Safety Guidelines for Bambu Lab R1 Laser Operation

This guide applies to Bambu Lab R1 CO_2 laser engraving/cutting equipment. The CO_2 laser emits invisible infrared light with a wavelength of 9~11 μm. Its hazards and protective measures differ from those of visible blue light lasers. Before use, please be sure to completely read this guide and the accompanying "Quick Start Guide","Disclaimer" and "Laser Safety Document".

I. Documents to Read Before Use

Before first use, please carefully read the "Quick Start Guide","Disclaimer" and "Laser Safety Document" and relevant safety warnings, paying special attention to installation steps, operational safety, laser safety, chemical safety, fire safety, and electrical safety. Ensure compliance with all steps and limitations, and understand the risks and countermeasures for each operation.

II. Special Warnings for Co_2 Lasers

1. Invisible Beam: 9~11 μm infrared light is completely invisible to the naked eye. It is impossible to determine if the laser is emitting light by 'seeing the light spot'. Never place hands, body, or reflective objects in the beam path and focal area.
2. Eye and Skin Hazards: CO_2 lasers are strongly absorbed by the cornea and skin surface, causing burns. Ordinary visible light/blue light goggles provide no protection against 9~11 μm. If operating in a non-fully enclosed state, you must use specialized protective eyewear marked as effective for the 9~11 μm wavelength, and primarily rely on the equipment's enclosed protective cover.
3. Always operate in an enclosed protective state: Ensure that official original laser protective enclosures, such as the chamber top lid, are properly installed and remain closed throughout the laser task. Laser emission is strictly prohibited if interlocks/emergency stops are not ready.

III. Correct Assembly, Ventilation & Protection

- Ensure the use of official original laser protective enclosures, and keep them closed during tasks.
- Laser cutting produces smoke, so at least one method of smoke extraction must be used: 1. Route the end of the smoke ventilation pipe outdoors for discharge (must comply with local regulations and not affect the surrounding environment); 2. Use a smoke purifier (purchased separately).
- Ensure the safety key is correctly inserted, and the emergency stop button is fully functional and easily accessible.
- Ensure the laser knife strips are correctly installed.
- Ensure the air assist tube is correctly connected.
- Ensure the water tank's water cooling status (water temperature, water level) is normal.
- Ensure the reflective mirrors and focusing lenses are clean and correctly installed.
- If excessive smoke leakage or unusual odors are detected, immediately terminate the task, check the ventilation and smoke extraction system, and resolve any issues before resuming.

- Ensure good heat dissipation for the laser tube and power supply area, and that air inlets and outlets are not obstructed.

IV. Co_2 Power Supply and Cooling Safety

- High Voltage Hazard: The CO_2 laser power supply is high voltage. Do not touch the laser power supply, electrodes, or high-voltage leads while powered on or immediately after powering off. Before maintenance, power off and fully discharge any residual high voltage according to specifications before proceeding.
- Cooling Must Be Normal: This product uses a glass tube CO_2 laser, so ensure that the cooling water circuit circulates normally, water temperature/volume are within the specified range, and coolant is mixed according to the instructions. Lack of water, interrupted flow, or overheating can lead to laser tube damage or even rupture. Before operation, confirm the cooling system is ready. If high water temperature/flow alarms are detected, immediately shut down the machine.

V. Optical Components (reflective Mirrors/Focusing Lenses) Safety

- Do not touch lenses with bare hands: The coatings on CO_2 reflective mirrors and the surfaces of ZnSe focusing lenses are fragile. Fingerprints and oil stains can absorb heat at high power, damaging the lenses and leading to cracking.
- ZnSe focusing lenses contain selenium, are toxic, and relatively brittle. When cleaning or replacing, follow proper procedures to avoid scratches and breakage. Do not dispose of fragments carelessly; treat them as hazardous waste and wash hands after handling. Additionally, do not put optical lenses in your mouth.
- Dirty or damaged lenses can lead to heat absorption, thermal lensing effects, and abnormal energy. Regularly inspect, maintain, and clean the lens surfaces. If severe contamination or damage is found, replace them promptly to ensure output beam quality and lens safety.

VI. Processing Safety

- Always set the correct parameters such as power and speed based on the material in the preprocessing software, to ensure smooth task execution and prevent potential risks. Especially when processing glass materials, inappropriate parameter settings can lead to glass cracking.
- Strictly prohibit processing materials that release harmful gases (e.g., PVC / chlorine-containing plastics produce chlorine gas and corrosive gases), as well as any materials of unknown composition or properties.
- Highly reflective materials (especially mirrored metals) can reflect 9~11 μm lasers. Reflected light can damage lenses, the laser tube, or injure personnel. Do not use this equipment to process highly reflective materials such as mirrored metals.

VII. Full-Time Supervision and Emergency Response

- A person must supervise the laser task at all times. In an emergency, immediately press the Emergency Stop Button to cut off power.

- Avoid prolonged direct staring at the processing area, to prevent fatigue damage to the eyes from infrared/reflected light and strong glare.
- The equipment will also emit light when performing optical path calibration adjustments. This must also be done in an enclosed and supervised state.
- Always keep fire extinguishing equipment, such as a CO_2 fire extinguisher, readily available near the equipment, and regularly inspect and maintain its condition to respond to fires or other incidents.

VIII. Post-Task Cleaning and Regular Maintenance

- After each task, carefully clean debris and dust from the work area to reduce the risk of fire and harmful particulates.
- Smoke accumulation inside the machine can reduce the efficiency and performance of components and cause potential damage. Please perform regular maintenance and upkeep according to the equipment maintenance tips (including lenses, guide rails, smoke extraction, cooling system, etc.); for details, refer to the equipment maintenance guide.

IX. Immediately Shut Down and Disconnect Power in the Following Situations

- Detection of open flames, continuous abnormal strong light or burning smell, or large amounts of dense smoke;
- Cooling abnormalities (high water temperature/flow interruption alarm);
- Abnormalities with the protective cover/interlock/emergency stop, or visibly contaminated or cracked lenses;
- Any uncertain abnormal conditions.

Safety warnings are continuously updated. Please refer to the latest version of the accompanying "Laser Safety Document" and official safety guidelines.

End Notes

We hope this guide has provided clear and practical support.
If the issue remains unresolved, please submit a support ticket and include your recent printer logs and additional pictures or other details. Our customer support team will review your request and provide detailed assistance.
You can also visit Bambu AI, which can instantly answer common questions and provide you with operational guidance.