

Operation Instructions

1.1 Startup Procedure

Turn on the voltage regulator → Turn on the computer → Open the water tank → Turn on the laser : First, turn on the emergency stop switch on the laser front panel, then turn the rotary switch to "ON" (Raycus to REM)].

Note:

1. The temperature is low in the winter, Please wait for the water tank to circulate for about 5 minutes, until the current temperature reaches approximately 15-20°C, before turning on the laser.
2. When turn on the machine, the water tank must be opened before turning on the laser. When shutting down the machine, turn off the laser first, then the water tank.
3. The shutdown procedure is the reverse of the startup procedure.

1.1 Operation Procedure

1. Open the computer software → Turn on the optical shutter, red light → Return to mechanical origin
2. Calibrate. Press the "z↓" button on the remote control to lower the cutting head to 1-2 mm from the plate, then click Calibrate. (Or, press and hold the "Assist" button on the remote control and press the "z↓" button simultaneously.)
3. Click "File" → Import File in the drawing to be cut (Note: This software only supports "DXF" file format. If the format is incorrect, you need to use "CAD" to open the original drawing and save it as "DXF" format).

4. Graphic adjustment: After importing the graphics, sort them first, and then add "guide lines" according to the required plate thickness. And divide them into "yin" and "yang" cutting.

(1) Sorting: Select the graphics → right click → Processing order
→ Automatic sorting.

(2) Guide lines: Select the graphics → right click → Guide lines → Guide settings.

(3) Yin-yang cutting: Select the graphics → right click → Yin-yang cutting
(Note: Yin-yang cutting is mainly for a certain part of a complex graphics. You only need to change a part of the graphics, not the entire graphics).

After completing the above, save. Click the software simulation button to observe the software running trajectory and whether the processing order is correct (limited to complex)

Note: Simple graphics can be sorted manually. Click the "123" button on the software to manually sort the graphics.

5. Cutting

(1) Click on the layer and import the cutting process according to the thickness of the plate (My Computer → F Drive → Process Library). Adjust the focus, air pressure, and nozzle according to the cutting process.

(2) Click on the direction key of the remote control to put the cutting head in the cutting position. Click "Workpiece Zero" (which represents the starting position of cutting) → Move the frame (observe that the required cutting pattern does not reach the outside of the plate) → Click "Start" to start cutting.

Note: During the cutting, if the residue does not fall off and rises, click the "Pause button" to clean the residue to prevent it from colliding with the cutting head. After cleaning, click the "Continue button" to continue cutting.

1.3 Precautions

1. The switching sequence of the water tank and laser.
2. The cutting must ensure that there is no obstacle alarm and the air pressure is guaranteed (the air must be turned on during cutting, otherwise it is easy to damage the lens).
3. Before clicking to start processing, make sure that the cutting head is always on the table.
4. If you use the same nozzle for a long time, check whether there is residue blocking the nozzle in time, which will affect the cutting effect and shorten the life of the cutting head.
5. Occasionally turn on the oil pump button to lubricate the guide rails and racks. If the oil pump alarm sounds, add lubricating oil in time.
6. Clean the dust and iron slag on the dust cover on time to ensure that the guide rails and racks are clean.
 - (1) Observe the coolant level. If there is a lack of coolant, add it in time.
 - (2) Water temperature alarm

Chapter 2 Frequently Asked Questions

2.1 The Impact of the Copper Nozzle on Cutting Quality

Misalignment between the nozzle center and the laser center affects cutting quality, including: impacting the quality of the cut end face, affecting the quality of sharp corners, and affecting perforation. In summary, the concentricity between the nozzle center and the laser is a key factor in determining cutting quality, especially when the workpiece is thicker. Therefore, the concentricity between the nozzle center and the laser must be adjusted to achieve a better cut end face.

2.2 The Impact of Cutting Speed

During cutting, the cutting speed is determined by the material and thickness of the sheet being cut. Different cutting speeds significantly affect laser cutting quality. Choosing the appropriate cutting speed can both improve laser cutting efficiency and achieve good cut quality.

2.3 The Impact of Cutting Gas and Pressure

During laser cutting, different cutting gases are selected based on the material and thickness of the sheet being cut. The selected cutting gas pressure significantly affects laser cutting quality. The main functions of the cutting gas are: supporting combustion and dissipating heat, promptly blowing away slag produced by cutting, preventing slag from rebounding upwards and entering the nozzle, and protecting the focusing lens.

2.4 Effect of Laser Cutting Power on Cutting Quality

During laser cutting, the choice of laser power also has a certain impact on the cutting quality. The cutting power should be determined based on the material and thickness of the plate being cut. Too much or too little power will not produce a good cut end face. Therefore, setting the appropriate laser power, combined with the appropriate cutting gas and pressure, can achieve good cutting quality without the formation of dissolution marks.

Laser Cutting Machine Maintenance Manual

I. Daily Operation

1. Parameter Settings

- Strictly follow factory settings. Avoid prolonged use of excessive power (>90%), excessive speed, or cutting highly reflective materials (such as copper and aluminum).
- Adjust power, speed, and focus position according to material thickness to avoid ineffective backlash and reduce mechanical wear.

2. Environmental Control

- Maintain a stable workshop temperature (recommended 20-25°C). Excessively high temperatures may cause machine freezes, while excessively low temperatures may cause short circuits.
- Clean dust from the workbench and electrical cabinets daily, and close electrical cabinet doors to prevent dust ingress.

3. Compressed Air and Electricity

- Ensure compressed air quality (oil-free and dry). Install a dust removal system to reduce metal dust accumulation.
- Use a stabilized power supply to prevent voltage fluctuations from damaging the equipment.

II. Core Component Maintenance

1. Laser and Optical System (Accounts for over 60% of aging factors)

- Lens Cleaning: Gently wipe the lens with a professional optical cleaner and tools to avoid scratches, at least once a month.
- Optical Path Alignment: Regularly check the focusing accuracy of the laser, reflector, and focusing lens to prevent power loss.
- Nozzle Maintenance: Maintain a distance of approximately 0.8mm between the nozzle and the workpiece to ensure proper operation of the tracking system.

2. Laser Maintenance

- Avoid full power overload operation. For long-term use, maintain power within 90% of rated power.
- Check output power stability quarterly. Recalibrate the optical path if it decreases by 10%.

3. Cooling System

- Cooling Water Management: Replace the cooling water every three months, maintaining a conductivity of 30-50 μ s/cm (>50 requires immediate replacement).
- Water Temperature Control: Maintain a temperature of 20-25°C. Clean the water tank and pipes regularly to prevent scale buildup and clogging.

4. Lubrication of moving Parts

- Lubricate the guide rails and lead screws quarterly (use the manufacturer's recommended lubricant) and remove any foreign matter from the dust cover.
- Inspect the gear rack for wear and replace any deformed parts promptly.

5. Transmission System

- Remove the dust cover and inspect the gear rack quarterly. Replace any wear exceeding 0.5mm.
- Coupling Tightening: Check the bolts weekly and ensure the torque meets the standard specified in the equipment manual.

三. Regular in-depth maintenance

Item	Frequency	Key Operations
Comprehensive optical system inspection	Monthly	Clean the lens and calibrate the optical path accuracy
cooling system cleaning	Every 3 months	Replace the cooling water, clean the water tank and pipes
mechanical structure inspection	Quarterly	Lubricate the guide rails and screws, and tighten the screws/nuts
electrical system maintenance	Semi-annually	Clean the control cabinet and back up the parameters to an external storage device

四、 . Maintenance During Idle Period (Critical!)

1. Power and Gas Disconnection: Turn off the main power supply and gas source, and drain the gas tank.
2. Dust Protection: Cover the cutting head and laser with a dust cover to prevent dust accumulation.
3. Moving Part Maintenance: Clean the guide rails and lead screw and apply anti-rust oil to prevent oxidation.
4. Environmental Control: Maintain a storage environment with a humidity of $\leq 70\%$ and a temperature of 5-40°C to avoid condensation and corrosion.

五. Common Troubleshooting

Symptoms	Possible causes	Solution
No response when powered on, indicator light off	Poor main power contact/fuse blown	Check the input power and replace the fuse
reduced cutting accuracy	rail wear/optical path deviation	Calibrate the optical path and lubricate or replace the guide rails
unstable laser output	excessive cooling water conductivity/lens contamination.	Replace the cooling water and clean the optical system.

六 . Key Points for Long-Term Maintenance

- Software Management: Regularly update control system software and optimize cutting parameters (such as power and focus position).
- Operation Training: Standardize operator behavior, prohibit overload operation, and establish a maintenance log to record equipment status.

These measures can significantly delay equipment aging and improve cutting accuracy and stability. The laser, optical system, and cooling system are of paramount importance for maintenance, accounting for approximately 60% of the factors affecting equipment lifespan. In the event of complex faults (such as control system anomalies), it is recommended to contact the manufacturer's technical support to avoid damaging core components by disassembling them yourself.

六、长效维护关键点

- **软件管理**：定期更新控制系统软件，优化切割参数（如功率、焦点位置）。
- **操作培训**：规范操作员行为，禁止超负荷运行，建立维护日志记录设备状态。

> 通过以上措施，可显著延缓设备老化，提升切割精度与稳定性。激光器、光学系统、冷却系统是维护的重中之重，约占设备寿命影响因素的60%。若遇复杂故障（如控制系统异常），建议联系厂家技术支持，避免自行拆解损坏核心元件。