operator's manual. Set the panel again according to operator's manual. Close the cover and press the interlock keys. Screw the joint tightly.
No laser emits. The instrument alarms.	The instrument has been working for too long and the coolant is too hot.	Stop running the instrument. Wait till the temperature of the cooling water goes down below 25°C, then restart the instrument.
The instrument makes big noise when running	The instrument is not Well- balanced.	Place the instrument on a stable and flat surface.
Red pilot beam doesn't converge or doesn't emit from the end of the tube. CO ₂ laser is off the center.	The articulated arm is either damaged inside or not working normally. No laser emits or output power drops significantly.	Refer to professional personnel for service.



Service Manual

Note: Operators are not allowed to adjust the components listed below:

Laser tube, articulated arm, diode pilot beam, microprocessor board.



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11. Technical Specification

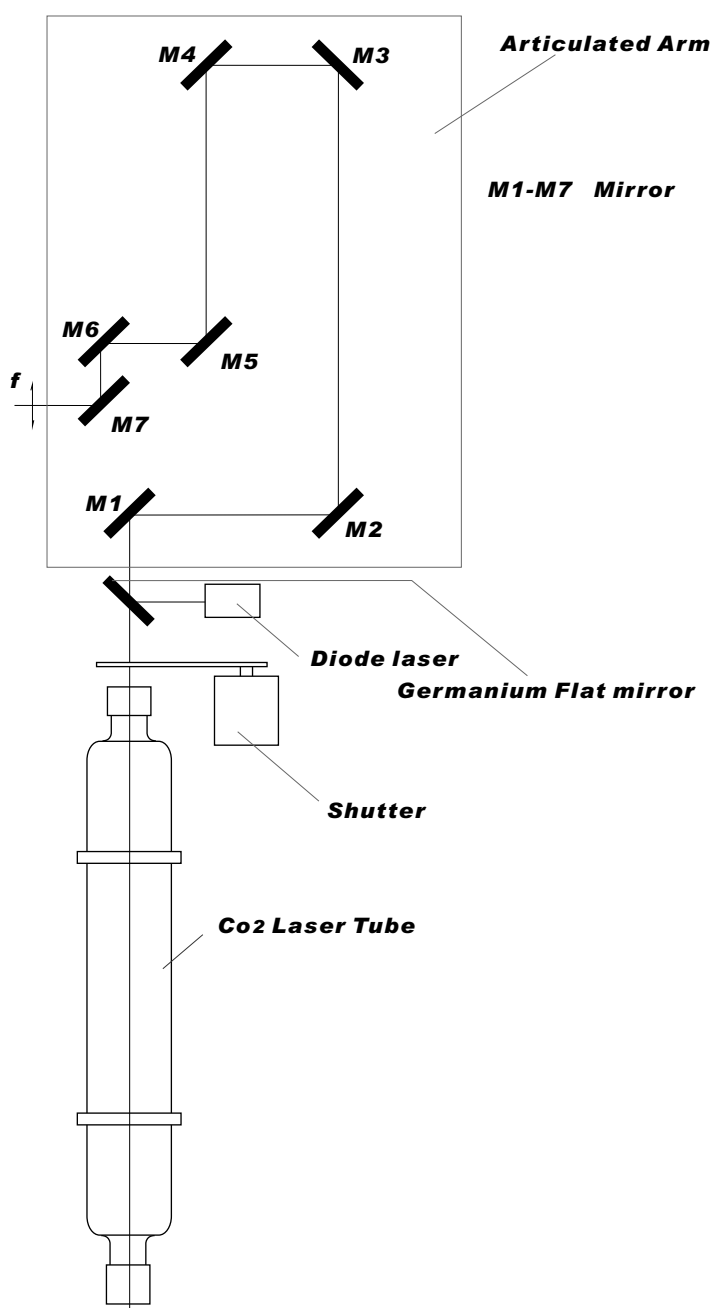
Laser Type	Sealed off CO₂ laser
Laser Wavelength:	10.6 microns
Laser Mode:	Low-valance mode
Output Power:	0~30W. cont adjustable
Focus Spot Diameter:	0.4mm
Divergence:	4mrad
Lens Focal Distance:	F=100mm
Power Instability:	± 10%
Delivery System:	Spring-balanced 7-joint articulated arm
Operation and control:	Touching switch Microprocessor- controlled
Working Modes:	Continuous, single pulse, repeat pulse and Super Pulse
Pulse Duration:	0.05~1s
Display:	LCD display
Cooling System:	Closed loop circulating water
Power Supply:	230V~, 50Hz (see supply circulating water)
Input Power:	500VA
Environment Temperature:	5~35°C
Relative Humidity:	<80%
temperature in transit	-40~50°C
Humidity in transit	<85%
Gross weight(kg)	50kg
Atomospheric pressure:	86.0kpa~106.0kpa
Warning up time:	5min
Electromagnetic requirement:	No electromagnetic Field interference
Other working conditions:	No obvious vibration or airflow

Specifications subject to change without notice



Service Manual

12. System schematics





Service Manual

13. Warranty & Service

The instrument is a well designed, user friendly laser surgical system with high quality. It performs perfectly under normal use and maintenance. Within a year from the date of purchasing, any damage caused by manufacturing or components defects can enjoy free repairing service.

Such service is valid only if the instrument is properly used. Any damage cause by improper use of the instrument, such as using unfitted power supply and wrong accessories, operating in a manner other than specified in this operators manual, damages caused by transportation, accidents unauthorized installation or maintenance, etc, such free service will be invalid immediately. The free service does not include accessories transportation free and door-to-door service charge of professional personnel.



Service Manual

14. Warnings, Identification & Labels

Label Explanations

No	Symbol	Definition
Label 1		NOTICE! PLEASE SEE ACCOMPANYING DOCUMENTS
Label 2		TYPE B APPLIED PART
Label 3		PROTECTIVELY EARTH
Label 4		DANGEROUS VOLTAGE
Label 5		DOOR INTERLOCK SWITCH WARNING
Label 6		WARNING LABEL HAZARD SYMBOL
Label 7		LASER APERATURE
Label 8		FUSE
Label 9	Remote Control	REMOTE CONTROL PLUG
Label 10	Footswitch	FOOTSWITCH PLUG
Label 11		WARNING AND EXPLANATORY LABEL
Label 12		MANUFACTURER AND PRODUCT INFORMATION
Label 13		EMERGENCY STOP
Label 14		KEY SWITCH