

RSD-SUNMAX-FL-CLC-1500W User Manual Ver.1.1

(English Edition)

RSD-SUNMAX Series
SUNMAX LASER

About this document: This is an English translation of the Japanese original prepared by SUNMAX LASER for reference purposes. In case of any discrepancy, the Japanese original shall prevail. Specifications are subject to change without notice.

RSD-SUNMAX-FL-CLC-1500W

User Manual



Ver. 1.1 (English Edition)

RSD Sunmax Laser
RINSYUNDOU Co., Ltd.

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Chapter 1 — About This User Manual

This user manual describes the configuration, operation, and maintenance of the fiber laser welding machine RSD-SUNMAX-FL-LCW.

This user manual is provided as a PDF file.

Hyperlinks are included in the text where needed so that you can easily cross-reference related sections. Note that if the manual is printed on paper, the hyperlinks can no longer be used.

Chapter 2 — Precautions

2-1 For Safe Use

Warnings and Cautions

- To use this product safely, be sure to read this manual before operating the product.
- Keep this manual close at hand so that you can resolve any questions about the product at any time.
- To prevent harm to you and others and damage to property, this manual marks hazardous operations and handling with the warning symbols below.

- If the machine fails or a person is harmed as a result of actions contrary to the instructions in this manual, the product may not be covered by the warranty even within the warranty period.

Make sure you fully understand the following before reading the main text.

WARNING	Indicates a hazard that, if handled incorrectly, is highly likely to result in fire, death, or serious injury to the user. Never perform the actions described.
CAUTION	Indicates a hazard that, if handled incorrectly, may result in property damage or serious injury. Never perform the actions described.

About the Symbols

The types of instructions you must follow are classified and explained with the following pictograms. Make sure you fully understand them before reading the main text.



- This symbol indicates a prohibited action.
- This symbol indicates that the product must not get wet.
- This symbol indicates that disassembly is prohibited.
- This symbol indicates that touching the product with wet hands is prohibited.
- This symbol indicates a risk of bursting.
- This symbol indicates a mandatory action ("something you must do").
- This symbol indicates that the power plug must be unplugged from the outlet.
- This symbol indicates a risk of ignition.

Safety Warnings



WARNING

- Do not continue using the laser machine or its accessory equipment in an abnormal condition, such as when smoke, a strange odor, or an abnormal noise is coming from it. Doing so can cause

malfunction, electric shock, or fire. Stop using the machine immediately, turn off the power switch, unplug the power plug from the outlet, and contact your dealer.

- Do not disassemble or modify the machine (except as instructed in this manual). Doing so can cause injury, electric shock, or fire. When performing maintenance described in this manual, or inspection or disassembly instructed by your dealer, always unplug the power plug from the outlet before starting work.
- Use the indicated power supply (AC200V). Using a power supply other than 200V can cause machine failure, fire, or electric shock. Consult a professional electrical contractor.
- Do not touch the machine or the power plug with wet hands. Doing so can cause electric shock.
- Do not work near open flames. Do not use the machine near sources of fire such as stoves or lit cigarettes.
- Watch for dust on the power cord. If dust accumulates on the power plug, it can generate heat and cause a fire.
- Handle the power plug with care. Incorrect handling can cause a fire. When handling the power plug:
 - Do not insert the plug with dust or other foreign matter on it.
 - Insert the plug fully, all the way to the base.



WARNING

- If a foreign object or liquid such as water gets inside the machine, do not continue using it. Doing so can cause electric shock, malfunction, or fire. Turn off the power switch immediately, unplug the power plug from the outlet, and contact your dealer.
- Do not operate the machine while wearing metal items such as watches or rings. Laser light striking metal can be reflected in unintended directions.
- Wear laser safety glasses (shield) and welding gloves during processing.
 - Contact between the laser beam and the human body during processing can cause injury or burns.
 - If the workpiece catches fire, protective equipment reduces the risk of the fire spreading.
 - Reflections can cause the laser beam to be emitted outside the machine. In such cases, it may unintentionally strike a person or cause a fire.

- Check that the supply gas is blowing out. Processing with the assist gas stopped greatly increases the risk of ignition.
- Check that there are no cooling water leaks. Water leaks can cause electric shock, malfunction, or fire. Turn off the power switch immediately, unplug the power plug, and repair the leaking part.
- Install a fire alarm and a fire extinguisher. For fire prevention and firefighting, always place a fire alarm and a fire extinguisher (or a bucket of water if no extinguisher is available) near the machine. Install the fire alarm at a height close to the ceiling.
- Do not install the machine in a location where the temperature falls below freezing. Water inside the hoses will freeze, causing damage to or rupture of the laser source. In winter, add antifreeze (coolant) to the water chiller.

Safety Cautions

CAUTION

- Watch the water temperature during processing. Water circulates through the laser source and the laser gun. If the cooling water temperature rises above the specified level, the laser source and laser gun may be damaged. In that case, stop laser processing and either wait for the water temperature to drop or replace the water in the tank.
 - Carry this product carefully when transporting it, and avoid vibration. It contains fragile parts. Transport it with care, as vibration can affect the laser source.
 - Clean this product regularly. To maintain stable performance, regularly clean the work table, the protection lens, and the focusing lens.
 - Do not plug in or unplug the power plug while the power is on. Doing so can cause malfunction.
 - Do not install the machine in an unstable location (a wobbly stand or a sloped surface). It may fall or tip over, causing malfunction or injury.
 - Do not place the machine in humid or dusty locations. This can not only degrade the machine's performance but also cause electric shock or fire.
 - Do not block the ventilation openings of this product. Blocking the openings traps heat inside and can cause a fire.
 - Check that the water chiller is operating. Firing the laser while the water-cooling pump is stopped will damage the protection lens. Whenever you turn on the machine, always confirm that the water-cooling pump is running.
-
- When the machine will not be used for a long period: for safety, turn off the power switch and unplug the power plug from the outlet.
 - When replacing consumable parts: for safety, turn off the power switch and unplug the power plug from the outlet before starting work.

- Never look directly at the laser emission during processing. Depending on the processing settings and the workpiece material, intense light may be emitted, which can cause impaired vision or eye pain. In severe cases, retinal damage can lead to blindness.

2-2 Installation Environment

The installation environment conditions for the machine are as follows.

- Ambient temperature: 0°C to 35°C
- Ambient humidity: 80% or less

Installation in the following locations is prohibited, as it can cause malfunction and shorten the machine's service life:

- Locations subject to sudden changes in temperature or humidity (this leads to deterioration of and damage to the optical lenses)
- Locations without clean air, where gases, dust, smoke, oil mist, or similar contaminants are generated; environments with high concentrations of CO₂, NO_x, or SO_x
- Locations subject to vibration or impact
- Locations near sources of high-frequency interference
- Locations where condensation occurs (if the ambient temperature falls below freezing, the cooling water and other parts may freeze and damage the machine)
- Locations with combustible materials nearby

Use the specified power cable. An undersized power cable or an incorrect connection can cause fire or electric shock.

Always ground the machine. If it is not grounded, malfunction or electrical leakage can cause electric shock.

2-3 Safety Measures During Use

Because the laser cleaning machine is designed so that the operator controls laser emission by hand, incorrect operation or handling can cause serious accidents. Extreme care is required during operation.



Incorrect use can damage the fiber laser cleaning machine and cause harm to the human body.

2-3-1 Operating Precautions

- When processing, always wear laser safety glasses, highly fire-resistant protective gloves, and a dust mask. People nearby must wear them as well. If the laser beam enters the eyes, it can, in the worst case, cause blindness. If it strikes the skin, it can cause injury accompanied by burns.
- Do not look into the laser emission port or point it at people.
- During emission, do not look into the emission port from the front or put your hand in front of it.
- Define a designated area for laser emission and restrict entry to anyone other than operators and authorized personnel.
- Watch out for reflected light while working. Highly reflective materials (such as copper and aluminum) can reflect the laser strongly. The laser can also be strongly reflected if it is emitted at an incorrect focal length.
- Do not bring flammable items into the laser emission area.
- Disassembly, repair, or modification by anyone other than a specialist is prohibited. Do not disassemble the machine except for normal maintenance. Malfunctions, electric shock, fire, or other problems arising from disassembly, repair, or modification are not covered by the warranty or repair service.
- People using cardiac pacemakers or similar devices must not approach the machine. The machine generates a magnetic field that can interfere with the normal operation of pacemakers and similar devices.
- In areas that direct or indirect laser light could reach, install barriers and signs to clearly separate them from other areas, and take measures to keep out everyone other than operators.
- Metal fumes may be generated during processing. Provide dust masks and ventilation equipment.

2-3-2 Preventing Laser Beam Leakage

To prevent laser beam leakage and process safely, observe the following when processing:

- Do not add or move workpieces or parts during processing.
- Close all doors of the machine when processing.
- When firing the laser during maintenance, never touch unrelated parts of the machine. Also, use fire-resistant boards, insulation, or similar materials to make sure the laser is not emitted onto the surrounding area.

2-3-3 Precautions During Work

- Do not damage the electrical wires, cables, or hoses. Do not step on, twist, or pull the cables. Damaged cables can cause electric shock, short circuits, or fire. Damaged hoses can cause water or air leaks.

- If the laser gun is overheating, stop processing immediately. The lens at the overheating point may be damaged. Continuing to process while it is overheating can, in the worst case, lead to damage to the laser source. If you damage the laser source by continuing to use the machine without replacing the lens, it will not be covered by compensation.
- If any abnormality occurs, such as a burning smell, abnormal noise, abnormal heat, or smoke, turn off the power and contact us immediately. There is a risk of electric shock or fire.
- In the event of a short circuit or malfunction, check that there are no foreign objects inside the equipment, especially metal or conductive objects.
- Do not use the machine when your clothing or body is wet, or in humid locations. Electrical components can cause electric shock or short circuits if they come into contact with water.
- After finishing processing and turning the machine's power OFF, cut off the power supply to the machine by unplugging it from the outlet or turning off the external circuit breaker.

2-3-4 Fire Prevention

- Storing flammable or explosive materials and miscellaneous goods around the machine is prohibited. Flying welding sparks can ignite combustible materials.
- Do not place flammable or explosive materials in the beam path or in places the laser beam can strike. If the laser beam hits flammable, explosive substances, it can cause a fire or explosion.
- Do not cover the equipment with blankets, cloth, or similar items, as this can cause the equipment to overheat and catch fire.
- In the event of a fire or explosion, turn off all power and use a carbon dioxide or dry powder fire extinguisher.

2-3-5 Low Temperatures

If the water temperature shown on the automatic water chiller is around 10°C or below, an error may occur. Leave the machine on standby with the main unit powered on. The automatic water chiller's heater will operate and the water temperature will gradually rise. Check the water temperature on the automatic water chiller before using laser processing.

2-3-6 High Temperatures

If the water temperature shown on the automatic water chiller is 35°C or above, an error may occur. Leave the machine on standby with the main unit powered on. The automatic water chiller's fan will operate and the water temperature will gradually fall. Check the water temperature on the automatic water chiller before using laser processing.

2-4 Points to Note During Use

2-4-1 Operating Points

- At power-up, wait until the water temperature reaches the proper range before turning on the laser source.

- Watch the angle of the laser gun (torch) while processing. If you emit the laser perpendicular to a reflective material, the reflected laser can bounce back into the laser gun and damage its internal parts, or reflected light may come back toward the operator. Hold the laser gun at an angle of 30 to 45 degrees.
- Before emission, check that the laser beam path is correct. A misaligned beam path can cause damage to the nozzle or lenses.

2-4-2 Lens Replacement

- Do not replace lenses in places where dust or grit is in the air.
- Do not replace lenses in places exposed to wind or drafts.
- When removing a lens from the laser gun, cover the opening with masking tape or the top cap to keep dirt and debris out of the interior.
- When installing a lens in the laser gun, check that no dust or particles are stuck to the lens before installing it.

2-4-3 Handling the Laser Gun and Cables

- Do not subject the laser gun to strong impacts such as dropping it. The internal lenses and precision components can be damaged.
- The laser gun's cable contains a fiber-optic cable. If the cable is damaged, the laser source will be damaged. Do not twist, step on, or pull the cable.

2-4-4 Air and Gas

- When using air, always use clean air with oil and moisture removed, using a dryer and a filter.
- Supply an appropriate air/gas pressure. Insufficient air/gas pressure can cause lens damage.

| 2-5 Laser Safety Standards and Classification

Safety standards have been established for laser products to prevent injury to users.

2-5-1 Laser Classes

In Japan, the JIS radiation safety standard for laser products, "C6802", has been established. This is the Japanese Industrial Standards translation of IEC 60825-1, so a product that complies with this standard can be said to meet safety standards common throughout the world. It specifies safety measures according to laser wavelength and power, the content of hazard warning labels, and other requirements.

レーザークラス	基準
クラス1	直接ビーム内観察を長時間行っても、またそのとき、観察用光学器具（ルーペ又は双眼鏡）を用いても安全であるレーザー製品。
クラス1M	裸眼（光学器具を用いない）で、直接ビーム内観察を長時間行っても安全であるレーザー製品。光学器具（ルーペ又は双眼鏡）を用いて観察すると、露光による目の障害が生じる可能性がある。クラス1Mレーザーの波長領域は、302.5nm～4000nmの間に限られている。
クラス2	400nm～700nmの波長範囲の可視光を放出するレーザー製品であって、瞬間的な被ばくの場合は安全であるが、意図的にビーム内を凝視すると危険なレーザー製品。光学器具を用いても目に障害が生じるリスクは増加しない。
クラス2M	可視のレーザービームを射出するレーザー製品であって、（光学器具を用いない）裸眼に対してだけ短時間の被ばくが安全なレーザー製品。光学器具（ルーペ又は双眼鏡）を用いて観察すると、露光による目の障害が生じる可能性がある。
クラス3R	直接のビーム内観察を行うと、目に障害が生じる可能性があるが、そのリスクが比較的小さいレーザー製品。目に障害が生じるリスクは露光時間とともに増大し、また意図的に目に露光することは危険である。
クラス3B	目へのビーム内露光が生じると、偶然による短時間の露光でも、通常危険なレーザー製品。拡散反射光の観察は通常安全である。
クラス4	ビーム内の観察及び皮膚への露光は危険であり、また拡散反射の観察も危険となる可能性があるレーザー製品。これらのレーザーには、しばしば火災の危険性が伴う。

2-5-2 Safety Standards

Handling of fiber laser welding machines is recommended to comply with the Japanese Industrial Standard "Safety of laser products (JIS C6802)". This standard was developed to prevent injuries caused by laser equipment.

JIS C6802 classifies laser equipment according to its hazard level, and the CLC series falls under the highest-hazard "Class 4". For the Class 4 CLC-1500/CLC-3000, we recommend implementing the following safety measures:

- Appointment of a safety supervisor: appoint a person with in-depth knowledge of laser equipment and laser beams as supervisor, and ensure thorough injury prevention and product management
- Establishment of a controlled area: partition off the welding work area and clearly mark it with signs
- Use of protective equipment: laser safety glasses suited to fiber lasers, protective gloves, long-sleeved clothing, a leather apron, a dust mask, and so on
- Inspection and maintenance: perform pre-shift inspections and periodic inspections and adjustments
- Safety and health education: provide education and training for operators
- Keeping out hazardous materials: do not bring explosives or flammable substances into the welding work area
- Hazardous gases, dust, etc.: take the measures required by the Industrial Safety and Health Act

In addition, the CLC-1500/CLC-3000 incorporates the following safety measures:

- Key control (the machine is controlled by a key)
- Warning labels affixed to the machine to alert users
- Laser emission control by shutter (the laser cannot be emitted unless the shutter is open)

2-6 Disclaimer

Please note in advance that we accept no responsibility whatsoever for damage, injury, accidents, or fire resulting from the use of this product.

Furthermore, we accept no responsibility for the damages listed below:

- Incidental damage arising from the use of this product or from defective parts
- Damage caused by failure to follow the safety measures and precautions described in "Chapter 2 — Precautions" of this manual
- Damage caused by modification of this product, or by combining it with equipment or software not provided by us

Chapter 3 — Overview and Configuration

3-1 Welding Machine Overview

The LCW machine consists of three main parts: the main unit, the laser gun, and the wire feeder.

3-1-1 Main Unit Overview

Overall view



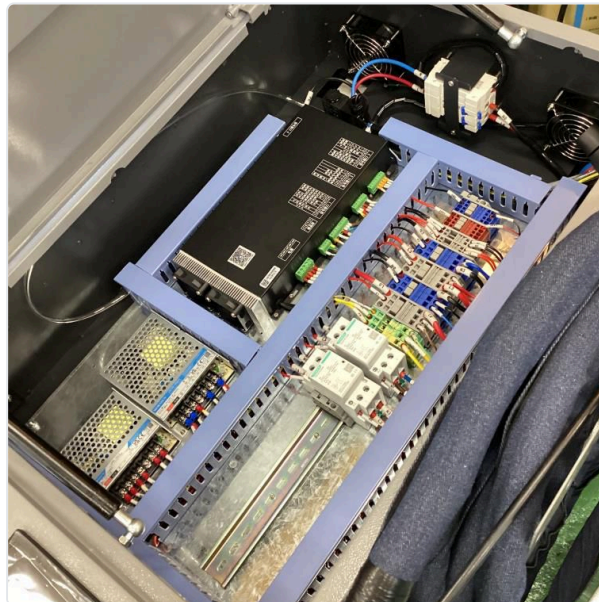
Rear view



3-2 Control Section

Opening the machine's upper door gives access to the laser unit, the water chiller, and the control section. Open and close this door only for maintenance; it is not opened or closed during normal processing.

To prevent hazards, never perform processing with the door open.



3-3 Main Unit Controls

The main unit controls are located on the upper front of the machine.

3-3-1 Circuit Breaker

The circuit breaker is installed on the rear of the machine. Use it to turn the power ON/OFF. When turning the power OFF, always switch the circuit breaker down as well.



3-3-2 Regulator / Filter

The regulator/filter is located on the rear of the machine. Supply air from an oil-free air compressor (if the humidity at the installation site exceeds 70%, an air dryer may be required), or supply air/gas from a nitrogen gas source.



3-3-3 Main Power Switch

Turns the main unit power ON/OFF.

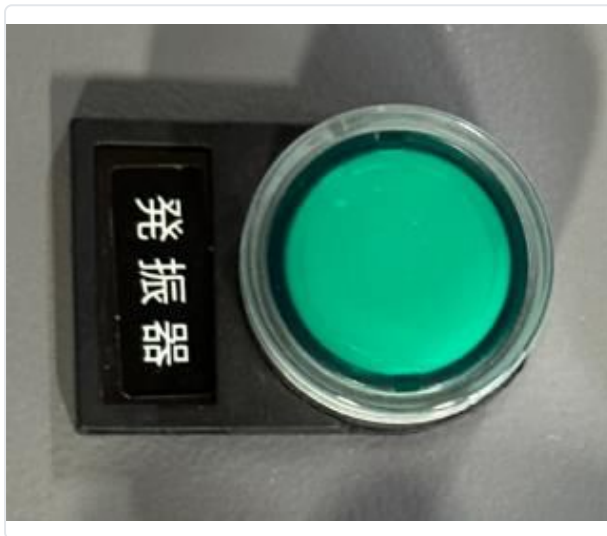
3-3-4 Voltmeter

The voltmeter lets you check the supply voltage. Operate the machine at 180V or higher and 220V or lower. When using a generator, supply power at 220V.

3-3-5 Laser Source Power Switch

Turns the laser source power ON/OFF. The switch lights up green while the power is on.

Turn on the laser source power only after the cooling water has reached the proper temperature.



3-3-6 Emergency Stop Button

Press the emergency stop button if an abnormality occurs or a dangerous situation arises. While the emergency stop button is pressed in, the machine cannot be powered on.

3-3-7 Control Panel

Refer to "Settings — Operation Screen".

3-3-8 Front

Opening the front door reveals the laser unit on the right and the automatic water chiller on the left.



Laser source

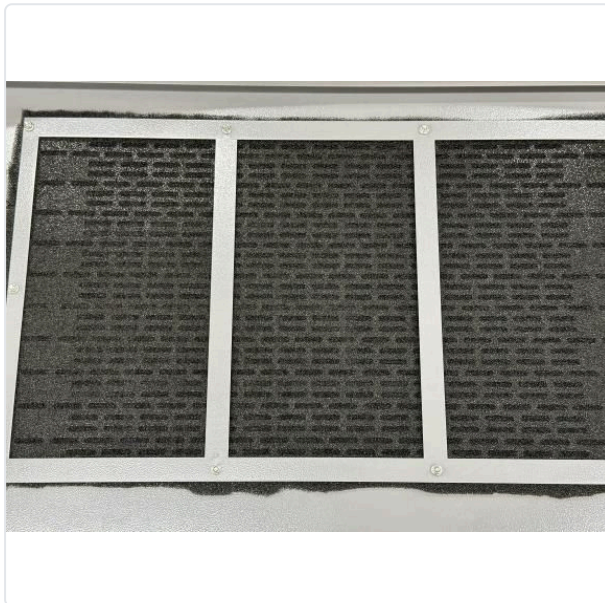
This is the laser source. It requires no operation by the user.

Note: The laser source installed may differ depending on the production lot and model.

Automatic water chiller

The automatic water chiller water-cools the laser gun and the laser source. The water chiller's power is linked to the machine's power.

The automatic water chiller requires periodic water replacement and filter cleaning. For maintenance details, refer to "Chapter 9 — Maintenance".



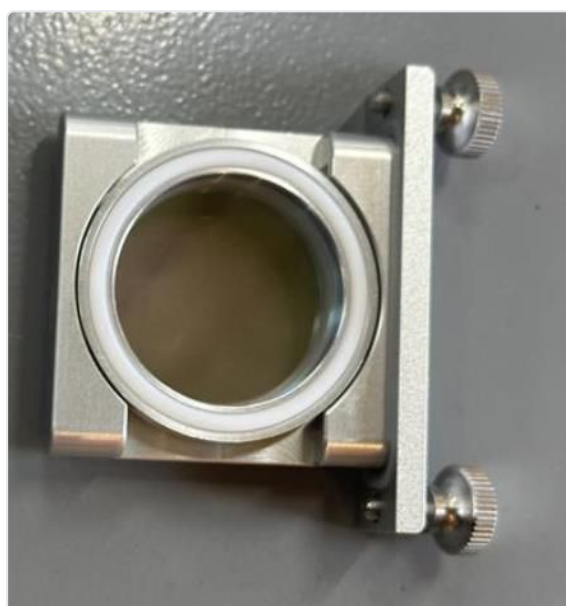
3-3-9 Left and Right Doors

Opening the left and right side doors gives access to the laser unit and the automatic water chiller. Filters are fitted to the doors and must be cleaned periodically.

3-4 Laser Gun

During processing, the operator holds the laser gun by hand and operates it. Using the wireless controller, you can operate laser emission and change the processing settings.

Note: The shape of the laser head may differ depending on the production period.



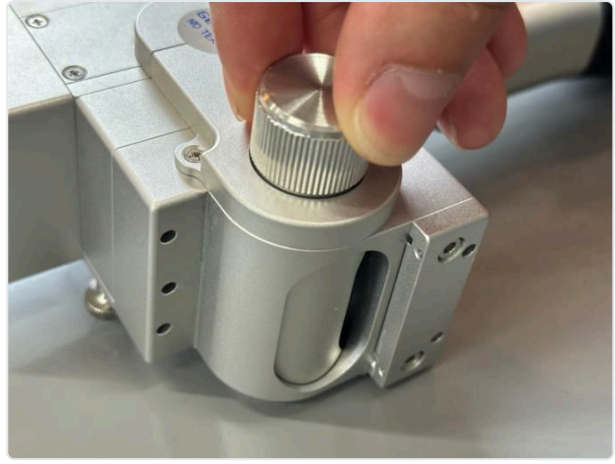
3-4-1 Protection Lens

The protection lens is housed inside the laser gun and can be removed. For the lens replacement procedure, refer to "Chapter 8 — Consumables: Protection Lens".

3-4-2 Laser Emission Switch

When the laser is in a ready-to-fire state, pressing this switch emits the laser from the laser emission port. Before pressing the switch, always confirm that the laser gun is pointed at the workpiece.

Pressing the laser emission switch carelessly leads directly to fire or accidents. Operate this button with the utmost care.



3-4-3 Safety Shutter

The safety shutter is part of the interlock (safety) function. The laser cannot be emitted unless the safety shutter is open. In addition, closing the shutter after each laser emission helps prevent dust and debris from entering the inside of the laser gun.

3-5 Accessories

3-5-1 Tool Box

The following accessories are supplied in the tool box.

- Protection lenses — 3 pcs
- Power keys — 2 pcs
- Focusing lens for beam path alignment
- Laser safety glasses — 2 pairs
- Air hose — 1 pc
- Hex wrench set — 1 set





- Laser cable protection cap — 1 pc
- Cotton swabs for lens cleaning — 100 pcs
- Cotton swabs and spare gaskets — 1 set
- Carrying case
- Beam path alignment jig — 1 pc
- Lens cleaner
- USB drive (user manual)
- Door lock key
- Blower
- Laser source connection cable





3-6 Automatic Water Chiller

The automatic water chiller is built into the main unit. In normal use, no operation of the water chiller is required.

- Do not operate the machine at room temperatures of 0°C or below.
- Do not operate the machine at room temperatures of 35°C or above, or at humidity of 80% or above. There is a risk of condensation! Condensation can damage the optical lenses of the laser source.

Chapter 4 — Processing Procedure

4-1 Startup and Shutdown

Start up and shut down the laser welding machine using the following procedures.

4-1-1 Startup

Start the laser machine using the following steps.

1. Before starting, always check the following:
 - Confirm that supply voltage is being provided to the power cable of the laser machine.
2. Turn on the circuit breaker on the rear of the machine.
3. Supply assist air / gas. For the type and supply amount of air/gas, refer to the "Assist Gas" section. Do not use the machine below 0.4 MPa.

When using air, always use an oil-free air compressor!

Usable gases: nitrogen, or clean air. Air/gas pressure: 0.4–0.75 MPa.

4. Turn the power key to the right. When the power comes on, the monitor starts up and the water chiller runs automatically.



Note: If the power does not come on, the emergency stop button may be pressed in.



5. Open the front door and check the water temperature. Check the value shown as "L.00.0".
6. Once the water temperature reaches the proper range, turn on the laser source power switch.
7. Set "Emission ON/OFF" on the control panel to ON.

The laser welding machine is now in a state where it can emit the laser.

Proper water temperature: 20°C to 30°C

If the water temperature is 20°C or below, warm up the machine first! At room temperatures near 0°C, the machine may not operate normally. Keep the room temperature above 0°C.

If the water temperature is 20°C or below, warm-up time is required; if it is 30°C or above, cooling time is required. As long as the water chiller is powered on, warm-up/cooling is performed automatically.

- If the water temperature is too high, alarms "E02" and "E10" occur. If they occur, wait until the water temperature drops.
- If the water temperature is too low, alarms "E08" and "E11" occur. If they occur, wait until the water temperature rises.



4-1-2 Laser Cleaning Procedure

Perform laser emission for processing (welding, cutting, cleaning) using the following steps.

Caution

Rust removal generates a large amount of harmful smoke. Do not work in poorly ventilated locations. Wear a dust mask and laser safety glasses when working. Never look into the laser emission port or point it at people!

Before starting cleaning, confirm that the laser beam path is correct and that gas is being supplied properly! Failure to do so can lead to damage.

Checking the air/gas pressure

- Gas pressure: 0.4–0.8 MPa. If a large amount of smoke is generated, set the air/gas pressure higher.
- Gas type: clean air (it must be free of moisture and oil); nitrogen may also be used.
- An air filter must be fitted. In environments where the humidity exceeds 70%, an air dryer may also be required.

Checking the laser beam path

Apply masking tape or similar to the nozzle and confirm that the red pointer is not touching the nozzle.



操作中はガスマスク、手袋、レーザー保護メガネの着用して下さい



Open "Settings" and configure the processing settings. Adjust the laser output according to the rust thickness and plate thickness: set the output higher for thick rust, and lower for thin plate. The swing width is the emission width. The swing frequency is the travel speed of the laser. For thick rust, lowering the frequency value lets the laser penetrate deeper and improves rust-removal efficiency.

About the swing frequency: start with 50 Hz as a baseline. If laser marks or heat are a concern, raise the value. To increase the cleaning power, lower the value.

Before starting processing, confirm that laser safety glasses and a dust mask are worn, and that no one is near the emission port of the laser gun (no one in front of the gun).

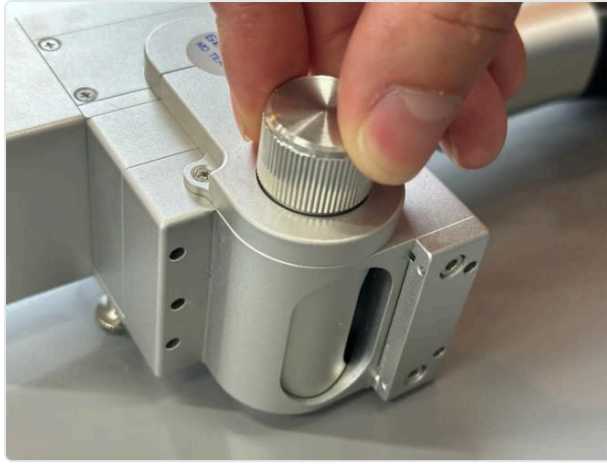
Caution! When using air, remove moisture, oil, and dust with a filter or dryer before use. In particular, if oil or water adheres to the protection lens, it will reflect the laser. If the reflected laser

reaches the laser source, it can damage the crystal of the laser source.

Do not emit the laser near combustible materials, and do not bring highly flammable materials close to the work area — this can cause fire!



Move the laser gun close to the object you want to apply the laser to. Open the safety shutter.



Point the laser gun at the material to be cleaned and double-click the laser emission switch. The laser is emitted, but the output changes greatly depending on the focal length (sparks and sound become intense at the focal point). Move the gun back and forth and perform cleaning at the correct position.

Once the bare metal surface is exposed, laser reflectivity increases. If the laser strikes the base material at a right angle, reflected light may return toward the operator performing laser emission.

If the air compressor's capacity is low and the air pressure falls below 0.4 MPa, you must wait until the air is recharged.

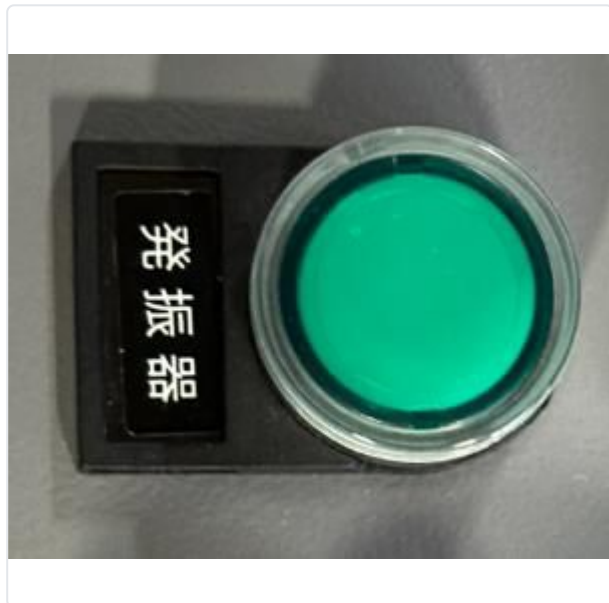
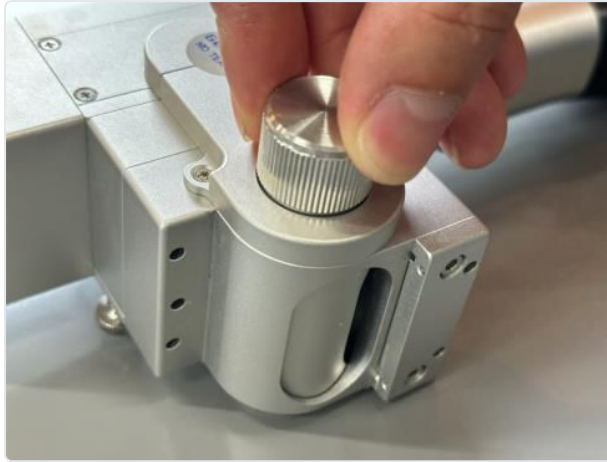
If a large amount of smoke is generated, use a large industrial fan or similar to direct the smoke away in the direction opposite the laser gun. This helps extend the life of the protection lens.



4-1-3 Shutdown

Shut down the laser welding machine using the following steps.

1. When work is finished, always confirm that the safety shutter is closed.
2. Set "Emission ON/OFF" on the control panel to OFF. (This is done as a safety measure; optional.)
3. Turn off the laser source power.



4. Turn the power key to OFF (counterclockwise) to switch off the machine power.
5. Turn off the circuit breaker on the rear of the machine.

Note that while the circuit breaker is on, the cooling fan of the control unit keeps running.

6. Close the main valve of the air/gas supply.



Chapter 5 — Operation

5-1 Main Unit Operation Screen

Use the operation panel to configure and operate the machine according to the workpiece material and the type of processing to be performed.



Selection operations and ON ⇄ OFF switching are performed by touching the buttons on the touch panel.

Example)

Numeric values are entered using the numeric keypad that appears when you touch the value field.

Numeric keypad

5-1-1 Display Screen

The center-left area of the display screen shows the details of the processing settings that will be applied to the work.

5-1-2 Switching Operations / Safety Shutter Status

In the center-right area of the display screen, you can switch the various operations ON/OFF, change the processing mode, and check the status of the safety shutter.



5-1-2-1 Emission ON/OFF

This is provided as one of the safety functions. The laser will not be emitted unless Emission ON/OFF is set to ON.

5-1-2-2 Red Pointer

You can change the display pattern of the red pointer (guide beam). The available guide beam patterns are a horizontal line and dots. Normally, leave it set to the line display and do not change it.

5-1-3 Safety Shutter

The laser will not be emitted unless the safety shutter is open (indicated as "ON"). The safety shutter physically blocks the laser. To set it to ON, turn the dial on the side of the laser gun clockwise to open the safety shutter.



5-1-4 Tabs

On the right side of the screen there are tabs that open the screens for each detailed setting.

Home

The Home button cannot be touched. It indicates the screen that is currently displayed.

Settings

Here you can change settings such as the laser output during laser emission and the swing width.

Touch the tab to switch to the Settings screen.



Always touch the "Apply" button at the bottom right of the screen after changing a value. If it is not touched, the value will not be saved.

Touching "Save" saves the processing settings (the data is retained even after the power is turned off).

Display of Setting Values

Item	Description
Swing frequency	The travel speed of the laser's side-to-side sweep. The higher the value, the faster it moves; even if you move the laser gun fairly quickly, the zebra lines (rust-removal streaks) become less noticeable. Determine the frequency value according to the condition of the rust to be removed and whether paint is present. As a basic rule, start emission at 50 Hz and adjust while checking the surface finish. For light rust: set the frequency higher [60–100 Hz] For heavy rust or paint: set the frequency lower [30–50 Hz]
Swing width	Change this according to the area you want to clean. When the scan width is wide, the laser is spread over a larger area, so the heat input is lower than with a narrow width and the cleaning power decreases. Maximum 300mm.
Laser output	This is the laser output. The larger the value, the stronger the laser applied — ideal for stubborn rust and mill scale. If a high output is applied to thin sheet metal or similar material, distortion may occur.
Duty ratio	Do not change. Leave it at 100%.
Pulse frequency	Not used.
Left/right output correction	Allows adjustment when the output varies between the left and right sides during laser emission.

Save Items

You can select and save three processes (processing settings), including the frequently used setting.

- **Frequently used setting:** You can save and use setting values that you use frequently.
- **Settings 1–2:** You can select and save two sets of parameter contents.

Saving Setting Values



- **Save:** Saves the settings in the parameters.
- **Apply:** Applies the settings. Unless you press Apply, the changed values are not applied.
- **Back:** Returns to the Home screen.



Advanced Settings

Here you can configure the detailed settings of the welding machine.

Touching "Settings" displays a password entry screen.

The password is "123456". After entering it, touch OK.

The screen shown below is displayed.



Advanced Settings (for Welding / Cutting)

Item	Description
Laser source output	The output of the installed laser source is set here. For a 1500W machine, it is 1500W. Do not change this value!
Pre-flow	The gas discharge time before laser emission. The default setting is 500ms. Do not set it below 500ms!
After-flow	The gas discharge time after laser emission. The default setting is 500ms. Do not set it below 500ms!
Swing calibration	Calibrates the emission width. Perform this calibration when the actually emitted swing width differs from the setting. $\text{Swing width setting value} \times \text{swing calibration} = \text{actual swing width}$.
Beam path adjustment	Corrects lateral misalignment of the laser beam path. Entering a negative value shifts the laser to the left; entering a positive value shifts the laser to the right. Adjust so that the red pointer light falls on the center of the nozzle.
Language	You can change the display language.
Emission start power	The power at the start of laser emission. The default value is 30%. If this value is extremely high, the protection lens becomes prone to breakage.
Up-slope	The laser ramp-up time — the time for the laser to reach the set output. If this value is extremely low, the protection lens becomes prone to damage. The default value is 500ms.
Emission end power	The power at the end of laser emission. The default value is 0%.
Down-slope	The laser down-slope time — the time until laser emission ends. The default value is 0ms.
Motor temperature threshold	Sets the temperature at which the motor temperature alarm is triggered. The default value is 65°C. Do not change this value.
Protection lens temperature threshold	Sets the temperature at which the protection lens temperature alarm is triggered. The default value is 50°C. Do not change this value.
Laser source warning polarity	Sets the polarity of the laser source warning. Do not change.
Water chiller warning polarity	Sets the polarity of the water chiller warning. Do not change.
Gas pressure warning level	Sets the polarity of the assist gas flow-rate warning alarm. Do not change.
Support	Press Support to view the recommended values and explanations for each setting.
Save	Touch the Save button to apply the changes you have made.

Back

Press Back to return to the Home screen.

Monitoring

You can monitor the status of the machine.



You can check the input signals, output signals, and other items.

Check this screen when a malfunction is suspected.

Diagnostics

In Diagnostics, you can check whether voltage is actually reaching the control devices.

Example: turn the gas permission signal ON — if no gas is supplied, this indicates that the solenoid valve may be damaged.

Chapter 6 — Air / Gas Settings

6-1 Assist Air / Gas

Air / gas is discharged from the laser emission port of the laser gun. If the assist air / gas is not sprayed properly, the lenses inside the laser gun may be damaged.

Connect the air / gas hose to the gas supply inlet on the rear of the machine.

6-1-1 Assist Air / Gas Types

For the spray gas, mainly air or nitrogen is used.

Important notes when processing with an air compressor

An air compressor may carry moisture or oil into the air line. If you continue processing while the air contains moisture or oil, it can adhere to the protection lens, scatter the laser beam, and damage the inside of the laser gun.

When using an air compressor, always connect a filter (in environments where the humidity exceeds 70%, an air dryer is also recommended) and use the air only after moisture and oil have been removed.

Caution! When using compressed air, remove moisture, oil, and dust with a filter or dryer before use.

In particular, if oil or water adheres to the protection lens, it will reflect the laser beam. If the reflected laser reaches the laser source, it may destroy the crystal inside the laser source.

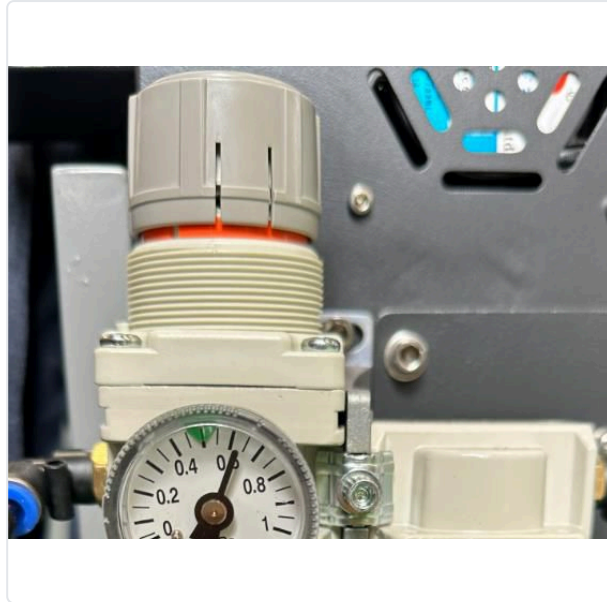
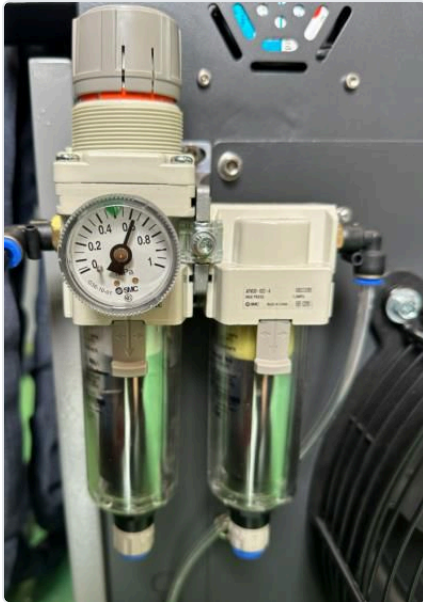


Left: oil adhering to the protection lens. Right: crystal section of the laser source destroyed by reflected laser light.

6-1-2 Air / Gas Pressure Setting

The spray gas pressure is a fundamental element of the processing settings. Fluctuations in gas pressure affect lens wear. Before starting processing, always check and adjust the gas pressure.

Pull the handle on top of the regulator upward (to unlock it). Turn it clockwise to raise the pressure and counterclockwise to lower it. Always watch the primary-side pressure while adjusting, approach the target pressure from the increasing direction, and when finished, push the handle back down to lock it securely.



For laser cleaning, 0.4 to 0.75 [MPa] is appropriate. The maximum adjustable pressure of the regulator is 0.75 MPa.

- Never supply 1 MPa or more!
- Supply at least 0.4 MPa! If the compressor capacity is insufficient, wait until the tank has been refilled before continuing.

Chapter 7 — Laser Gun Adjustment

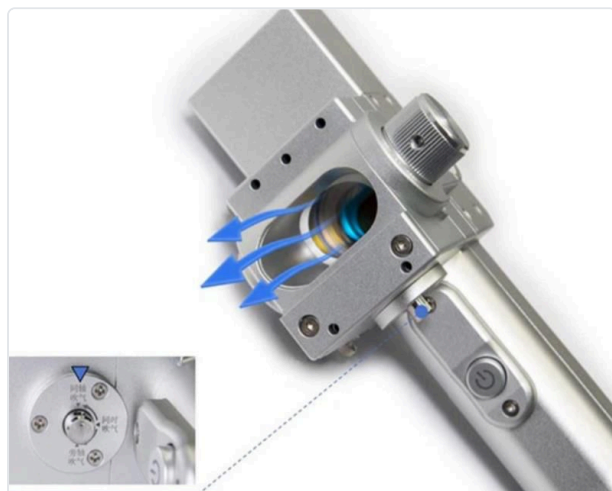
The laser gun (torch) requires periodic adjustment.

7-1 Adjusting the Air Outlets

By turning the selector dial on the lower part of the laser gun, you can change which outlet the assist air / gas is sprayed from. Change the setting according to the amount of smoke generated during processing and the quality of the supplied air.



The selector dial has three positions:



Dial position	Air outlet behavior	When to use
Position 1	Blows air from the protection lens side.	Use when a large amount of smoke is generated. Position 1 protects the protection lens best.
Position 2	Blows air from the protection lens side and upward from in front of the protection lens.	Intermediate setting.
Position 3	Blows air only from in front of the protection lens.	Use when the air quality is poor — for example, in high humidity or when condensation causes moisture in the air.

7-2 Laser Beam Path

The laser beam coming from the laser source must reach the nozzle opening correctly. An impact such as dropping the laser gun can shift the beam path out of alignment. If you continue processing with a misaligned beam path, the nozzle or lenses may be damaged, and in the worst case the laser source itself can be damaged.

Beam Path Adjustment Procedure

Replace the focusing lens with the beam-path-adjustment lens "D20T5F60". Use the "D20T5F60" lens included with the accessories.



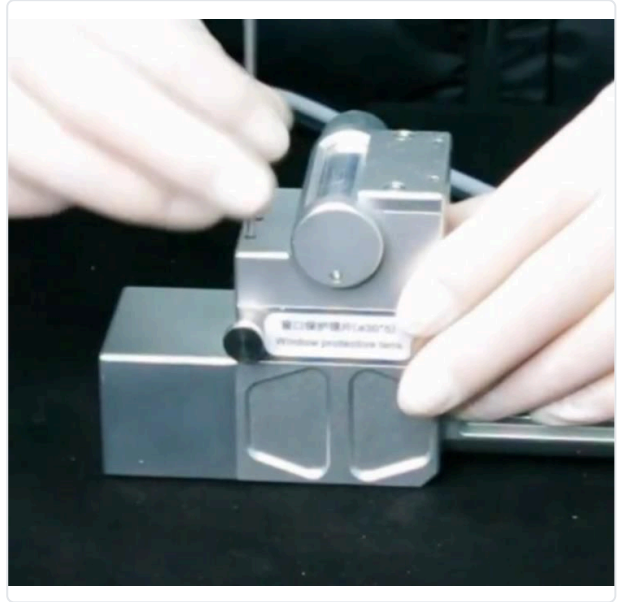
Items to prepare

- **Air blower / duster, etc.** — Any dust visible to the naked eye is strictly prohibited. If dust or dirt adheres to a lens, blow it off with air.
- **A clean environment** (working inside a clean bench is preferable) — Working where dust is airborne is strictly prohibited. Work in an environment that suppresses dust adhesion, such as inside a clean bench or a box-type enclosure.
- **Hex wrenches** — Required to loosen the set screws and other fasteners.

- **Protective tape / masking tape** — Required to seal openings so that dust and dirt cannot get inside the laser gun.

Step 1: Replace the focusing lens with the beam-path-adjustment lens

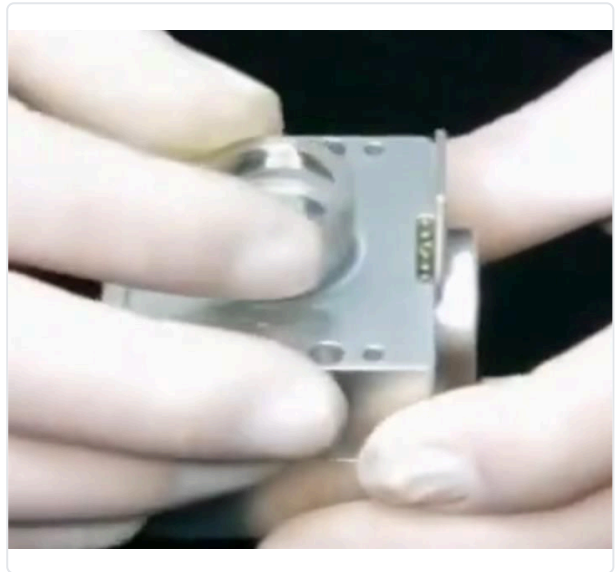
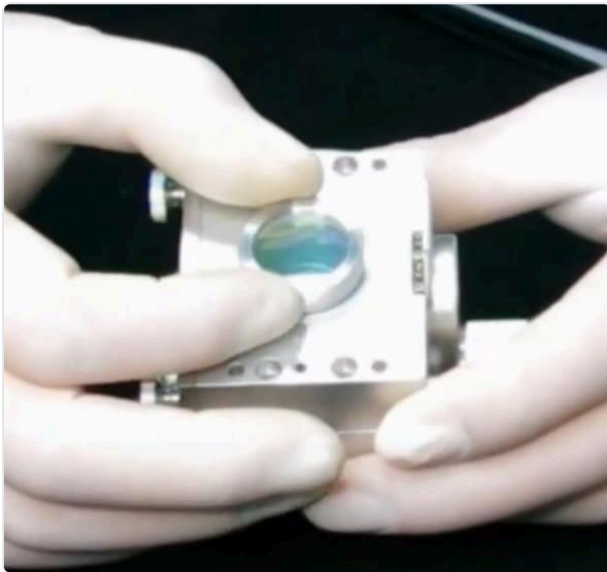
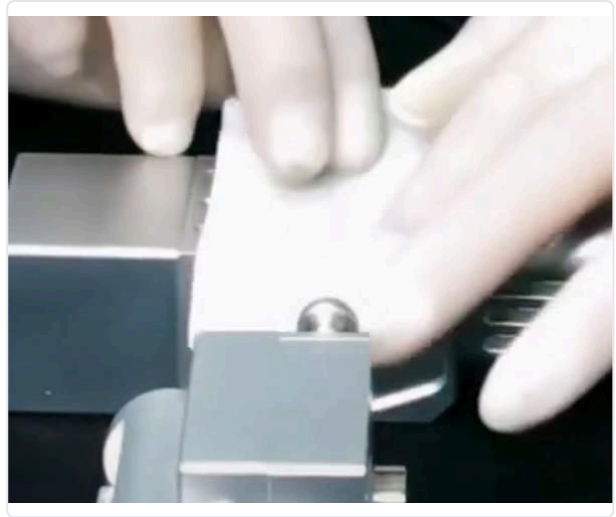
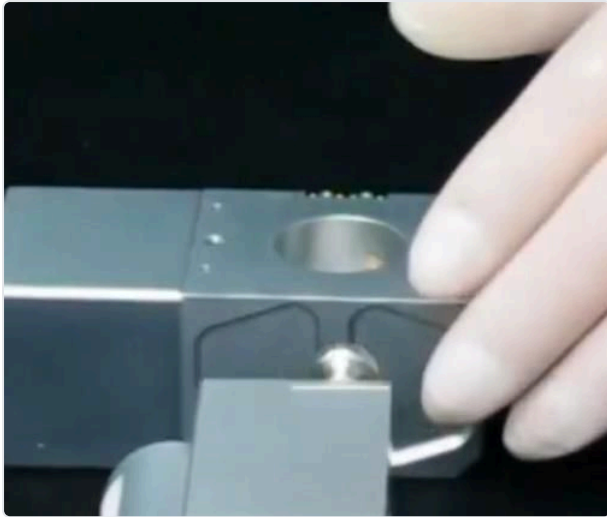
When you turn the laser emission port face-up, you will see five small hex screws. Remove these screws.



Caution — Work in a place with as little airborne dust as possible! If dust gets inside the laser gun, it will damage the other lenses. To prevent secondary damage, always work in a clean place.

Loosening the screws allows you to remove the upper part of the laser gun (the protection lens side). Once removed, the reflector lens side is exposed. Be sure to cover it with protective tape or similar so that no dust can enter.

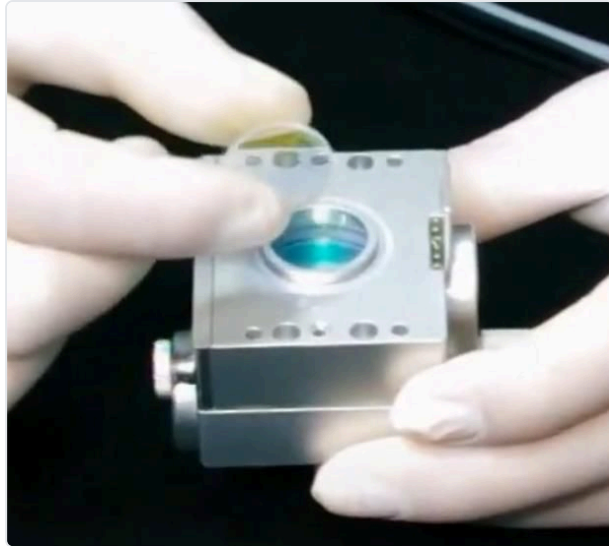
Turn the retaining ring counterclockwise. When it has been turned all the way, the ring can be removed.



Immediately cover the openings with protective tape or similar so that dust cannot enter.

The lens has a specific orientation. The focusing lens is a plano-convex lens: install it so that the convex side faces downward (toward the laser emission port).

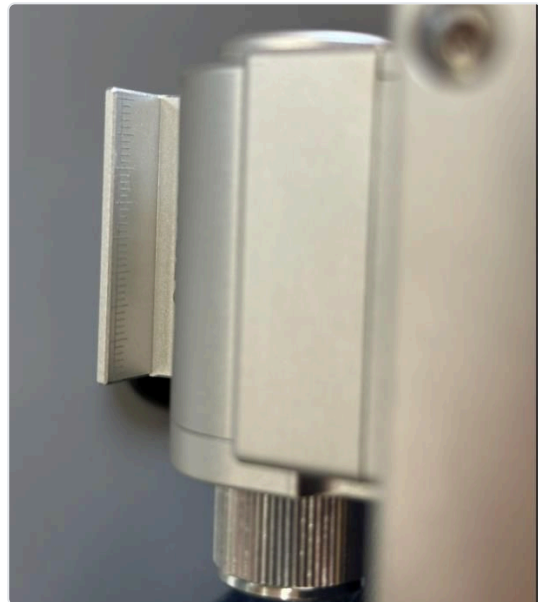
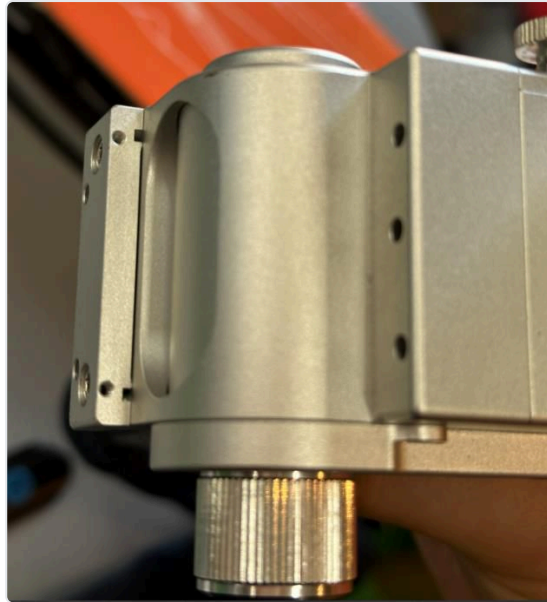
When placing it into the lens case, the convex side must face down. The convex side pointing toward the nozzle is the correct orientation.



Step 2: Attach the beam-path-adjustment stay

Attach the adjustment stay shown below to the laser gun.

Mount the stay just in front of the laser emission port of the laser gun and fix it in place with the 2 screws.

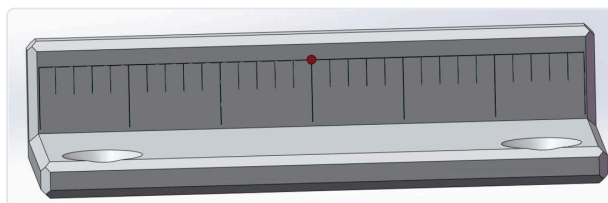


Step 3: Beam path adjustment in Detailed Settings (normal adjustment method)

Go to Detailed Settings, enter the password "123456", then enter a beam path adjustment value to perform the adjustment.

- Entering a positive (+) value moves the beam path to the right.
- Entering a negative (–) value moves the beam path to the left.

Adjust until the red pointer is at the center of the scale (– value moves it left, + value moves it right).

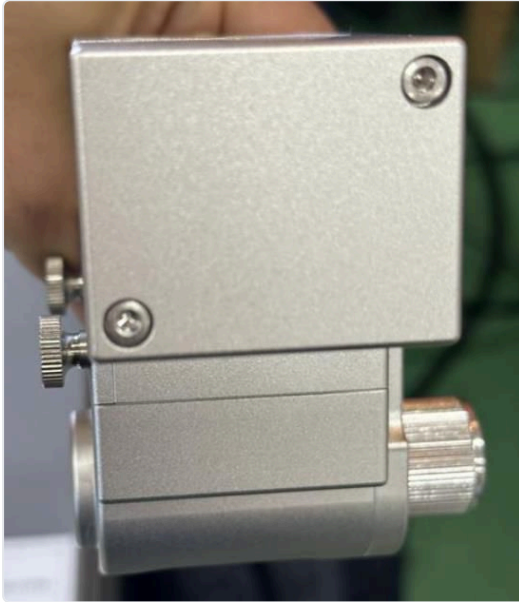


Step 4: Motor angle adjustment (when the beam path is greatly misaligned)

If the beam path is greatly misaligned, adjust the laser beam path by moving the motor directly.

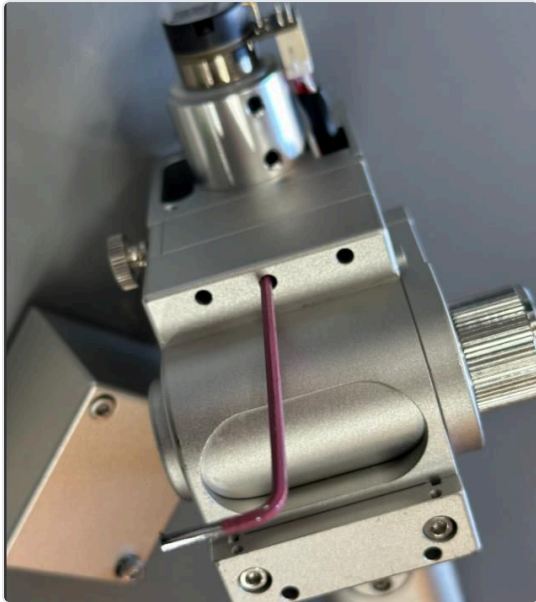
Remove the screws on the top of the laser gun.

Disconnect the motor connector.



Loosen the motor fixing screws. Once loosened, the motor can be turned by hand.

Turn the motor by hand and adjust it so that the red pointer comes to the center of the gauge.



Adjust the red pointer to the center of the scale.

Chapter 8 — Consumables

8-1 Laser Safety Glasses and Protective Shield

Laser safety glasses and protective face shields can be purchased from our sales site. Laser safety glasses must be worn during any work involving laser emission. Wear laser safety glasses that suit the operator (preferred shade level, over-glasses type, etc.).

Sales site: https://www.e-inzai.com/shop/www/shop/sunmax/product_lcwparts-n1.html

The service life of the laser safety glasses / protective shield is 3 years. Do not use glasses or shields

more than 3 years after opening.



8-2 Lenses

Several lenses are built into the laser gun.

Lenses are basically treated as consumables. How quickly they wear depends on the material being processed and on how the machine is used. When used correctly, they can last a long time.

Sales site: https://www.e-inzai.com/shop/www/shop/sunmax/product_clcparts.html

When a lens is damaged, the lens generates heat. The laser gun is equipped with a temperature sensor and sounds an alarm when the temperature becomes high. Note: in some cases the alarm may not be triggered.

8-2-1 Protection Lens

The protection lens is mounted at the tip of the laser gun (torch). Because it sits closest to the nozzle opening, it is the part that wears out fastest.



If you perform rust removal without blowing air, rust dust and fumes raised during processing can adhere to the lens and damage it. An appropriate supply of air pressure is required.

Main Causes of Damage

The protection lens is a consumable. It is a part that must be replaced when its condition deteriorates.

- **Misaligned laser beam path** — Welding or processing while the laser beam path is misaligned will damage the lens.
- **Insufficient air / gas** — Processing without supplying air or gas. If dust such as rust particles or fumes adheres to the lens, burning occurs and the laser light can no longer pass through. Process with an appropriate air pressure. Recommended air pressure: 0.4–0.7 MPa.
- **Moisture or oil in the air** — If the air compressor does not sufficiently remove moisture, oil, and dust, this leads to wear of the protection lens.
- **Dust adhering during lens replacement** — There are cases where dirt adheres to the lens during replacement and the laser then passes through and burns the lens. Take the utmost care when performing replacement.
- **Impact from dropping, etc.** — Dropping the laser gun and subjecting it to impact may damage the lens.

Replacement Procedure

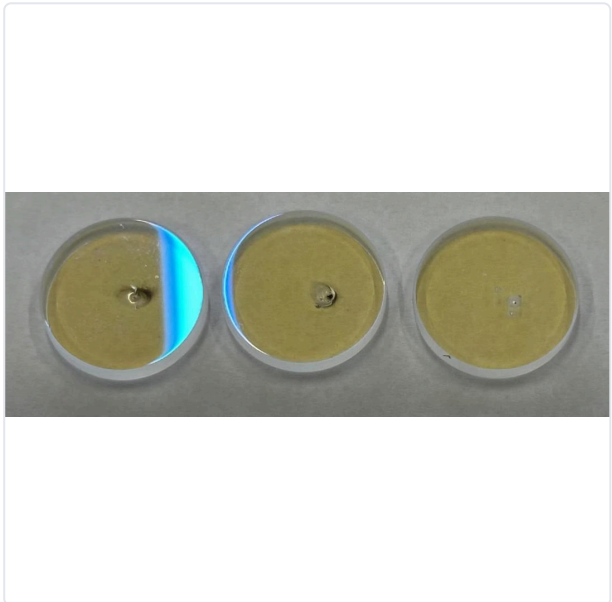
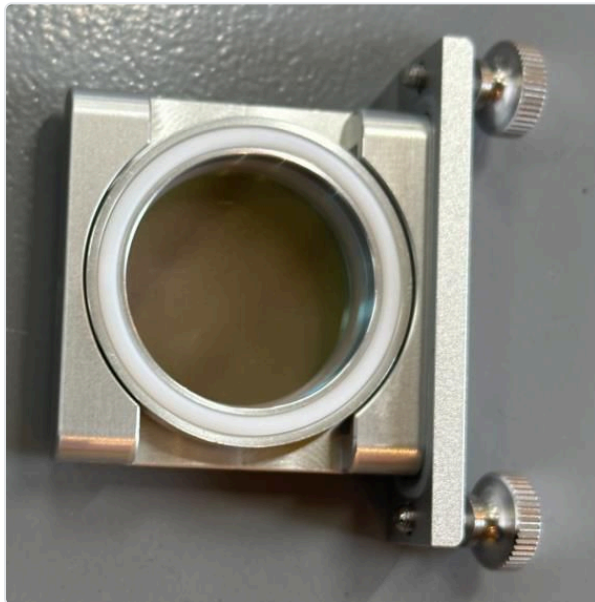
What to prepare

- **Air blower / air duster, etc.** — Any dust visible to the naked eye is strictly prohibited. If dust or dirt adheres to the lens, blow it off with air.
 - **Protective tape / masking tape** — Required to seal openings so that dust and dirt cannot enter the inside of the laser gun.
1. Two screws are fitted. Loosen both screws. Once they are loosened, you can pull out the case that holds the protection lens. Note: immediately after pulling it out, cover the opening with masking tape or similar.



Caution: Work in a location with as little airborne dust as possible! If dust gets inside the laser gun, it will damage the other lenses. To prevent secondary damage, always work in a clean location.

2. Check that there is nothing abnormal on the protection lens. Any adhering matter such as spatter or dirt is absolutely unacceptable.
3. Inspect the lens. If the lens shows spatter or burn marks as in the figure below, replacement is required.



4. Remove the washer from the lens case.

5. After removing it, fit a new lens. The lens has no specific orientation. Never touch the lens surface — always hold the lens by its edges when replacing it.



8-2-2 Focusing Lens

The focusing lens is mounted at the tip of the laser gun (torch).

The focusing lens focuses the laser light emitted from the laser source.



Main Causes of Damage

This lens is a consumable. It is a part that must be replaced periodically.

- **Misaligned laser beam path** — Welding or processing while the laser beam path is misaligned will damage the lens.
- **Insufficient air / gas** — Processing without supplying gas, or welding while the gas supply is low, will damage the lens. For processing that generates a lot of fumes, use a larger amount of gas. Also supply a larger amount of gas when welding aluminum.
- **Dust adhering during lens replacement** — There are cases where dust adheres to the lens during replacement and the laser then passes through and burns the lens.
- **Impact from dropping, etc.** — Dropping the laser gun and subjecting it to impact may damage the lens.

Replacement Procedure

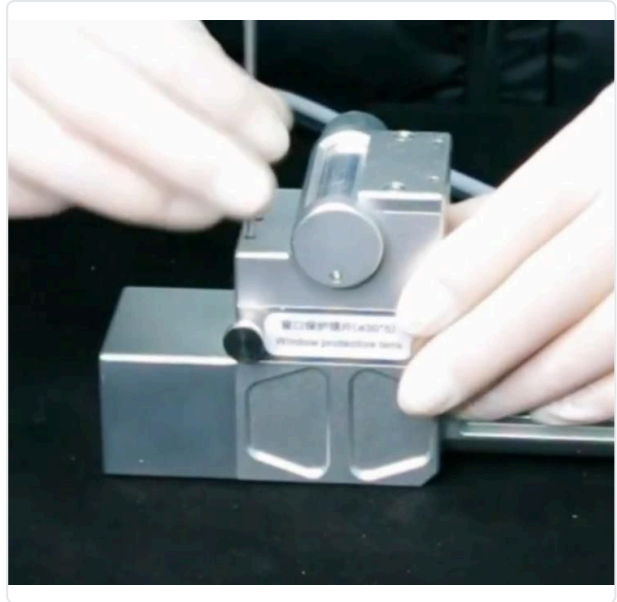
What to prepare

- **Air blower / air duster, etc.** — Any dust visible to the naked eye is strictly prohibited. If dust or dirt adheres to the lens, blow it off with air.
- **A clean environment (working inside a clean bench is preferable)** — Working where dust is airborne is strictly prohibited. Work in an environment that suppresses dust adhesion, such as inside a clean bench or a box-shaped enclosure.
- **Hex wrench** — Needed to loosen the set screws and similar.

- **Protective tape / masking tape** — Required to seal openings so that dust and dirt cannot enter the inside of the laser gun.

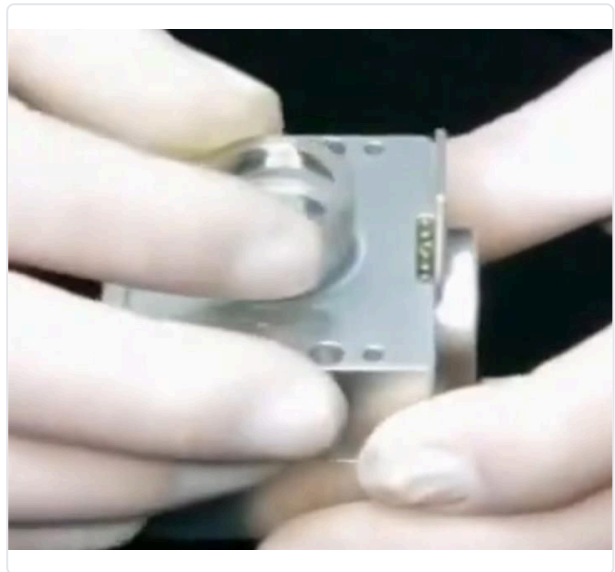
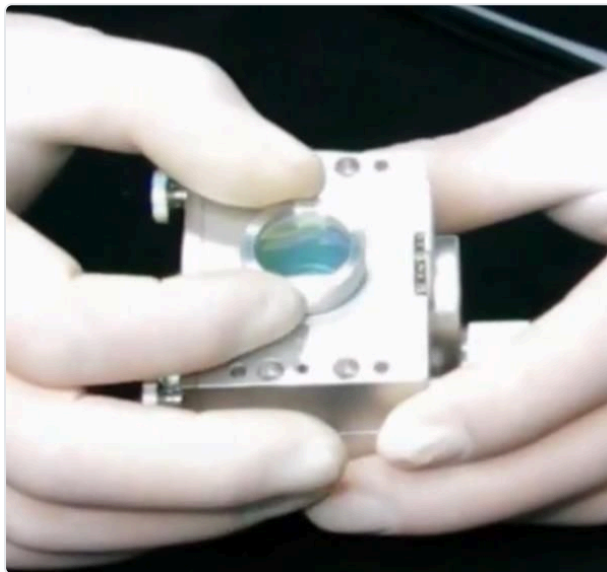
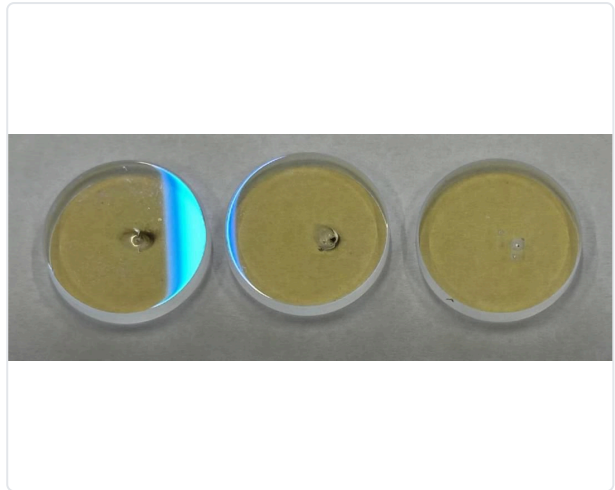


1. With the emission port facing upward, you will see four small hex screws. Remove these screws.
2. Once the screws are loosened, the upper part of the laser gun (the protection lens side) can be removed. When it is removed, the reflection lens side is exposed. Be sure to cover the opening with protective tape or similar so that no dust can enter. *Do not loosen the middle screw of the three screws in a row!*

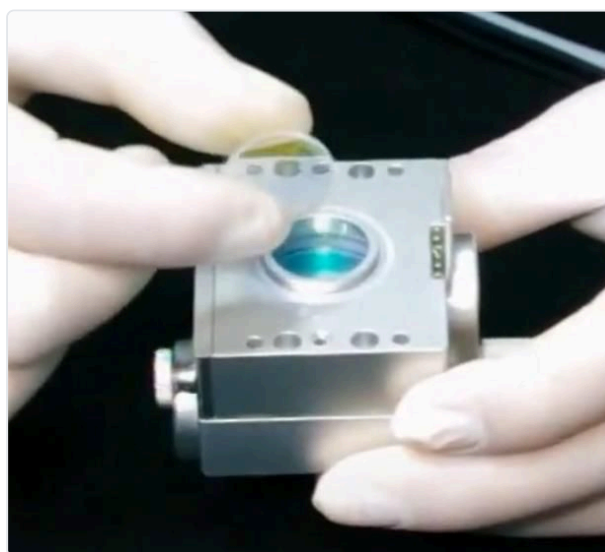


Caution: Work in a location with as little airborne dust as possible! If dust gets inside the laser gun, it will damage the other lenses. To prevent secondary damage, always work in a clean location.

3. Inspect the lens. If the lens shows spatter or burn marks as in the figure below, replacement is required.
4. Turn the ring counterclockwise. When it is fully turned, the ring can be removed. Immediately cover the opening with protective tape or similar so that no dust can enter.



5. The lens has a specific orientation. The lens is a plano-convex lens. Install it with the convex side facing downward (toward the emission port).
6. After fitting the new lens, reverse the removal steps to return the laser gun to its original state.



(Figure labels: Focusing lens / Toward the emission port)

8-2-3 Reflection Lens

The reflection lens is mounted on the motor and performs the weaving motion (swinging the laser left and right).

The reflection lens is particularly sensitive to vibration and impact. The lens may crack if subjected to a strong impact.



Main Causes of Damage

- **Misaligned laser beam path** — Welding or processing while the laser beam path is misaligned will damage the lens.
- **Dust adhering during lens replacement** — There are cases where dust adheres to the lens during replacement and the laser then passes through and burns the lens.
- **Impact from dropping, etc.** — Dropping the laser gun and subjecting it to impact may damage the lens. The reflection lens in particular is a part that is vulnerable to impact.

Replacement Procedure

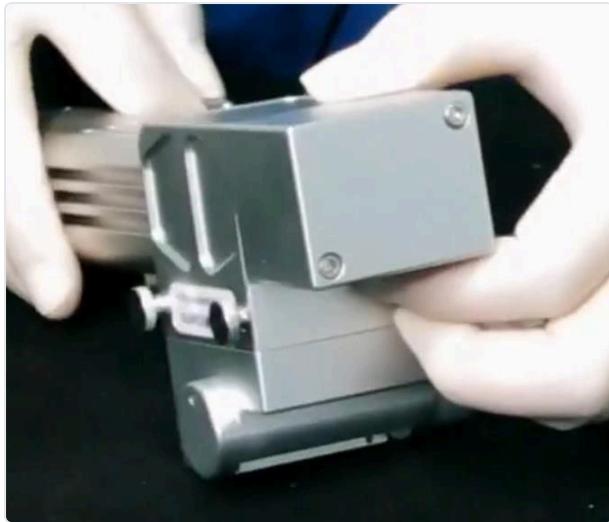
What to prepare

- **Air blower / air duster, etc.** — Any dust visible to the naked eye is strictly prohibited. If dust or dirt adheres to the lens, blow it off with air.
- **A clean environment (working inside a clean bench is preferable)** — Working where dust is airborne is strictly prohibited. Work in an environment that suppresses dust adhesion, such as inside a clean bench or a box-shaped enclosure.
- **Hex wrench** — Needed to loosen the set screws and similar.
- **Protective tape / masking tape** — Required to seal openings so that dust and dirt cannot enter the inside of the laser gun.

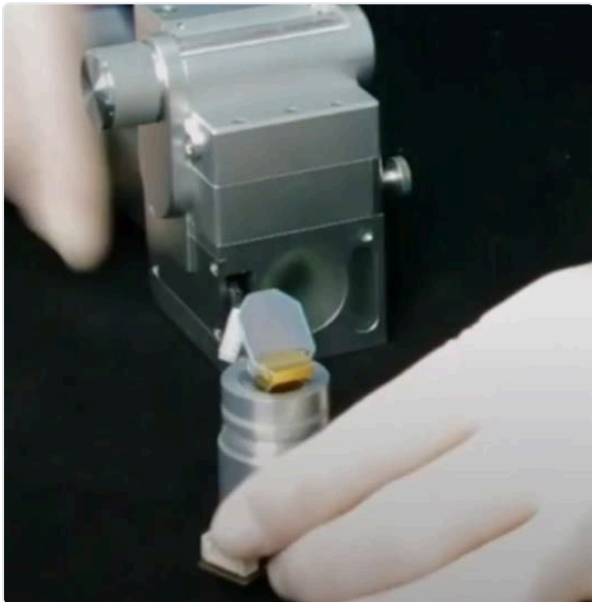
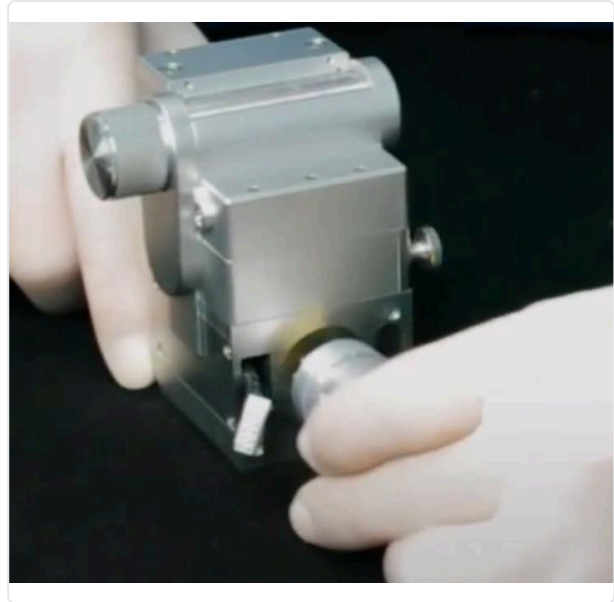
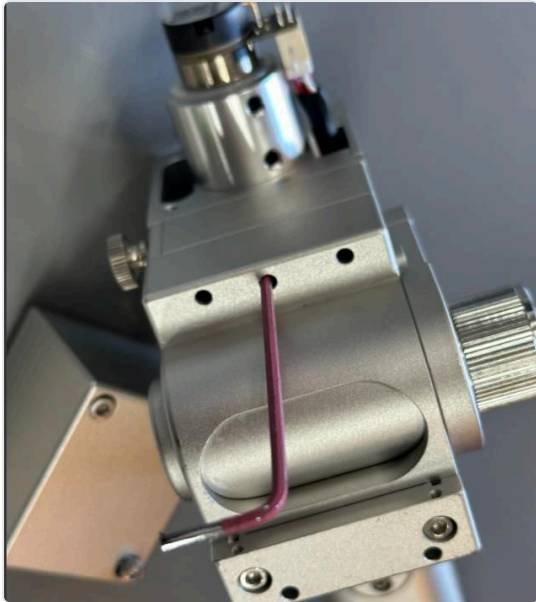


Caution: Work in a location with as little airborne dust as possible! If dust gets inside the laser gun, it will damage the other lenses. To prevent secondary damage, always work in a clean location.

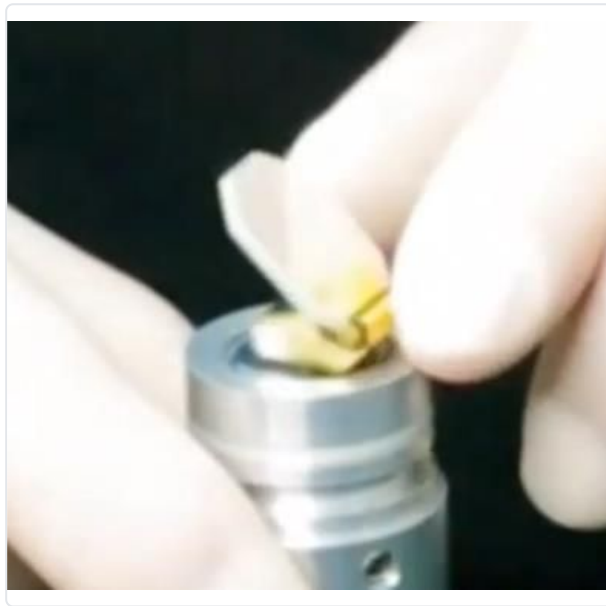
1. First, remove the body of the laser gun.
2. Remove the screws at the locations fastened with Phillips-head screws.
3. Once all the screws are removed, the body can be taken off.
4. Disconnect the connector under the motor.



5. Loosen the motor fixing screws. Once they are loosened, the motor can be pulled out.
6. As soon as the motor is pulled out, seal the opening with protective tape so that no dust can get inside the laser gun.

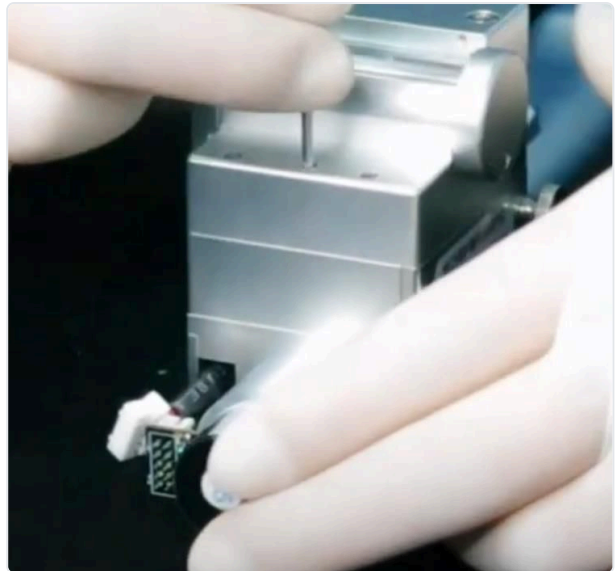
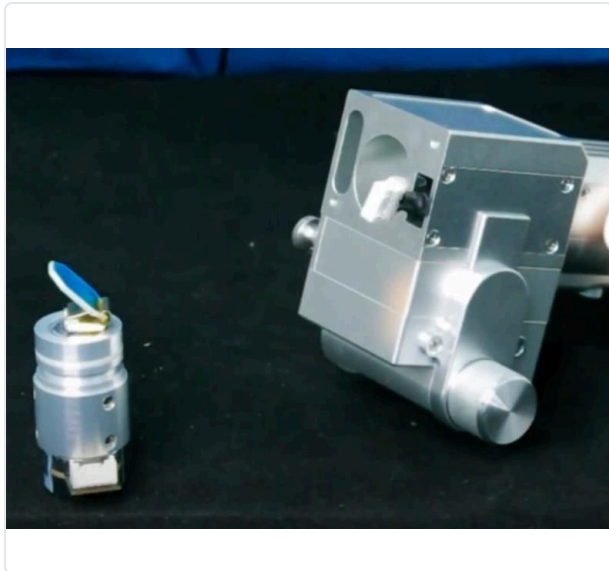


7. Loosen the two screws on the lens stay. Once they are loosened, the reflection lens (as a set with the stay) can be removed.
8. Fit the new reflection lens. When fitting it, set it so that the motor connector is aligned at a 90° angle. After setting it, also check that the lens can swing about 45° to the left and right.



(Figure labels: Aligned at the 90° position / 45° to the left / 45° to the right)

9. If the adjustment is correct, return the motor to the laser gun.



After fitting the motor, you must check that the beam path is not misaligned. Removing the motor causes the beam path to shift. Be sure to carry out the beam path adjustment described in Chapter 7 to realign the laser beam path.

8-2-4 Collimator Lens

The collimator lens is the lens that makes the laser beam parallel.



Main Causes of Damage

This lens is a consumable. It is a part that must be replaced periodically.

- **Misaligned laser beam path** — Welding or processing while the laser beam path is misaligned will damage the lens.
- **Dust adhering during lens replacement** — There are cases where dust adheres to the lens during replacement and the laser then passes through and burns the lens.
- **Impact from dropping, etc.** — Dropping the laser gun and subjecting it to impact may damage the lens.

Replacement Procedure

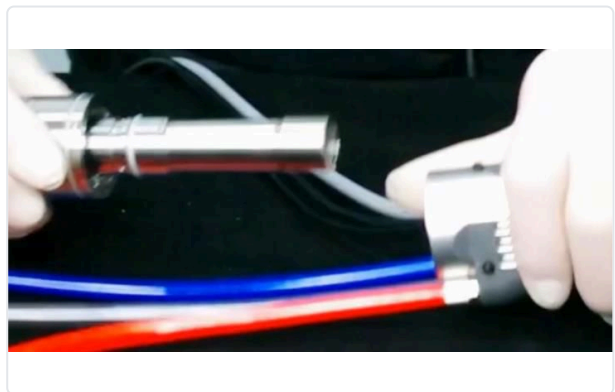
What to prepare

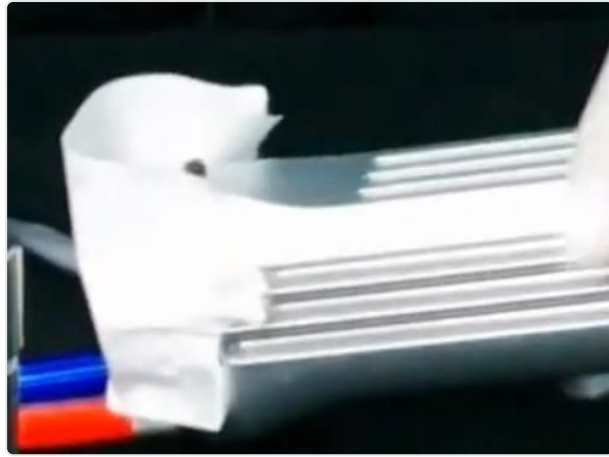
- **Air blower / air duster, etc.** — Any dust visible to the naked eye is strictly prohibited. If dust or dirt adheres to the lens, blow it off with air.
- **A clean environment (working inside a clean bench is preferable)** — Working where dust is airborne is strictly prohibited. Work in an environment that suppresses dust adhesion, such as inside a clean bench or a box-shaped enclosure.
- **Hex wrench** — Needed to loosen the set screws and similar.
- **Protective tape / masking tape** — Required to seal openings so that dust and dirt cannot enter the inside of the laser gun.
- **UV light (optional)** — When you shine a UV light on dust, it glows clearly, allowing you to reliably prevent dust contamination.



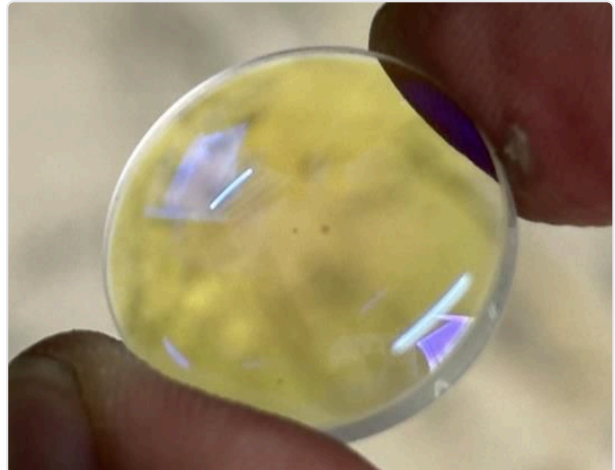
Caution: Work in a location with as little airborne dust as possible! If dust gets inside the laser gun, it will damage the other lenses. To prevent secondary damage, always work in a clean location.

1. Remove the three set screws at the base.
2. Once the set screws are removed, the part holding the collimator lens can be pulled out. Pull it out carefully.
3. After pulling it out, seal the opening with tape so that no dust can enter the inside of the laser gun.





4. Check the lens for damage or burn marks.
5. Turn the cap at the tip counterclockwise.



Any dust or burn marks visible to the naked eye all require replacement. If they cannot be removed with alcohol or an air duster, replace the lens. Do not touch the surface of the lens!

(Figure label: Reference — lenses requiring replacement)

6. When the cap is removed, the parts are assembled in the following order from the bottom: thin washer, collimator lens, thick washer.



(Figure labels: Thin washer / Collimator lens / Thick washer / Cap)

Do not let any dust get inside! As soon as the lens is removed, seal the opening with tape! If the machine is used with dust inside the cable, the lens in the laser source will be damaged!

7. The lens has a specific orientation. The collimator lens is a plano-convex lens: one side is flat and the other side is convex. Install it with the convex side facing up.
8. Reinstall the lens by reversing the removal steps.
9. Check that no dust is adhering to the lens or to the area shown in the red frame before assembling. If it is assembled with dust adhering, the lens will be damaged. If you have a UV light, shine the light on

the parts to make certain that no dust is adhering.



Dust is strictly prohibited! Always install the lens in a completely dust-free condition!

(Figure label: Collimator lens)

8-3 Where to Purchase Consumables

Consumables are sold on our sales site "Laser Kan".

This machine is the FL-CLC. Go to the sales page from "FL-CLC Consumables".

<https://www.e-inzai.com/shop/www/shop/sunmax/index.html>



ファイバーレーザー洗浄機(クリーニング・ケレン機)部品	
ファイバーレーザー洗浄機(クリーニング・ケレン機) 消耗品 (定期的に交換を推奨)	
▶ FL-CLC消耗品	
ファイバーレーザー洗浄機(クリーニング・ケレン機) 交換部品・オプション品	
▶ FL-CLC レーザーガン部品	

Chapter 9 — Maintenance

9-1 About Maintenance

To clean dirt from the machine body, wipe it with a dry or slightly dampened cloth, or, if necessary, with a diluted neutral detergent or alcohol. Do not use special solvents or gasoline; they may deform the structure or discolor the surface.

Do not place containers of liquid on top of the machine. Spilled water can damage the insulation, and corrosive liquids may corrode the equipment.

9-2 Water Chiller Maintenance

The automatic water chiller is built into the machine body. The water must be replaced periodically.



Parts shown: water fill port / controller / water level gauge / drain.

9-2-1 Replacing the Cooling Water

The water in the water chiller tank must be replaced periodically.

Even when using plain water, always use clean water. Mixing in an anti-corrosion agent helps prevent corrosion. If the water is not replaced at appropriate intervals, scale and dirt will build up inside the water chiller and the water flow may deteriorate.

Do not use well water! Algae will grow and quickly clog the pump!

Replacement interval

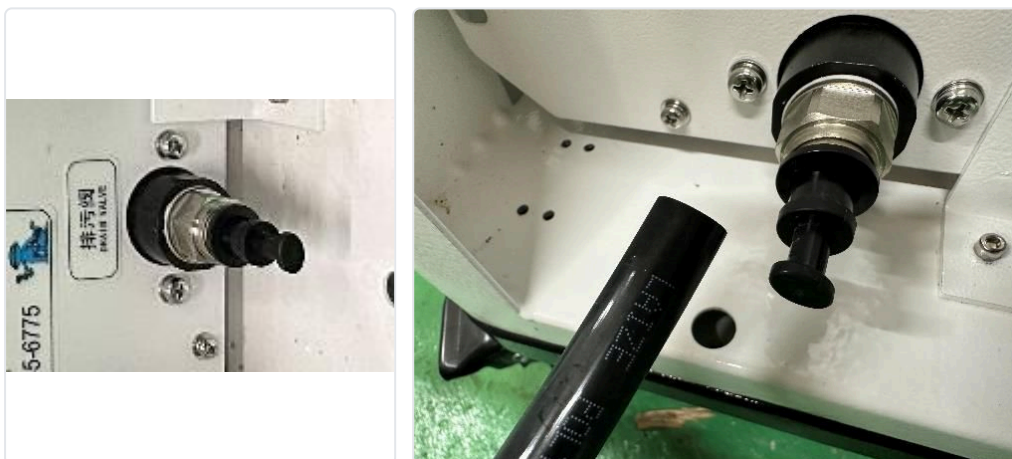
- Plain water: every 2 to 3 months
- Coolant / antifreeze (containing an anti-corrosion agent): once a year

Caution: freezing. If there is a risk of the cooling water freezing in winter, mix in antifreeze/coolant. Never use it undiluted — always dilute it before use. If the concentration is too high, it puts a load on the pump and can cause failure, so take care. Normally dilute at 4 L (coolant) : 7 L (water). Even in cold regions, dilute to no more than 5:5. Undiluted coolant alone is not acceptable.

How to replace the water

Open the front door, pull out the drain valve plug, and release the water. Press the gray part and pull out the black plug.

The water comes out with force. Release it carefully.



Remove the cap from the water fill port and pour in the water.

Fill the water through the fill port. The tank capacity of the automatic water chiller is 13 L, but about 10 to 11 L is sufficient. If you overfill it, water may spill from the fill port when the machine is moved.

Check the water level gauge and keep adding water until the level is within the green range (gauge indications: High / Normal / Low).



After filling, close the cap of the water fill port.

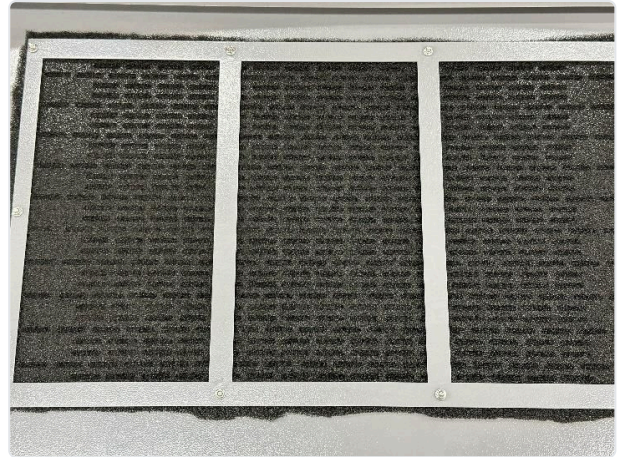
9-2-2 Cleaning the Left and Right Filters

Clean the filters mounted on the left and right sides of the water chiller.

Guideline: clean once every 1 to 2 months.

Open the doors on the left and right sides of the machine. Lift each door upward to remove it.

A filter is attached to each door. Clean it thoroughly. Blowing it off with compressed air (air blow) is sufficient.



9-2-3 Cleaning the Fins

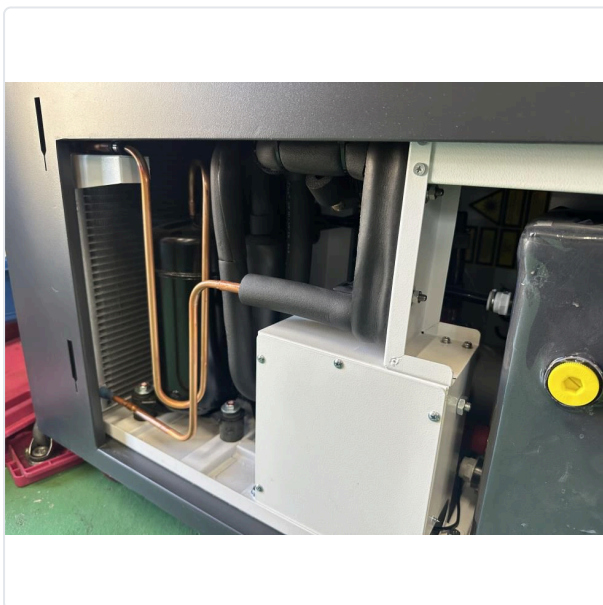
When the left door is removed, the fins are visible. If dirt has adhered to the fins, cleaning is required. Remove dust with an air blower or similar. We recommend cleaning the fins at the same time as cleaning the filters.

Guideline: clean once every 1 to 2 months.

9-2-4 Cleaning the Exhaust Fans

Remove dust and dirt from the fans on the rear of the machine with an air blower or similar.

Guideline: clean once every 1 to 2 months.



9-2-5 Air Regulator / Filter

An auto-drain type regulator/air filter is fitted on the rear of the machine. Although it is an auto-drain type, accumulated water is discharged once it reaches a certain amount. Check for air leaks and for damage or freezing of the bowl.



Freeze prevention. The regulator is a semi-drain type: check visually whether water has accumulated, and drain it periodically. If water remains inside the regulator (including the filter) in below-freezing conditions, there is a risk of freezing. In below-freezing conditions, the water inside the regulator must be removed.

Adjust the knob shown in the red frame to drain the water.

Turn the knob toward "O" (counterclockwise) to drain. Once the water has drained, turn it toward "S" (clockwise).



If water remains inside the regulator (including the filter) in below-freezing conditions, there is a risk of freezing. In below-freezing conditions, the water inside the regulator must be removed.

9-3 Long-Term Storage

9-3-1 Machine Body

Protect the machine body with a dust cover or similar so that dust and metal particles do not settle on it.

Drain the cooling water from the water chiller. If the machine is left unused for a long period, the cooling water may become contaminated.

Chapter 10 — Troubleshooting

10-1 Alarms

A water chiller alarm occurs when the water temperature is too high, the water temperature is too low, or the water level is insufficient.

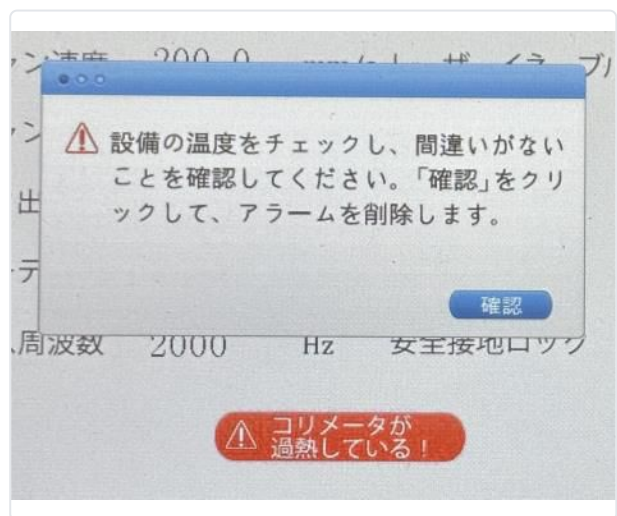
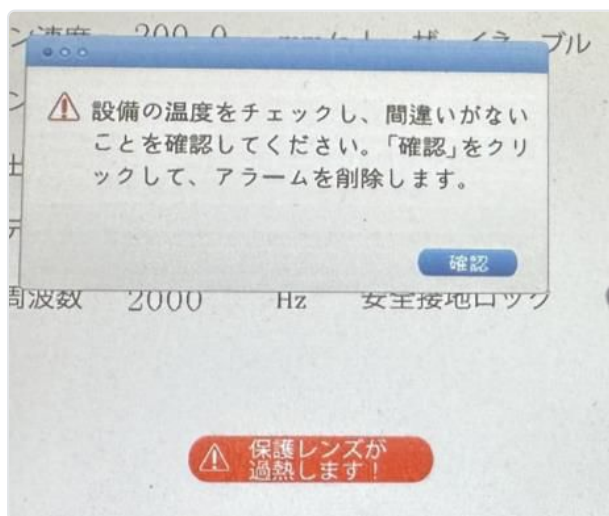
If the temperature of the laser gun becomes too high, an alarm is generated for the lens at the overheating location. While an alarm is active, the laser cannot perform laser emission. Check whether the lens indicated on the screen is damaged. If it is damaged, it must be replaced.

10-1-1 Protection Lens / Focusing Lens

If the protection lens or the focusing lens is damaged, the alarm "The protection lens is overheating!" appears on the screen. Check the protection lens or the focusing lens. See the figure below for how to check.

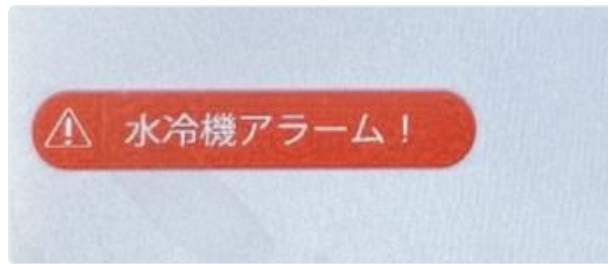
10-1-2 Collimator Lens

If the collimator lens is damaged, the alarm "The collimator is overheating!" occurs. Check the collimator lens for damage. See the figure below for how to check.



10-1-3 Water Chiller Alarms

A water chiller alarm occurs when the water temperature is abnormal, when there is no water flow, or when the water chiller is not operating.



Alarm E02 occurs

This occurs when the water temperature is too high. The water chiller has a built-in cooler and heater; the error stops once the water temperature approaches the optimum of about 30°C. Check the water temperature — this error occurs when the temperature is close to 40°C.

Alarm E08 occurs

This occurs when the water temperature is too low. The water chiller has a built-in cooler and heater; the error stops once the water temperature approaches about 20°C. Check the water temperature — this error may occur when the temperature is close to 10°C.

Alarm E10 occurs

This occurs when no water flow is detected on the laser gun side. Open the cable cover of the laser gun and check that the hose is not kinked.

Water chiller alarm list

When a problem occurs, a water chiller alarm is generated and the machine can no longer operate.

Alarm	Description	Action / Cause
E01	Laser unit water temperature sensor abnormality	Check the cable of the water temperature sensor. If there is no fault, the water temperature sensor may be damaged.
E02	Laser unit high temperature	The cooling water of the laser unit has become hot. Ventilation of the fans on the rear of the machine may be poor, or foreign matter may have entered the water. Improve ventilation and replace the water.
E03	Compressor pressure abnormality	Ventilation of the water chiller may be insufficient, or dust/foreign matter may be clogging the vents. Clean them.
E04	Reverse phase	Phase reversal. Check the power supply wiring.
E05	Laser unit water flow abnormality	The water flow in the cooling piping on the laser unit side is abnormal (no flow). Scale or foreign matter may have entered the system.
E06	Water level alarm	The water level is insufficient. Add water.
E07	Compressor overload	Ventilation of the water chiller may be insufficient, or dust/foreign matter may be clogging the vents. Clean them.
E08	Laser source water temperature low	The water temperature on the laser source side is too low. Raise the room temperature.
E09	Laser gun water temperature sensor abnormality	Check the connection of the temperature sensor.
E10	Water temperature high	Allow time for the water to cool. Check that the relay operates correctly.
E11	Water temperature low	Allow time for warm-up. Check that the relay operates correctly.
E12	No water flow on the laser gun side	Check the piping. Check that the pipe fittings are not loose. Check that there is water flow in the piping on the laser gun side. Foreign matter inside the piping may be obstructing the water flow.

10-2 Laser Alarms

A laser alarm occurs when there is an abnormality in the laser source. When an alarm occurs, you must connect to the laser source with the dedicated application and run a diagnosis.

Note: if the power of the laser source is switched on while the water temperature is 20°C or below, a laser alarm will occur. Be careful.



10-2-1 Checking Alarms with a Smartphone

Install the app on your smartphone.

<http://gxshdownload.bwt-tj.com:8770/BWT11/V1.html>

Open the download site from the link above. The app to download differs depending on the type of your smartphone (see figures: for iPhone / for Android).

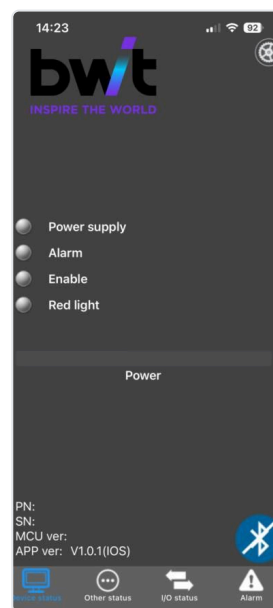
After downloading, launch the app.

Open the front door to create an environment where the Bluetooth connection is easier to establish.

Touch the Bluetooth mark at the bottom right of the screen (the Bluetooth mark shown in the red frame).

Note: Bluetooth must be turned ON on your smartphone.

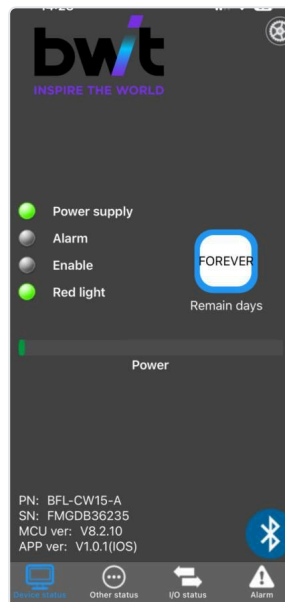
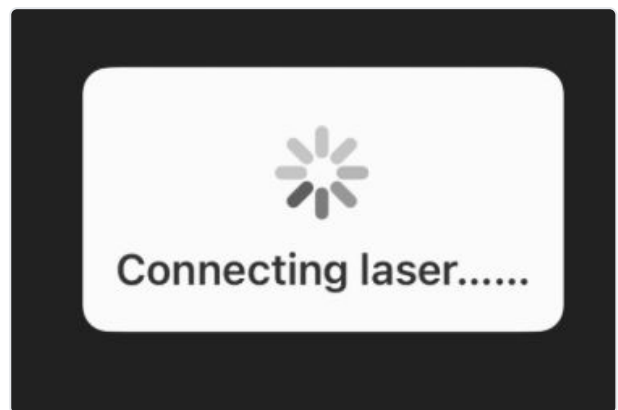
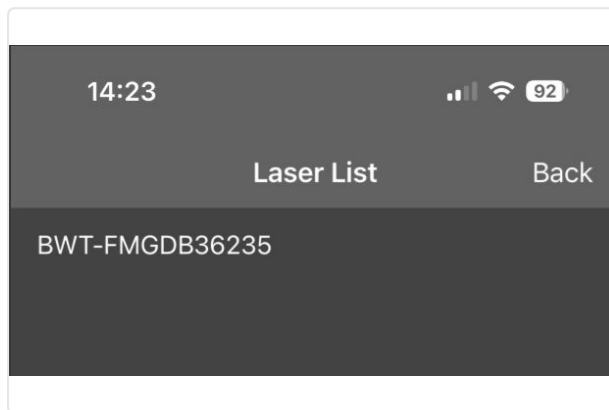
Touch the area shown in the red frame to connect to the laser source.



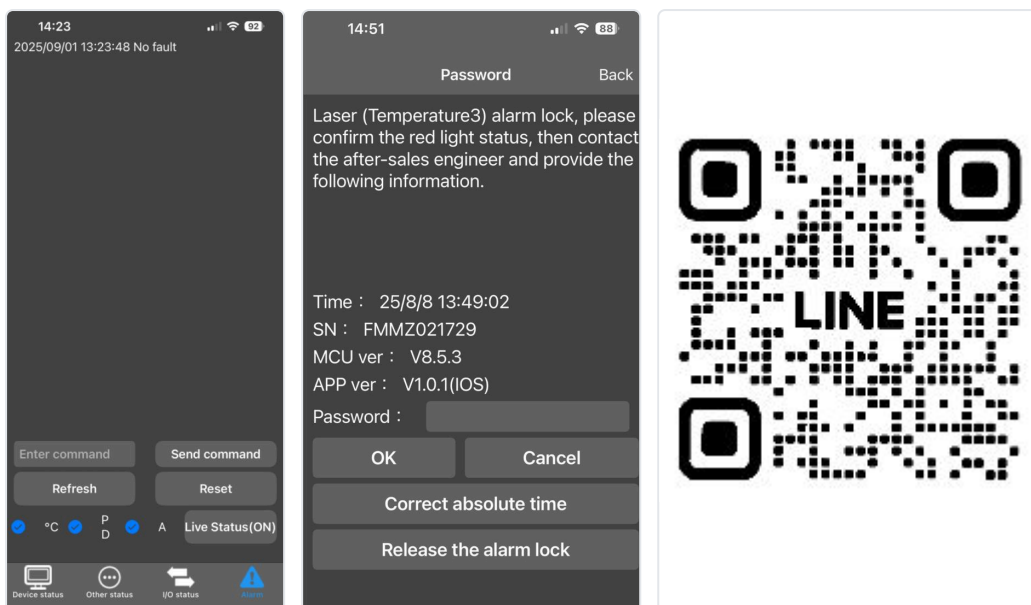
Wait until the "Connecting Laser" indication disappears.

When the details of the laser source are displayed as shown in the figure below, the connection is complete.

Select "Alarm" from the tabs at the bottom and press the "Refresh" button to update the alarm information. If the lamp on "Alarm" is lit, an abnormality has occurred in the laser source. Check the details and take action.



Take a screenshot of the alarm and send it to the manufacturer.



If alarms occur repeatedly, a forced lock may be applied.

Email	webmaster@laser-machine.com
Phone	058-294-7333
LINE official account	(see QR code)
Support hours	9:00–17:00 (closed on Saturdays, Sundays, and national holidays)

10-2-2 Checking Alarms with the PC Application

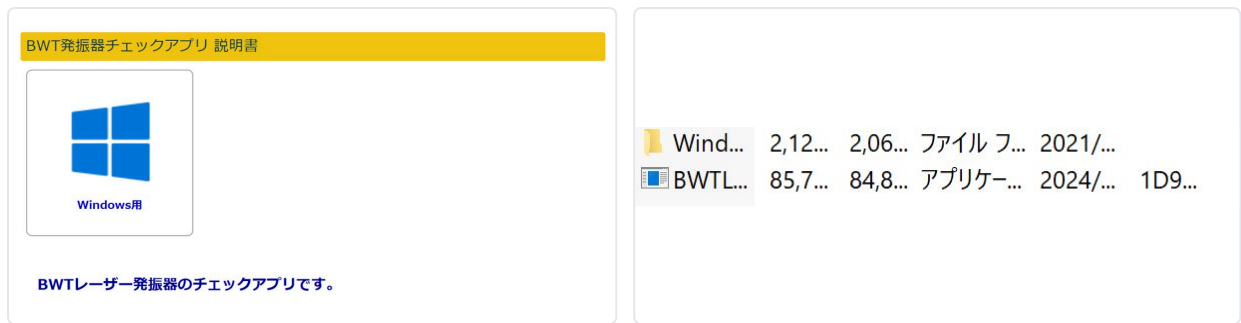
Downloading the application

Install the application on your PC. The connection to the laser source is made with an RS-232C cable, so prepare a PC near the machine.

<https://www.laser-machine.com/software/index.shtml#software2>

Open the download page from the link above and download the Windows application shown in the figure below.

The download contains 2 types of files: the first is the USB driver, and the second is the laser source application.



Installing the USB driver

Install the USB driver. Click the exe file downloaded from the website to install it.

1. Click "Extract" to proceed.
2. Click "次へ" (Next) to proceed.



3. Select "同意します" (I agree), then click "次へ" (Next) to proceed.
4. When the process is complete, click "完了" (Finish). The driver installation is now complete.

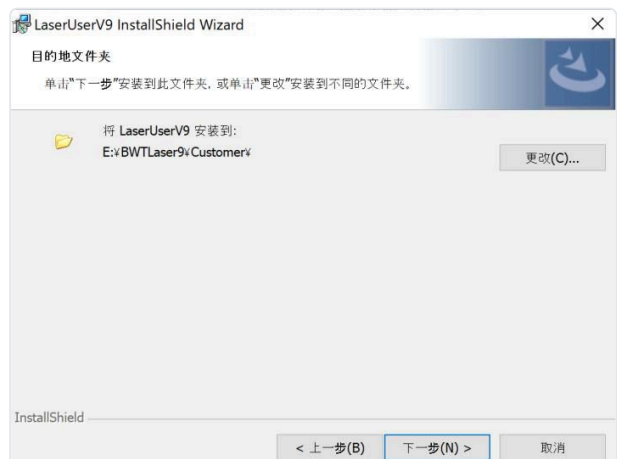
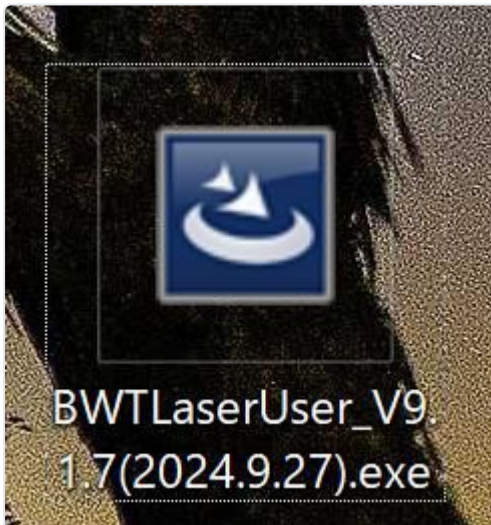


Installing the laser source application

When installing the files, always use "Run as administrator".

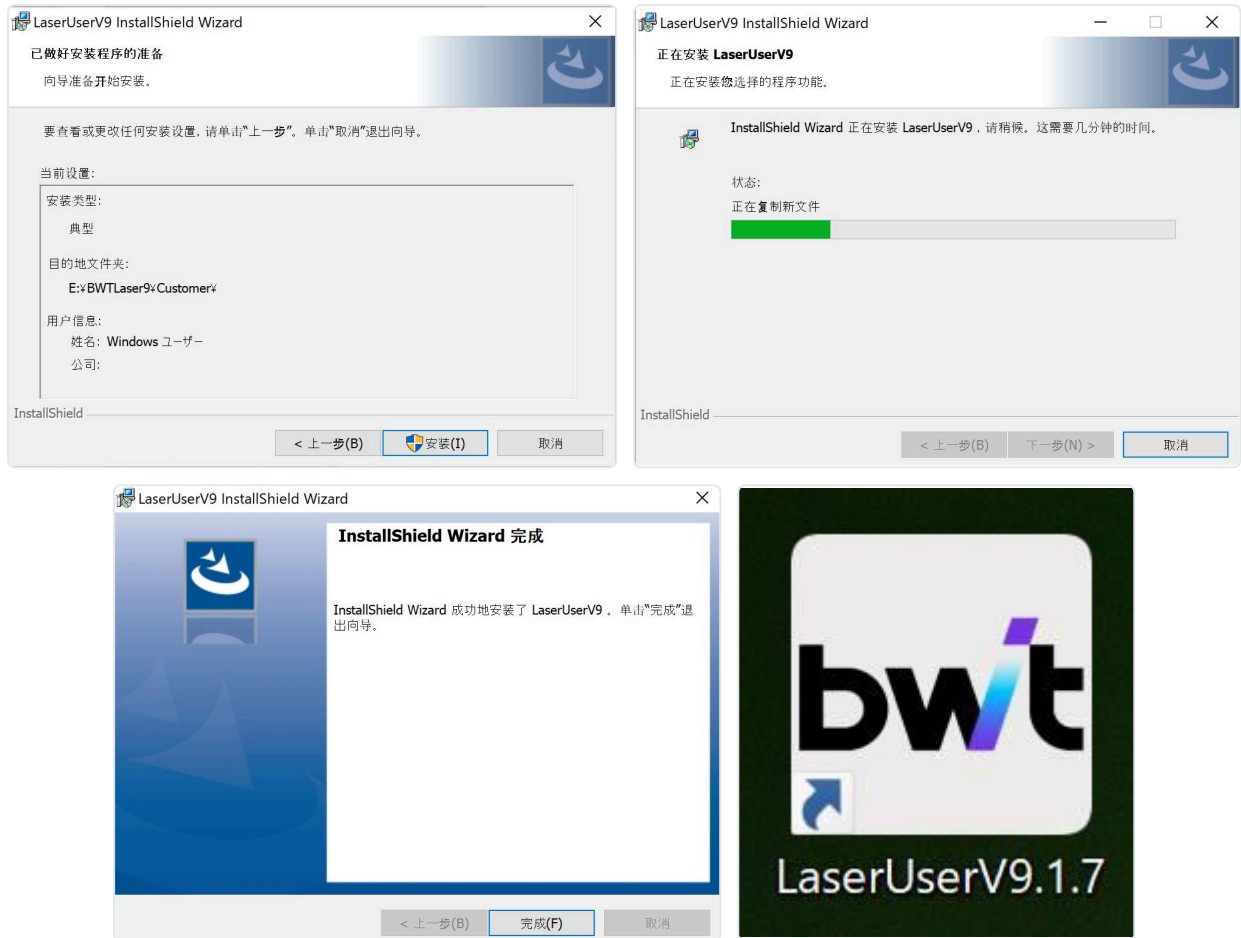
Click the exe file downloaded from the website to install the application.

1. Open the file and proceed with the installation. Click "下一步" (Next) to go to the next step.
2. Click "下一步" (Next) again to go to the next step. (On this screen you can specify where the files are saved.)



3. Click "安装" (Install) to proceed. The installation will start.
4. Click "完成" (Finish).

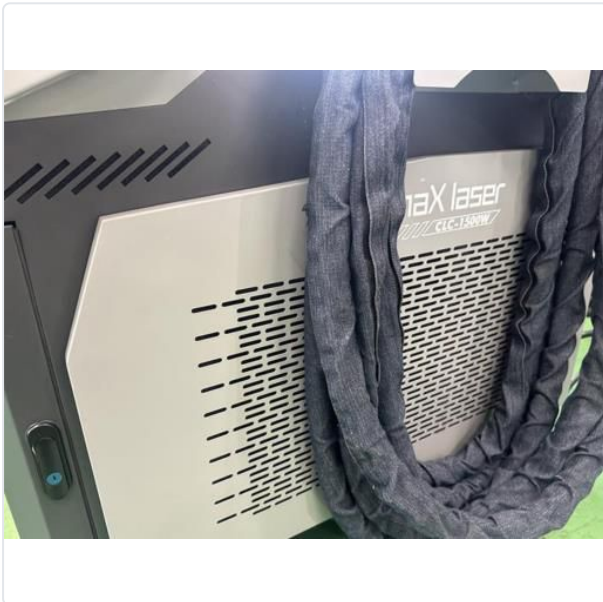
The application icon will appear on the desktop.



Using the laser source application

Connect the "laser source connection cable" included in the toolbox to the laser source and the PC.

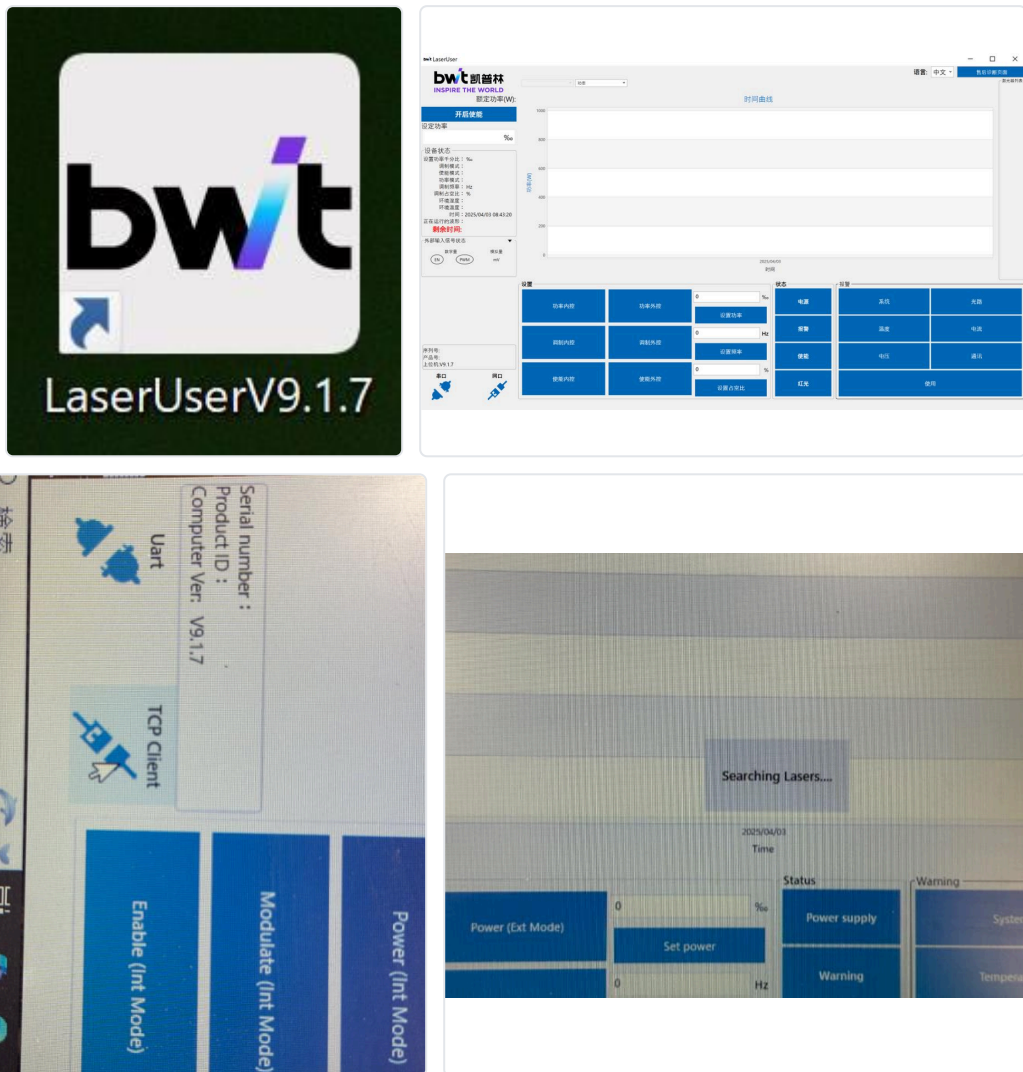
- Connect the USB connector to the PC.
- Connect the D-sub connector on the other end to the laser source. Open the door on the right side of the machine.
- The D-sub connector socket is located on the rear of the laser source. Plug in the connector.



Click the application icon shown on the desktop to launch it.

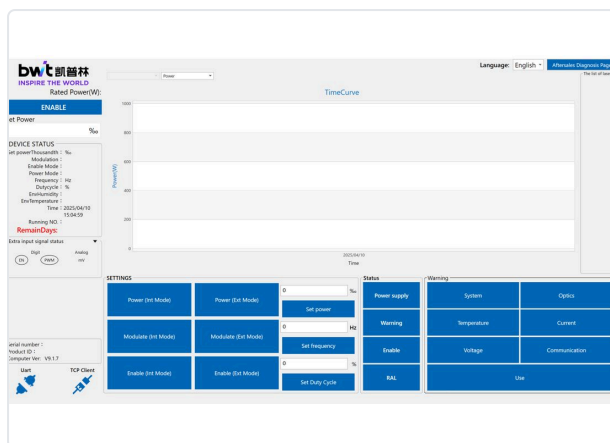
If the screen is displayed in Chinese, use the language switch at the top right of the screen to change it to English.

Click "Uart" to start the connection to the laser source.



Once the connection is complete, check that there is no abnormality in the "Warning" area at the bottom right of the screen.

If the area is shown in red as in the figure below, an abnormality has occurred. Take a screenshot and contact support.



Email	webmaster@laser-machine.com
Phone	058-294-7333
LINE official account	(see QR code)
Support hours	9:00–17:00 (closed on Saturdays, Sundays, and national holidays)

10-3 Support Contact

If you cannot resolve a problem, or if an abnormality has occurred and you need support from our staff, please contact us at the contact details below. Sending photos or videos along with your message helps us understand the situation in more detail.



Email	webmaster@laser-machine.com
Phone	058-294-7333
LINE official account	(see QR code)
Support hours	9:00–17:00 (closed on Saturdays, Sundays, and national holidays)