

# Medical CO2 laser system User's Manual

Model LS30-1A

**CE Approved**  
**FDA Approved**

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Every effort has been made by the manufacturer to ensure that the data given in this document is accurate. This product will be improved continuously, the information contained herein are subject to change without notice.

The manufacturer has no responsibility for the result that is caused by user's fault or wrong operation on the instrument, and no responsibility for any errors or omissions in this document or the information contained in this document!

# User's Manual

(Version LS30-1A)

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# 1. Introduction



Model LS30-1A Medical Carbon Dioxide (CO<sub>2</sub>) Laser System (see Fig.2) is widely used in all open operation including vaporization, cutting and coagulation. The satisfactory results may be given using the instrument in the treatments of following diseases such as pointed condyloma, hemorrhoids, cervical erosion, nasal polyp, nevus, benign tumor, tattoo and so on. It is an indispensable medical appliance for common surgery, gynecology, urology, anus, otorhinolaryngology, plastics, dermatology and stomatology.



## 2. Precautions of safety

### Note:

*Before operate the instrument, read the user's manual first please!*

*Never allow untrained personnel to operate the laser. The operator must be trained with basic laser physics, laser safety, tissue interaction, laser operating procedures and hands-on experience.*

*The operator must get the qualification certificate of laser therapy according to the law of state government.*

*As this apparatus has high-pressure voltage and laser radiation, operators should use it with great attention. Safety measures are stated in the Instruction Manual. Improper operation, adjustment, or maintenance may cause danger of laser radiation and high-pressure shock.*

### On laser radiation safety

1) The CO<sub>2</sub> laser is classified as class 4 laser product and the red LD aiming beam laser is classified as class 3A laser product, which are according to the standard of IEC (International Electrotechnical Commission) 60825-1:1993 Safety of laser products—Part 1: Equipment classification, requirements and user's guide.

2) The nominal ocular hazard distance (NOHD) after focusing (f=100mm) handpiece is 4.4m and after 50mm focus lens is 2.2m, which are calculated according to IEC 60825-1:1993. If the handpiece without focus lens, the NOHD can be more than 40m!

3) Never stare into laser aperture and look directly into the laser beam or its reflection, permanent damage to the eye can occur. Be careful, the safety distance for eye is 40m away when the handpiece without focus lens.

4) The laser radiation safety shall be paid special attention in the operation of the instrument. All personnel in the therapeutic room have to wear the special protective eyewear so as to prevent the eye from injuring.

### Warning:

*Protective eyewear can only prevent the damage to eyes that caused by diffuse reflection.*

*It cannot prevent the damage to eyes that are caused by full power laser direct or reflective radiation, so, never look directly into the laser beam or its reflection even if protective eyewear is used.*

5) Note: when the handpiece with focus lens is used, the laser output power will be 15% more compared with using the handpiece without focus lens.

6) Do not shoot laser onto a wall or any other things to avoid unexpected reflection or causing a fire. Windows and glass door panels require to be fitted with blinds or film that are made by fireproofing material, which will prevent inadvertent exposure to radiation of persons outside the laser area.

7) Do not use inflammable anesthetics or oxidizing gases such as nitrous oxide (N<sub>2</sub>O) and oxygen (O<sub>2</sub>) in course of the instrument operation. Some material as cotton goods would be ignited in rich oxygen and higher temperature caused by the operation of the laser instrument. The inflammable solutions used in clean and sterilization shall be volatilized before starting the laser instrument.

8) Please note that the handpiece of the guiding beam arm must be kept downward while the instrument is unattended. Do not place the arm anywhere to avoid unexpected hurt.

9) In operating room, prohibit mirror reflection. The substance with reflection function must be paid special attention, unexpected reflection can cause injury. Remove all shiny reflective objects such as ring, watchband, large accouterment, glass and metallic utensils away from the patient and the operating physician to avoid the damage of reflection.

10) Never depress the footswitch without first verifying the safe orientation of the articulated arm and the attached headpieces.

11) The operator shall pay full attention that the instrument must be in stand-by state when it is not in use temporarily.

12) Keep the switch-on key with the authorized person only to prevent unauthorized use of the laser system.

13) The Medical Smoke Evacuator shall be installed in the treatment area and the warning note **---Warning:** the evacuated smoke may contain biological particulate-- shall be marked in the proper position.

### 3. Main Specifications

Laser Type:	CO <sub>2</sub> Laser Device
Wavelength:	10.6μm
Mode:	Low mode
Output Power:	5-25W(or 30W) Step Adjustable per 1 Watt
Light Beam Divergent Angle:	≤6mrad
Starting Voltage:	≤25KV
Operating Voltage:	≤10KV
Operating Current:	3-25mA
Focal Flare Diameter:	≤0.4mm
Focal Length of Lens:	f=100mm
Power Unstability Degree:	< ±10%
Indication Beam:	2mW 670nm Semiconductor Laser
Transmission System :	6-Articulation Joint Spring-Balanced Light Guiding Arm
Operating Mode;	Continuous, Single, Repeated and Modulated pulse
Display:	Power and Pulse Output Time; Pulse Interrupted Time
Power Adjustment:	5-25W(or 30W), Step Adjustable per 1W
Pulse Output:	0.01-2.95 seconds, step adjustable per 0.01s
Pulse Intermission:	0.01-2.95 seconds, step adjustable per 0.01s
Cooling System:	Built-in circulating water cooling
Input Voltage:	AC110V±10%; 60Hz
Environmental temperature:	5-40
Relative Humidity:	≤80%
Dimension:	400mm*370mm*1080mm
Weight:	21Kg

## 4. Structure

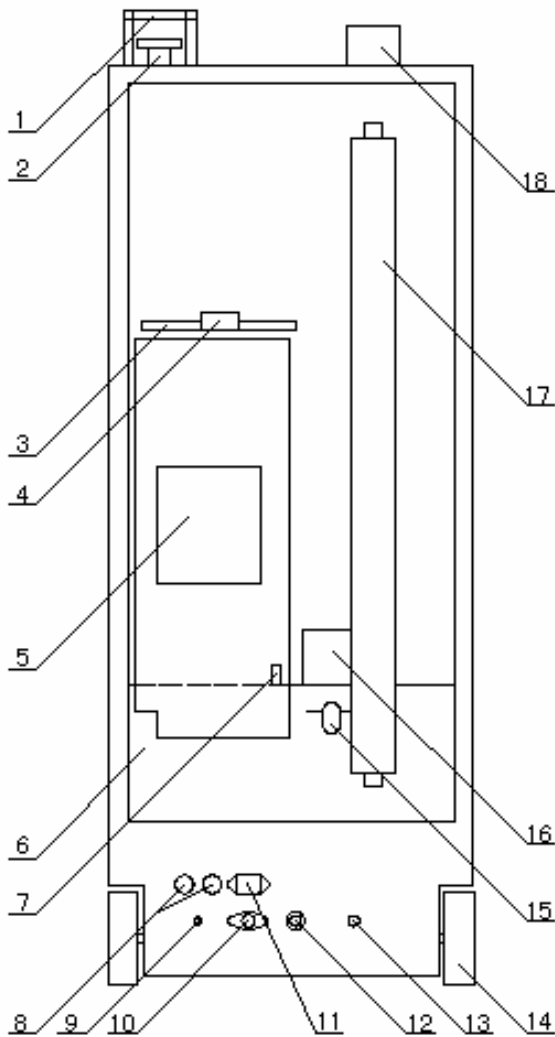


1—laser guiding arm  
4—main body  
7—wheel

2—emergency stop switch  
5—Interlocking Remote Control Device  
8—fuse  
9—foot switch

3—operation panel  
6—power socket

## Structure Sketch



- 1—handle                      2—emergency stop switch              3—power control board  
 4—door safety switch

\*when back door is opened, the laser machine will stop working automatically.

- 5—HV power supply              6—water tank              7—water inlet              8—fuse  
 9—machine grounding port              10—socket for foot switch              11—socket for power in  
 12—Interlocking Remote Control Device (It is set usually on the door of the treatment room. When the door is opened during the treatment, laser output will be cut off immediately till the door is closed for the purpose of safety.  
 13—water outlet              14—wheel              15—window to observe the water level  
 16—hydraulic switch              17—CO2 laser tube              18—base for laser guiding beam arm



## 5. Preparation for Using

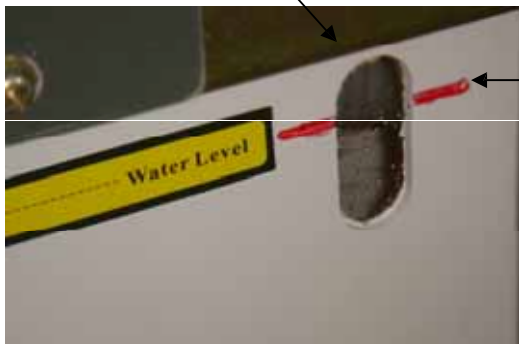
- 1) When opening up the packing case, first you should examine the cabinet of the unit and be sure there is no obvious collision damage. You should also make sure that there is no drop-out between structural parts and connecting lines and all the packing list parts are installed properly. (See the packing list parts.)
- 2) Opening up the back side door of the cabinet, you should find the injection point of the tank, and then fill clean water into the tank (distilled water is better if possible.) until the water reaches the red line.

**Warning:**

***Starting the Power Switch without water in the tank is forbidden, or the circulating water pump will be burnt down.***

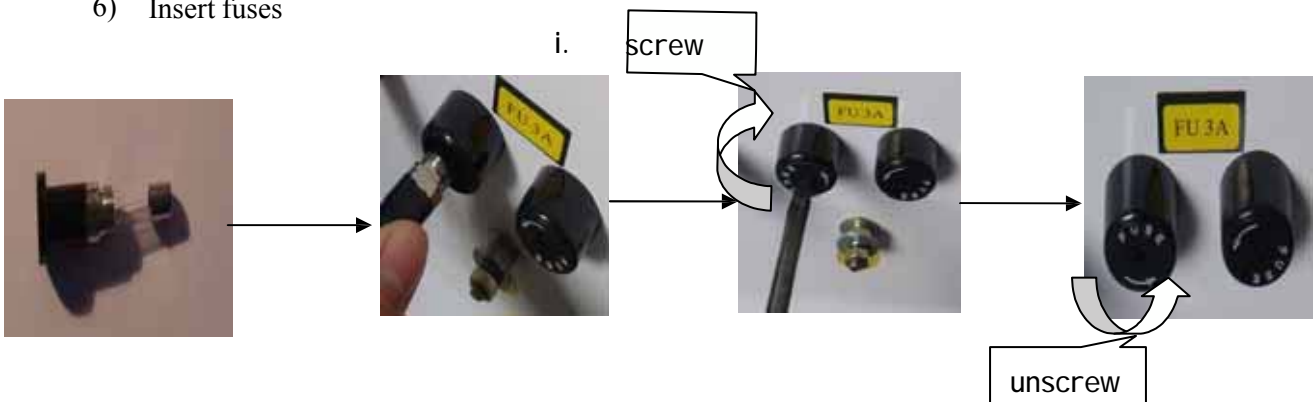


Inject of distilled water into the rubber tube

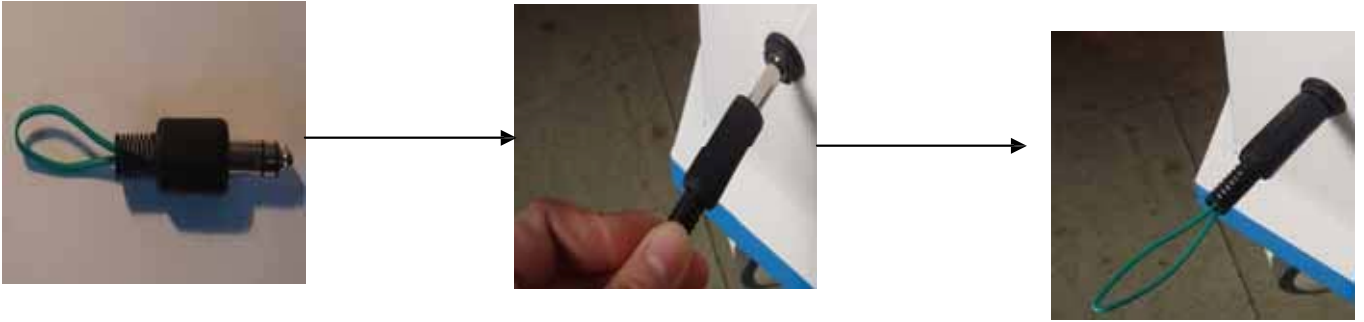


Red line of water lever

- 3) Make sure whether the power voltage coincides with the voltage needed by the
  - i. unit.
- 4) Screw into earth plug
- 5) Insert the plug of the foot switch connecting line into the socket on the back of the unit. Push the notch till the connection is reliable.
- 6) Insert fuses
  - i.



- 7) Insert radio lock



- 8) Insert the two ends of the power line into the power input socket and power socket separately. (The power socket must have a good earth); connect the earth nail on the under bed of the outer-shell with ground firmly.



- 9) Insert the key into the switch hole of the control board, and turn the key 90 degree in the direction of right-hand, and in the meantime, the power is on and the circulating water pump and the cooling fan inside the unit are turned on.
- 10) Turn off the power after several minutes' test run.

## 6. Installation and Adjustment

### 6.1 Laser Guiding System:

CO<sub>2</sub> laser guiding system is composed of debugging tube, laser guiding arm, focusing probe, focus-out probe, expanding beam unit, nose clip and connecting base. The connecting base is fixed on the laser output end of the unit. Generally speaking, this system can be used when the laser-guiding arm is connected and locked tightly to the connecting base.

Choose low power output after turning on the machine. Use a piece of paper to check the laser beam.

If the laser beam is not in the centre, or, if the path of the red semiconductor guiding beam does not well coincident with the CO<sub>2</sub> laser path, or, If there are double points and double lines, you may need

### 6.2 CO<sub>2</sub> Laser Output Beam core Adjustment:

Firstly, take off the laser-guiding arm and equip the debugging tube on the connecting base. Then adjust CO<sub>2</sub> Laser device to make CO<sub>2</sub> laser beam aim at the core of the debugging tube and make sure that the beam goes through the debugging tube coaxially. Thirdly, switch on and select the lowest power, and inspect the position of the flare of the debugging tube end by a piece of pergamyn. Fourthly, adjust laser device repeatedly until the CO<sub>2</sub> Laser beam go into from the center of beginning core of the debugging tube, and go out from the ending core. At last, take off the debugging device, put on the laser guiding arm and lock it tightly.

The process of indication adjustment of isotopic light route is the same as above. Adjusting till the focusing flare of the red semiconductor laser coincides with that of CO<sub>2</sub> Laser.

Select lower power after switching on. Inspect the output condition of the laser by a piece of pergamyn at the flat surface of the output end of the laser guiding arm.

Use focusing probe to do cutting operation in general. When conducting burning cure in large area, take off the focusing probe and put on the focus-out probe in order to control the size of the flare

# 7. Operation Instruction

. Operating the machine:

1. Turn the key of POWER SUPPLY in the direction of clockwise; the POWER SUPPLY pilot lamp will be lighted. If it works regularly, the WATER COOLING pilot lamp will be lighted.
2. If you select guide light, press GUIDING SWITCH button until GUIDING pilot lamp is lighted
3. Put off the laser output probe and put on the laser output defocus.
4. Press “on” of high voltage switch, the high voltage switch lamp will be lighted, control the laser output by foot switch, turn right the “Voltage Adjust” and adjust the current to 3-4mA, you can feel the heat at the laser output defocus.

II. Operating Medical Cure:

1. Select proper laser output probe.
2. Operate the machine: Same as the 1 and 2 in I.
3. Power adjust: choose the “Continuous” operation condition, press high voltage switch on, put the asbestos board under the laser output and press the foot switch. Adjust the Current Adjust, the current will increase and the laser output powers also increase.
4. Function Selection: Continuous and Pulse. Pulse has four steps(0.05, 0.1, 0.2 and 0.5), each step means the pulse output time and the pulse break time.
5. Operating Medical Cure: choose the proper working method (continuous and pulse), control the laser output by foot switch.

III. Closing the machine

Turn left the Current Adjust” to zero, then close the key power switch.

## 8. Attention

- \*Don't face the laser output beam to eyes or other healthy skins directly in any case.
  
- \*Avoid aiming the laser beam at smooth reflective surface, such as stainless steel, mirror surface etc. in order not to hurt eyes or skins by the reflection of laser beam.
  
- \*If the unit is cleaned by alcohol, the laser irradiation only can be used after the alcohol becomes dry. The laser beam should avoid irradiating inflammable and explosive cargo.
  
- \*In order to make the viewing fields of the operated part clear and avoid focusing lens to be polluted, smoke-extracting facility should be equipped when operating.
  
- \*Suggest that the operators wear laser-eye shield with corresponding wavelength when operating.
  
- \*High-voltage power exists inside the apparatus, only specialized technician is allowed to open up the cabinet in order to avoid the danger of electric shock.
  
- \*If extraordinary noise and smell is found when the apparatus is working, the apparatus must be stopped immediately for inspection. Power should be cut off before inspection.
  
- \*The apparatus assembles glass laser tube inside. So pay attentions not to fall down when transport it.

## 9. Mark Instructions

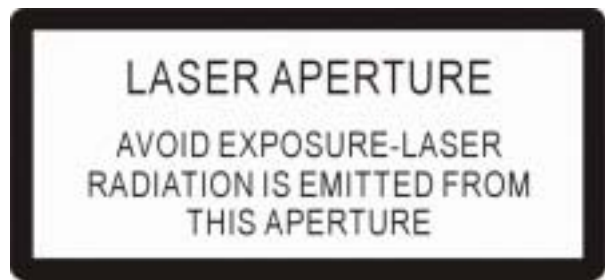
### MARK INSTRUCTION



### LASER DANGER MARK



**LASER WARNING MARK**



**LASER OUTPUT HOLE**



**ELECTRICAL EQUIPMENT CLASSIFIED MARK**

## 10. Packing List

Sequence Number	Title	Quantity	Unit	Remarks
1	Laser Guiding Arm	One	Set	6 arms
2	Power Cable	One	Piece	
3	Foot Switch	One	Piece	
4	Power Switch Key	Two	Piece	
5	Cabinet Key	Two	Piece	
6	Fuse ( 4A )	Two	Piece	
7	Interlocking Remote Control Device	One	Piece	
8	Water Filling Pipe	One	Piece	

## 11. Normal Use Distance for Eyes

$$\text{NOHD} = \frac{\sqrt{4 P_0 / \pi E_{\text{MPE}}}}{\Phi} - a$$

Explanation

$P_0$ —Output power of laser tube ;

$E_{\text{MPE}}$ —Max. irradiation level permitted ;

$\Phi$ —Diverging angle of laser beam ;

$a$ —Diameter of laser beam



JZ-1A uses  $\text{CO}_2$  laser tube, length 880mm, suppose the atmosphere reducing could be ignored, then:

$$\begin{aligned} \text{NOHD} &= \frac{\sqrt{4 \times 30 / 10^3 \pi - 0.004}}{3 \times 10^{-3}} & P_0 &= 30\text{W} & , & & E_{\text{MPE}} &= 10^3 \text{W} \cdot \text{m}^{-2}, \\ &= \frac{\sqrt{120 / 3140 - 0.004}}{3 \times 10^{-3}} & \Phi &= 3\text{mrad}, a &= 4\text{mm} \\ &= 63.8(\text{m}) \end{aligned}$$

That means, in the condition of normal using and ignored the atmosphere reducing, the NOHD is 63.8m.

## 12. Check & Maintenance of Laser Tube

Time Interval of checking: one year from the laser tube begin to be used. You can replace the tube according to the requirement of manual. Attention: Please make tube's anode and cathode matches the ones of power, or it will damage the tube.