

RSD-SUNMAX-FL-LCW-1500W/2000W-PRO User Manual Ver.2.5 (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-LCW-1500W/2000W-PRO

User Manual

(S Type)

Ver. 2.5 (English Edition)



RSD SUNMAX LASER
RINSYUNDOU Co., Ltd.

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Chapter 1 — About This User Manual

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

This user manual is provided as a PDF file.

Hyperlinks are placed throughout the text where needed so that you can easily cross-reference related sections. Note that hyperlinks cannot be used if the manual is printed on paper.

Chapter 2 — Safety 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 or other people and damage to property, this manual uses the following signal words to identify hazardous operations and handling.
- If the machine fails or a person is harmed as a result of actions that go against 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 this manual.

WARNING	Indicates a hazard that, if the product is handled incorrectly, is highly likely to result in fire, or in death or serious injury to the user. Describes actions that must never be performed.
CAUTION	Indicates a hazard that, if the product is handled incorrectly, could result in property damage or serious injury. Describes actions that must never be performed.

About the Pictograms

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



- This symbol indicates a prohibited action.
- This symbol indicates that the product must not be allowed to 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 an action that must be performed.
- 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 to use the laser processing machine or its accessory equipment in an abnormal state — for example, if smoke, an unusual smell, or an unusual noise is coming from it.**

Doing so may cause failure, 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 may 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 (AC 200 V).**

Using a power supply other than 200 V may cause the machine to fail, or cause fire or electric shock. Consult a qualified electrical contractor.

- **Do not touch the machine or the power plug with wet hands.**

Touching them with wet hands may cause electric shock.

- **Do not work near open flames.**

Do not use the machine where there are sources of ignition such as heaters or lit cigarettes.

- **Watch out for dust on the power cord.**

If dust adheres to the power plug, it can generate heat and cause a fire.

- **Handle the power plug with care.**

Incorrect handling may cause a fire. When handling the power plug:

- Do not insert the plug while dust or other foreign matter is attached to it.
- Insert the plug fully, all the way to its base.



- **If foreign objects or liquids such as water get inside the machine, do not continue to use it.**

Doing so may cause electric shock, failure, 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 may be reflected and radiated in unintended directions.

- **Wear laser safety glasses (or a protective shield) and welding gloves during processing.**

- Contact between the laser beam and the human body during processing leads to injury and burns.
- If the workpiece material catches fire, protective equipment reduces the likelihood of the fire spreading.
- Reflections may direct laser light outside the machine. In such cases, the beam may unintentionally strike a person or cause a fire.

- **Confirm 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, failure, or fire. Turn off the power switch immediately, unplug the power plug, and repair the leaking point.

- **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 processing 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.**

The water inside the hoses will freeze, causing damage to or rupture of the laser source. In winter, add antifreeze (coolant) to the water chiller.

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.

- **When transporting this product, carry it carefully and avoid vibration.**

It contains fragile components. Transport it carefully, as vibration may 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 may cause failure.

- **Do not install the machine in an unstable location (a wobbly stand or a sloping surface).**

The machine may fall or tip over, causing failure or injury.

- **Do not place the machine in humid or dusty locations.**

Not only may the machine's performance deteriorate, but there is also a risk of electric shock or fire.

- **Do not block the ventilation openings of this product.**

Blocking the ventilation openings traps heat inside and creates a risk of fire.

- **Confirm that the water chiller is operating.**

Emitting the laser while the cooling water pump is stopped will damage the protection lens. When you turn on the processing machine, always confirm that the cooling water pump is operating.

- **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 workpiece material, intense light may be produced, which can cause visual impairment or eye pain. In severe cases, retinal damage may result in blindness.

2-2 Installation Environment

The installation environment requirements 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 failure and shorten the machine's service life.

- Locations with sudden changes in temperature or humidity (this leads to deterioration of and damage to the optical lenses)
- Locations without clean air, where gas, dust, smoke, oil mist, or similar is 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 subject to condensation (if the ambient temperature falls below freezing, the cooling water and other parts may freeze and the machine may be damaged)
- Locations near combustible materials

Use the specified power cable. Insufficient power cable capacity or an incorrect connection method may cause fire or electric shock.

Always ground the machine. If the machine is not grounded, failure or current leakage may cause electric shock.

2-3 Safety Measures During Use

Because a laser welding machine is designed so that the operator controls laser emission by hand, incorrect operation or handling can lead to serious accidents. Exercise the utmost care during operation.

Incorrect use and handling can damage the fiber laser welding machine and cause serious harm to the human body.



2-3-1 Operating Precautions

Wear protective equipment

Always wear laser safety glasses (rated for the fiber laser wavelength) and highly fire-resistant protective gloves. If the laser beam enters your eyes, it can, in the worst case, cause blindness. If the laser beam strikes your skin, it can cause burns and other injuries.

Do not look into the emission aperture, and do not put your face or hands in front of it

The laser is emitted from the emission aperture, so this is extremely dangerous. Never look into the emission aperture. During processing, the laser beam may be reflected depending on the workpiece material (aluminum, copper, brass, etc.), the condition of the lenses, and the focal length. Putting your hands or face in front of the emission aperture is extremely dangerous — never do so.

Confirm that the red pointer is on the base material

A red pointer (guide beam) is emitted from the emission aperture. Before emitting the laser, always confirm that the red pointer is correctly striking the base material. If the red pointer is not on the base material, the laser beam may be emitted off the base material. In that case, do not emit the laser; check the position and settings, and then start the work again.

Fume control

Laser emission instantaneously melts metal at high temperature, generating fumes (metal oxide smoke), gases, and hazardous particles. These can cause harm to human health (such as respiratory disorders), degrade the work environment, and contaminate the equipment, so reliable fume control measures are required.

2-3-2 Preventing Laser Beam Leakage

- Define a designated area for laser emission, and restrict entry so that only operators and authorized personnel can enter. In any area that direct or indirect laser light could reach, install fences and signs to clearly separate it from other areas and take measures to keep everyone other than operators away. Also, do not bring flammable items into the laser emission area.
- When emitting the laser during maintenance, never touch parts of the machine that are not involved in the work. In addition, use fire-resistant boards, insulating material, or similar to ensure that the laser is not radiated onto the surroundings.

2-3-3 Fire Prevention

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

2-3-4 Pacemakers

- Persons who use cardiac pacemakers or similar devices must not approach the machine. The laser welding machine generates magnetic fields that can interfere with the normal operation of pacemakers and similar devices.
- In any area that direct or indirect laser light could reach, install fences and signs to clearly separate it from other areas and take measures to keep everyone other than operators away.

2-4 Points of Caution During Use

2-4-1 Points of Caution for Operation

- At startup, turn on the power to the laser source only after the water temperature has reached the proper range.
- During processing, pay attention to the angle of the laser gun (torch). If the laser is emitted with the gun held perpendicular to the workpiece, the reflected laser can travel back into the laser gun and damage its internal components. Hold the laser gun at an angle of 30 to 45 degrees.
- Before emission, confirm that the laser beam path is correct. Misalignment of the beam path can cause damage to the nozzle and lenses.

2-4-2 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 leaks and air leaks.
- If the laser gun is overheating, stop processing immediately. The lens at the overheating point may be damaged. If you continue processing while the gun is overheating, in the worst case the laser source may be damaged. Damage to the laser source caused by continued use without replacing the lens is not covered by the warranty.
- If any abnormality occurs, such as a burning smell, unusual noise, abnormal heat, or smoke, turn off the power and contact us immediately. There is a risk of electric shock, fire, or other hazards.
- In the event of a short circuit or failure, confirm that there are no foreign objects — especially metal or conductive objects — inside the equipment.
- Do not use the machine when your clothing or body is wet, or in humid locations. If electrical components come into contact with water, electric shock or short circuits can result.
- After finishing processing and turning off the machine's power, cut off the power supply to the machine, for example by unplugging the power plug or switching off the external circuit breaker.
- Disassembly, repair, or modification by anyone other than a specialist is prohibited. Do not perform any disassembly beyond normal maintenance. Failures, electric shock, fire, or other problems arising from disassembly, repair, or modification are not covered by the warranty or repair service.

2-4-3 Lens Replacement

- Do not replace lenses in locations where dust or dirt is in the air.

- Do not replace lenses in locations exposed to wind or drafts.
- When removing a lens from the laser gun, cover the opening with masking tape or the top cap to prevent debris from getting inside.
- Before installing a lens in the laser gun, check that no dust or particles are adhering to the lens.

2-4-5 About Gas

- When using compressed air, install a dryer and a filter, and always use clean air from which oil and moisture have been removed.
- Supply the appropriate gas pressure. Insufficient gas pressure can cause damage to the lenses.

2-4-5 About the Water Chiller

At low temperatures

If the automatic water chiller's temperature display reads around 15°C or below, an error may occur. Leave the machine powered on and wait for a while. 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 starting laser processing.

At high temperatures

If the automatic water chiller's temperature display reads 35°C or above, an error may occur. Leave the machine powered on and wait for a while. 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 starting laser processing.

Replacing the cooling water

To prevent corrosion and freezing of the cooling water, it must be replaced regularly. For details, see Section 9-3, "Water Chiller Maintenance," in Chapter 9.

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," is in force. This is the Japanese Industrial Standards translation of IEC 60825-1, so compliance with this standard means the product meets a safety standard that is common worldwide. It specifies safety measures according to the wavelength and power of the laser, 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、瞬間的な輝くときは安全であるが、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

It is recommended that fiber laser welding machines be handled in compliance with the Japanese Industrial Standard "Safety of laser products (JIS C6802)." This standard was established to prevent injuries caused by laser equipment.

JIS C6802 classifies laser equipment according to its hazard level, and the LCW series falls under "Class 4," the highest hazard level. For the Class 4 models LCW-1500W-PRO / LCW-2000W-PRO / LCW-3000W-PRO, we recommend implementing the following safety measures.

- **Appointment of a safety officer:** Appoint a person with in-depth knowledge of laser equipment and laser beams as the safety officer, and thoroughly enforce injury prevention and product management.
- **Establishment of a controlled area:** Partition off the welding work area and mark it clearly with signs.
- **Wearing 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 equipment:** Perform pre-operation inspections and periodic inspections and adjustments.
- **Safety and health education:** Provide education and training to operators.
- **Keeping hazardous materials out:** Do not bring explosives or flammable substances into the welding work area.
- **Hazardous gases, dust, and similar:** Take the measures required under the Industrial Safety and Health Act.

In addition, the LCW-1500W-PRO / LCW-2000W-PRO / LCW-3000W-PRO incorporate the following safety features.

- Key control (the machine is controlled with a key)
- Continuity-based laser emission (the laser is not emitted unless the torch is in contact with the material)
- Warning labels affixed to the machine to alert users
- Ground-connection-based laser emission control (the laser is not emitted unless the ground clip is connected)

2-6 Disclaimer

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

Furthermore, we accept no responsibility for any of the following damages:

- Incidental damages arising from the use of this product or from defective parts
- Damages arising from failure to observe the safety measures and precautions described in "Chapter 2 — Safety Precautions" of this manual
- Damages caused by modification of this product, or by combining it with equipment or software in which we are not involved

Chapter 3 — Overview and Configuration

3-1 Overview of the Laser Welding Machine

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

3-1-1 Overview of the Main Unit

Overall view

- If the optional signal lamp has been added, it is mounted on the top of the machine.
- Depending on the production lot, some machines are not equipped with the indicator.



Rear view

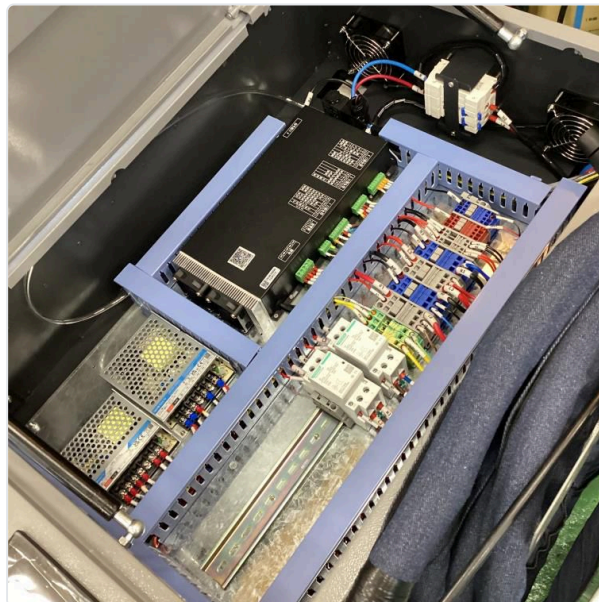
Note: Depending on the production lot, the gas pressure detection sensor may be mounted on the upper operation section.



3-2 Control Section

Opening the top door of the machine gives access to the laser unit, the water chiller, and the control section. Open this door only for maintenance; do not open or close it during normal processing.

To prevent danger, never perform processing with the door left open.



3-3 Main Unit Operation Section

The main unit operation section is located at the upper front of the main unit.



3-3-1 Power Key

Turns the power of the laser welding machine main unit ON and OFF.

Power OFF / Power ON

3-3-2 Gas Pressure Detection Sensor

This sensor detects whether the proper amount of gas is being supplied. The correct value is set at the factory before shipment. To prevent damage to the lens caused by insufficient gas pressure or forgetting to turn on the gas, the sensor triggers an alarm when the gas discharge pressure at the torch outlet falls to 0.06 MPa or below.

3-3-3 Laser Source Power Switch

Turns the power of the laser source ON and OFF. It lights up green when the power is on.

Note: Turn on the laser source power only after the water temperature has reached the appropriate level.

3-3-4 Emergency Stop Button

Press the emergency stop button if an abnormality occurs or a dangerous situation arises. While the emergency stop button is pressed, no power is supplied to the machine.

3-3-5 Operation Panel

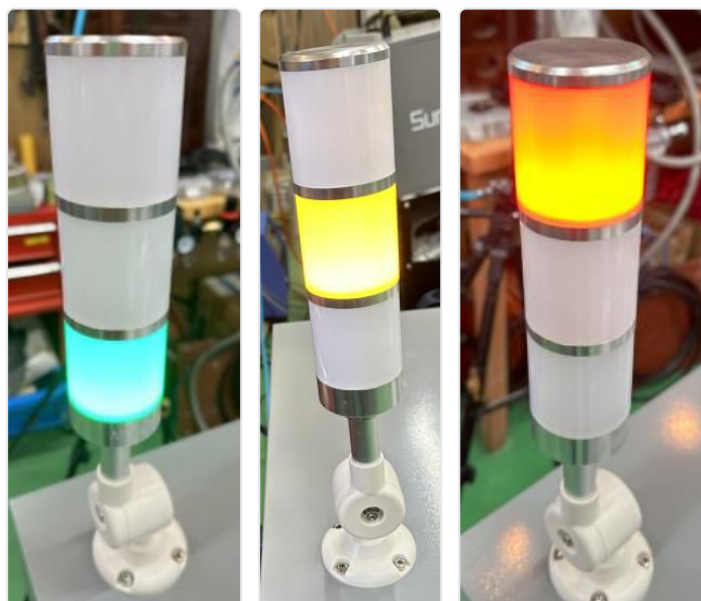
Refer to the "Settings — Operation Screen" section.



3-4 Top Section

3-4-1 Signal Lamp (Optional)

The signal lamp indicates the operating status of the laser machine main unit by color and sound.



- **Green — Standby:** The main unit power is on and no laser emission is taking place.
- **Yellow — Laser emission in progress:** The laser is being emitted.
- **Red — Alarm:** An abnormality has occurred. In this case, a warning sound is generated at the same time as the light. The warning sound continues until the alarm is cleared.

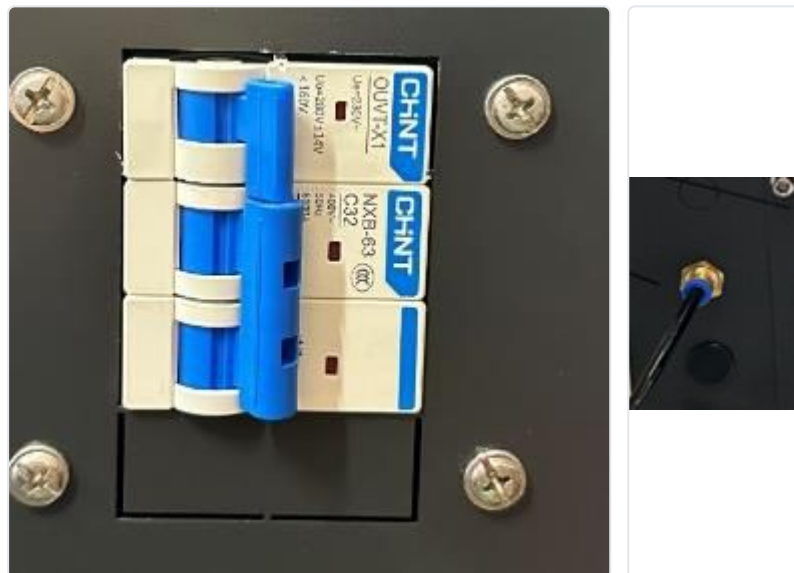
3-5 Rear Section

3-5-1 Breaker

The breaker is installed on the rear of the machine. Use it when turning the power ON and OFF. When turning the power OFF, always switch the breaker down as well.

3-5-2 Gas Connection Port

This is the gas connection port. Set and supply the gas pressure according to the processing mode and the thickness of the plate being welded.



3-6 Inside the Main Unit

3-6-1 Front

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



Laser source

This is the laser source. No operation of this unit is required.

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

Automatic water chiller

The automatic water chiller cools the laser gun and the laser source with water. The power of the water chiller is linked to the power of the machine.

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

3-6-2 Left and Right Doors

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



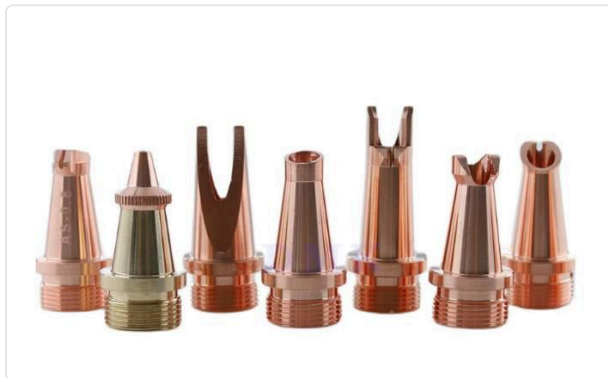
3-7 Laser Gun

The operator holds the laser gun in their hand and operates it when performing processing. 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.

When switching between welding mode, cutting mode, and cleaning mode, the component parts of the laser head must be changed.

- Welding
- Cutting
- Cleaning



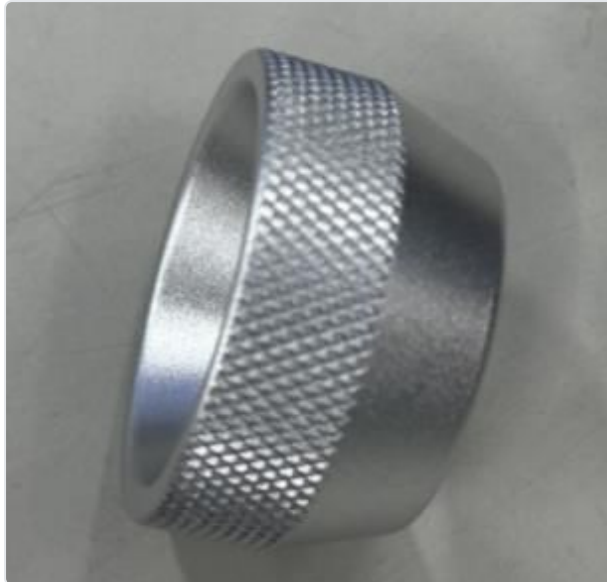
3-7-1 Nozzle

The nozzle is attached to the tip of the laser gun. It is a part that can be replaced according to the processing application. The nozzle to be attached differs depending on the processing mode (except cleaning). Nozzles are treated as consumables and must be replaced when worn out by long-term use. For details, refer to the "Nozzle" section.

3-7-2 Laser Head

The laser head is replaced according to the type of processing. Welding and cutting use the same laser head. Replacement is required when switching between welding or cutting and cleaning.

Welding / Cutting — Cleaning

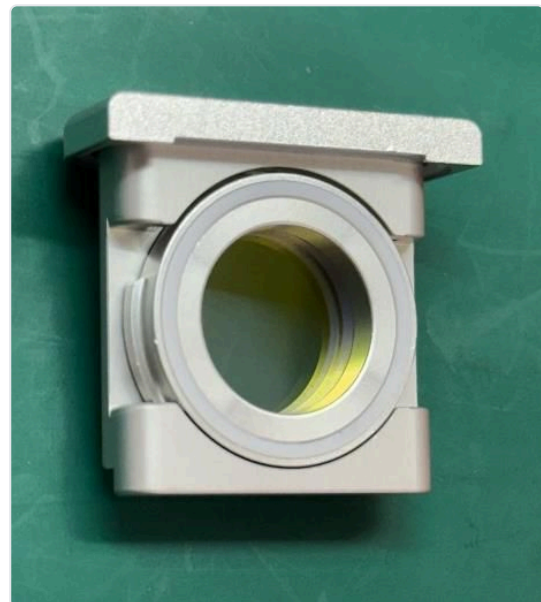


The laser head for welding and cutting is used with a nozzle attached to its tip. It is used to adjust the focal length and the direction of the nozzle.

The laser head for cleaning is trumpet-shaped, and no nozzle is attached to it.

3-7-3 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".



3-7-4 Focusing Lens

The focusing lens is housed inside the laser gun and can be removed. The focusing lens must be replaced when switching between welding/cutting mode and cleaning mode. For the lens replacement procedure, refer to "Chapter 8 — Consumables: Focusing Lens".

There are two different types of focusing lenses.

Focusing lens for welding and cutting

This focusing lens is used when performing welding or cutting.

The lens case is labeled "Focusing lens for welding". When replacing the lens, attach the focusing lens for welding and cutting.

Focusing lens for cleaning

This focusing lens is used when performing cleaning (rust removal).

The lens case is labeled "Focusing lens for cleaning". When replacing the lens, attach the focusing lens for cleaning.



3-7-5 Laser Emission Trigger

When the machine is in a state where laser emission is possible, pressing the trigger causes the laser to be emitted from the laser emission port (nozzle tip). Before pulling the trigger, always confirm that the laser gun is pointed at the workpiece.

Careless pressing of the laser emission trigger can lead directly to fire or accidents. Operate this button with the utmost care.

3-7-6 Earth Clamp

The earth clamp is part of the interlock function (safety function). In welding and cutting, laser emission becomes possible by connecting it to a location that is electrically continuous with the laser gun.

Laser emission becomes possible by connecting the clamp to a location that has electrical continuity with the workpiece. If the clamp is connected to a location with no continuity to the workpiece, or is left unconnected, the laser will not be emitted even if the laser emission trigger is pressed.



3-8 Accessories

3-8-1 Wire Feeder

Overview

The wire feeder is a device that automatically supplies welding wire when performing welding. When welding without filler wire (autogenous welding), stop the wire supply.

Note: The wire feeder is not included if the double-wire option was selected at the time of purchase.

Included accessories

A complete set of wire-related accessories is contained inside the wire feeder.

- Wire tube, 5 m
- Rollers 0.8/1.0 mm (the 1.2/1.6 mm rollers are already installed in the feed unit)
- Wrenches, 2 types

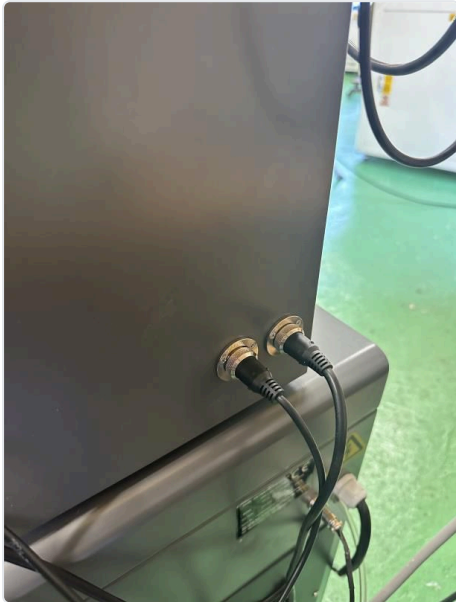


- Pipes, 2 types

- Hex wrenches, 2 types
- Wire nozzles, 1 set

Connection to the laser welding machine main unit

A power cable and a signal cable come out of the rear of the wire feeder. For the feeder to operate, both of these cables must be connected.

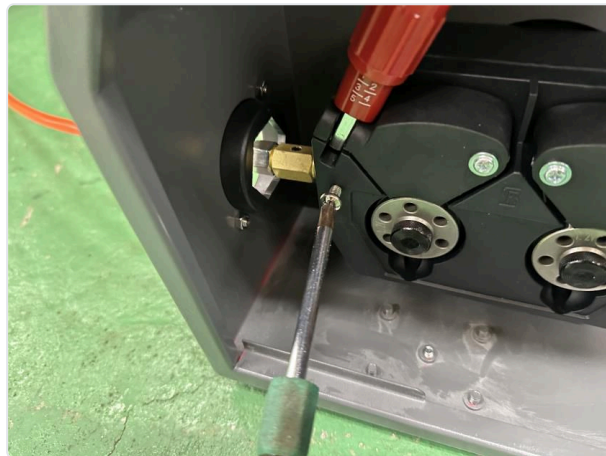
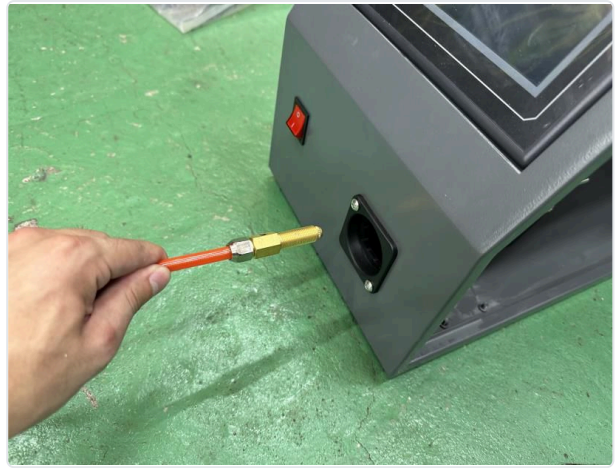


How to install the wire

First, connect the wire tube to the wire feeder.

Connect the part with the shape shown in the photo to the wire feeder.

To attach it, tighten the Phillips screw.



Next, attach the roller that matches the diameter of the wire to be installed.

Two rollers are provided: "0.8/1.0" and "1.2/1.6".



For the welding wire attached to the wire feeder, use solid wire on a reel.

Do not use flux-cored wire. It will damage the lens.

About welding wire sizes

Usable welding wire diameters are $\phi 0.8$ to 1.6 mm.

The wire size used generally increases as the workpiece becomes larger. When processing thin material of about 1 mm, we recommend starting with the smallest size, 0.8 mm.

The wire mounting section is fitted with a spacer for 5 kg wire reels. When mounting a 20 kg reel, remove the spacer.

Attach the wire.



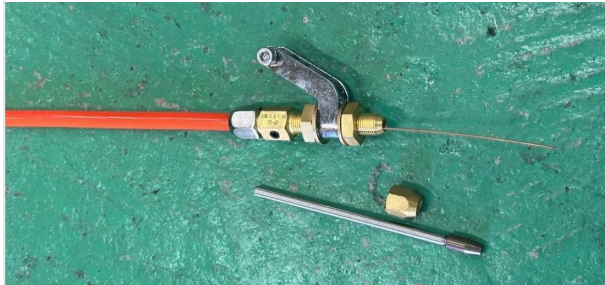
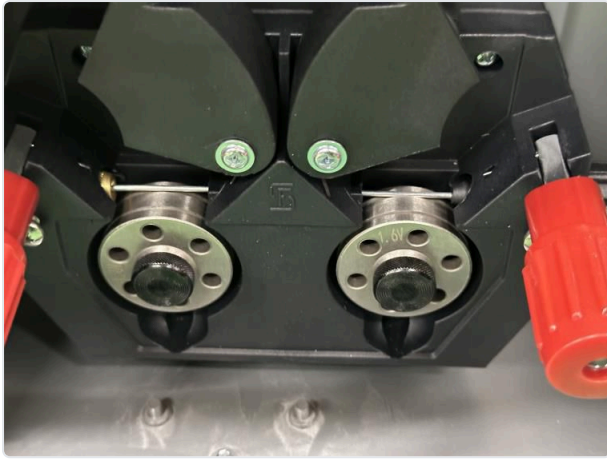
When a stiff wire is attached, the wire reel may spin freely. Tighten the hex screw at the part circled in red to adjust the spring tension. Tightening is particularly necessary when using stiff wire of 1.6 mm or larger.

Fit the wire into the groove and feed it in until it enters the wire tube.

Tighten the red handle to secure the wire. At this time, adjust the pressure according to the wire diameter so that the wire does not slip. The thinner the wire, the more tightening is required (the larger the setting value).

Guideline: wire diameter 1.0 mm or less: 1–2 / wire diameter 1.0/1.2 mm: 2–3 / wire diameter 1.6 mm or more: 3 or higher.

When feeding the wire, remove the pipe at the tip section before feeding.



Next, press "manual wire feed" to feed the wire until it reaches the tip of the wire tube.

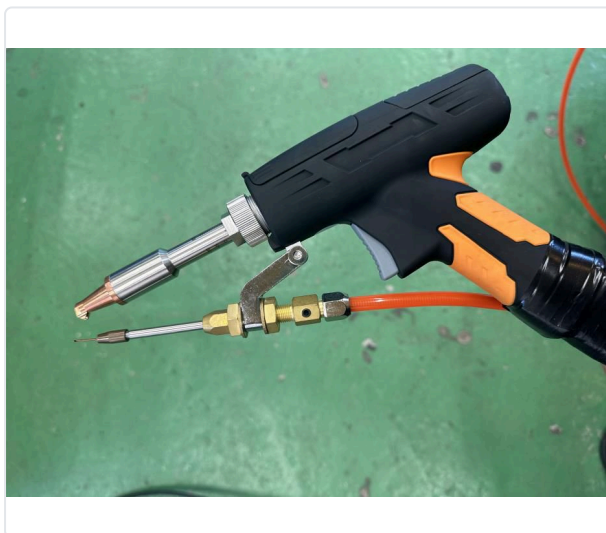
Once you have fed the wire out beyond the length of the pipe, attach the pipe.

Attach the wire nozzle that matches the wire diameter. If the hole diameter of the wire nozzle does not match the diameter of the welding wire, the wire feeder will not operate properly.



Attach the wire tube to the laser gun.

Keep the gap between the wire nozzle and the nozzle as narrow as possible. If the gap is too wide, the welding wire will come out of the nozzle guide (groove) during welding and the weld will become unstable.



Eliminate the gap between the nozzles.

3-8-2 Double Wire Feeder (optional)

Overview

The double wire feeder is an optional item. It feeds two welding wires at the same time, making welds with a long leg length possible. You can also feed wire on one side only and use it as a single feeder.

Note: The color of the wire feeder may differ depending on the production period.

Accessories

A complete set of wire-related accessories is packed inside the wire feeder.

For single use (1-wire feeding)

- Wire tube, 5 m
- Rollers 0.8/1.0 mm (the 1.2/1.6 mm rollers are already installed in the feed unit)
- Wrenches, 2 types



- Pipes, 2 types

- Hex wrenches, 2 types
- Wire nozzle, 1 set

For double use (2-wire feeding)

- Wire tube, 5 m
- Rollers 0.8/1.0 mm (the 1.2/1.6 mm rollers are already installed in the feed unit)
- Wrenches, 2 types
- Wire fixing brackets: 1 pc for $\Phi 1.2$, 1 pc for $\Phi 1.6$, 1 pc for $\Phi 2.0$
- Welding nozzles: AS-12D 2 pcs, AS-16D 2 pcs, AS-20D 2 pcs
- Adapter (not used)

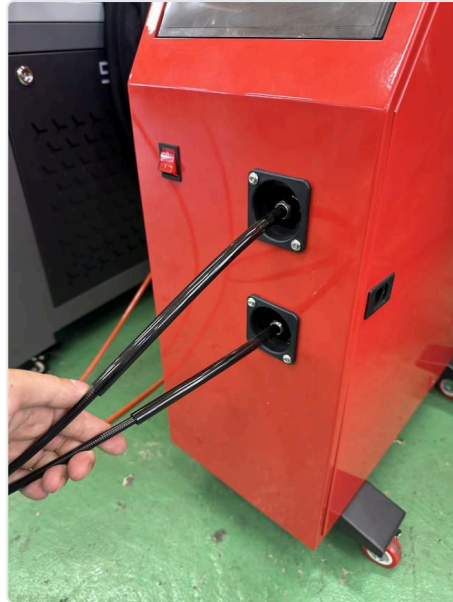
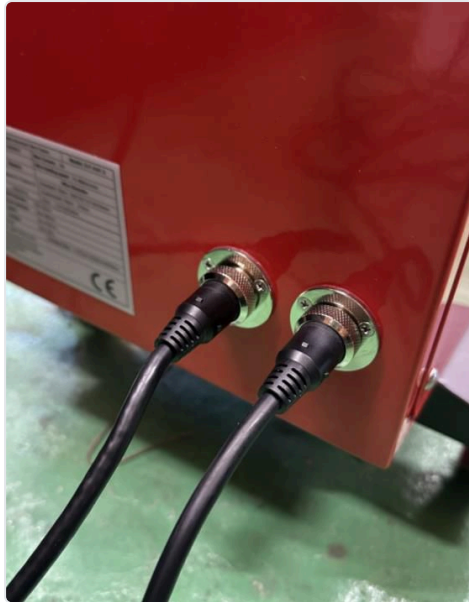




Connection

To connect the wire feeder, there are a signal cable and a power cable that connect to the laser welding machine body.

Connect the signal cable and the power cable to the main unit (200 V power, signal cable).



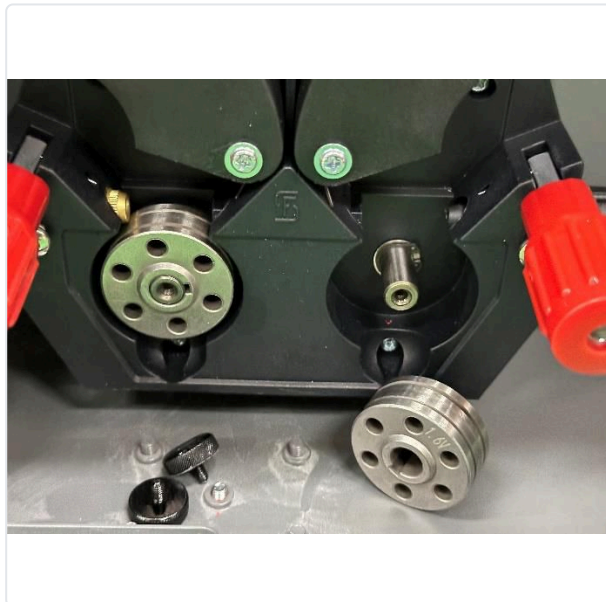
Installing the wire

First, connect the wire tube. It splits into two tubes at the tip.

To connect it, tighten the Phillips screws to secure it in place.

Next, install the rollers that match the diameter of the wire you are going to use.

Two rollers are available: "1.2/1.6" and "2.0/2.5".



Use solid welding wire on a reel as the wire loaded into the wire feeder.

Do not use flux-cored wire. It will damage the lens.

About welding wire sizes: the usable welding wire diameters in double-wire operation are $\Phi 1.2$ to 2.0 . As a rule, the larger the workpiece, the larger the wire size used.

The wire mounting shaft is fitted with a spacer for 5KG wire reels. Remove the spacer when mounting a 20KG reel.

Mount the wire reel as shown in the photo.

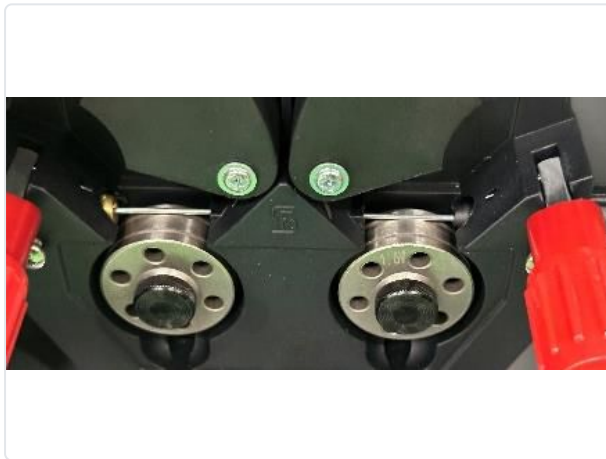


When a stiff wire is installed, the wire reel may spin freely. Tighten the hex screw at the part circled in red to adjust the spring tension. This adjustment is especially necessary when using wire of 1.6 mm or larger.

Fit the wire into the groove and insert it until it enters the wire tube.

Tighten the red handle to hold the wire in place. At this point, adjust the pressure according to the wire diameter so that the wire does not slip. The thinner the wire, the more tightening is required (the larger the setting value).

Guideline: wire diameter 1.0 mm or less: 1–2; wire diameter 1.0/1.2 mm: 2–3; wire diameter 1.6 mm or more: 3 or higher.



After mounting the wire, feed the wire through. Before feeding, remove the wire tube and the fixing bracket at the tip. The double-use wire fixing brackets come in two different lengths. For the 1500/2000W,

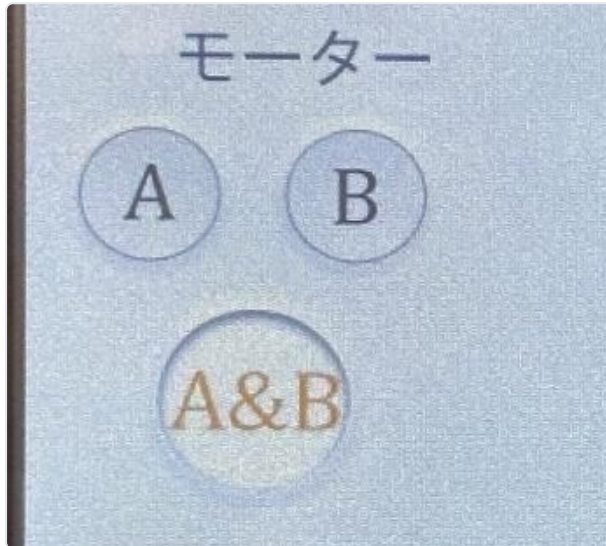
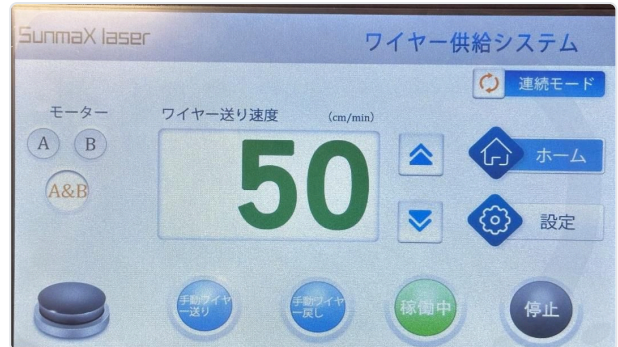
use the shorter bracket.



Loosen the set screws at 2 points. (Brackets: for 3000W / for 1500/2000W)

Once the wire tube is secured to the wire fixing bracket, confirm that the selected motor is set to A&B.

Next, press "manual wire feed" and feed the wire until it reaches the tip of the wire tube.



Select A&B. Press and hold the button to feed the wire.

When the wire comes out, attach the wire tube to the fixing bracket.

Attach the wire nozzle that matches the wire diameter. If the hole diameter of the wire nozzle does not match the diameter of the welding wire, the wire feeder will not operate properly.

Adjust the mounting position so that the wire sits firmly in the groove of the nozzle.

Note: The mounting position must be adjusted according to the focal length.

Note: The photos show the 3000W type.



Tighten the set screws at 2 points. Tighten the set screw — by tightening the set screw you can adjust the length of the mounting position.

Using the double wire feeder as a single feeder

There are two methods: install the single-use wire tube and use the unit as a single feeder, or keep the double-wire fixing bracket installed and feed only one wire to weld in single-wire mode.

Method 1: welding with the single-wire fixing bracket installed

Attach the single-use wire tube to either A or B (top or bottom) of the double wire feeder.

After attaching the wire tube, load the wire at the position where you attached it.

For single use, the "0.8/1.0" and "1.2/1.6" rollers can be installed.



When feeding the wire, remove the pipe at the tip section before feeding.

Next, select the motor for the side you attached the wire to, then press "manual wire feed" and feed the wire until it reaches the tip of the wire tube. If you attached it to A (top), select motor A; if you attached it to B (bottom), select motor B.

- Selecting A feeds the upper wire.
- Selecting B feeds the lower wire.

Once the wire has been fed out beyond the length of the pipe, reattach the pipe.



Attach the wire nozzle that matches the wire diameter. If the hole diameter of the wire nozzle does not match the diameter of the welding wire, the wire feeder will not operate properly.

Attach the wire tube to the laser gun.

Keep the gap between the wire nozzle and the nozzle as narrow as possible. If the gap is too wide, the welding wire will come out of the nozzle guide (groove) during welding and the weld will become unstable.



Method 2: single-wire welding with the double-wire fixing bracket installed

Use motor A or B to specify whether the upper or lower wire is fed.

- Selecting A feeds the upper wire.
- Selecting B feeds the lower wire.

After selecting one of them, attach the single-use nozzle and perform welding.



3-8-3 Tool Box

The accessories supplied in the tool box are as follows.

- Welding and cutting nozzles, 1 set
- Protection lenses, 5 pcs
- Cleaning kit, 1 set
- Power keys, 2 pcs
- Laser safety glasses, 2 pcs
- Air hose, 1 pc
- Hex wrenches, 1 set

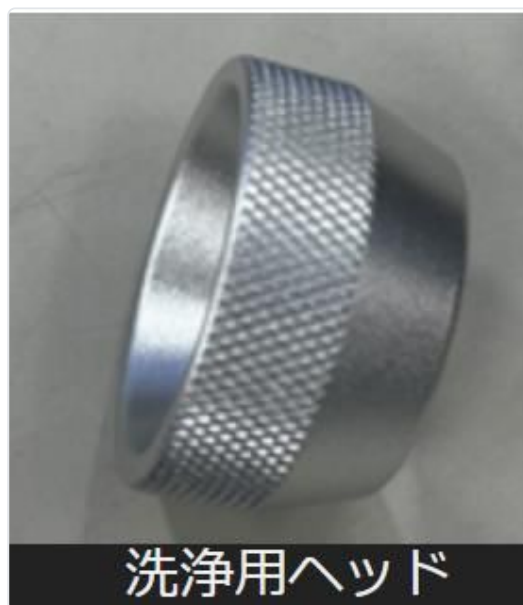


標準ノズルセット

- ・ AS-12
- ・ ES-12
- ・ CS-12
- ・ BS-16
- ・ FS-16
- ・ Cタイプ
- ・ CTタイプ
- ・ AS-20D(ダブルワイヤー用)



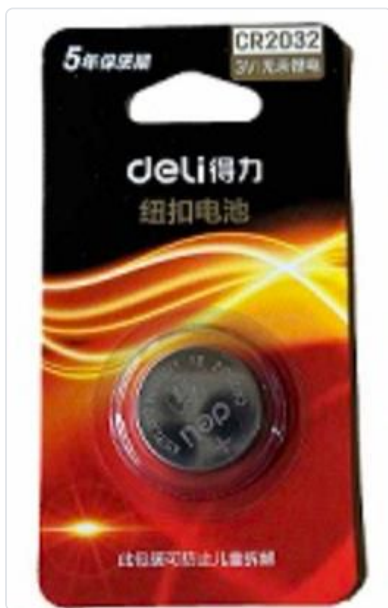
洗浄用焦点レンズ



洗浄用ヘッド



- Laser cable protection cap, 1 pc
- Cotton swabs for lens cleaning, 100 pcs
- Battery for the controller, 1 pc
- Case
- Laser gun holder, 1 pc
- Lens cleaner
- USB drive (user manual)
- Door lock key
- Blower





3-7 Automatic Water Chiller

The automatic water chiller is built into the main unit. In normal use, there is no need to operate the water chiller.

Do not operate the machine at a room temperature of 0°C or below.

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

Chapter 4 — Processing Procedure

4-1 Startup and Shutdown

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

4-1-1 Startup

Start the laser processing machine using the following procedure.

1. Before startup, always check the following:
 - Confirm that supply voltage is being provided to the power cable of the laser processing machine.
2. Turn on the breaker on the rear of the machine.

If the breaker will not stay in the ON position, power may not be supplied correctly.

3. Supply the assist gas.

For the gas type and supply rate, refer to the "Injection Gas" section. The machine cannot be used at pressures of 0.15 MPa or below.

Usable gases	Nitrogen / Argon / Clean air / Oxygen
Gas pressure	0.15–0.8 MPa



4. Turn the power key to the right. When the power is turned on, the monitor starts up and the water chiller begins running automatically.

If the power does not come on, the emergency stop button may have been pressed.

Power OFF / Power ON



5. Open the front door and check the water temperature.

Check the digital readout. The upper row shows the current water temperature. The machine must warm up or cool down until this temperature reaches the proper range. (If the power is left on, the water will reach the proper temperature automatically.)

Check the value in the upper row! In the photo shown, you must wait until the temperature reaches 20°C.

6. Once the water temperature is within the proper range, turn on the laser source switch.



7. On the operation panel, set "Laser Emission ON/OFF" to ON.

The laser welding machine is now ready to emit the laser.

Proper water temperature: 20°C to 30°C

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

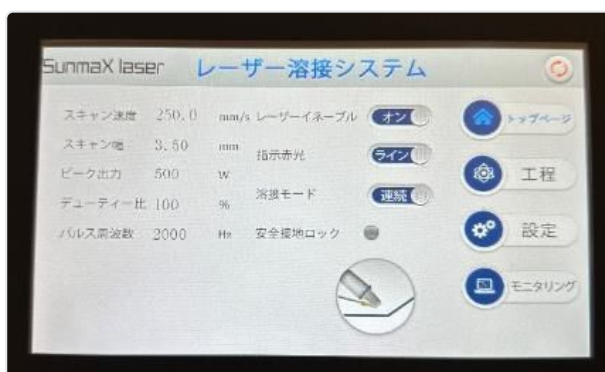
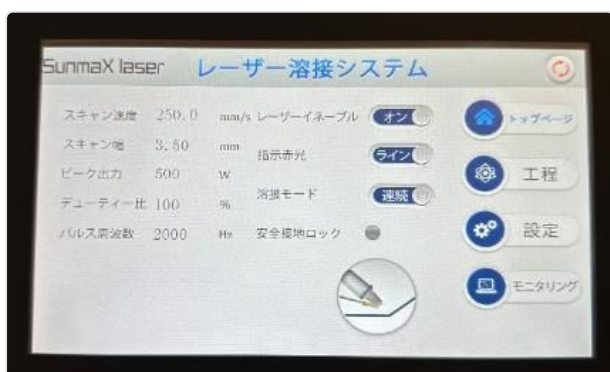
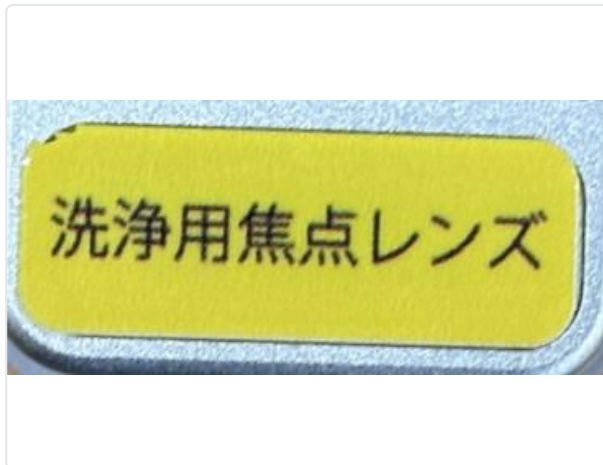
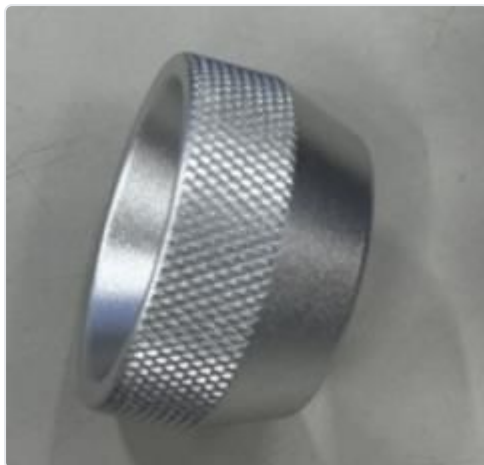
If the water temperature is below 20°C, warm-up time is required; if it is above 30°C, cooling time is required. As long as the water chiller is powered on, it warms up or cools down automatically.

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

4-1-2 Processing Modes

Depending on the processing mode you want to use, the laser gun configuration and settings differ as shown in the table below.

	Welding mode	Cutting mode	Cleaning mode
Processing mode on the operation panel	Welding/cutting mode	Welding/cutting mode	Cleaning mode
Parts connected to the laser gun	Laser head for welding/cutting + wire tube	Laser head for welding/cutting	Laser head for cleaning
Focusing lens	Focusing lens for welding/cutting	Focusing lens for welding/cutting	Focusing lens for cleaning
Nozzle	Welding nozzle	Cutting nozzle	None
Wire feeder	Used	Not used	Not used





4-1-3 Laser Processing Procedure

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

For Welding

Procedure up to welding:

Caution

The operator must always wear laser safety glasses, a dust mask, and protective equipment while working.

During welding, strong reflected light may occur depending on the material and the focal length. Never expose your face or hands beyond the nozzle.

1. Confirm that the laser gun is configured for "welding mode". Confirm that the focusing lens installed is the one "for welding/cutting".



When replacing the lens, any dust that has entered the inside of the cover may contaminate the lens. Remove it with an air duster or similar tool! If you replace the lens while dust is present, the lens will be damaged. Always replace the lens so that no dust adheres to the inside of the laser gun or to the lens. Remove any dust inside the cover!

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

Checking the gas pressure

- Single wire: 0.15–0.25 MPa / Double/triple wire: 0.2–0.3 MPa
- For materials that generate a lot of fume, such as mill scale or plated materials, weld with a higher gas pressure.
- For aluminum, use the maximum of the recommended gas pressure range above.

Gas types

Nitrogen and argon. We recommend using nitrogen when welding steel and stainless steel, and argon when welding aluminum. When using an argon gas regulator, use a flow rate of 15 L/min or more.

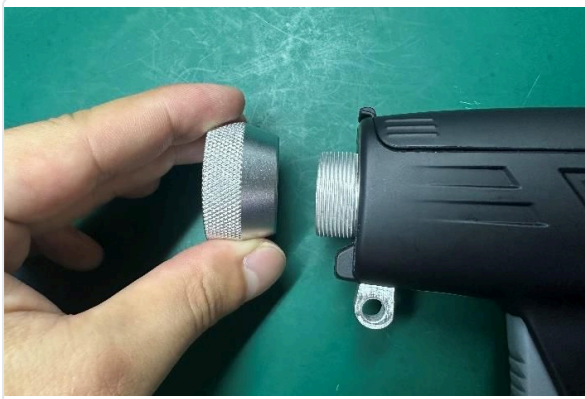
Checking the laser beam path

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

Beam path correct / Beam path incorrect

Finally, attach the pipe, then attach the nozzle and the wire nozzle according to the welding job and the welding wire diameter. For the nozzle types, refer to "Chapter 8 — Consumables (Nozzles)".

Tighten the set screw.



Confirm that the nozzle and the wire nozzle are mounted straight (vertically). If they are mounted at an angle, the wire will be off-center and the bead may not be uniform.

2. Adjust the focal length to match the material being welded. This is set by the length of the pipe at the tip of the laser gun. Numbers are engraved on the pipe; the values differ between steel/stainless steel and aluminum.

If the focus is incorrect, the laser will scatter without penetrating the material. If you continue welding with the focus off, the lens may be damaged. Refer to "Chapter 7 — Focusing".

Aluminum, copper, and similar materials have high reflectivity — work with particular caution! For aluminum welding, the focus is correct at the position where the sparks turn green.

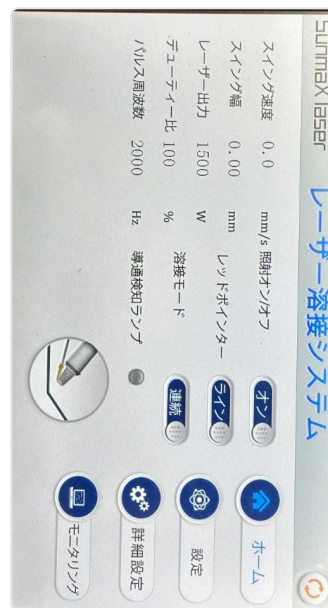
Reference values (with wire): steel/stainless steel = 0; aluminum = 0 to -3.

- These are reference values only. The focus position at which the material melts in may differ depending on the material. As a rule, adjust the focus for each material you want to weld.
- When welding without wire, adjust to a more positive (+) value than when using wire.



3. Adjust the gas pressure.

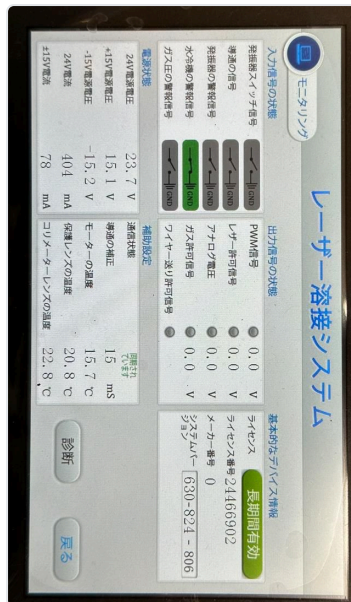
When using a gas pressure gauge, adjust the pressure using the welding settings table as a reference. In general, as the laser power increases, the gas pressure increases. Adjustment range: 0.15–0.25 MPa.



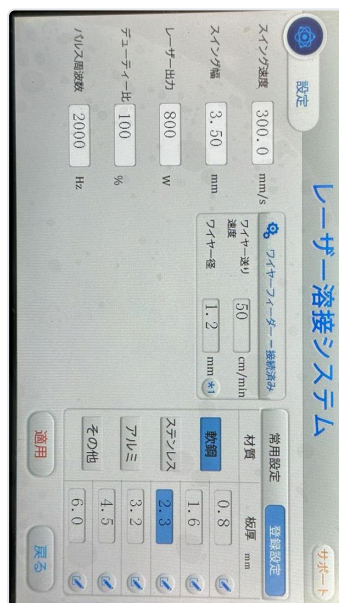
When using a flow meter, the following operation is required. When using an argon gas flow meter, for example for aluminum welding, you need to adjust the flow rate while referring to the pressure gauge on the rear of the machine.

1. Touch "Monitoring" on the operation panel.
2. Touch "Diagnosis".
3. Turn on "Gas Enable".
4. Check the pressure reading on the gas detector on the rear of the machine, and set the pressure to a value above 0.06 MPa.

Gas pressure: 0.06–0.2 MPa



4. The operation panel must be set to "Laser Welding System".
5. Open "Settings" and configure the settings according to the plate thickness to be welded.
6. If required, set the welding wire in the wire feeder. For the installation method, refer to the wire installation section.



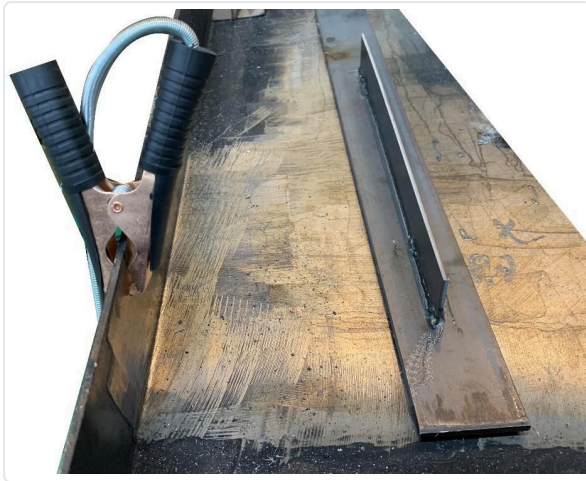
7. Before starting processing, confirm that you are wearing laser safety glasses and a dust mask, and that no one is near the emission port of the laser gun (no one in front of the gun).
8. Attach the earth clip to a point that is electrically continuous with the welding material. Note: anodized aluminum (alumite) is not conductive.

The earth clip acts as a safety device that prevents unintended laser emission. The laser is emitted only when there is electrical continuity between the laser gun nozzle and the earth clip. Therefore, if the earth clip is electrically open, or there is no continuity with the workpiece, the laser will not be emitted.

If the worktable is metal and is electrically continuous with the workpiece, attach the earth clip to the worktable.

If there is no continuity between the worktable and the workpiece, attach the clip directly to the workpiece.

Earth clip / Workpiece / Worktable (welding table)

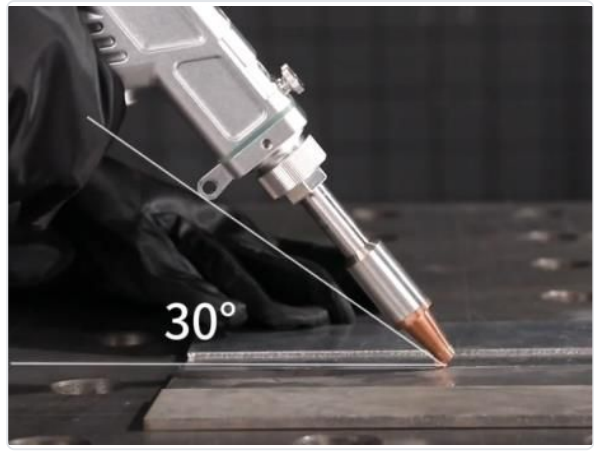


9. Place the nozzle of the laser gun against the workpiece and press the laser emission button. The laser is emitted and welding becomes possible.

If you weld perpendicular to the workpiece (90 degrees), the reflected laser light can damage the lenses inside the laser gun and, in the worst case, the laser source. The welding angle should be approximately 30–40 degrees.

The penetration direction changes with the angle of the torch (laser gun). For butt welding, weld with the gun aimed perpendicular to the joint, but take care when performing fillet welding. The strength of a laser weld comes from penetration; against the 90-degree corner, aim at 30 degrees when welding.

Welded at a 30-degree tilt / Welded at a 45-degree tilt



- When you temporarily take your hand off the laser gun and set it down, for example while exchanging workpieces, place the laser gun where there is no electrical continuity with the earth clip. If you interrupt processing and temporarily leave the workstation for any reason, turn laser emission OFF (or shut the machine down).
- Do not perform work that passes electric current, such as arc welding, at the same worksite.

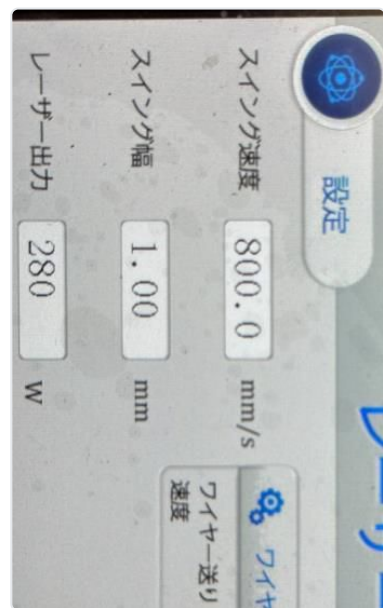
Visually check the condition of the weld while welding. If the protection lens is damaged or the focus is off, no sparks will be generated at all. If a flame is visible near the nozzle, the protection lens may be broken or the focus may have shifted. The sound during welding also changes: when the lens and focus are normal, the spark sound is loud; when the lens is damaged or the focus is off, the sound becomes dull.

If welding fume adheres to the lens, the laser is attenuated. In that case, remove it using IPA (99% alcohol) and lens-cleaning cotton swabs.



Welding Without Wire

Autogenous (fusion) welding without wire is performed with a dedicated nozzle attached.



The settings that differ significantly from welding with wire are the swing speed and swing width values. Since welding without wire is relatively fast, the swing speed value must be increased. Because there is no

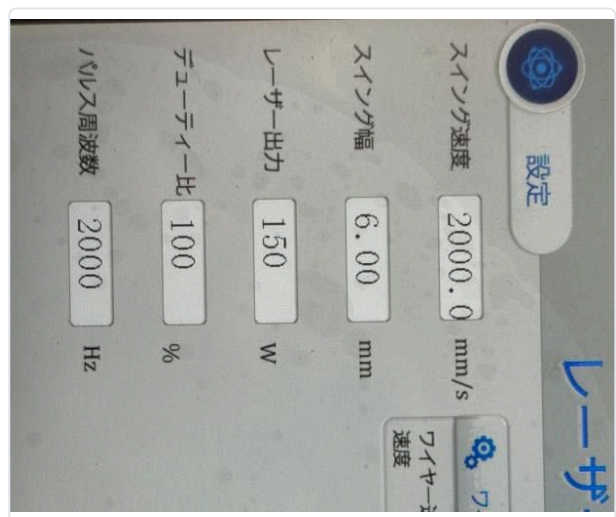
wire, the swing width must also be narrowed. The thinner the sheet, the higher the swing speed value and the lower the swing width value.

- With the autogenous welding nozzle, there is no need to change the focal length from the setting used for welding with wire.
- When welding with a nozzle other than the autogenous welding nozzle, the focal length changes, so adjustment is required.
- Recommended swing speed: 400–1000 (a lower value is recommended for aluminum)
- Recommended swing width: 1–3 mm

In autogenous welding, unlike when using wire, the welder must maintain the travel speed by hand. If you want to weld in a straight line, using a guide makes the work easier.

Burn Mark (Heat Tint) Removal

By reducing the laser power and emitting the laser over the burn marks, you can remove surface deposits and heat tint.



Adjust the parameter values.

- Since no wire is used for burn mark removal, remove the wire feed section and attach the autogenous welding nozzle or the double-wire nozzle before starting.
- Swing speed: use a speed of 1000–2000.
- Swing width: the available width depends on the type of nozzle attached. With the autogenous welding nozzle the emission width can be set up to a maximum of 6 mm; with the double-wire nozzle,

up to a maximum of 8 mm.

- Laser power: use a range of 150–300 W. For heavier burn marks, increase the power.

Problems During Welding

The nozzle or pipe overheats

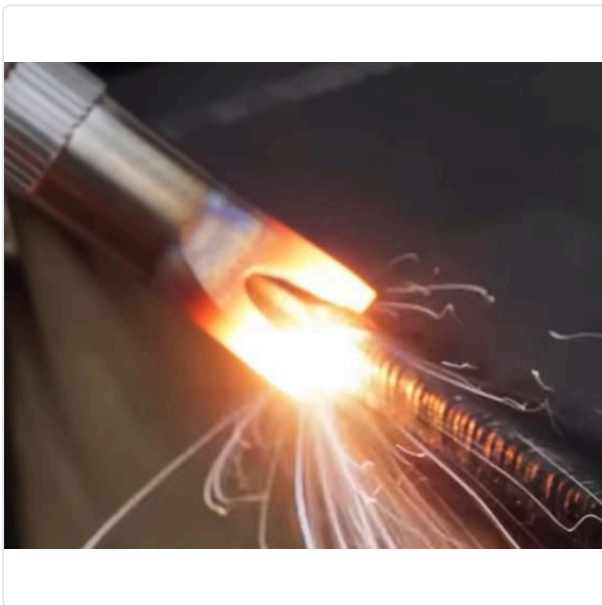
Check whether the red pointer is touching the nozzle. If the red pointer is touching the nozzle, the laser beam path is off and the laser is striking the nozzle or cylinder — this condition is abnormal. Stop processing immediately and adjust the beam path.

Apply masking tape to the nozzle and check the laser beam path.

- If the beam path is off to the left or right, adjust the value in "Advanced Settings" → "Beam Path Adjustment".
- If the beam path is off vertically, refer to "Chapter 7 — Laser Gun Adjustment" and perform the adjustment.

The figure below shows an actual example.

Beam path correct / Beam path incorrect

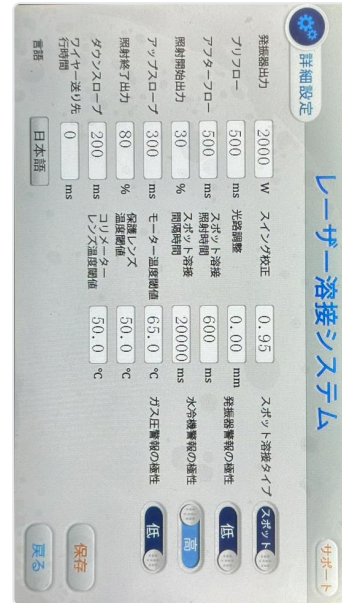


In this example the laser is striking the nozzle itself and the nozzle has deformed. If the nozzle glows red, the beam path is off. If you continue to use the machine with the beam path off, the lens will be damaged, so take care.

The wire does not separate cleanly

1. Because the wire feed section is integrated with the hand torch, the laser must be striking the wire when you separate it at the end of a weld. As a guide, pull the gun toward yourself while raising it

A close-up photograph of a laser cutting head. The head is made of polished metal and has a copper-colored nozzle at the bottom. A bright red laser line is visible, extending from the nozzle and hitting a metal plate. The metal plate has a mottled, greyish-green surface. The background is blurred, showing some industrial equipment.

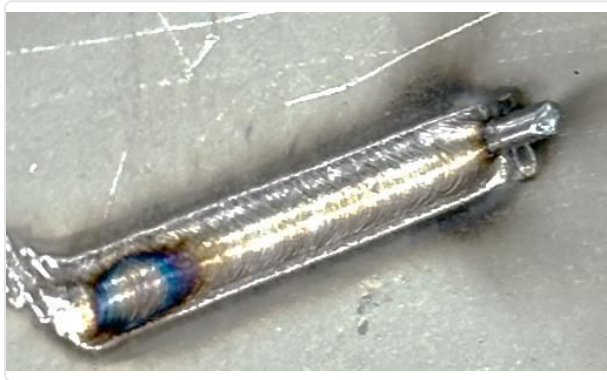
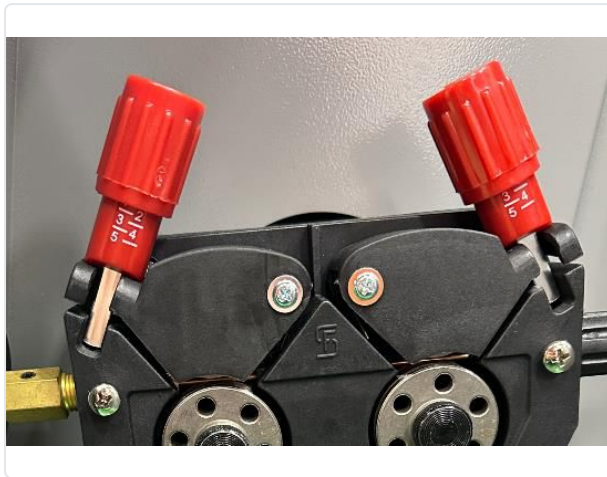


The wire may be slipping (the feed roller spinning without gripping). Adjust the wire clamping force.

Guide: wire diameter 1.0 mm or less = 1 to 2 or less; wire diameter 1.0 mm/1.2 mm = 2 to 3; wire diameter 1.3 mm or more = 3 or more.

- Also check that the fixing point of the wire tube is not interfering with the feed roller.

- Placing the wire feeder in a higher position can also improve the situation, making the wire feed easier to feel and smoother.



Preventing wire from remaining at the weld start point

If the wire is ahead of the red pointer (the laser emission point) when welding starts, wire may remain at the weld start point. In that case, you can prevent this by adjusting the "Retract" value in the wire feeder settings.

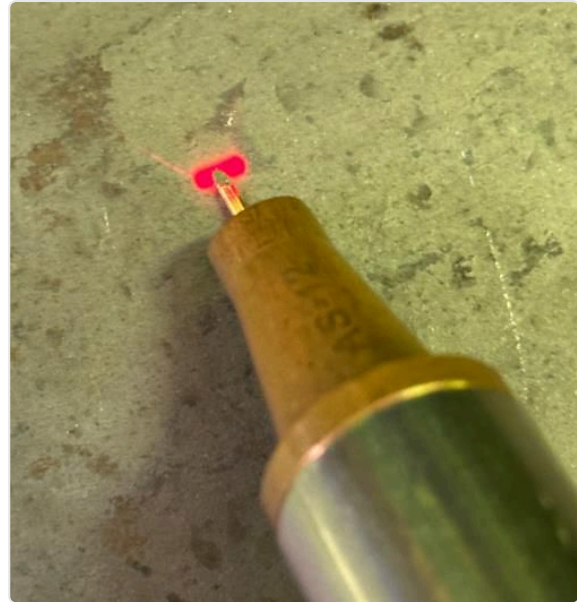
The red pointer is not centered on the wire

If the red pointer (guide beam) is not striking the center of the wire, the weld will be biased to the left or right. Note: pay careful attention to the laser beam path, and adjust to a position where the red pointer does not strike the nozzle.

Correct the value in "Advanced Settings" → "Password: 123456" → "Beam Path Adjustment".

- Entering a negative value adjusts the beam to the left.
- Entering a positive value adjusts the beam to the right.

Note: the beam path is not updated unless you press Save.



レーザー溶接システム

詳細設定

リセット

発振器出力	2000	W	スインッチ校正	0.95	mm	スボット溶接タイマ	スボット
フィードロー	500	ms	光路調整	0.00	mm	発振器電源の感度	低
フィードロー	500	ms	スボット溶接	600	ms	水冷機電源の感度	高
照射開始出力	30	%	照射時間	20000	ms	ガス圧警報の感度	低
フィードロー	300	ms	モーター温度増値	65.0	°C		
照射終了出力	80	%	冷却機温度	50.0	°C		
フィードロー	200	ms	コンタクト	50.0	°C		
フィードロー	0	ms	フィードロー				

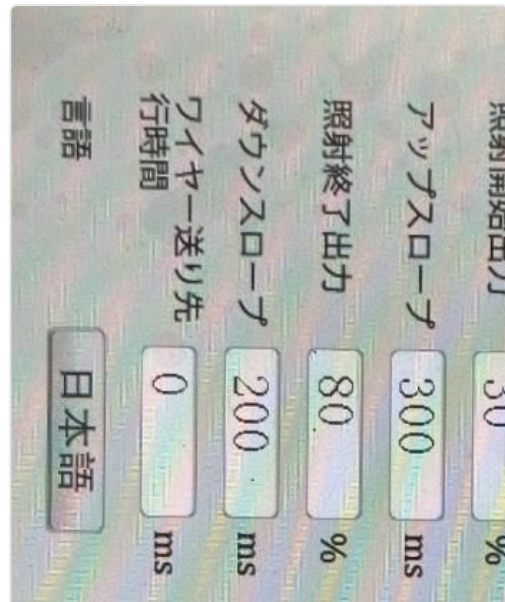
言語 日本語

戻る 保存

Preventing oxidation at the weld end

Set a feed delay value in the wire feeder settings. At the end of a weld, the wire can block the shielding gas. By setting a wire feed delay, the after-flow gas can be applied to the end of the weld.

Setting value: minimum 200 ms



Craters

If craters occur at the end of laser welding, increase the down-slope value in Advanced Settings. If you release the laser emission button while continuity is maintained at the end of the weld, the laser can be stopped gradually. Craters can be especially pronounced when welding aluminum, so we recommend configuring the down-slope setting.

Oxide entrapment in aluminum welding

The focal length may be incorrect, the laser beam path may be off, or the lens may be in poor condition. Try focal length settings in the range of 0 to -3. The position where the sparks turn green and the material melts in is the correct focal length. If there is no improvement, the beam path may be off or the protection lens may be damaged.

Note: depending on the type and condition of the base material, the sparks may not glow green. In that case, check whether an oxide film adheres to the edges of the weld bead.

If excessive spatter occurs when welding galvanized material

This phenomenon occurs mainly when the heat input is excessive. Adjust the welding conditions according to the following procedure.

1. Use the setting values for mild steel listed in the settings table as the baseline.
2. Set the swing speed to +100, set the gas pressure higher, and perform the weld.
3. If the molten metal still appears to boil even under the above conditions, lower the output and weld again.

If protection lens consumption is high

Protection lens wear can become comparatively high when welding materials with black scale (mill scale) or galvanized coatings, or when performing continuous fillet welding. Adjust the welding conditions according to the following procedure.

1. Install a nozzle with a built-in protective shield. Installing a shielded nozzle reduces wear on the protection lens. (Shielded nozzles are sold separately.)
2. Increase the gas pressure / flow rate. Gas consumption will increase, but consumption of the protection lens can be reduced.



Left: with appropriate setting values. Right: with inappropriate setting values.

Cutting

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

Checking the gas pressure

- Gas pressure: 0.4–0.8 MPa
- Gas type: clean air (must be completely free of moisture and oil), nitrogen, or oxygen (steel only)

Checking the laser beam path

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

Caution: The laser penetrates through the base material. Pay careful attention to where the penetrating beam will strike. Shield the far side of the beam with a steel plate, backing plate, or similar.

The operator must always wear laser safety glasses, a dust mask, and protective equipment while working.



Left: beam path correctly aligned. Right: beam path misaligned.

Cutting procedure

1. Confirm that the laser gun is in cutting mode.

Confirm that the focusing lens installed is the “welding focusing lens”. (Cutting mode uses the same focusing lens as welding.)

When replacing the lens, any dust that has entered the inside of the cover may contaminate the optics. Remove it with an air duster or similar before replacement. Replacing the lens while dust is present will damage the lens. Always make sure that no dust adheres to the inside of the laser gun or to the lens during replacement.

Confirm that a cutting nozzle is attached to the tip of the laser gun. To switch from cleaning mode to cutting mode, follow the steps shown in the figure below.



Remove any dust inside the cover!



Attach the cutting nozzle and pipe to complete the setup.

2. Turn off the power of the wire feeder. If the power is left on, welding wire will be fed during laser emission. (Turn off the wire feeder power; tighten the set screw.)

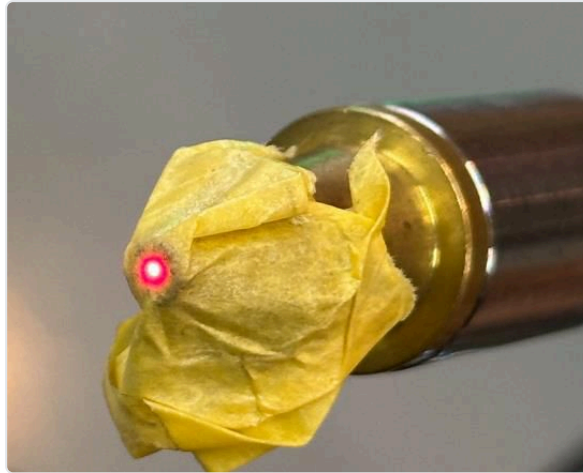
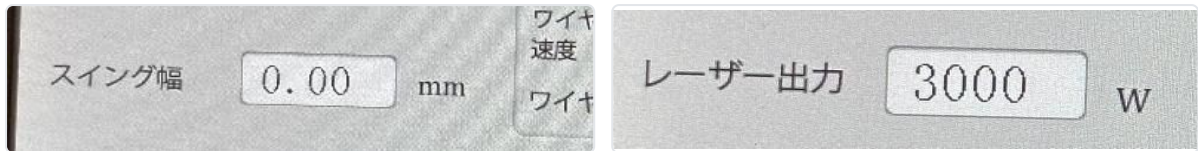
3. The control panel must be set to "Laser welding system".

4. Open "Settings" and set the "Swing width" value to 0.

If a swing width value is entered, the laser will strike the nozzle. Continuing to use the machine with the swing width set above 0 will lead to damage to the nozzle and the lens.

5. Specify the laser output. High output is normally not a problem, but at high output the beam that penetrates the base material becomes powerful, so a backing plate must be considered. If the output is too strong, reduce it.

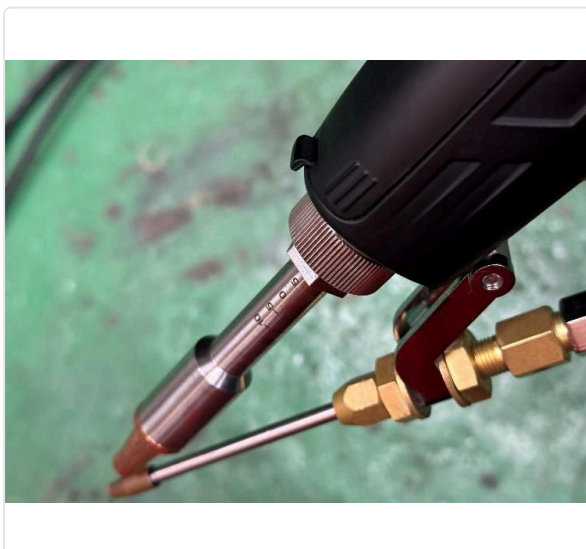
6. Attach masking tape to the tip of the cutting nozzle and confirm that the red pointer falls at the center of the hole. If it is not centered, adjust the beam path.



Left: beam path correctly aligned. Right: beam path misaligned.

7. For materials with paint coatings, rust, or a galvanized surface, keep the nozzle lifted off the workpiece while emitting the laser. Using a thick plate as a guide makes it easy to operate with the nozzle lifted.
8. Attach the earth clip to a point with electrical continuity. The laser will not be emitted if continuity is not detected.
9. Adjust the focal length to suit the material being cut. The focal length is set by the length of the pipe at the tip of the laser gun. Numbers are engraved on the pipe; the values differ between steel/stainless steel and aluminum. If the focus is incorrect, the material will not melt through and the laser will disperse. The focal distance is the same as for normal welding; when cutting steel, use the focal length used for welding steel.

Recommended focal length: 0 to +3. The focal length changes with the distance from the base material to the lens, and may vary depending on the material and plate thickness. For plate thicknesses up to about 3 mm, cutting at a focal length of +3 is recommended.



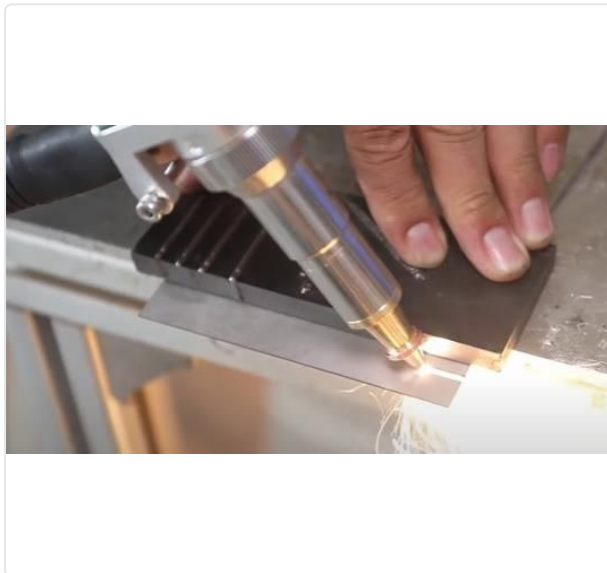
10. Before starting processing, confirm that laser safety glasses and a dust mask are worn, and that there is nobody near the emission port of the laser gun (nobody in front of the gun).
11. Place the nozzle of the laser gun against the workpiece and press the laser emission trigger. The laser is emitted and cutting becomes possible.

Danger! The laser penetrates through the base material!

Cutting three-dimensional objects and the like is extremely dangerous! Always work in a place where there are no people in the surrounding area.

The penetrating laser beam is extremely dangerous. Before working, thoroughly confirm that there are no highly flammable materials or people beyond the point of penetration.

The energy of the laser is extremely powerful. Use thick steel plate or similar for shielding.



Cleaning procedure

Caution: Rust removal generates large amounts 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 and never 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 to the machine.

Checking the gas pressure

- Gas pressure: 0.6–0.8 MPa (welding focusing lens; F400 cleaning focusing lens)
- Gas pressure: 0.4–0.8 MPa (F800 cleaning focusing lens)
- If a large amount of smoke is generated, set the gas pressure higher.
- Gas type: clean air (must be completely free of moisture and oil); nitrogen may also be used

An air filter must be installed. In addition, an air dryer may be required when humidity is high.

Checking the laser beam path

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



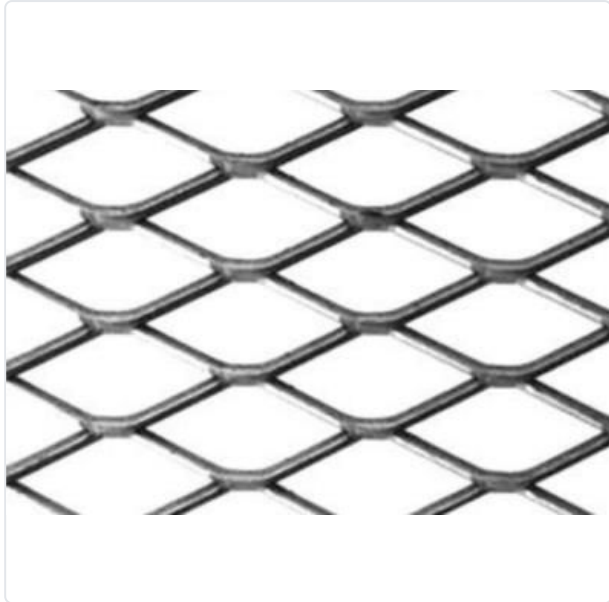
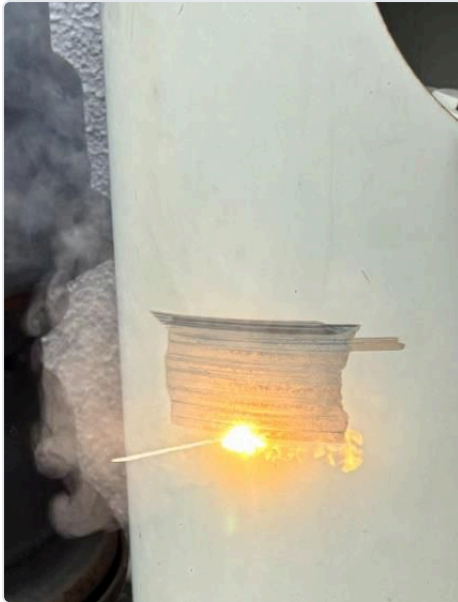
Left: beam path correctly aligned. Right: beam path misaligned.

Precautions and hazards in cleaning mode

Beware of laser reflection!

If the laser is emitted onto metal surfaces, mirror-finished objects, aluminum materials, and the like, the laser may be reflected. For example, when paint is stripped away and the bare metal surface is exposed, depending on the surface roughness, aiming the laser perpendicular to the surface can reflect the beam back toward the operator. Pay close attention to whether there are any combustible materials or people near the surface being irradiated.

Aluminum and mirror-finished stainless steel in particular have high reflectivity, so extra care is required. Wearing laser safety glasses is an absolute requirement for the operator. If there are people nearby, work with careful attention to reflections.



Laser beam / reflected beam — danger if combustible materials are nearby!

Beware of the penetrating laser!

If the target is expanded metal or has holes in it, the laser may pass straight through. Even a beam that has passed through can cause damage depending on the distance. Place a steel plate or similar shielding behind the workpiece.

If the target object has holes, the laser will pass through it — this is dangerous!

When using air, pay close attention to air quality!

Caution: When using air, remove moisture, oil, and dust with a filter and 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 inside the laser source.



Left: photo of a laser source crystal section damaged by reflected laser. Right: photo of a protection lens with oil adhering to it.

Lens configurations for cleaning

The procedure differs as follows depending on the type of lens installed.

1. Cleaning with the welding focusing lens installed — used for light rust removal and burn-mark removal
2. Cleaning with the F800 cleaning focusing lens installed — used for removing corroded rust and paint coatings
3. Cleaning with the F400 cleaning focusing lens (option) installed — used for removing corroded rust and paint coatings

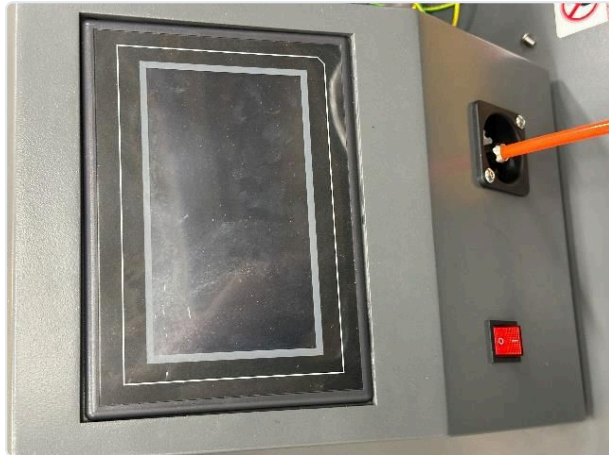
(1) Using the welding focusing lens

When cleaning with the welding focusing lens, the maximum irradiation width (swing width) is 30 mm and the focal length is 150 mm.

Because the distance to the work is shorter than with the F800 cleaning focusing lens, the protection lens is more easily damaged by the smoke generated during cleaning. Setting the gas pressure as high as possible is recommended.

Recommended gas pressure: 0.6–0.8 MPa (adjust according to the amount of smoke and sparks generated). When using air, always use a filter or similar to remove oil and moisture. (An oil-free air compressor is required.)

Set the laser head to the cleaning configuration. Follow the steps shown in the figure below to attach the cleaning laser head. (Loosen the set screw.)

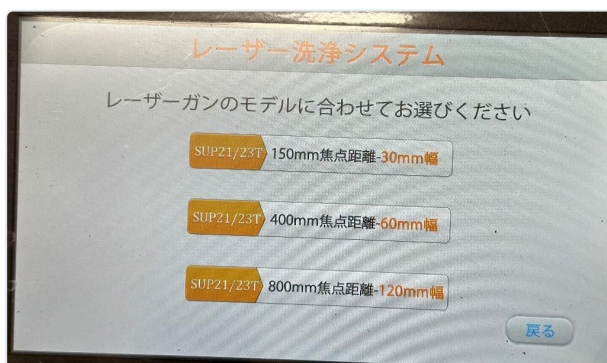


Turn off the power of the wire feeder. If the power is left on, welding wire will be fed during laser emission.

Open the detailed settings and check the laser gun model. Password: "123456".

The laser gun model must be "150mm focal length-30mm width". Touch the laser gun model field and select "150mm focal length-30mm width".

Once the laser gun model shows "focal length 150mm, width 30mm", touch Save to complete the setting.



Next, open "Settings" and configure the processing settings.

Adjust the laser output according to the thickness of the rust and the plate thickness: set the output higher for thick rust, and lower for thin sheet metal. The swing width is the irradiation width. The swing frequency is the travel speed of the laser. For thick rust, lowering the frequency value produces a hammering effect and improves rust-removal efficiency.

Pay careful attention to the laser output value while working. When cleaning with the welding lens, strong laser marks tend to remain on the work. Working within an output range of 200 W–500 W is recommended.

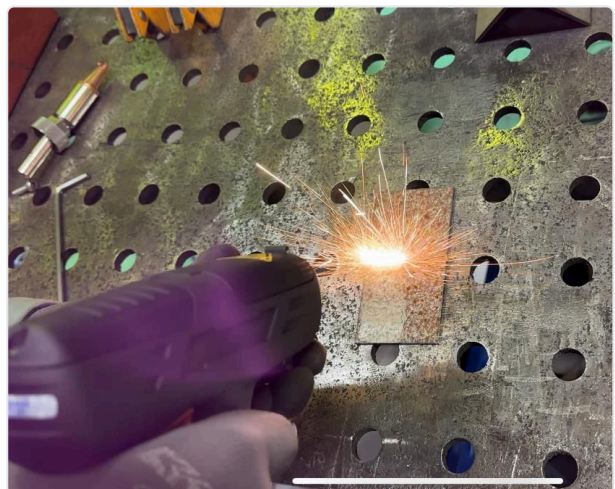
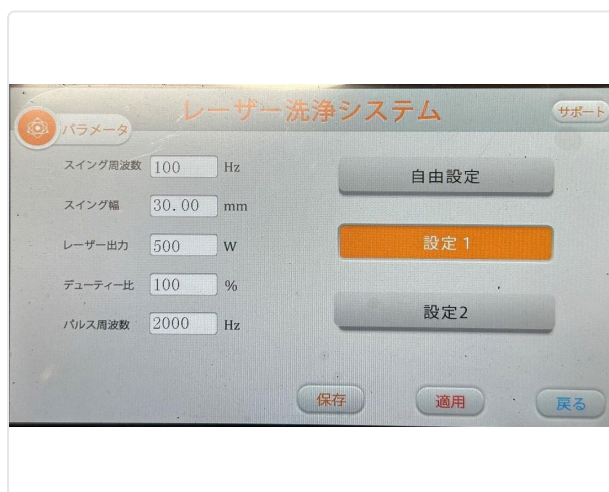
Also, because the distance to the work is short, refrain from using this mode for paint-coating removal and other jobs that generate large amounts of smoke.

Before starting processing, confirm that laser safety glasses and a dust mask are worn, and that there is nobody near the emission port of the laser gun (nobody in front of the gun).

Point the laser gun at the material to be cleaned and double-click the emission trigger. The laser will be emitted; the effective output varies greatly with the focal distance (sparks and sound become intense at the focus). Move the gun back and forth and perform cleaning at the correct position.

Laser output: set to 100–400 W.

Do not emit the laser near combustible materials, and do not bring highly flammable materials nearby — doing so can cause a fire!



(2) Using the F800 cleaning focusing lens

(This lens is the cleaning focusing lens included as a standard accessory.)

In this mode, the lens must be replaced. Replace it with the cleaning focusing lens carefully so that no dust gets inside.

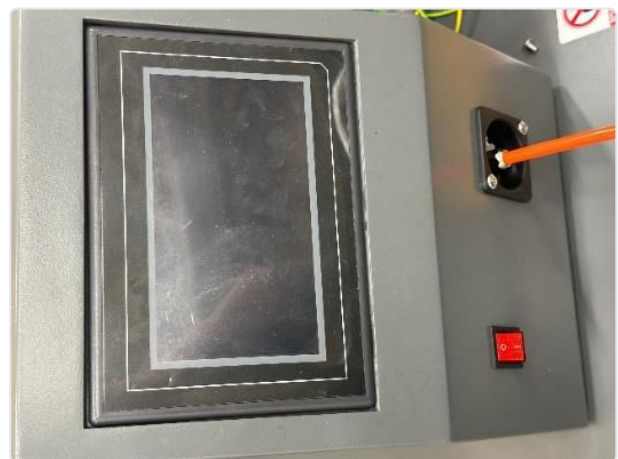
When the cleaning focusing lens is used, a set distance (approx. 800 mm) can be maintained from the work, so the risk of smoke entering the laser gun (torch) is low. This makes it possible to perform paint-coating removal and other work that generates smoke.

When replacing the lens, any dust that has entered the inside of the cover may contaminate the optics. Remove it with an air duster or similar! Replacing the lens while dust is present will damage the lens. Always make sure that no dust adheres to the inside of the laser gun or to the lens during replacement. Remove any dust inside the cover!

Recommended gas pressure: 0.4–0.8 MPa (adjust according to the amount of smoke and sparks generated). When using air, always use a filter or similar to remove oil and moisture. (An oil-free air compressor is required.)



Set the laser head to the cleaning configuration. Follow the steps shown in the figure below to attach the cleaning laser head. (Loosen the set screw.)

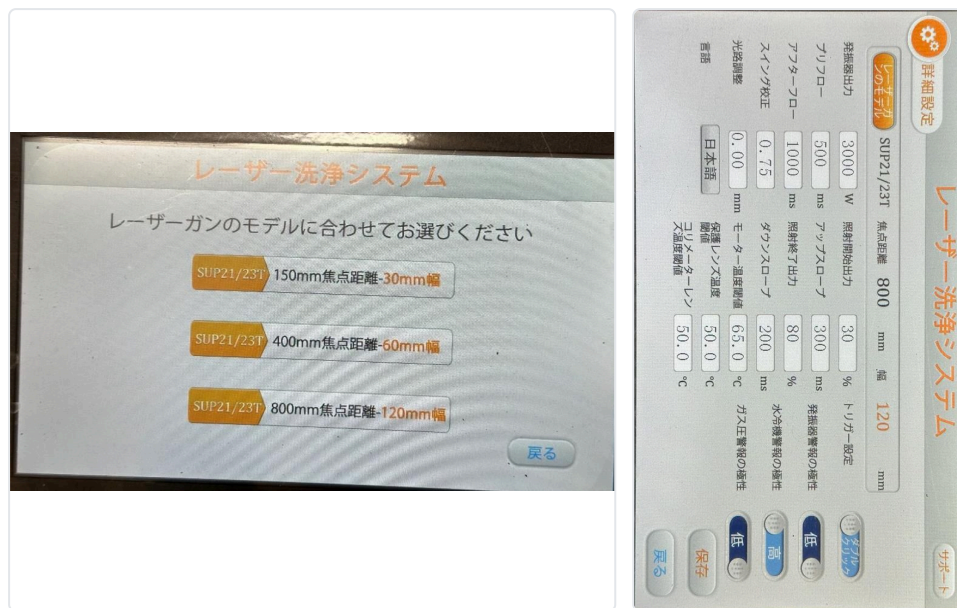


Turn off the power of the wire feeder. If the power is left on, welding wire will be fed during laser emission.

Open the System screen and check the laser gun model. Password: "123456".

The laser gun model must be "800mm focal length-120mm width". Touch the laser gun model field and select "800mm focal length-120mm width".

Once the laser gun model shows “focal length 800mm, width 120mm”, touch Save to complete the setting.



Next, open “Settings” and configure the processing settings.

Adjust the laser output according to the thickness of the rust and the plate thickness: set the output higher for thick rust, and lower for thin sheet metal. The swing width is the irradiation width. The swing frequency is the travel speed of the laser. For thick rust, lowering the frequency value produces a hammering effect and improves rust-removal efficiency.

When the cleaning focusing lens is used, there is no restriction on the laser output setting; it can be set up to the maximum output of the installed laser source.

Before starting processing, confirm that laser safety glasses and a dust mask are worn, and that there is nobody near the emission port of the laser gun (nobody in front of the gun).

Point the laser gun at the material to be cleaned and double-click the emission trigger. The laser will be emitted; the effective output varies greatly with the focal distance (sparks and sound become intense at the focus). Move the gun back and forth and perform cleaning at the correct position.

Do not emit the laser near combustible materials, and do not bring highly flammable materials nearby — doing so can cause a fire!



(3) Using the F400 cleaning focusing lens (option)

(This lens must be purchased separately.)

In this mode, the lens must be replaced. Replace it with the cleaning focusing lens carefully so that no dust gets inside.

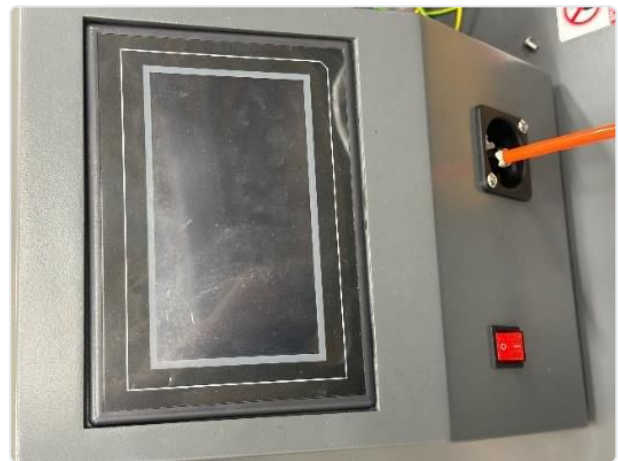
When the optional F400 lens is used, the distance from the work to the laser gun (torch) is approx. 400 mm. Because the distance to the work is shorter than with the F800 cleaning focusing lens, the protection lens can be damaged more easily by the smoke generated during cleaning, so the gas pressure must be set high.

When replacing the lens, any dust that has entered the inside of the cover may contaminate the optics. Remove it with an air duster or similar! Replacing the lens while dust is present will damage the lens. Always make sure that no dust adheres to the inside of the laser gun or to the lens during replacement. Remove any dust inside the cover!

Recommended gas pressure: 0.6–0.8 MPa (adjust according to the amount of smoke and sparks generated). When using air, always use a filter or similar to remove oil and moisture. (An oil-free air compressor is required.)



Set the laser head to the cleaning configuration. Follow the steps shown in the figure below to attach the cleaning laser head. (Loosen the set screw.)

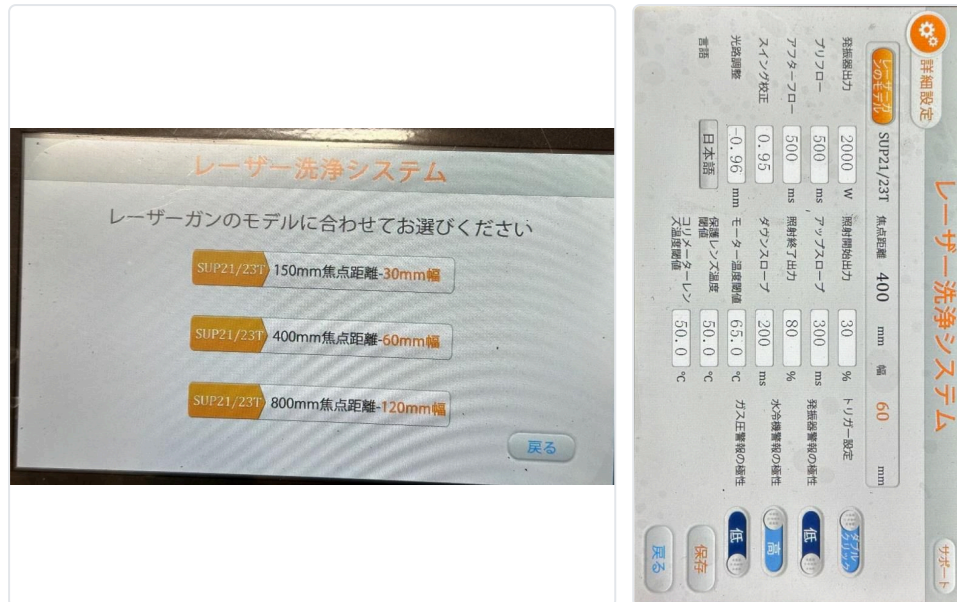


Turn off the power of the wire feeder. If the power is left on, welding wire will be fed during laser emission.

Open the System screen and check the laser gun model. Password: "123456".

The laser gun model must be "focal length 400mm, width 60mm". Touch the laser gun model field and select "focal length 400mm, width 60mm".

Once the laser gun model shows "focal length 400mm, width 60mm", touch Save to complete the setting.



Next, open “Settings” and configure the processing settings.

Adjust the laser output according to the thickness of the rust and the plate thickness: set the output higher for thick rust, and lower for thin sheet metal. The swing width is the irradiation width. The swing frequency is the travel speed of the laser. For thick rust, lowering the frequency value produces a hammering effect and improves rust-removal efficiency.

When the cleaning focusing lens is used, there is no restriction on the laser output setting; it can be set up to the maximum output of the installed laser source.

Before starting processing, confirm that laser safety glasses and a dust mask are worn, and that there is nobody near the emission port of the laser gun (nobody in front of the gun).

Point the laser gun at the material to be cleaned and double-click the emission trigger. The laser will be emitted; the effective output varies greatly with the focal distance (sparks and sound become intense at the focus). Move the gun back and forth and perform cleaning at the correct position.

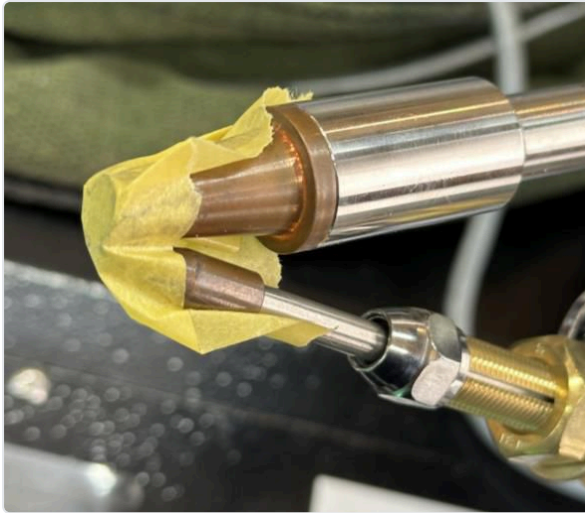
Do not emit the laser near combustible materials, and do not bring highly flammable materials nearby — doing so can cause a fire!



4-1-4 Shutdown

Shut down the laser welding machine using the following procedure.

1. When work is finished, cover the emission port (nozzle) of the laser gun with tape or similar so that no dust or debris can get inside, and store it. Dust enters particularly easily in the cleaning configuration.
2. Set "Emission ON/OFF" on the control panel to OFF. (Turn it off as a safety measure; optional.)
3. Turn off the power of the laser source.



Left: power ON. Right: power OFF.

4. Turn the power key to OFF (counterclockwise) to switch off the machine.



Left: power ON. Right: power OFF.

5. Switch off the breaker on the back of the machine.

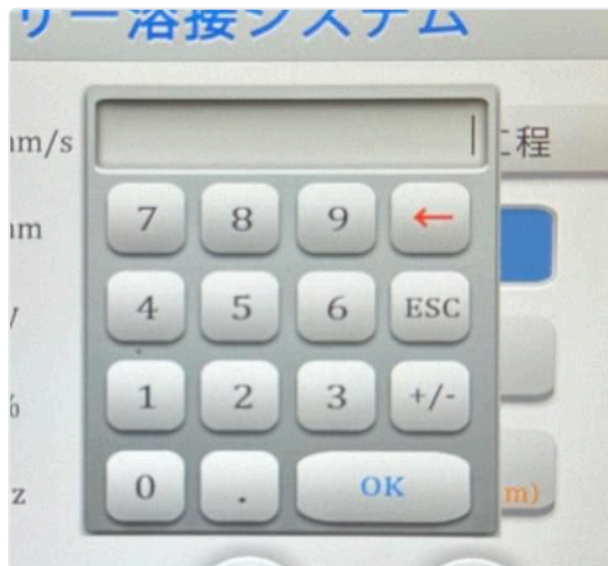
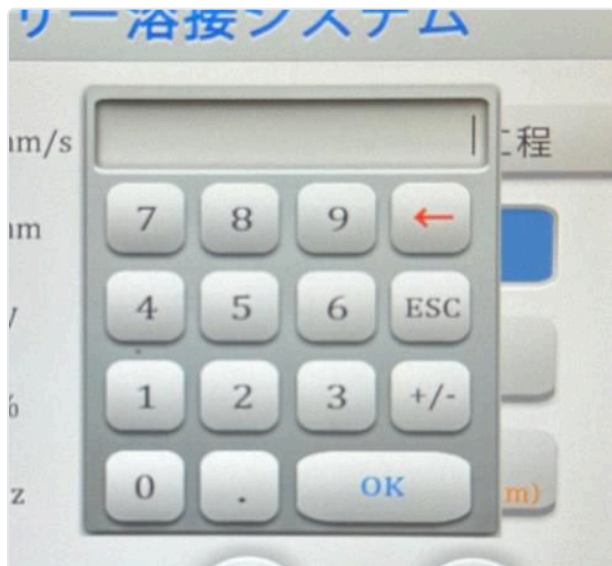
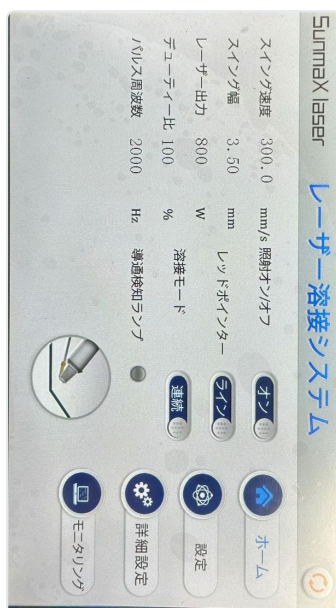
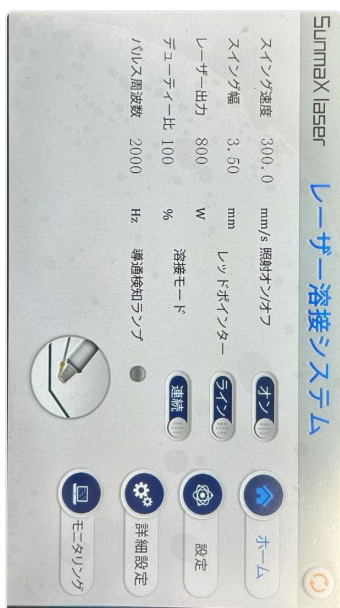
Note that while the breaker remains on, the cooling fan of the control unit continues to run.

6. Close the main gas valve.

Chapter 5 — Operation Panel

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.



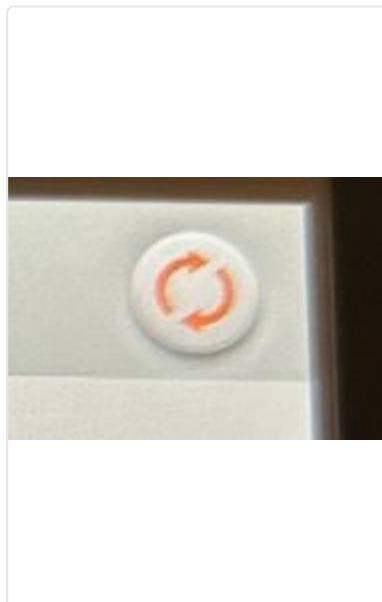
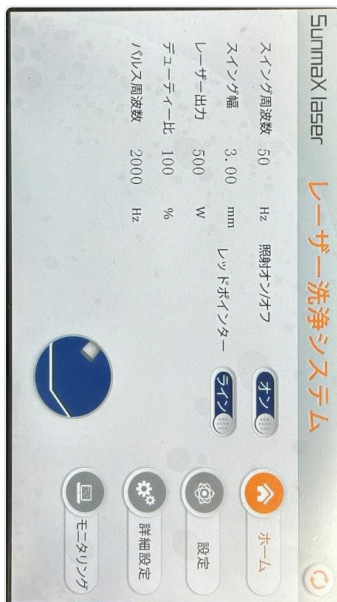
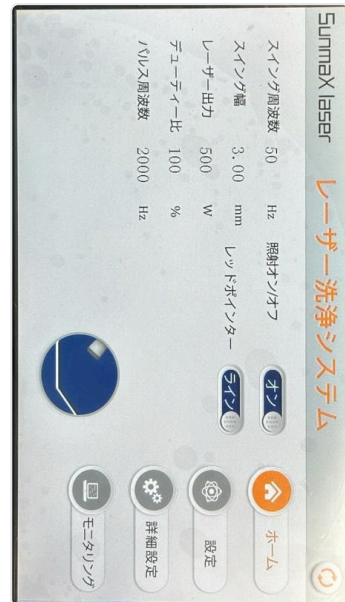
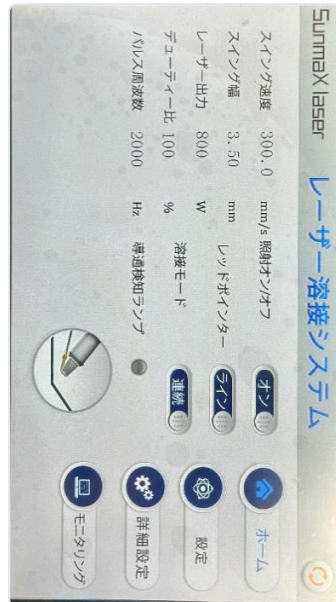
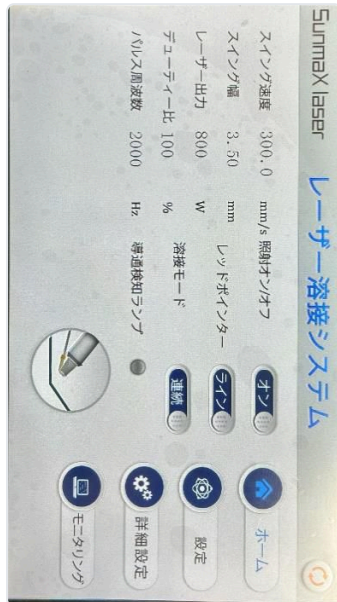
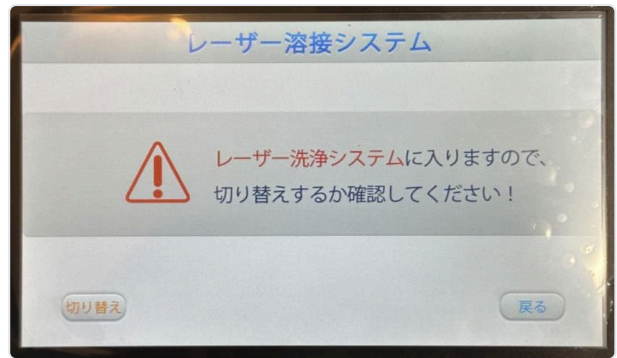
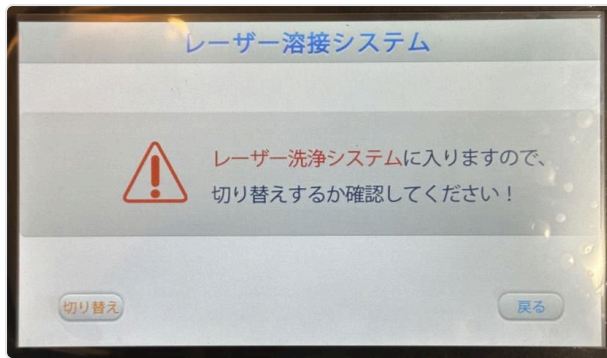
Selection operations and ON ⇔ OFF switching are performed by touching the buttons on the touch panel.

Example:

Numeric values are entered using the numeric keypad, which is displayed when you touch a value field.

5-1-1 Switching the Mode Screen

The main screen has two display modes, "Welding / Cutting" and "Cleaning". Switch the display according to the type of processing to be performed.



To switch the display, touch the switch button at the top right of the screen.

When you touch it, a confirmation screen appears asking whether to switch.

- To switch, touch "Switch".
- To return to the previous screen, touch "Back".

5-1-2 Display Screen

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



5-1-3 Switching Operations and Checking Continuity

In the center-right area of the display screen, you can switch various functions ON/OFF, change the processing mode, and check whether ground continuity is established.

5-1-3-1 Emission ON/OFF

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

5-1-3-2 Red Pointer

You can change the display of the red pointer (guide beam).

The available guide beam patterns are a horizontal line and a dot. Normally, leave it set to the line display and do not change it.

5-1-3-3 Welding Mode

You can change the welding mode used during laser welding.

The available types are "Continuous" for normal welding and "Spot" for spot welding.



5-1-4 Continuity Detection Lamp

During welding and cutting, the laser is not emitted unless ground continuity is established — this is a safety mechanism (interlock function). When continuity is established, the lamp lights up green.

Left: continuity not established Right: continuity established

5-1-5 Tabs

On the right side of the screen there are tabs for making each of the detailed settings.

Left: screen for welding / cutting Right: screen for cleaning

Home

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

Settings (for Welding / Cutting)

Here you can change the parameters.

Touching the tab switches the screen.



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

Touch "Back" to return to the "Home" screen.

On this screen, you can change the processing settings used for welding and cutting.

Display of Setting Values

The values of the currently configured welding / cutting settings are displayed.

To change a value, touch the item you want to change so that the numeric keypad is displayed.

Swing speed

This is the weaving speed of the laser.

The higher the value, the faster the weaving speed of the laser. If the speed is too high, heat escapes and the welding wire may not melt completely; if it is extremely low, welding defects such as pits and spatter may increase.

The balance with the wire feed speed is important. If the feed speed is high, the swing speed value must be increased.

Reference values: with wire, 200–400

Without wire: 400–1000

Swing width

This is the emission width of the laser.

The larger the value, the wider the bead width. Increasing the width inevitably reduces the amount of heat applied to any single point on the base material, so you need to increase the heat input by reducing the wire feed speed, raising the peak output, or lowering the scan speed.

Laser power

This is the laser output. Increasing the value increases weld penetration; decreasing it reduces penetration.

Duty cycle

This is the percentage of time that the laser is ON. The higher the percentage, the more the laser is emitted and the greater the heat input.

Normally, use it at 100%. If set below 100%, the laser operates in pulsed emission.

Pulse frequency

Used when performing pulse welding. * This takes effect when the duty cycle is below 100%.

It is the number of emissions per second. A higher frequency gives a higher overlap rate; a lower frequency gives a lower overlap rate. For pulse welding, adjust the frequency in the range of 5 Hz to 20 Hz.

Wire Feeder

The interface consists of two main sections: 'Wire Feeder' and 'Material'.

Wire Feeder Section:

- Top Row (Connected):** The title bar says 'ワイヤーフィーダー 接続済み' (Wire Feeder Connected). The 'ワイヤー送り速度' (Wire Feed Speed) is set to 60 cm/min. The 'ワイヤー径' (Wire Diameter) is set to 1.2 mm, with a red asterisk indicating it is not the default.
- Second Row (Not Connected):** The title bar says 'ワイヤーフィーダー' (Wire Feeder). The 'ワイヤー送り速度' is 70 cm/min. The 'ワイヤー径' is 1.6 mm, with a red asterisk.
- Third Row (Connected):** The title bar says 'ワイヤーフィーダー 接続済み'. The 'ワイヤー送り速度' is 60 cm/min. The 'ワイヤー径' is 1.2 mm, with a red asterisk.

Material Section (Bottom Row):

This section shows a grid for selecting material and plate thickness. The '常用設定' (Common Settings) button is on the right.

材質 (Material)	板厚 (Plate Thickness) mm
軟鋼 (Soft Steel)	0.8
ステンレス (Stainless Steel)	2.3
アルミ (Aluminum)	3.2
その他 (Others)	4.5
	6.0

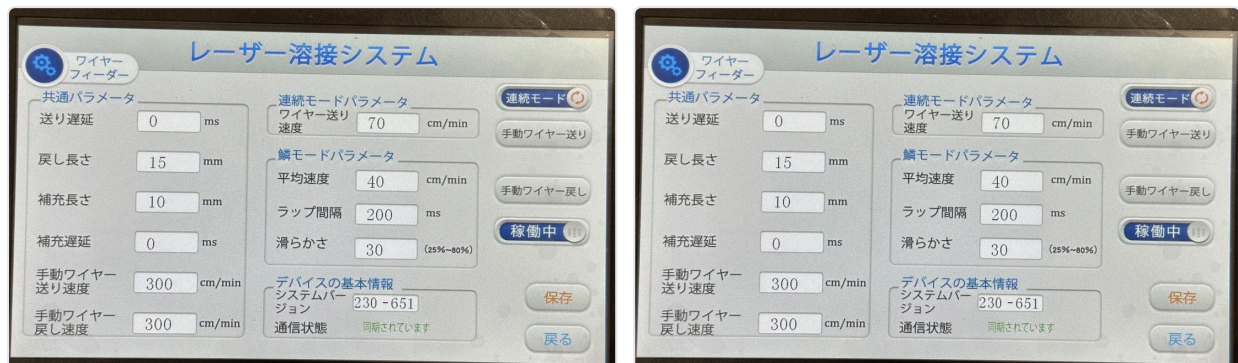
When the connection with the wire feeder is established, "Connected" is displayed.

Left: connected Right: not connected

The wire feeder information is displayed.

You can enter the currently set wire feed speed and the wire diameter to be used.

When "Registered settings" is selected, "x1" and "x2" are displayed next to the wire diameter. These are shown to distinguish between single-wire and double-wire use: x1 means "single" and x2 means "double". The recommended sheet thickness differs between single and double wire. Touch the wire feeder text to change the wire feeder's detailed settings.



Feed delay

Delays the wire feed at the start of welding. This makes it possible to apply heat to the base material first, before welding begins.

Retract length

Retracts the wire at the end of welding. Adjusts the wire stick-out length.

Refill length

Feeds the wire at the end of welding. Adjusts the wire stick-out length.

Refill delay

Delays the refill length operation.

Manual wire feed speed

Sets the feed speed used when feeding the wire manually (manual wire feed).

Manual wire retract speed

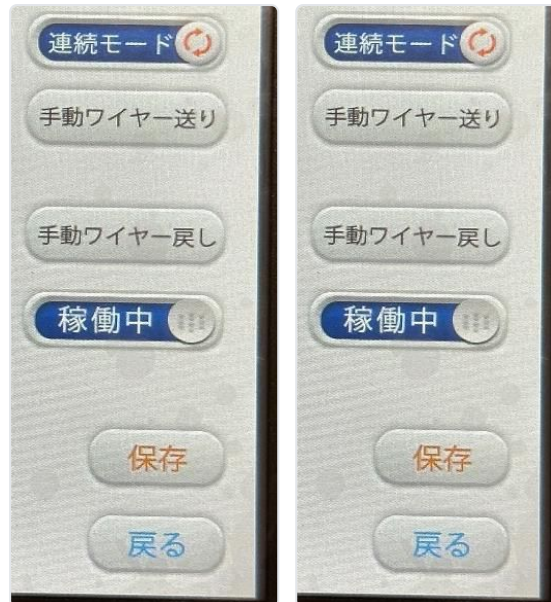
Sets the feed speed used when retracting the wire manually (manual wire retract).

Wire feed speed (in Continuous mode)

Sets the wire feed speed during welding.

Average speed (in Fish-scale mode)

Sets the average wire feed speed for welding in fish-scale mode.



Overlap interval (in Fish-scale mode)

Sets the overlap of the scales for welding in fish-scale mode. The larger the value, the larger the overlap interval between scales and the more prominent the scale pattern becomes.

Smoothness

Adjusts the unevenness of the scales in fish-scale mode welding. Set a lower value if you want to emphasize the shape of each scale, or a higher value if you want a smoother scale appearance.

Device basic information

Do not operate this item.

Mode switching / various operations

Here you can select "Continuous mode" or "Fish-scale mode", operate the manual wire feed, and start or stop the wire feeder.

Frequently Used Settings

The image displays four screenshots of a software interface for setting frequently used values. The interface is divided into two main sections: '常用設定' (Common Settings) and '登録設定' (Registered Settings). The '常用設定' section includes a '材質' (Material) dropdown menu and a '板厚 mm' (Sheet Thickness mm) input field. The '登録設定' section contains a list of registered values for both material and thickness, each with a blue edit icon.

Material	Sheet Thickness (mm)
軟鋼 (Soft Steel)	1.0
ステンレス (Stainless Steel)	1.5
アルミ (Aluminum)	2.5
その他 (Others)	3.0
	4.0
	5.0

Left: single wire, Right: double wire

You can register setting values that you use frequently.

Registered settings

You can use setting values that we have prepared according to material type and sheet thickness. Note that these values are reference values only. You are free to change them as you like.

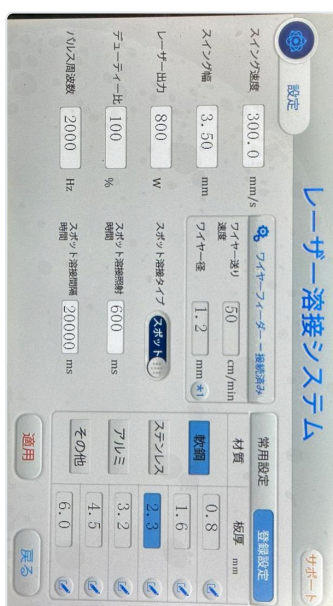
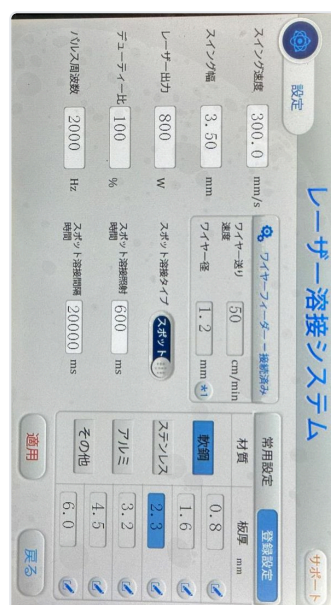
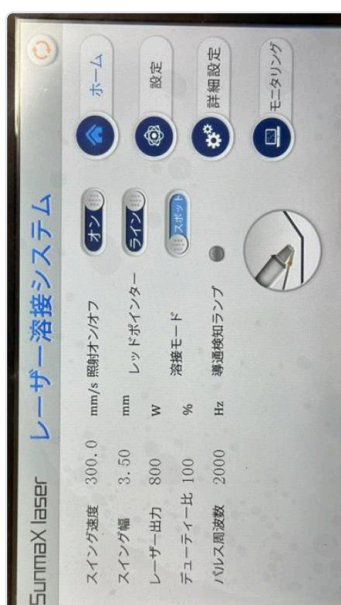
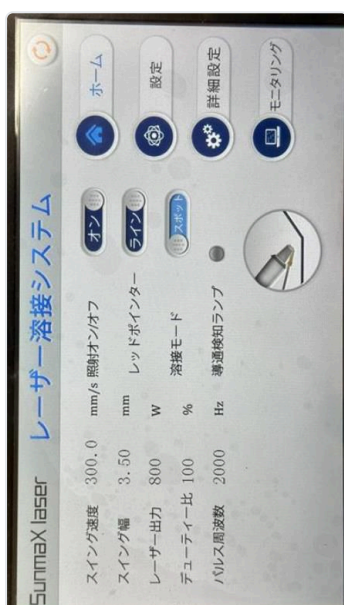
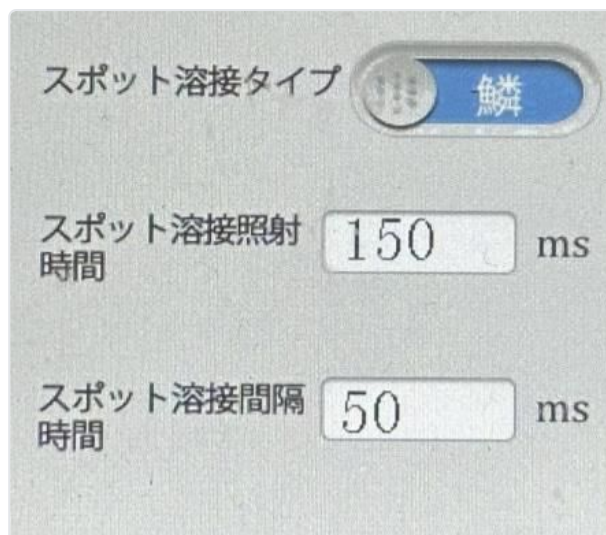
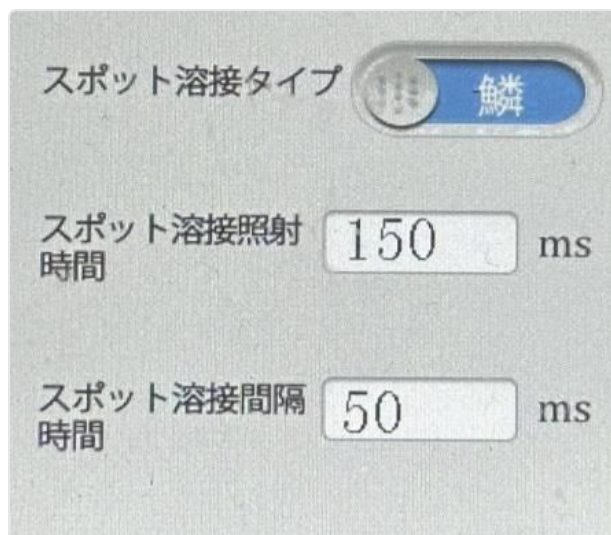
The parameters displayed differ depending on whether a single wire or a double wire is used.

* Settings for sheet thicknesses of 9 mm or more cannot be registered.

Left: single Right: double

Spot Mode

When "Spot" is selected as the welding mode, setting items for spot welding are displayed among the parameters.



Spot welding type

Fish-scale

With wire in use, fish-scale welding is performed by adjusting only the laser output time.

The emission start / end power settings in the system are disabled. With this welding method, the protection lens is more easily damaged than in normal operation. If you want to produce a fish-scale bead, we recommend using the wire feeder's "Fish-scale mode" instead.

Spot

Used to perform spot welding at regular intervals, either with or without wire.
Set the welding emission time and the interval time.

Settings (Cleaning Mode)

On this screen, you can change the processing settings used for cleaning (rust removal).

Setting values

Swing frequency

This is the movement speed of the laser's lateral oscillation. The higher the value, the faster it moves, and zebra lines (rust-removal marks) become less noticeable even if you move the laser gun fairly quickly.
Determine the frequency value according to the condition of the rust to be removed.

- For light rust: set a higher frequency value [70–100 Hz]
- For heavy rust or paint: set a lower frequency value [30–60 Hz]

Swing width

Change this according to the area to be cleaned. When the scan width is wide, the laser is spread over a larger area, and the heat input is lower than when the width is narrow. The maximum is 120 mm.

Laser power

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, distortion may occur.



Duty cycle

Leave it at 100%. Do not change it.

Pulse frequency

Not used.

Saved Items

You can select and save 3 processes (processing settings), including the frequently used settings.

Frequently used settings

You can save and use setting values that you use frequently.

Settings 1-2

You can select and save 2 sets of parameter contents.

Saving Setting Values



Save

Saves the settings in the parameters.

Apply

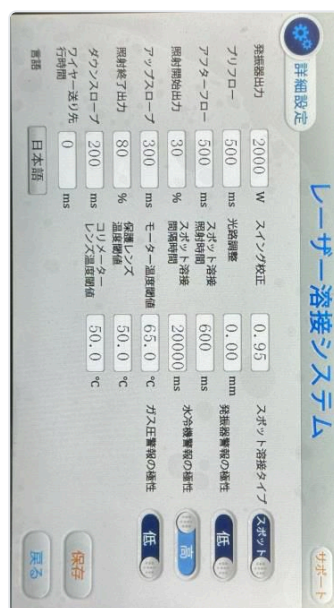
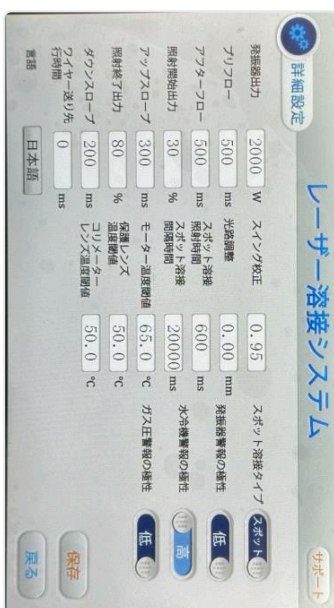
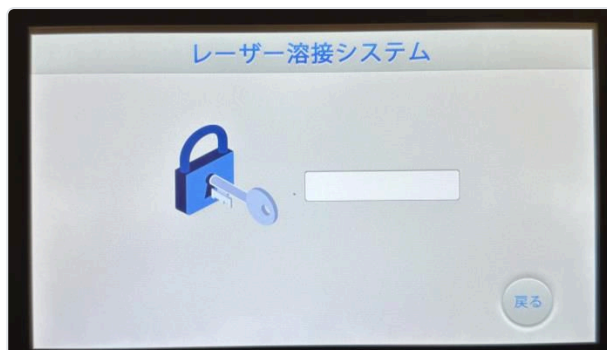
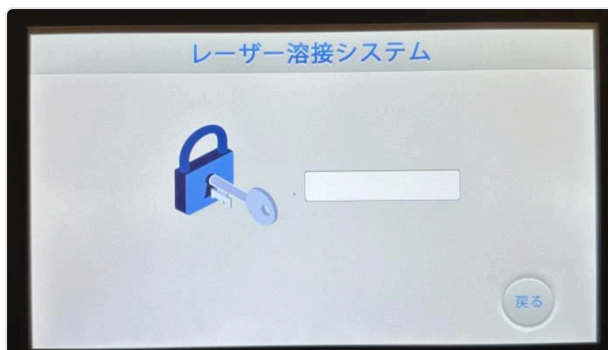
Applies the settings in the parameters. Unless you press Apply, the changed values are not applied.

Back

Returns to the top page.

Advanced Settings

You can configure the detailed settings of the laser welding machine.





Touch Settings, and a password entry screen is displayed.

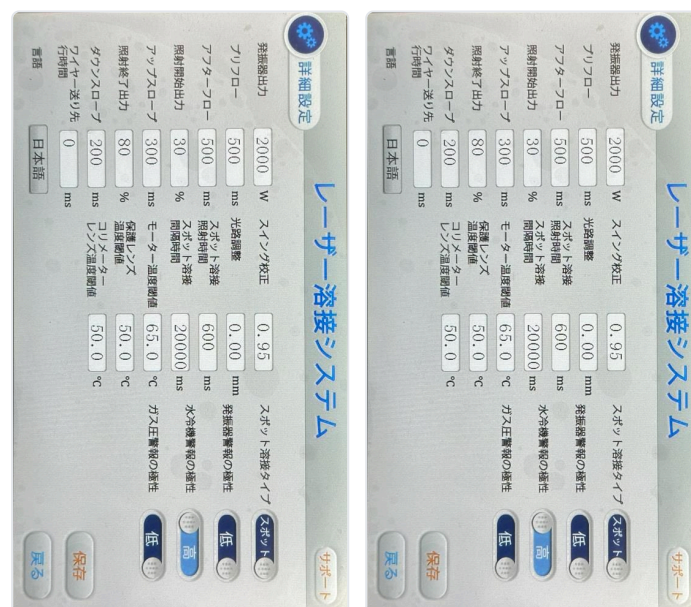
The password is "123456".

After entering it, touch OK.

The screen shown below is displayed.

Left: screen for welding / cutting Right: screen for cleaning

Advanced Settings (for Welding / Cutting)



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 jet time before laser emission. The default setting is 500 ms.

Do not set this below 500 ms!

After-flow

The gas jet time after laser emission. The default setting is 500 ms.

Do not set this below 500 ms!

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 will be damaged more easily.

Up-slope

The laser ramp-up slope time — the time it takes for the laser to reach the set output.

* If this value is extremely low, the protection lens is more likely to be damaged.

The default value is 300 ms.

Emission end power

The power at the end of laser emission. If the emission end power value is too low, it becomes difficult to cleanly detach the wire at the end of welding. Conversely, if it is too high, craters are more likely to occur.

The default value is 80%.

Down-slope

The down-slope time of the laser — the time until laser emission ends.

Change this value when dealing with craters at the end of welding. To prevent craters, increase the value.

The laser output is then gradually reduced at the end of welding, preventing crater formation.

The default value is 200 ms.

Wire feed lead time

Sets the time by which the wire is fed ahead of the laser emission.

Scan calibration

Calibrates the emission width. Perform calibration if the actually emitted swing width differs from the setting.

Swing width setting × scan calibration = actual swing width.

Optical path adjustment

Corrects lateral misalignment of the laser optical 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 beam falls on the center of the nozzle.

Spot welding emission time

Sets the spot welding time.

Spot welding interval time

Sets the interval (time) until the next weld.

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.



Collimator lens temperature threshold

Sets the temperature at which the collimator lens temperature alarm is triggered.

The default value is 50°C.

Do not change this value.

Spot welding mode

You can change the welding pattern used for spot welding.

- **Fish-scale:** performs fish-scale welding using wire. * The protection lens wears more easily.
- **Spot:** can be used both with and without wire. In Spot, spot welding is performed for the set time and at each set interval.

Laser source alarm polarity

Sets the polarity of the laser source alarm.

Do not change this setting.

Water chiller alarm polarity

Sets the polarity of the water chiller alarm.

Do not change this setting.

Gas pressure alarm level

Sets the polarity of the assist-gas flow-rate warning alarm.

Do not change this setting.

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 top page.

Detailed settings (for cleaning)



Laser gun model

Do not change this setting.

Laser source output

The output of the installed laser source is set here. On a 1500W machine it is 1500W. Do not change this value!

Afterflow

The gas injection time before laser emission. The default setting is 500 ms. Do not set it below 500 ms!

Preflow

The gas injection time after laser emission. The default setting is 500 ms. Do not set it below 500 ms!

Scan calibration

Calibrates the emission width. Perform this calibration if the actual swing width being emitted differs from the setting.

Swing width setting × scan calibration = actual swing width.

Optical path adjustment

Corrects lateral misalignment of the laser beam path.

In cleaning mode the optical path cannot be adjusted accurately. If the optical path is misaligned, you must switch to welding mode, change the lens to the welding lens, and then adjust the optical path.

Emission start power

The laser power at the start of laser emission.

The default value is 30%.

Note: If this value is high, the protection lens is more likely to be damaged. It cannot be set to 0.

Up-slope

The laser ramp-up time — the time for the laser to reach the set output.

Note: If this value is extremely low, the protection lens is more likely to be damaged.
The default value is 300 ms.

Emission end power

The laser power at the end of laser emission.
The default value is 80%.

Down-slope

The laser down-slope time — the time taken until laser emission ends.
The default value is 200 ms.

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.

Collimator lens temperature threshold

Sets the temperature at which the collimator lens temperature alarm is triggered.
The default value is 50°C. Do not change this value.

Trigger setting

You can change the interlock setting.
Normally, as a safety feature, the laser will not fire unless the button is clicked twice.
You can select whether the laser fires on a double click or on a single click.

For safety reasons, use the double-click setting.

Laser source warning polarity

Sets the polarity of the laser source warning.
Do not change this setting.

Water chiller warning polarity

Sets the polarity of the water chiller warning.
Do not change this setting.

Gas pressure warning level

Sets the polarity of the assist gas flow warning alarm.
Do not change this setting.

Support

Press Support to view the recommended values and explanations for each setting.

Save

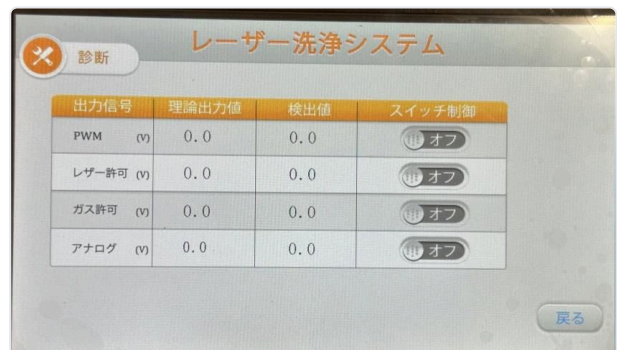
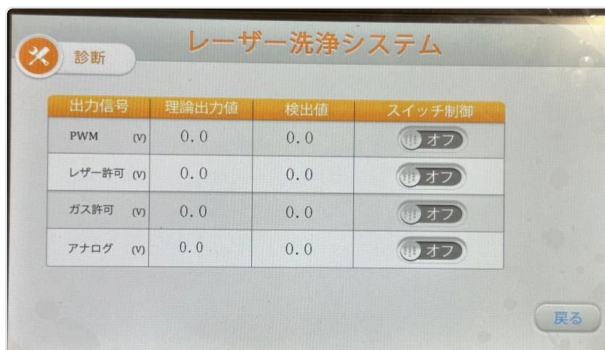
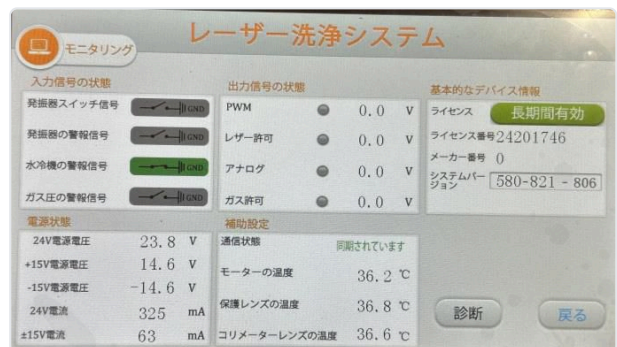
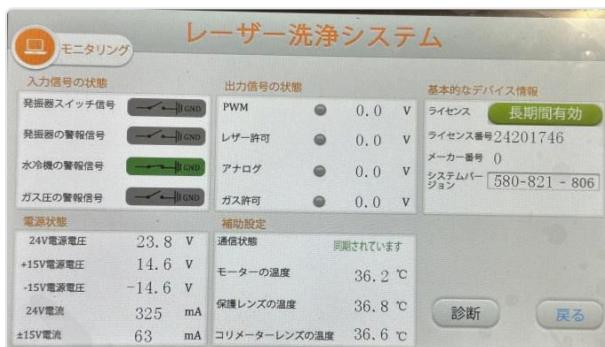
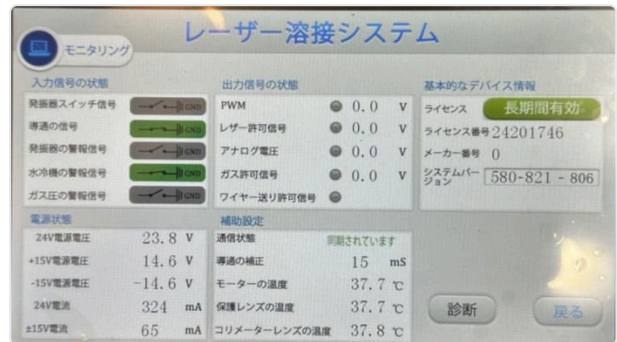
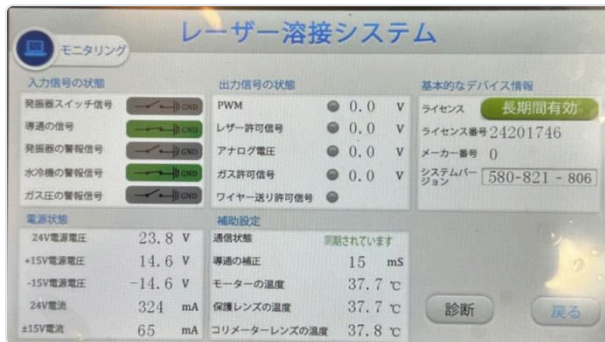
Touch the Save button to apply the changes you have made.

Back

Press Back to return to the top page.

Monitoring

You can monitor the machine status.



Left: screen during welding/cutting Right: screen during cleaning

You can check the input signals, output signals, and other information.
Check this screen when a fault is suspected.

Diagnosis

In Diagnosis, you can check whether voltage is actually reaching the control devices.
For example, if you turn the gas enable signal ON and no gas is supplied, this indicates that the solenoid valve may be damaged.

5-2 (Single-wire) Wire feeder operation screen

Use the operation panel to configure and operate the machine according to the workpiece material and the type of work.



5-2-1 Wire feed speed

The wire feed speed is the welding speed. Set it according to the material and plate thickness being welded.

To change a value, touch the number to display the numeric keypad, or touch the arrow keys.

- Increases the value
- Decreases the value
- Enter the value using the numeric keypad

5-2-2 Changing the mode

You can change the wire feed pattern used during welding.



- **Continuous mode** feeds the wire continuously at the set speed. This is the normal welding method.
- **Scale mode** advances and retracts the wire at fixed intervals, producing a weld close to a TIG finish.

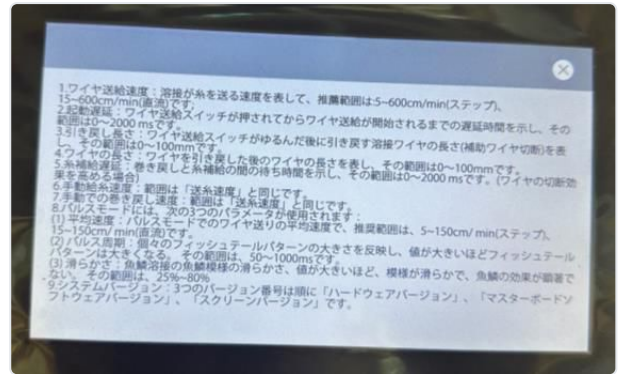
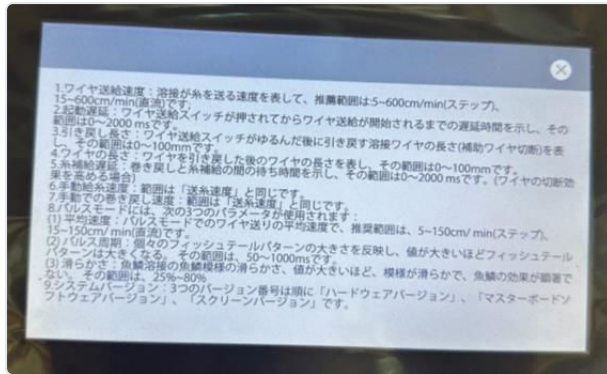
5-2-3 Top page

This is the screen currently displayed.

5-2-4 Settings

You can change the wire feed settings. The items displayed differ depending on the selected mode.

Left: continuous mode Right: scale mode



Wire feed speed

Sets the wire feed speed.

Wire feed delay

Delays the wire feed at the start of laser emission.

This allows heat to be applied to the base material first before the wire is fed, which is useful when welding thick material.

Retract length

The length by which the wire is retracted at the end of welding.

The value varies depending on the wire diameter used.

Refill length

The length by which the wire is advanced at the end of welding.

The value varies depending on the wire diameter used.

Refill delay

Delays the wire feed when the wire is advanced at the end of welding.

Manual wire feed speed

Sets the feed speed used when feeding the wire to the nozzle tip, such as when replacing the wire.

Default value: 300

Manual wire retract speed

The speed at which the wire is retracted.

Default value: 300

Support

Touch Support to view a screen with explanations of each setting.

Average speed (in scale mode)

The average wire feed speed. Unlike continuous mode, the wire is also moved back and forth, so the speed is displayed as an average.

Lap interval (in scale mode)

Sets the number of scale laps in scale-mode welding. The larger the value, the larger the lap interval between scales and the more prominent the scales become.

Smoothness (in scale mode)

Adjusts the surface relief of the scales in scale-mode welding. Set a lower value to make the scale pattern more pronounced, or a higher value to make the scales smoother.

Manual wire feed

Used when replacing the wire, for example. Touch the button and the wire is fed toward the nozzle opening.

Manual wire retract

Press the button and the wire retracts.

Run / Stop

Whether or not the wire is used is switched with the Run and Stop buttons.



To weld using the wire, make sure the Run lamp is lit.

To perform autogenous (fusion) welding without filler wire, make sure the Stop lamp is lit.

5-2-5 Scale mode

As its name suggests, scale mode is a function that creates a scale-pattern bead. The wire is fed while being moved back and forth during welding. In scale mode, the lap interval and smoothness settings are added in addition to the wire feed speed.



Lap interval

Determines the spacing between scales. The larger the value, the lower the lap rate and the larger and more clearly defined the scales become.

Smoothness

The length over which the wire is moved back and forth.

A longer back-and-forth stroke makes the scales stand out clearly and strongly; conversely, a shorter stroke produces a fainter scale pattern.

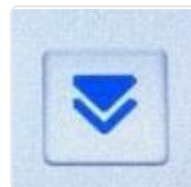
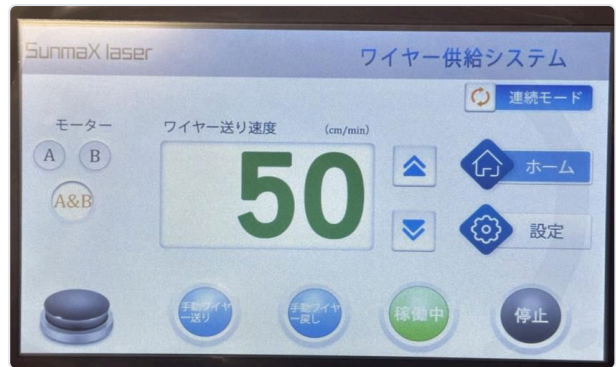
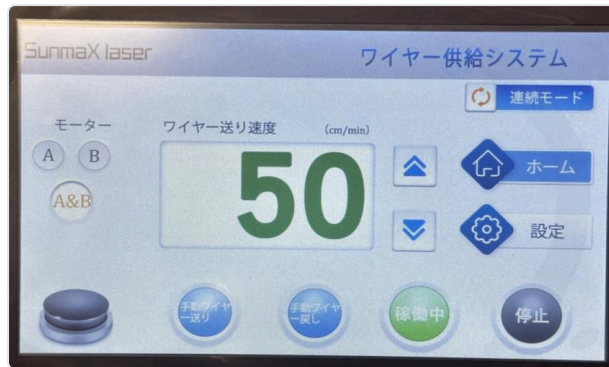
Average speed

Sets the average wire feed speed for scale-mode welding.

5-3 (Double-wire) Wire feeder operation

Refer to this section if the optional double-wire feeder is installed.

Use the operation panel to configure and operate the machine according to the workpiece material and the type of work.



5-3-1 Wire feed speed

The wire feed speed is the welding speed. Set it according to the material and plate thickness being welded.

To change a value, touch the number to display the numeric keypad, or touch the arrow keys.

- Increases the value
- Decreases the value
- Enter the value using the numeric keypad

5-3-2 Switching between single and double

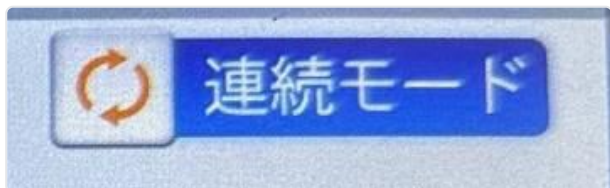
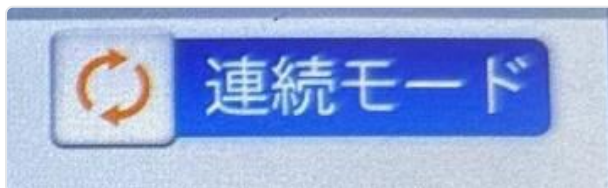
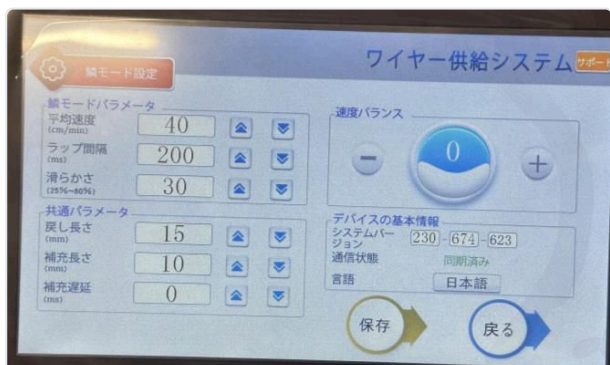
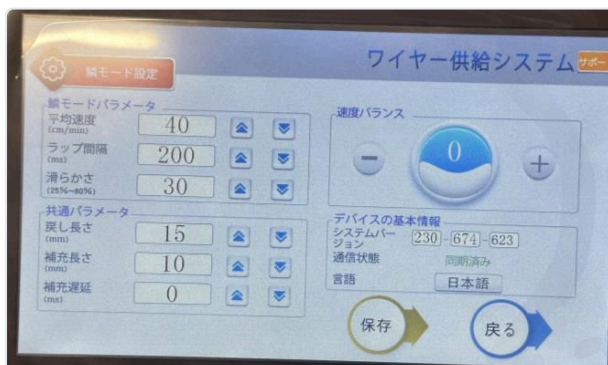
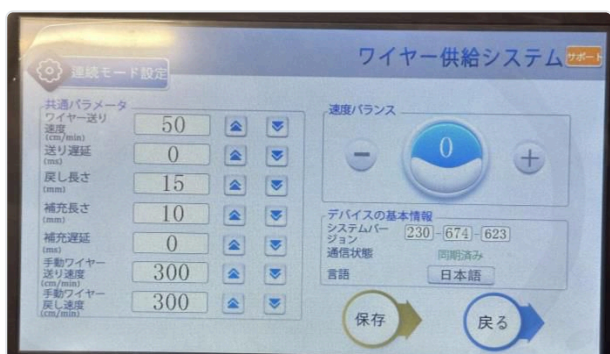
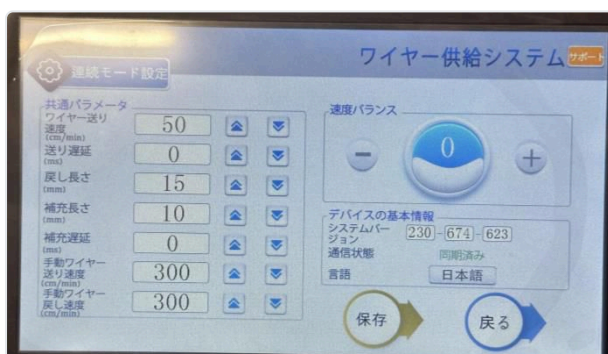
You can switch between feeding a single wire or feeding two wires (double).



- Select **A** to feed the upper wire.
- Select **B** to feed the lower wire.
- Select **AB** to feed both wires.

5-2-2 Changing the mode

You can change the wire feed pattern used during welding.



- **Continuous mode** feeds the wire continuously at the set speed. This is the normal welding method.
- **Scale mode** advances and retracts the wire at fixed intervals, producing a weld close to a TIG finish.

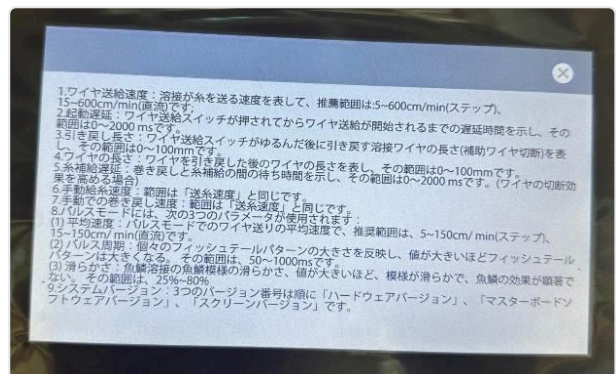
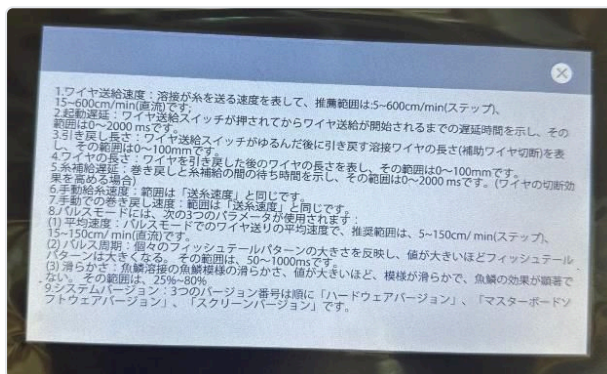
5-2-3 Home

This is the screen currently displayed.

5-2-4 Settings

You can change the wire feed settings. The items displayed differ depending on the selected mode.

Left: continuous mode Right: scale mode



Wire feed speed

Sets the wire feed speed.

Feed delay

Delays the wire feed at the start of laser emission.

This allows heat to be applied to the base material first before the wire is fed, which is useful when welding thick material.

Default value: 100

Retract length

The length by which the wire is retracted at the end of welding.

The value varies depending on the wire diameter used.

Refill length

The length by which the wire is advanced at the end of welding.

The value varies depending on the wire diameter used.

Refill delay

Delays the wire feed when the wire is advanced at the end of welding.

Manual wire feed speed

Sets the feed speed used when feeding the wire to the nozzle tip, such as when replacing the wire.

Default value: 300

Manual wire retract speed

The speed at which the wire is retracted.

Default value: 300

Support

Touch Support to view a screen with explanations of each setting.

Average speed (in scale mode)

The average wire feed speed. Unlike continuous mode, the wire is also moved back and forth, so the speed is displayed as an average.

Lap interval (in scale mode)

Sets the number of scale laps in scale-mode welding. The larger the value, the larger the lap interval between scales and the more prominent the scales become.

Smoothness (in scale mode)

Adjusts the surface relief of the scales in scale-mode welding. Set a lower value to make the scale pattern more pronounced, or a higher value to make the scales smoother.

Speed balance

Used when the speeds of motor A and motor B differ.

Manual wire feed

Used when replacing the wire, for example. Touch the button and the wire is fed toward the nozzle opening.

Manual wire retract

Press the button and the wire retracts.



Run / Stop

Whether or not the wire is used is switched with the Run and Stop buttons.

To weld using the wire, make sure the Run lamp is lit.

To perform autogenous (fusion) welding without filler wire, make sure the Stop lamp is lit.

5-2-5 Scale mode

In scale mode, the lap interval and smoothness settings are added in addition to the wire feed speed. As its name suggests, scale mode is a function that creates a scale-pattern bead. The wire is fed while being moved back and forth during welding. In scale mode, the lap interval and smoothness settings are added in addition to the wire feed speed.



Lap interval

Determines the spacing between scales. The larger the value, the lower the lap rate and the larger and more clearly defined the scales become.

Smoothness

The length over which the wire is moved back and forth.

A longer back-and-forth stroke makes the scales stand out clearly and strongly; conversely, a shorter stroke produces a fainter scale pattern.

Average speed

Sets the average wire feed speed for scale-mode welding.

Chapter 6 — About Gas

6-1 Assist Gas

Gas is ejected from the laser emission port of the laser gun. If the gas is not ejected properly, correct welding cannot be performed.

Connect the gas hose to the gas supply port on the rear of the machine.

6-1-1 Assist Gas Types

Nitrogen is mainly used as the assist gas.

Usable gas types	Nitrogen, argon, oxygen (for cutting) * Compressed air can also be used (clean, moisture-free air only).
-------------------------	---

For welding

For welding, use nitrogen or argon.

For welding iron and stainless steel, nitrogen is recommended. There is no quality degradation due to nitriding, the keyhole (the deep, recessed penetration shape) is more stable than with argon gas, and nitrogen itself costs less than argon. For these reasons we recommend nitrogen. In addition, on stainless steel, using nitrogen suppresses the formation of blowholes better than argon.

For welding aluminum, argon gas is recommended. (Welding with nitrogen is possible, but aluminum is easily affected by nitrides, so argon is recommended.)

For welding titanium, use argon.

For cutting

For cutting, change the gas type according to the material.

For iron, using oxygen or an air compressor increases cutting capability. For metals other than steel, use nitrogen as the standard gas. (If oxidation is not a concern, oxygen can also be used.)

With nitrogen: up to approx. 4 mm. With air or oxygen: up to approx. 8 mm.

For cleaning

For cleaning, nitrogen or an air compressor is recommended.

Cautions when processing with an air compressor!

An air compressor may carry moisture or oil into the gas line. If you continue processing with moisture or oil in the gas, it will adhere to the protection lens, scatter the laser beam, and may damage the inside of the laser gun. When using an air compressor, always connect a filter (an air dryer is also preferable) and remove all moisture and oil before use.

6-1-1 Gas Pressure Setting

The assist gas pressure is a fundamental element of the processing settings. Variations in gas pressure have a major effect on processing results. Before starting any processing, check and adjust the gas pressure.

Set the gas pressure within the following ranges:

Welding	Single wire: 0.15–0.25 [MPa] / Double wire: 0.2–0.3 [MPa]
Cutting	0.4–0.8 [MPa]
Cleaning	0.4–0.8 [MPa] (when using a welding lens: 0.6–0.8 MPa)

Processing results change with gas pressure. Keep the gas pressure constant during processing.

- Never process without gas. Doing so will damage the laser gun.
- Do not set the gas pressure to 0.8 [MPa] or higher — never above 0.8 [MPa]. This can cause a malfunction.
- If the gas pressure is too low, the protection lens is more likely to overheat and become contaminated. Do not set the gas pressure to 0.2 [MPa] or lower MPa. For aluminum welding, use the maximum gas pressure.

Chapter 7 — Laser Gun Adjustment

The laser gun (torch) requires periodic adjustment.

7-1 Laser Beam Path

The laser beam coming from the laser source must reach the nozzle opening correctly. If you continue processing with a misaligned beam path, the nozzle and lenses may be damaged, and in the worst case the laser source itself may be damaged.

The figure below shows an actual example.

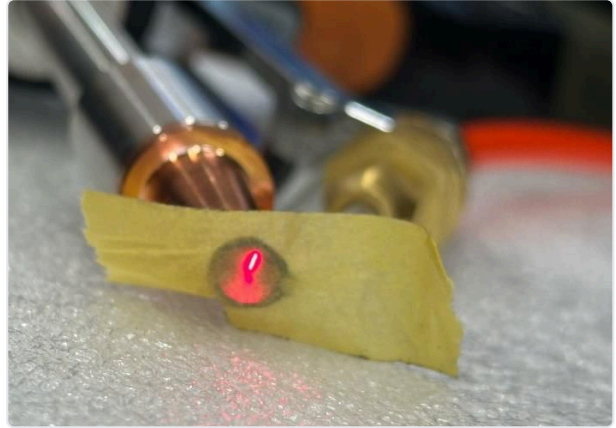
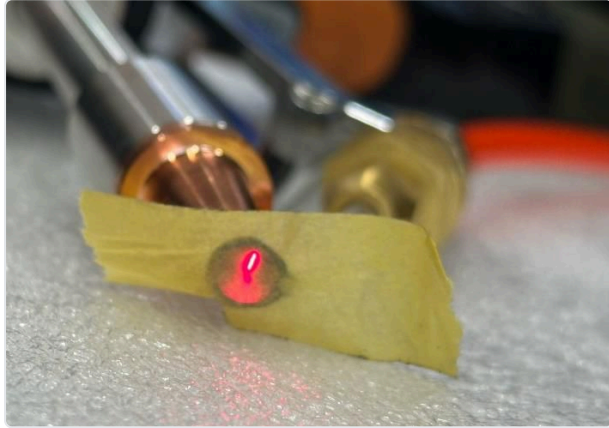


The laser has struck the nozzle itself and deformed it. If the nozzle glows bright red, the beam path is misaligned. If you keep using the machine with the beam path misaligned, the lenses will be damaged — be careful.

7-1-1 Adjustment Procedure

* Adjust the beam path using the welding focusing lens.

1. Attach the AS-12 nozzle to the laser gun (torch).
2. Apply masking tape to the tip of the nozzle.
3. Set the scan width to maximum. With the AS-12 attached, set the scan width to 6 mm.



レーザー溶接システム

設定

スイング速度 300.0 mm/s

スイング幅 6.00 mm

レーザー出力 500 W

チューナー比 100 %

パルス周波数 2000 Hz

レーザー送り速度 3.5 cm/min

常用設定

登録設定

リセット

適用

戻る

レーザー溶接システム

設定

スイング速度 300.0 mm/s

スイング幅 6.00 mm

レーザー出力 500 W

チューナー比 100 %

パルス周波数 2000 Hz

レーザー送り速度 3.5 cm/min

常用設定

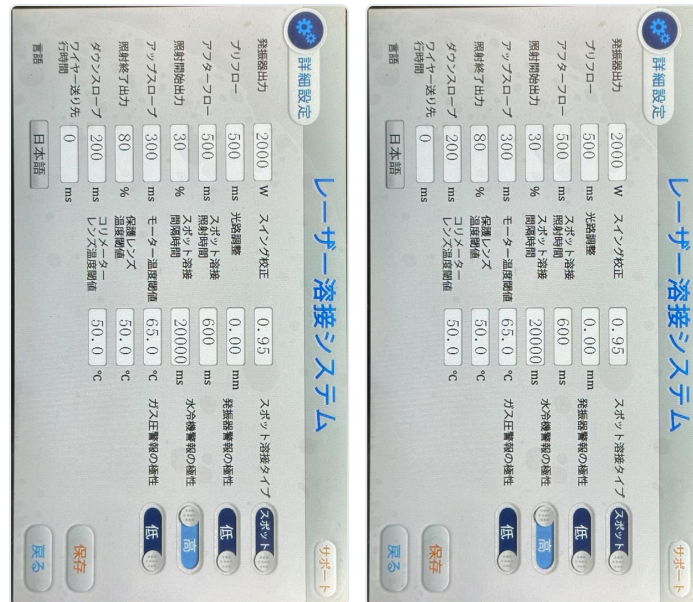
登録設定

リセット

適用

戻る

Check that the red pointer is at the center of the nozzle opening. If it is shifted to one side, or only the edge of it is visible as in the figure below, the beam path is misaligned.



Normal / Abnormal (adjustment required)

Left-right deviation

Left-right deviation can be corrected with "Beam Path Adjustment" in the advanced settings. The password for the advanced settings is "123456".

- Entering a negative value moves the beam to the left.
- Entering a positive value moves the beam to the right.

* The beam path is not updated unless you press Save.

Vertical deviation

Remove the cover at the upper rear of the laser gun (torch). Loosen the screw to remove the cover.



There are three hex screws. The screw on the torch-tip side is the motor fixing screw. It is loosened only when adjusting the motor angle or replacing the reflection lens. If you loosen this screw, the beam path will shift significantly.

Do not loosen this screw! The motor angle will change.

Adjust the beam path (vertical deviation) with the two lower screws. Use these two screws to adjust the beam up and down.



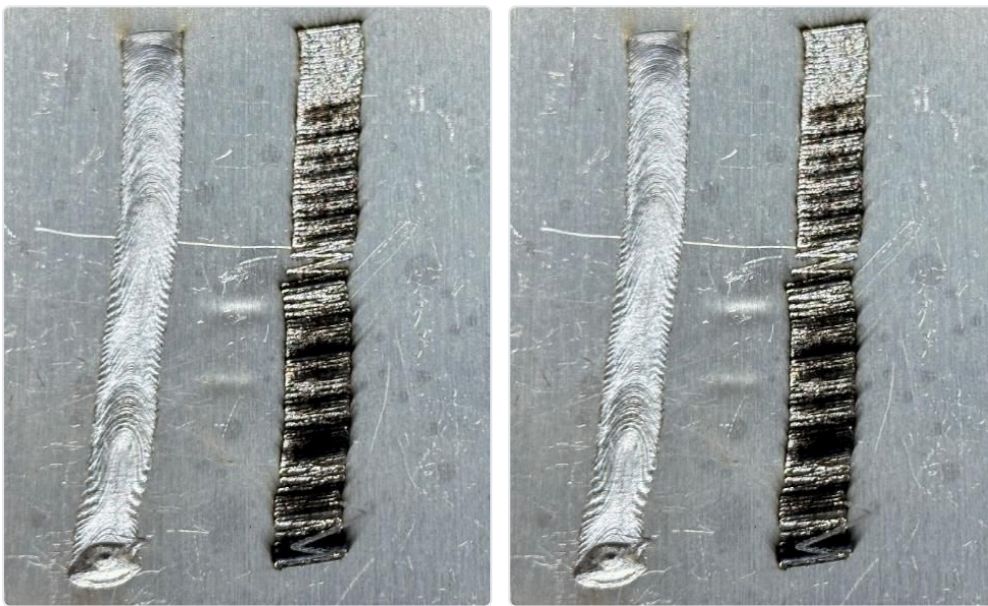
- Loosening the upper screw raises the pointer; tightening it lowers the pointer.
- Loosening the lower screw lowers the pointer; tightening it raises the pointer.

Adjust while watching the balance between the two screws. Ideally, both set screws should be moderately tightened.

7-2 Focus Adjustment

The focal length corresponds to the extension of the cylinder section of the laser gun (the distance from the focusing lens to the nozzle; a numbered scale is engraved on it). Adjust the focal length according to the material to be welded. If the focal length is incorrect, the laser does not penetrate the material and is reflected instead.

Reflected laser light scatters forward toward the operator and is dangerous.



The figure below shows an example with aluminum welding. When the focus is correct, the weld penetrates fully. When the focus is off, oxidation is drawn in, soot adheres to the weld, and penetration is shallow.

In focus / Out of focus

Focus adjustment procedure

Emit the laser and search for the position that gives the deepest penetration. The focal length may differ depending on the material to be welded, the type of nozzle used, and whether welding wire is used or not.

1. Select and set the material and plate thickness you want to weld.
2. Adjust the scale value. Normally adjust within the range of -10 to $+10$.
3. Emit the laser onto the base material and search for the position with the deepest penetration. When the focus is correct, the laser sparks strongly and penetrates deeply (it also produces more sound).

When the focus is off, there is little sparking and no penetration. Perform actual welding and check at which scale position penetration becomes deepest. Adjust within the scale range of +10 to –10.



レーザー溶接システム

設定

スイング速度 300.0 mm/s
スイング幅 3.50 mm
レーザー出力 800 W
チューナー比 100 %
パルス周波数 2000 Hz

ワイヤ・ワイヤー・溶接済み
ワイヤ径 50 cm/min
ワイヤ径 1.2 mm

常用設定
材質 板厚 mm
ステンレス 2.3
アルミ 3.2
その他 4.5
6.0

適用 **戻る**

レーザー溶接システム

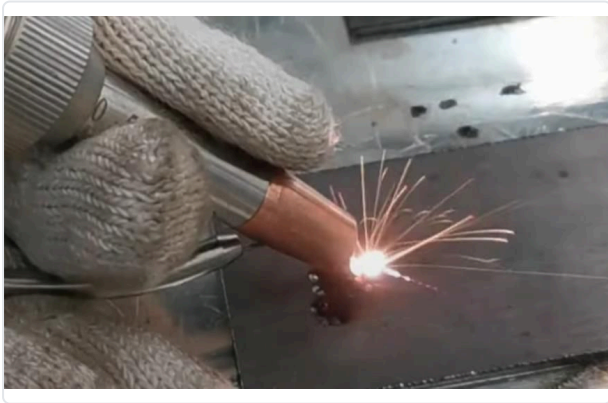
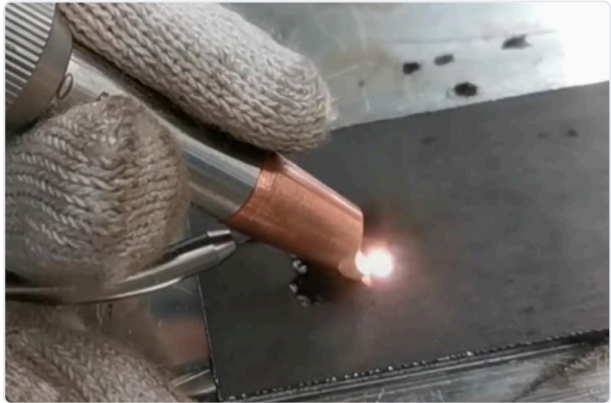
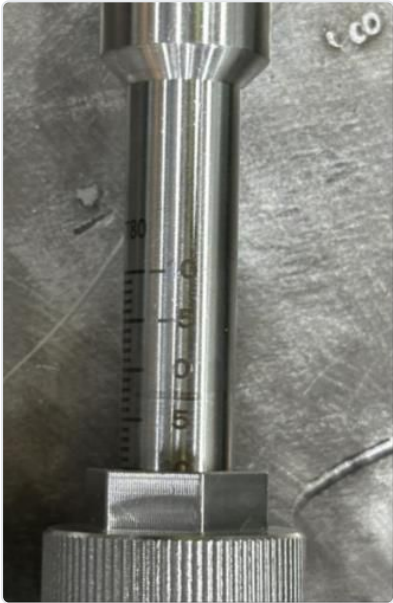
設定

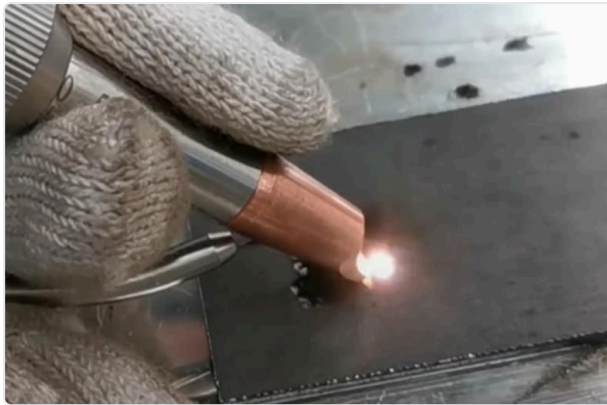
スイング速度 300.0 mm/s
スイング幅 3.50 mm
レーザー出力 800 W
チューナー比 100 %
パルス周波数 2000 Hz

ワイヤ・ワイヤー・溶接済み
ワイヤ径 50 cm/min
ワイヤ径 1.2 mm

常用設定
材質 板厚 mm
ステンレス 2.3
アルミ 3.2
その他 4.5
6.0

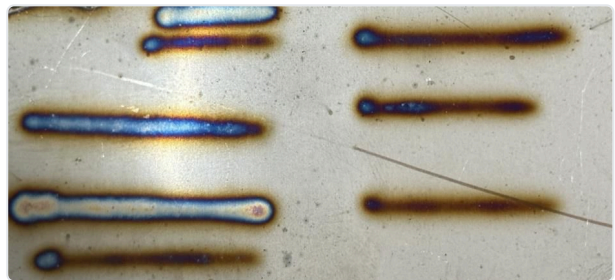
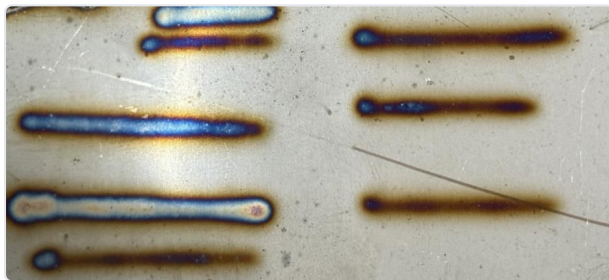
適用 **戻る**





When the focus is off, strong reflected light is generated. Work with caution.

Check the finish of the weld bead and the degree of burn-through on the back side to confirm at which focal length the weld penetrates.



Reference values

Iron / stainless steel	0
Aluminum	0 to -3

- * Without wire, the values above may shift toward the + side.
- * The focus may change depending on the type of nozzle.
- * The focus is not guaranteed to match the values above! Adjust for each material.

After completing the adjustment, tighten the nut firmly with a wrench. If it is left loose, the beam path will not align correctly!

Chapter 8 — Consumables

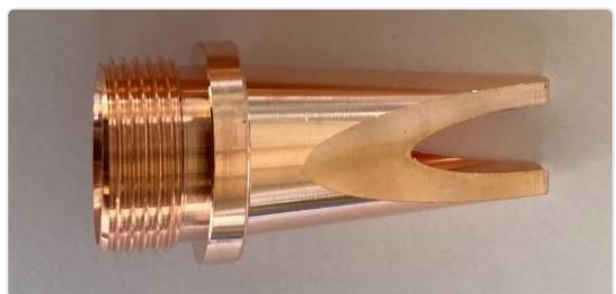
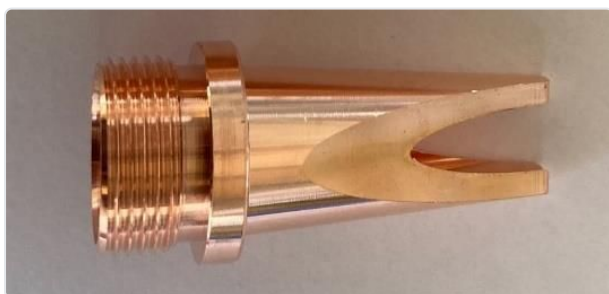
8-1 Nozzles

The nozzle is the laser emission opening located at the tip of the laser gun. Several nozzle shapes are available; replace the nozzle according to the type of work being performed. Sales site: <https://www.e-inzai.com/shop/www/shop/sunmax/index.html>

8-1-1 Welding Nozzles

Change the nozzle according to the arrangement of the workpiece material to be welded, and when switching to cutting mode, etc.

Welding nozzles have a U-shaped tip.



- With recess
- Without recess

Select the nozzle size according to the diameter of the welding wire. Each nozzle carries an engraved marking; the application and the applicable wire diameter differ. The engraving differs depending on the wire diameter and shape the nozzle is intended for.

Standard set



AS-12



AS-12



BS-16



BS-16



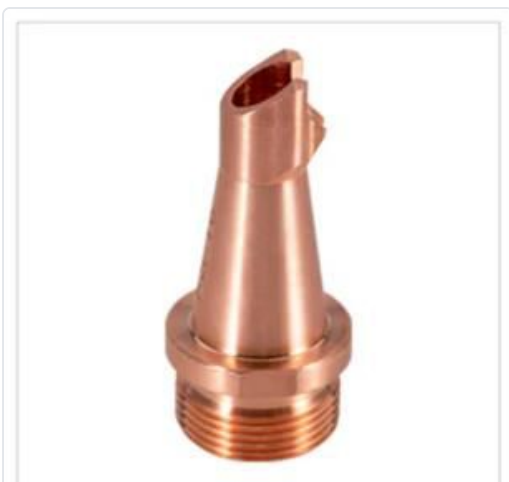
CS-12



CS-12



Nozzle type	Applicable wire diameter
All-purpose welding nozzle. Can be used at any welding angle.	0.8–1.2 mm
All-purpose welding nozzle. Can be used at any welding angle.	1.6 mm
Nozzle used for welding outside corners.	0.8–1.2 mm
Nozzle used when using the guide.	0.8–1.2 mm



FS-16



FS-16





Nozzle type	Applicable wire diameter
Nozzle used when using the guide.	1.6 mm
Nozzle dedicated to autogenous welding (welding without filler wire).	—
Nozzle dedicated to cutting. Use with the scan width set to 0.	—

In addition, optional nozzles are sold on our “Laser Kan” online shop.

Double wire (option)

Nozzles for double wire have a different shape. The emission opening is wider, and there are two wire mounting grooves.

- AS-12D: for wire diameter 1.2 mm (can also be used with 1.0 mm)
- AS-16D: for wire diameter 1.6 mm
- AS-20D: for wire diameter 2.0 mm

8-1-2 Wire Nozzles

The wire nozzle is attached to the wire liner.

The nozzle diameter differs according to the wire diameter.

Available sizes: 0.8 / 1.0 / 1.2 / 1.6



For double wire (option)

Wire nozzle for double wire. It is shaped so that two wires can be fed at the same time.

Included wire diameters: 1.2, 1.6, 2.0

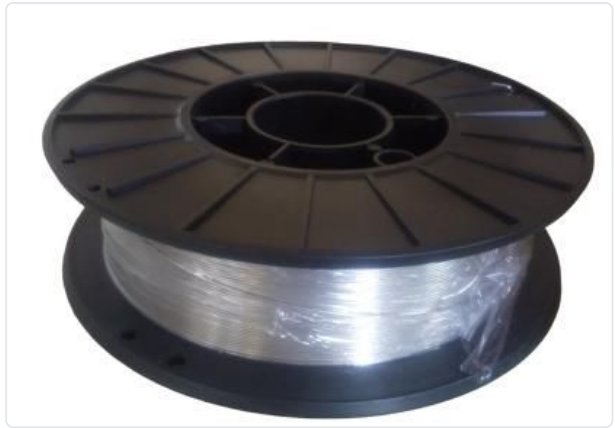
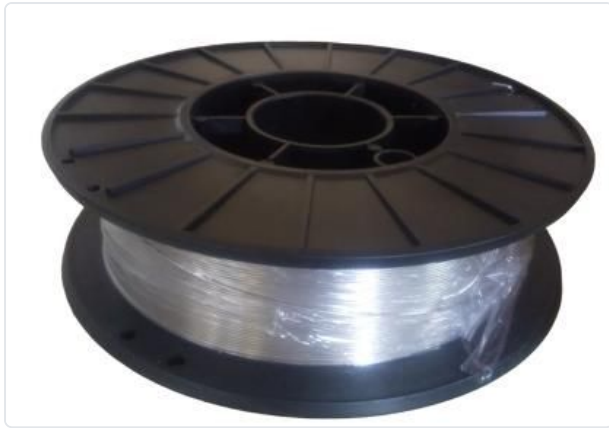
8-2 Welding Wire

Use solid wire for MIG/MAG as the welding wire. Welding wire is also sold on our sales site.

8-3 Laser Safety Glasses and Protective Shield

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

The service life of the laser safety glasses / protective shield is 3 years. Do not use them once 3 years have passed after opening.





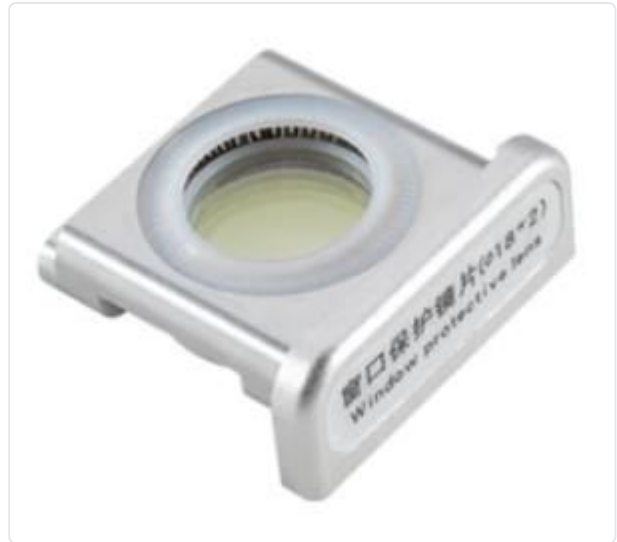
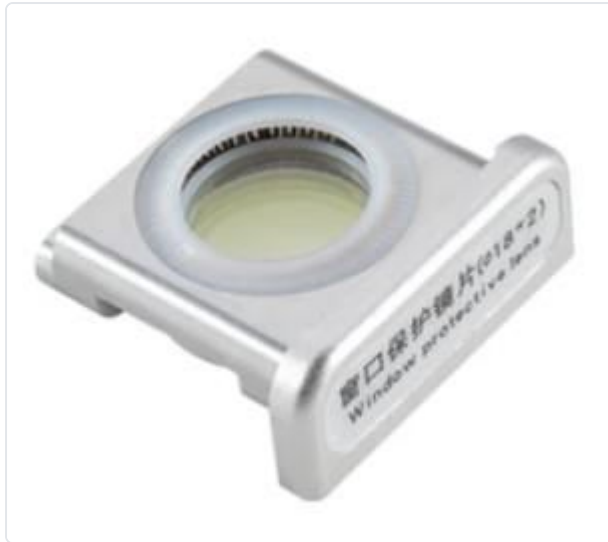
8-4 Lenses

Several lenses are built into the laser gun.

Lenses are treated as consumables. The rate of wear differs depending on the material being processed and how the machine is used. If used correctly, they can last a long time.

When a lens is damaged, the lens generates heat. The laser gun is equipped with a temperature sensor and raises an alarm when the temperature becomes high. * In some cases, no alarm is raised.





8-4-1 Protection Lens

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

If you perform welding, cutting, or rust removal without spraying gas, the lens will be damaged immediately. Causes of damage vary: processing with an improper beam path, welding with the laser gun held vertically, and so on.

Main causes of damage

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

- **Laser beam path misalignment:** Welding or processing while the laser beam path is misaligned will damage the lens.
- **Insufficient gas:** Processing without supplying gas, or welding with too little gas supply, will damage the lens. For work that generates a lot of fume, use a larger amount of gas. Also supply extra gas when welding aluminum.

Welding: single wire 0.2–0.25 MPa / double wire 0.25–0.3 MPa; Cutting: 0.4–0.8 MPa; Cleaning: 0.4–0.8 MPa

- **Out of focus:** Welding while out of focus generates more spatter and more reflected light, which can damage the lens. Weld at the correct focus for the material.
- **Moisture or oil in the gas:** If oil or moisture gets into the assist gas, the laser light is diffused. This occurs especially easily when using an air compressor. When using air, supply it through a dryer and a filter.
- **Vertical welding:** Welding with the laser gun held upright allows reflected laser light to enter the inside of the laser gun and can damage the lens.
- **Dust adhering during lens replacement:** If dust adheres to the lens during replacement, the laser can pass through and burn the lens. Exercise the utmost care when performing replacement work.

Replacement procedure

Items 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.

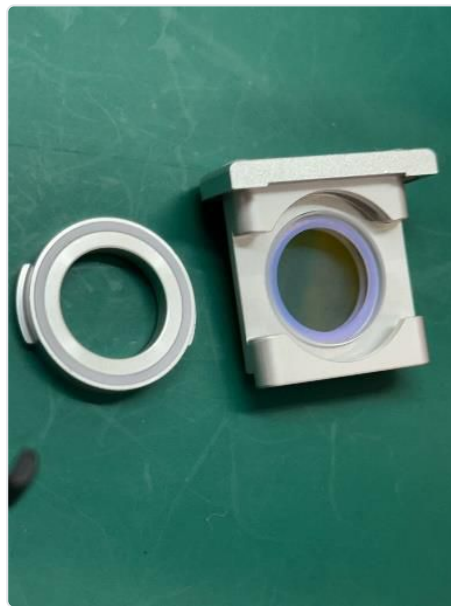
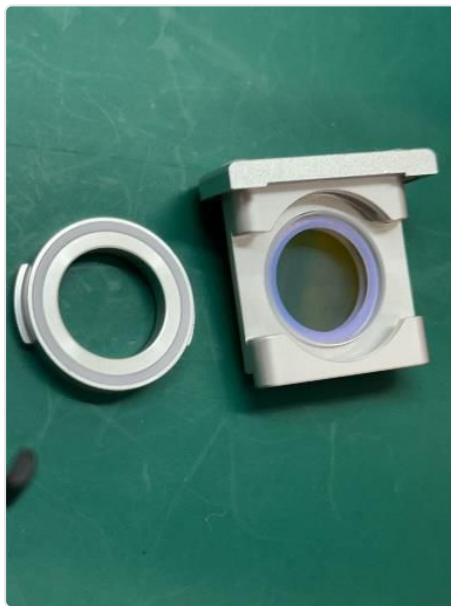
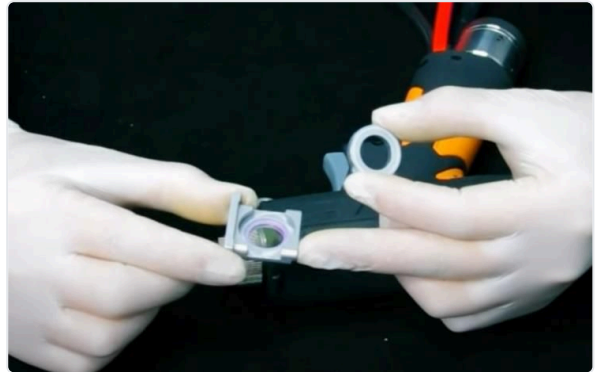
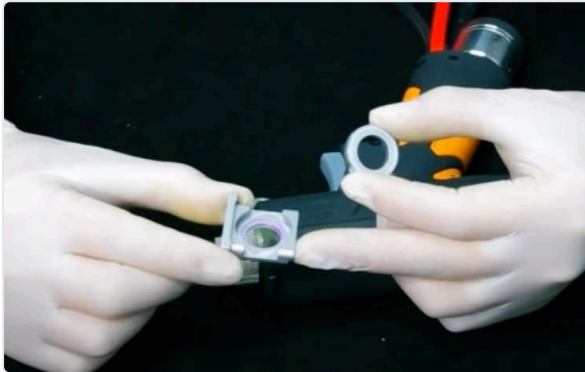
Caution: Work in a place with as little airborne dust as possible! If dust gets inside the laser gun, it will damage the other lenses. Work in a clean location to prevent secondary damage.

1. Open the cover on the top of the laser gun (torch). Two lenses are installed. The one with the white sticker is the protection lens.



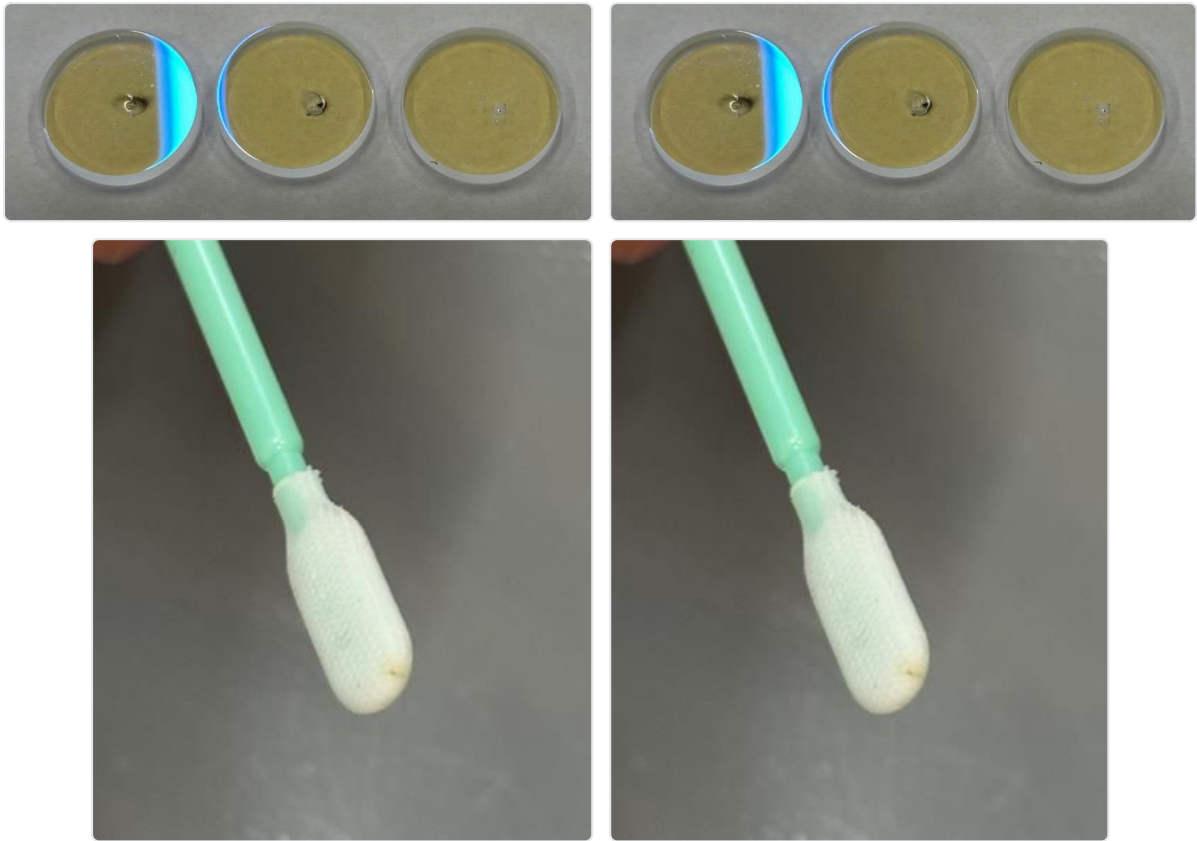
If dust has entered the inside of the cover, remove it with an air duster! Replacing the lens while dust is present will damage the lens.

2. Pull out the lens, then close the cover. Close the cover immediately!
3. Remove the washer from the lens case.



Remove any dust inside the cover!

4. Inspect the lens. If there is spatter or burn damage on the lens as shown in the figure below, replacement is required.



If fume has adhered to the lens, clean the lens using IPA (99% alcohol concentration) and a lens-cleaning swab.

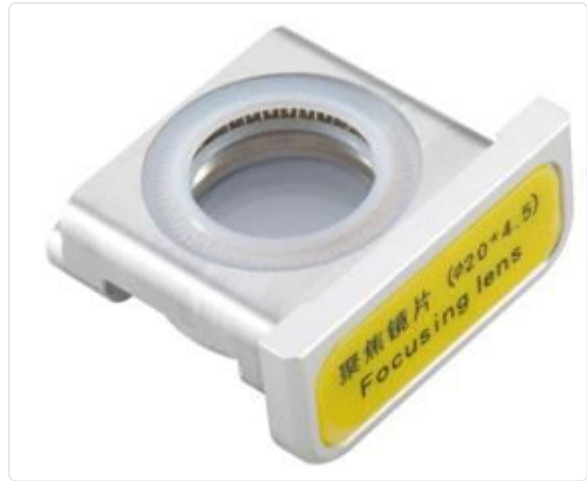
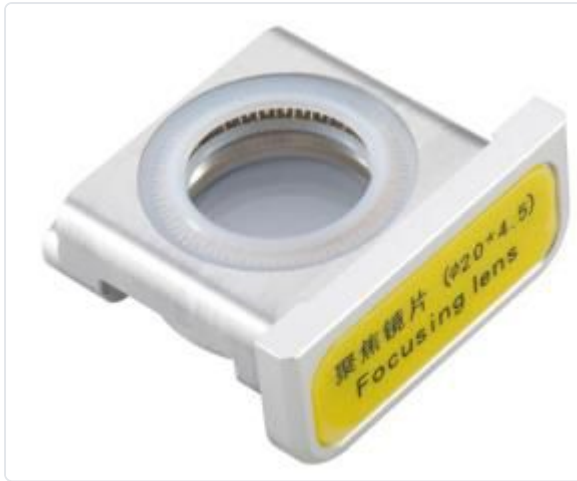
5. After removing the old lens, install a new lens. The protection lens has no specific orientation. Never touch the lens surface — always hold the lens by its edge when replacing it.

8-4-2 Focusing Lens

The focusing lens is a lens installed at the tip side of the laser gun (torch).

The focusing lens focuses the laser light emitted from the laser source. The lens to be installed differs depending on the type of work, e.g. welding or cleaning.

If you perform welding, cutting, or rust removal without spraying gas, the lens will be damaged immediately. Causes of damage vary: processing with an improper beam path, welding with the laser gun held vertically, and so on.



Main causes of damage

The lens is a consumable part that requires periodic replacement.

- **Laser beam path misalignment:** Welding or processing while the laser beam path is misaligned will damage the lens.
- **Insufficient gas:** Processing without supplying gas, or welding with too little gas supply, will damage the lens. For work that generates a lot of fume, use a larger amount of gas. Also supply extra gas when welding aluminum.
- **Vertical welding:** Welding with the laser gun held upright allows reflected laser light to enter the inside of the laser gun and can damage the lens.

- **Dust adhering during lens replacement:** If dust adheres to the lens during replacement, the laser can pass through and burn the lens.

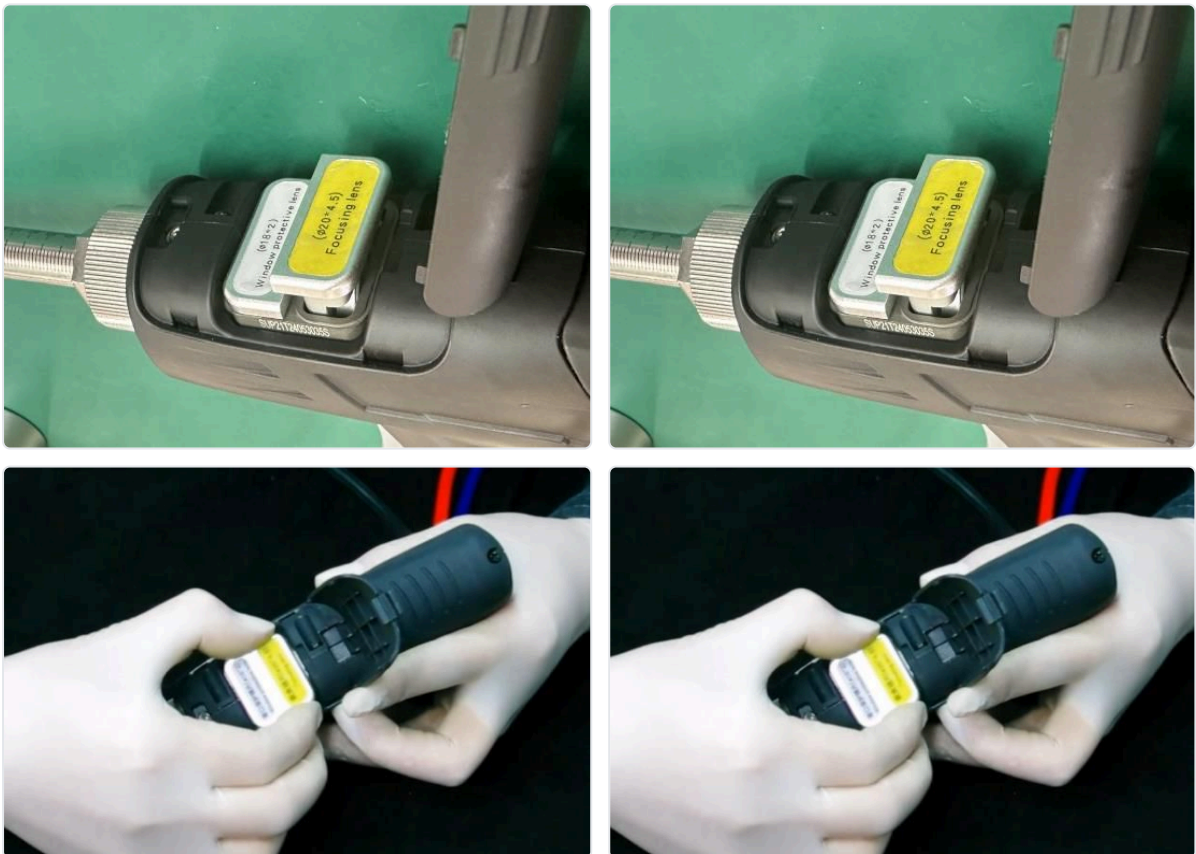
Replacement procedure

Items 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.

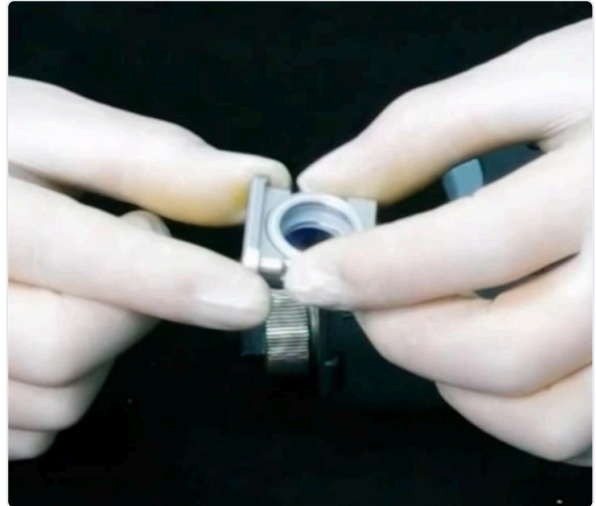
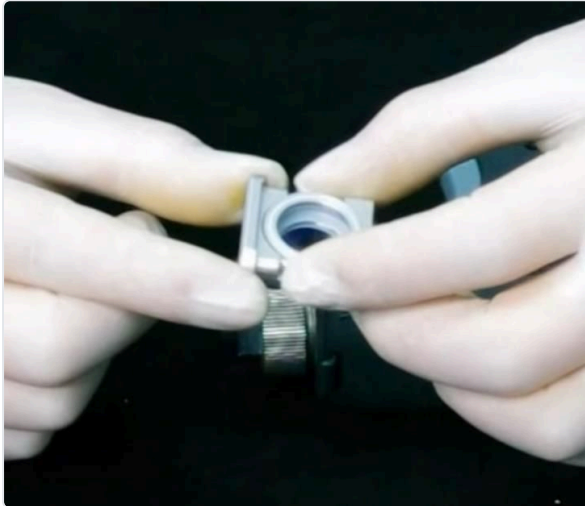
Caution: Work in a place with as little airborne dust as possible! If dust gets inside the laser gun, it will damage the other lenses. Work in a clean location to prevent secondary damage.

1. Open the cover on the top of the laser gun (torch). Two lenses are installed. The one marked with the yellow sticker is the focusing lens.



If dust has entered the inside of the cover, remove it with an air duster! Replacing the lens while dust is present will damage the lens.

2. Pull out the lens, then close the cover. Close the cover immediately!
3. Remove the washer and replace the lens. The focusing lens has a specific orientation.



Remove any dust inside the cover!

4. The focusing lens is a plano-convex lens. Install it in the lens case with the convex side facing down. The correct orientation is with the convex surface facing toward the nozzle.



5. After replacing the focusing lens, install it carefully so that no dust adheres to it.

8-4-3 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 shock. The lens may crack if subjected to a strong impact.



Main causes of damage

- **Laser beam path misalignment:** Welding or processing while the laser beam path is misaligned will damage the lens.
- **Insufficient gas:** Processing without supplying gas, or welding with too little gas supply, will damage the lens. For work that generates a lot of fume, use a larger amount of gas. Also supply extra gas when welding aluminum.
- **Vertical welding:** Welding with the laser gun held upright allows reflected laser light to enter the inside of the laser gun and can damage the lens.
- **Dust adhering during lens replacement:** If dust adheres to the lens during replacement, the laser can pass through and burn the lens.
- **Impact such as dropping:** Dropping the laser gun and subjecting it to impact may damage the lens. The reflection lens in particular is a shock-sensitive part.

Replacement procedure

Items 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.
- Hex wrench — required for loosening set screws, etc.
- Protective tape / masking tape — needed to seal the inside of the laser gun so that dust and dirt cannot get in.
- A clean environment (working inside a clean bench is preferable) — working in an area with airborne dust is strictly prohibited. Work must be performed in an environment that suppresses dust adhesion, such as inside a clean bench or a box-shaped enclosure.



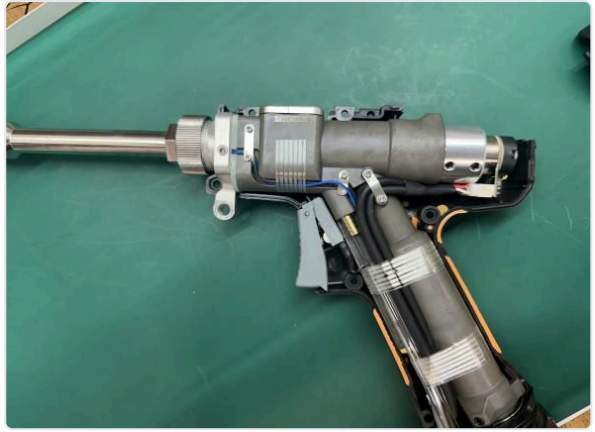
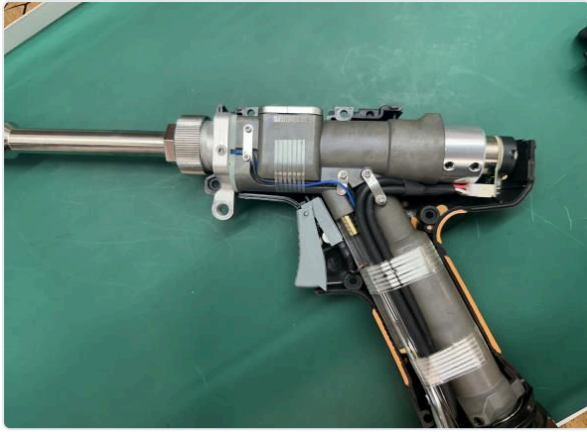
Caution: Work in a place with as little airborne dust as possible! If dust gets inside the laser gun, it will damage the other lenses. Work in a clean location to prevent secondary damage.

1. First, remove the body of the laser gun. Remove the screws at the locations fastened with Phillips screws.



2. Once all the screws have been removed, the body can be taken off.

3. Disconnect the connector under the motor.
4. Loosen the motor fixing screw. Once loosened, the motor can be pulled out.



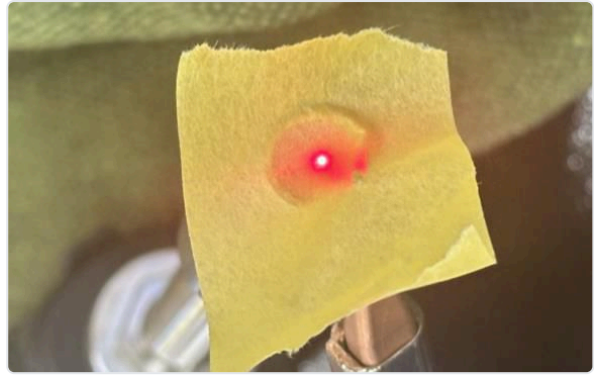
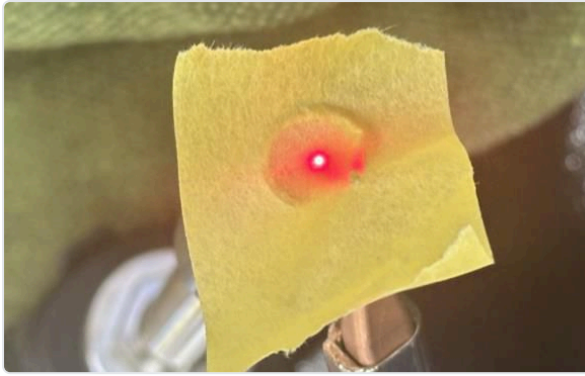


5. As soon as the motor has been pulled out, seal the opening with tape so that no dust can get inside the laser gun.





6. Loosen the two screws of the lens stay. Once loosened, the reflection lens (as a set with the stay) can be removed.
7. Install the new reflection lens. When installing it, align the center of the reflection lens with the motor connector. If they are not aligned, the laser will not be emitted correctly.
8. After attaching the lens to the motor, return the motor to its original position and plug in the connector.



9. After plugging in the connector, turn on the power of the laser welding machine. Once the power is on, start up the laser source power supply and set the machine to the state in which the red pointer is emitted.
10. Move the motor itself to adjust the position so that the red pointer comes to the exact center of the nozzle. Applying masking tape to the nozzle makes this easier to see.
11. Once the pointer has been roughly adjusted to the center position of the nozzle, tighten the motor fixing screws.
12. Refer to the laser beam path adjustment procedure in Chapter 6 and adjust the beam path.

13. Once the beam path adjustment is complete, return the body to its original state.



8-4-4 Collimator Lens

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



Main causes of damage

The lens is a consumable part that requires periodic replacement.

- **Laser beam path misalignment:** Welding or processing while the laser beam path is misaligned will damage the lens.
- **Insufficient gas:** Processing without supplying gas, or welding with too little gas supply, will damage the lens. For work that generates a lot of fume, use a larger amount of gas. Also supply extra gas when welding aluminum.
- **Vertical welding:** Welding with the laser gun held upright allows reflected laser light to enter the inside of the laser gun and can damage the lens.
- **Dust adhering during lens replacement:** If dust adheres to the lens during replacement, the laser can pass through and burn the lens.
- **Impact such as dropping:** Dropping the laser gun and subjecting it to impact may damage the lens.

Replacement procedure

Items to prepare

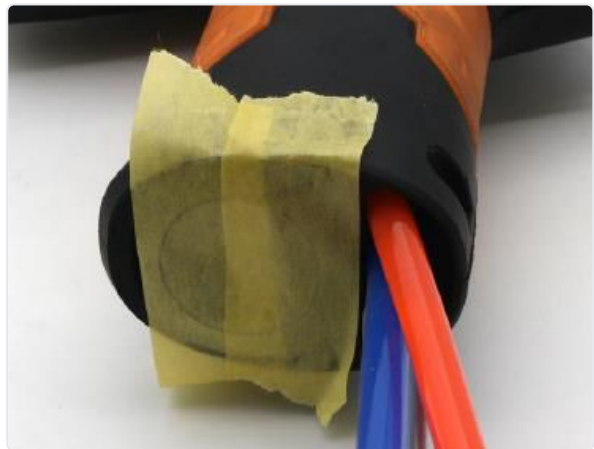
- Air blower, air duster, etc.
Any dust visible to the naked eye is strictly prohibited. If dust or dirt adheres to the lens, blow it off with air.
- A clean environment (working inside a clean bench is preferable) — working in an area with airborne dust is strictly prohibited. Work must be performed in an environment that suppresses dust adhesion, such as inside a clean bench or a box-shaped enclosure.
- Hex wrench — required for loosening set screws, etc.
- Protective tape / masking tape — needed to seal the inside of the laser gun so that dust and dirt cannot get in.
- UV light (optional) — shining a UV light on dust makes it glow clearly, so you can reliably prevent dust contamination.



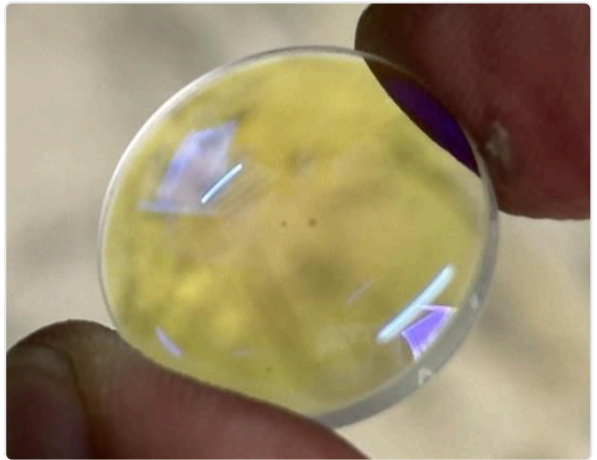
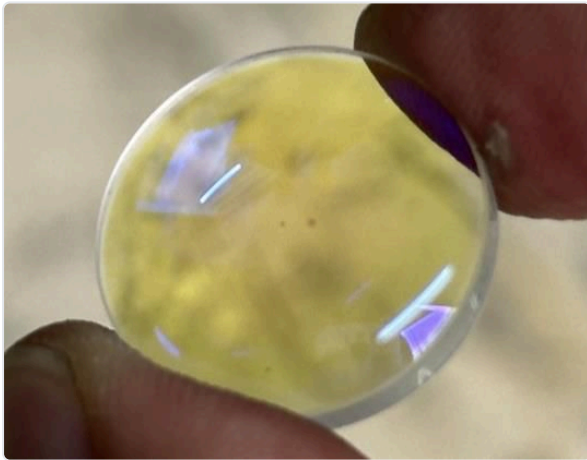
Caution: Work in a place with as little airborne dust as possible! If dust gets inside the laser gun, it will damage the other lenses. Work in a clean location to prevent secondary damage.

1. Remove the three set screws at the base section.





2. Once the set screws are removed, the part holding the collimator lens can be pulled out. Pull it out carefully.
After pulling it out, seal the opening with tape so that no dust can enter the inside of the laser gun.
3. Next, seal the laser gun opening at the location from which the part was pulled out.
4. Check the lens for damage or burn marks.

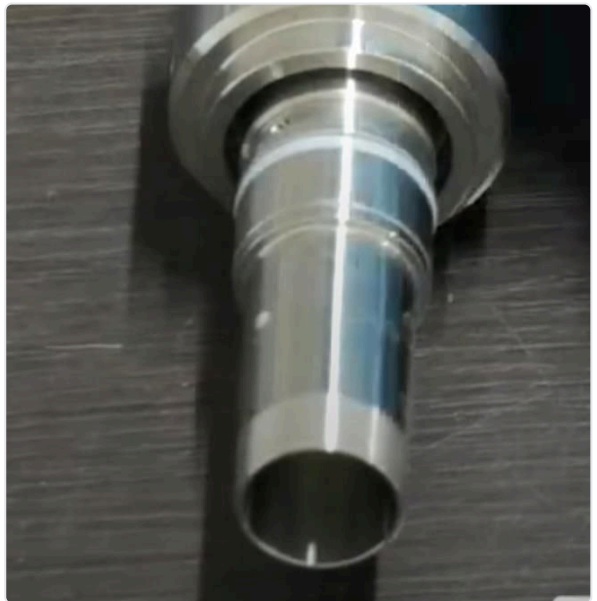




Any dust or burn marks visible to the naked eye require replacement. If they cannot be removed with alcohol or an air duster, replace the lens. Do not touch the lens surface!

Reference: lenses requiring replacement

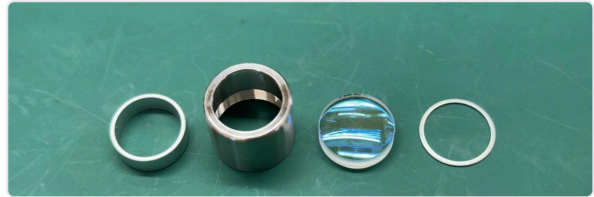
5. Turn the cap at the tip counterclockwise.
6. When the cap is removed, the parts are installed in the following order from the bottom: thin washer, collimator lens, thick washer.



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

7. The lens has a specific installation 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 parts in the reverse order of removal.

Check that no dust is adhering to the lens or to the area shown in the red frame before assembly. If the lens is installed with dust on it, the lens will be damaged. If you have a UV light, shine it on the parts to reliably confirm that no dust is adhering. Dust is strictly prohibited — always install the lens in a completely dust-free state!

8-5 Where to Purchase Consumables

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

This welding machine is the S-type FL-LCW. Please purchase products labeled "S type".

* Welding wire, laser safety glasses, etc. are common parts shared across models.

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



ファイバーレーザー溶接機用部品



【ファイバーレーザー溶接機用 FL-LCWシリーズ消耗品（定期的交換を推奨）】

- ▶ レンズ(保護レンズ、焦点レンズなど)
- ▶ ノズル(ノズル、ワイヤーノズルなど)
- ▶ 溶接ワイヤー・ワイヤーチューブ
- ▶ その他消耗部品
- ▶ 保護メガネ・保護面
- ▶ クーラント・不凍液

ファイバーレーザー溶接機用部品



【ファイバーレーザー溶接機用 FL-LCWシリーズ消耗品（定期的交換を推奨）】

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- ▶ その他消耗部品
- ▶ 保護メガネ・保護面
- ▶ クーラント・不凍液

Chapter 9 — Maintenance

9-1 About Maintenance

- To remove dirt from the machine body, wipe it with a dry or slightly damp cloth, or, if necessary, with 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 the machine. Spilled water can damage the insulation, and corrosive liquids can corrode the equipment.

9-2 Cleaning the Protection Lens

The protection lens may become dirty due to welding fumes and similar contamination. If you continue working with a dirty lens, the focus may shift and the laser output may drop.

The sound during welding also changes. When the lens and focus are normal, the spark sound is loud; if the lens is dirty or damaged, or the focus is off, the sound becomes dull.

If dirt adheres to the lens, the laser is attenuated. In that case, remove the dirt using IPA (99% alcohol) and lens-cleaning swabs. If the dirt cannot be removed, replace the lens.



9-3 Water Chiller Maintenance

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



- Water filler port
- Controller
- Water level gauge
- Drain

9-3-1 Replacing the Cooling Water

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

Even when using plain water, use clean water. Mixing in a corrosion inhibitor helps prevent the water from degrading. 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!

Fluid	Replacement interval
Water	Every 2–3 months
Coolant / antifreeze (containing corrosion inhibitor)	Every 1 year

How to replace the water

1. Open the front door and pull out the drain valve plug to release the water. Press the gray part and pull out the black plug.
Note: The water comes out forcefully. Release it carefully.
2. Remove the cap of the water filler port and pour in water.





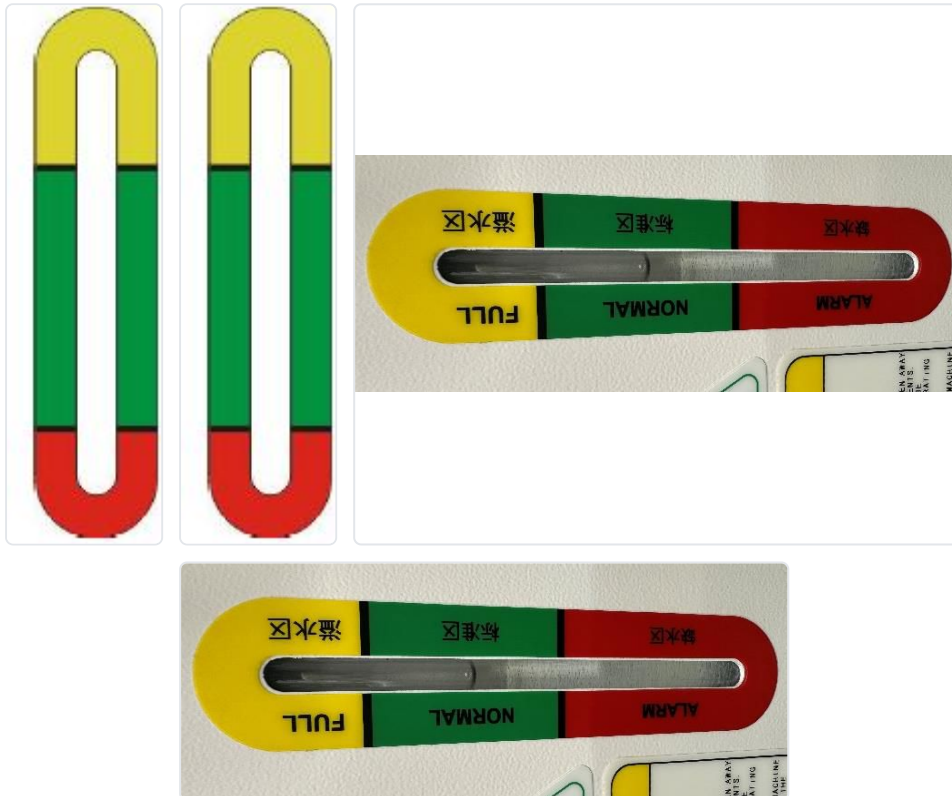
Caution: Freezing

In winter, when the cooling water may freeze, mix in antifreeze/coolant. Do not 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 at no more than 5 : 5. Using undiluted fluid only is not acceptable.

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

Check the water level gauge and add water until the level is within the green range (High / Normal / Low).

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

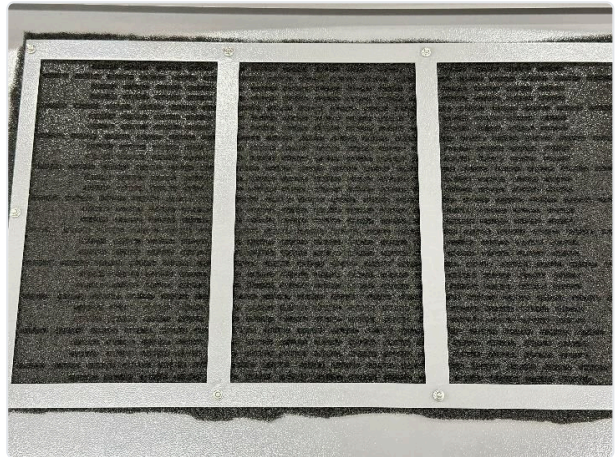
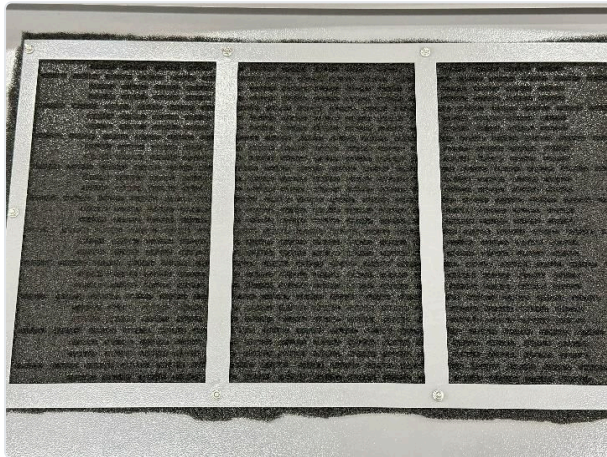


9-3-2 Cleaning the Left and Right Filters

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

1. Open the left and right doors of the machine. Lift each door upward to remove it.
2. A filter is attached to each door. Clean it thoroughly. Blowing it off with compressed air is sufficient.

Guideline: clean once every 1–2 months.



9-3-3 Cleaning the Fins

When you remove the left door, the fins are visible. If dirt adheres to the fins, they must be cleaned. Remove dust with an air blower or similar. We recommend cleaning them at the same time as the filters.

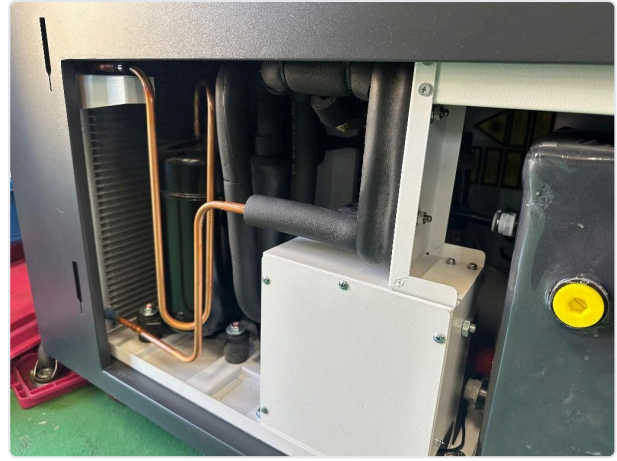
If the air pressure is too strong, the fins may be deformed. Use caution.

Guideline: clean once every 1–2 months.

9-3-4 Cleaning the Exhaust Fan

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

Guideline: clean once every 1–2 months.



9-4 Long-Term Storage

9-4-1 Machine Body

Protect the machine body with a dust cover or similar so that it is not covered with dust or iron powder. Drain the cooling water from the water chiller. If the machine is left unused for a long period, the cooling water may become contaminated.

9-4-2 Wire Feeder

Protect the wire feeder with a dust cover or similar so that it is not covered with dust or iron powder.

9-4-3 Laser Gun

Cover the laser emission aperture with tape or similar. The laser gun contains lenses inside. To prevent the lenses from being damaged by humidity, we recommend storing the laser gun in a zip-lock or plastic bag together with a desiccant.

Chapter 10 — Troubleshooting

10-1 Alarms

A water chiller alarm occurs when the water temperature is too high, too low, or the water level is insufficient. When the temperature of the laser gun becomes very high, an alarm occurs for the lens at the overheating location.

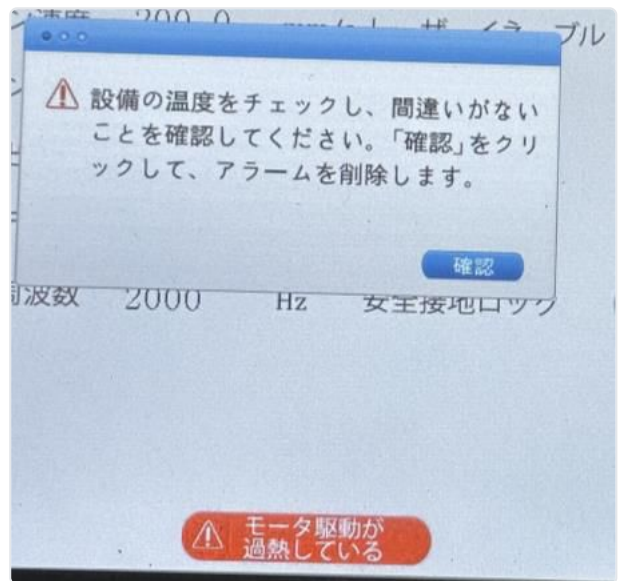
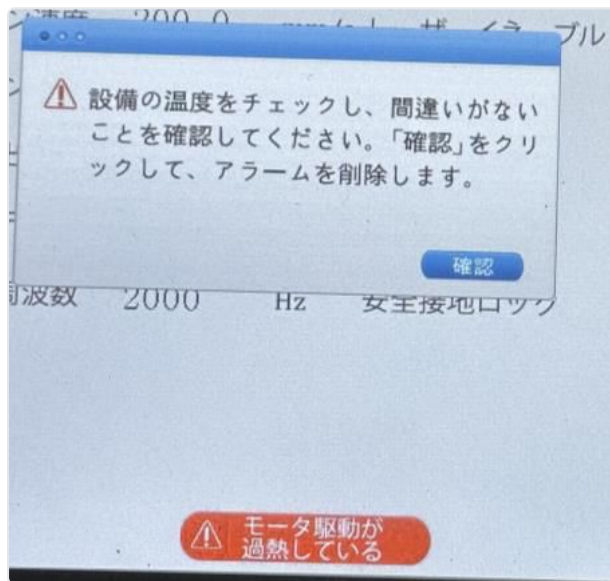
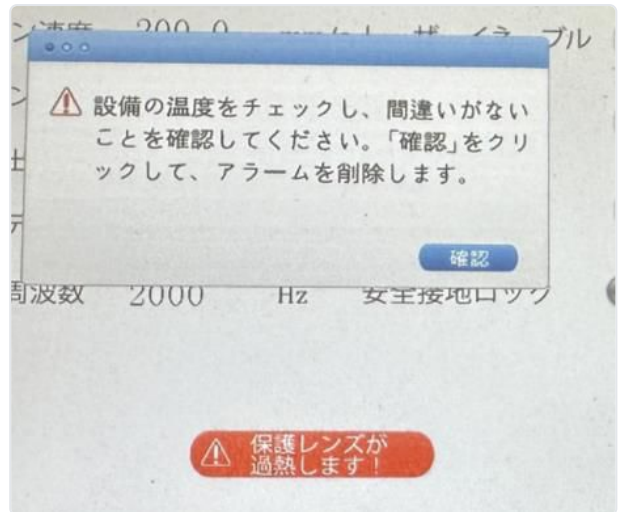
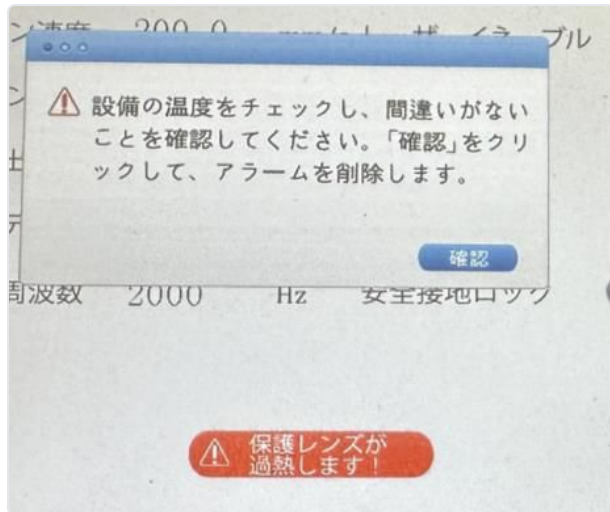
While an alarm is active, the laser cannot be emitted. Check whether the lens shown on the screen is damaged. If it is damaged, it must be replaced.

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. Check procedure:

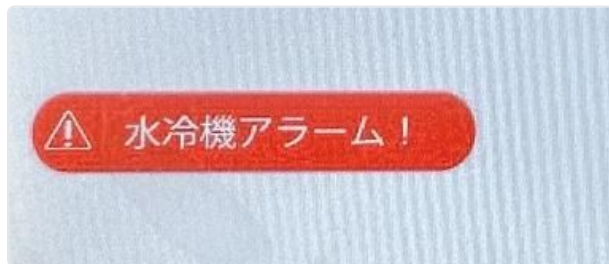
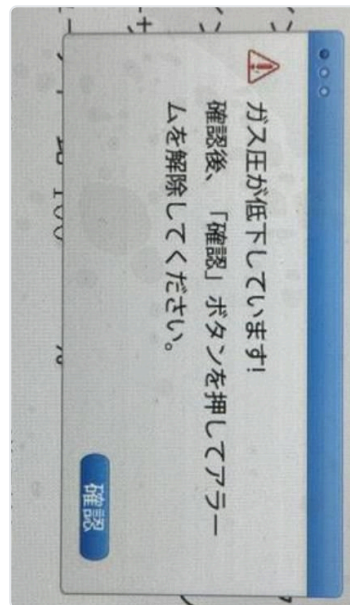
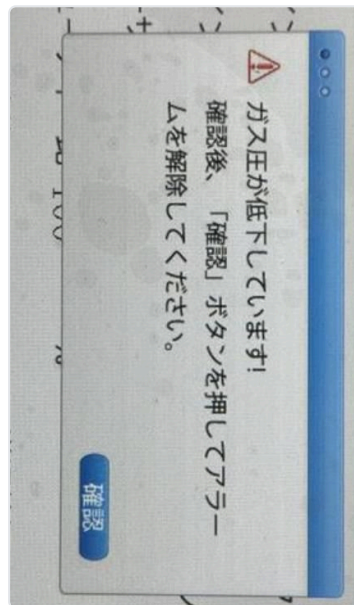
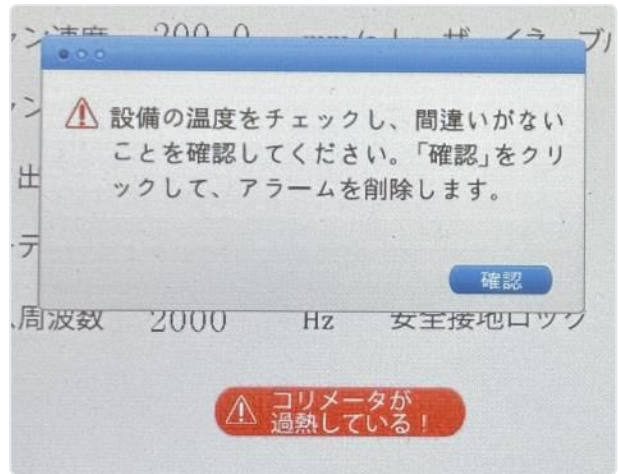
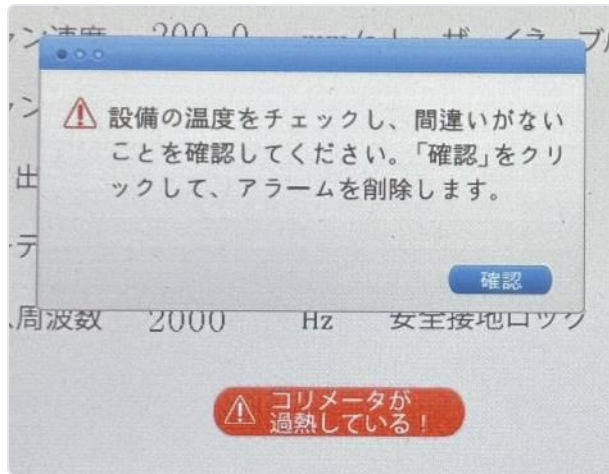
10-1-2 Reflection Lens / Motor

If the reflection lens is damaged or the motor overheats, the alarm "The motor drive is overheating!" occurs. In this case, either the reflection lens is damaged and overheating, or the motor has overheated due to prolonged use. Check procedure:



10-1-3 Collimator Lens

If the collimator lens is damaged, the alarm "The collimator is overheating!" occurs. Check the collimator lens for damage. Check procedure:



10-1-4 Gas Pressure Alarm

The gas pressure is low. Supply at least 0.15 MPa.

Do not supply 0.8 MPa!

10-1-5 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.

If 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 reaches the proper range of around 30°C. Check the water temperature — this error occurs when the temperature is close to 40°C.

If 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 reaches the proper range of around 20°C. Check the water temperature — this error may occur when the temperature is close to 10°C.

If alarm E05 occurs

The circulation of the cooling water is poor. If you are using a high-viscosity antifreeze or coolant (such as automotive coolant), dilute it with water to about one-third strength.

Water chiller alarm list

When a problem occurs, a water chiller alarm is generated and the machine cannot operate.

Code	Alarm	Cause / action
E01	Laser unit water temperature sensor error	Check the water temperature sensor cable. If there is no problem, the water temperature sensor may be damaged.
E02	Laser unit high temperature	The cooling water of the laser unit is hot. Lower the room temperature or allow cooling time. Note: if the room temperature is close to 40°C, lower the room temperature.
E03	Compressor pressure error	The water chiller ventilation may be insufficient, or dust or foreign matter may be clogging the vents. Clean them.
E04	Reverse phase	Reverse phase. Check the power supply wiring.
E05	Laser unit water flow error	The water circulation is weak. If you are using a high-viscosity coolant or antifreeze, dilute it to about one-third strength.
E06	Water level alarm	The water level is insufficient. Add water.
E07	Compressor overload	The water chiller ventilation may be insufficient, or dust or 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 error	Check the connection of the temperature sensor.
E10	High water temperature	The water temperature on the laser gun side is high. Lower the room temperature or allow cooling time. Check the relay operation.
E11	Low water temperature	Raise the room temperature or allow warm-up time. Check the relay operation.
E12	No water flow on the laser gun side	Check the piping. Check that the pipe fittings are not loose. Check whether there is water flow in the piping on the laser gun side. Foreign matter may have entered the piping and be obstructing the flow.

10-2 Laser Alarms

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

If the laser source is powered on while the water temperature is 20°C or below, a laser alarm will occur. Use caution.

10-2-1 Checking Alarms with a Smartphone

Install the app on your smartphone.

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

Go to the download site from the link above. The app to download differs depending on the type of smartphone you use (left: for iPhone, right: for Android).

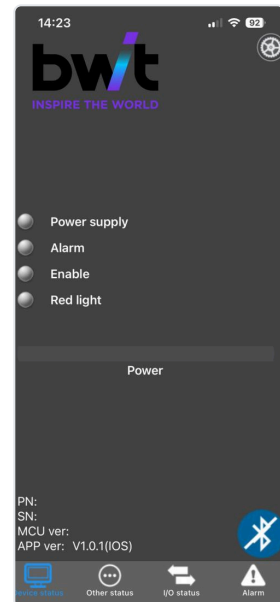
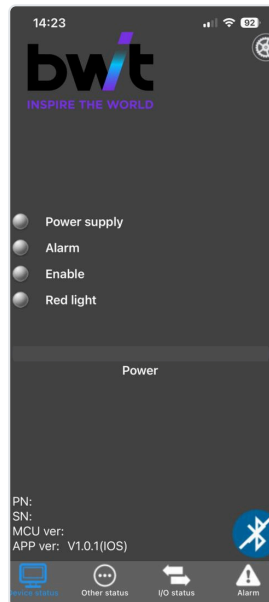


After downloading, launch the app.

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

Touch the Bluetooth icon at the bottom right of the screen (the Bluetooth mark outlined in red).

Note: Bluetooth must be turned ON on your smartphone.

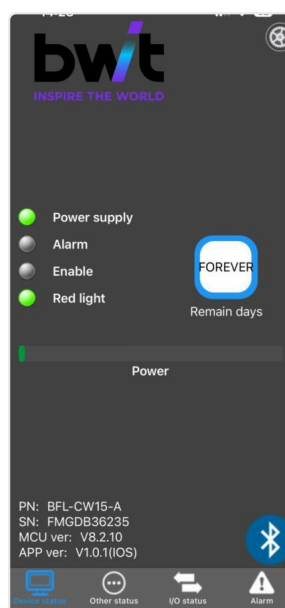
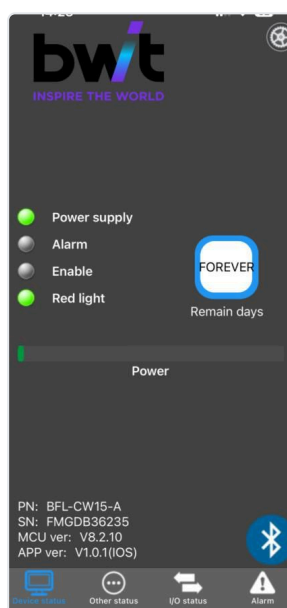
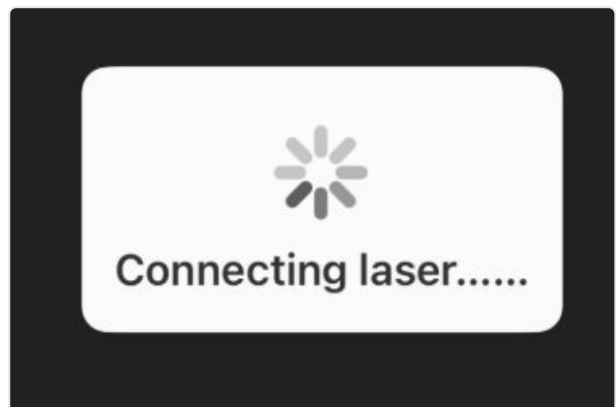
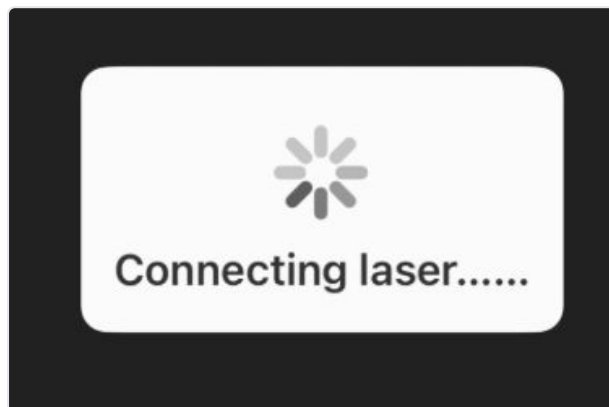
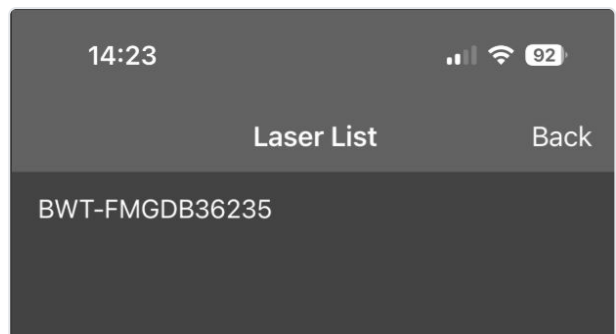
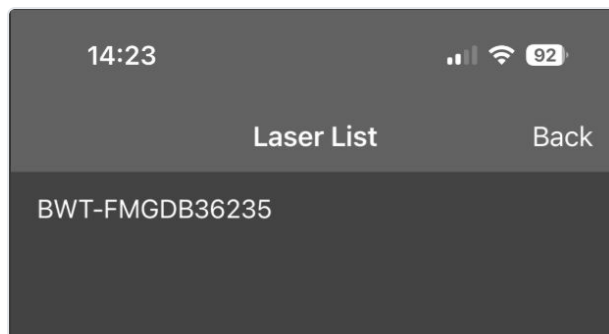


Touch the item outlined in red to connect to the laser source.

Wait until the message "Connecting Laser" disappears.

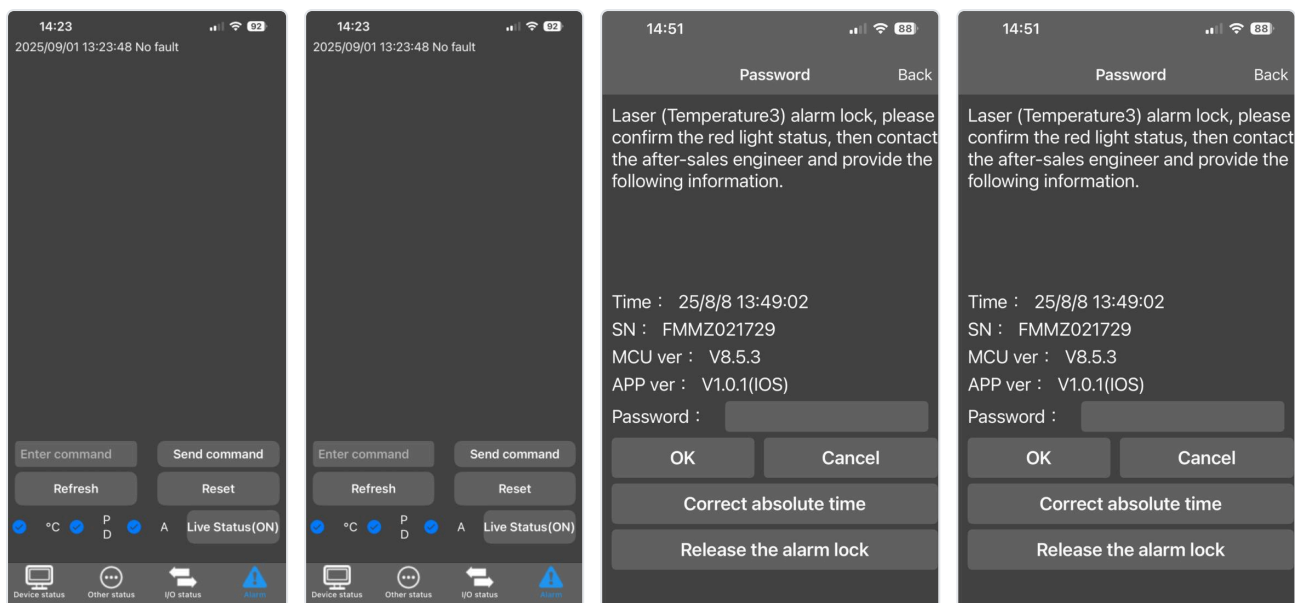
When the details of the laser source are displayed as shown below, the connection is complete.

If the "Alarm" lamp is lit, a fault has occurred in the laser source. Check the details and take the appropriate action.



Select "Alarm" from the tabs at the bottom and press the "Refresh" button to update the alarm information. Send a screenshot of the alarm 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 Sat, Sun, and public holidays)

10-2-2 Checking Alarms with the PC Application

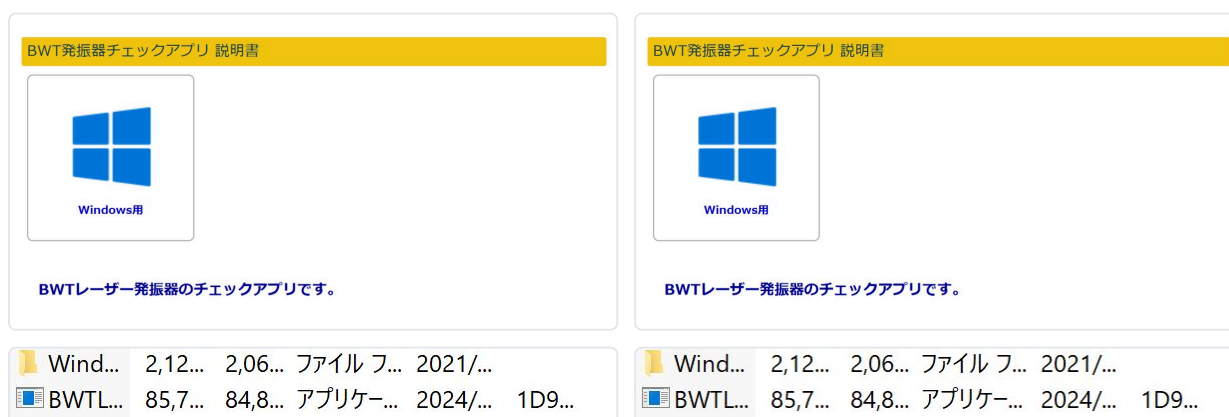
Downloading the application

Install the application on your PC. The connection to the laser source is made with an RS-232C cable, so place the 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 below.

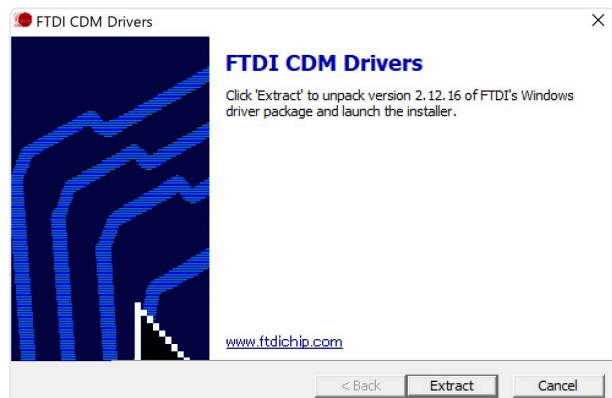
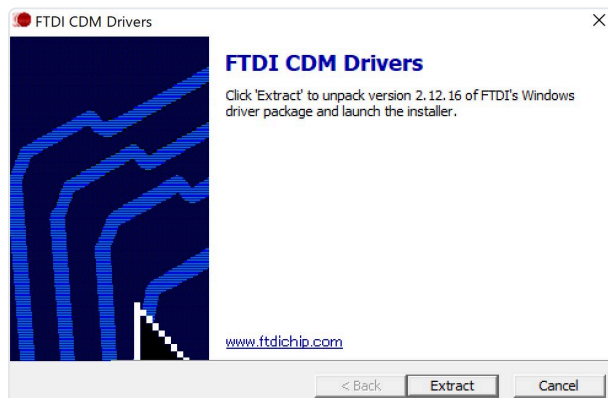
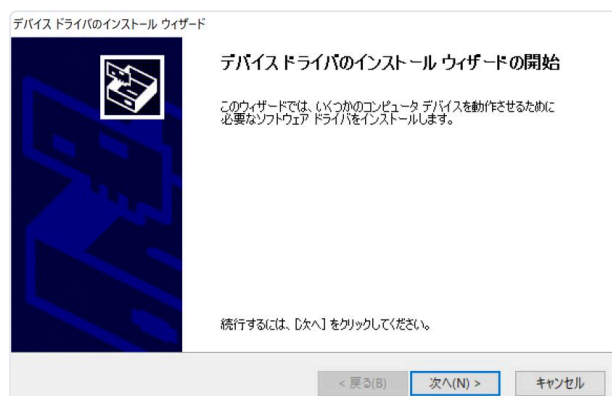
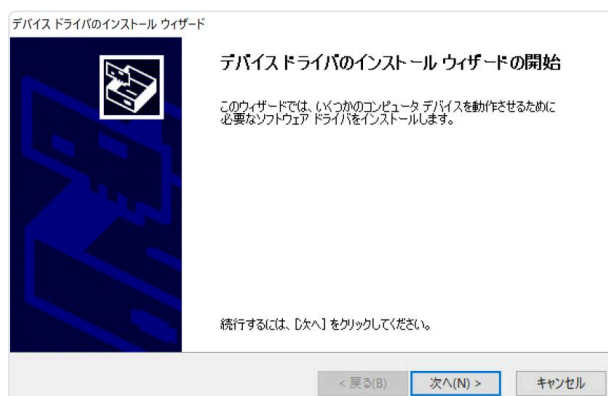
The download contains two files: one is the USB driver, and the second is the laser source application.



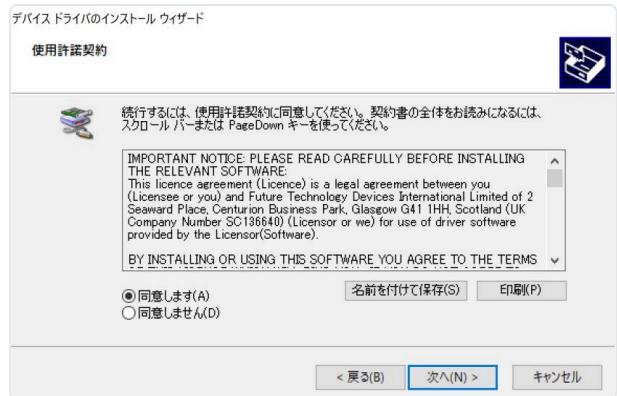
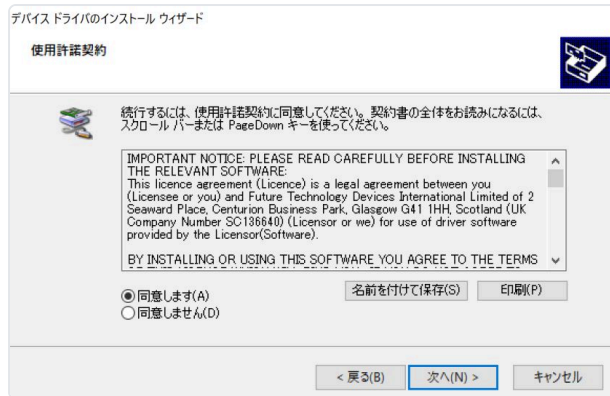
Installing the USB driver

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

1. Click "Extract" to proceed.
2. Click "Next" to proceed.



1. Select "I agree" and click "Next" to proceed.
2. When the installation is complete, click "Finish". The driver installation is now complete.

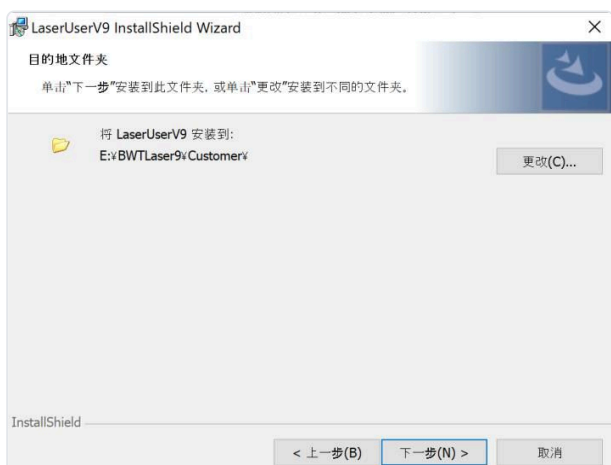
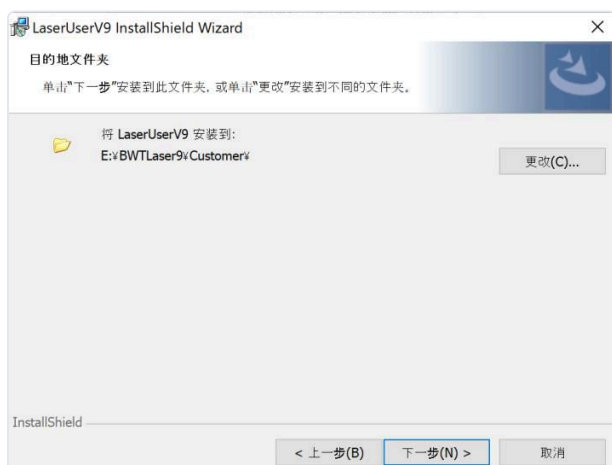
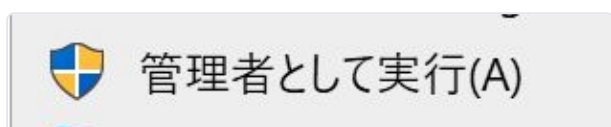
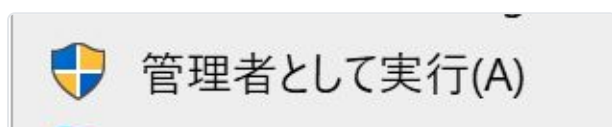
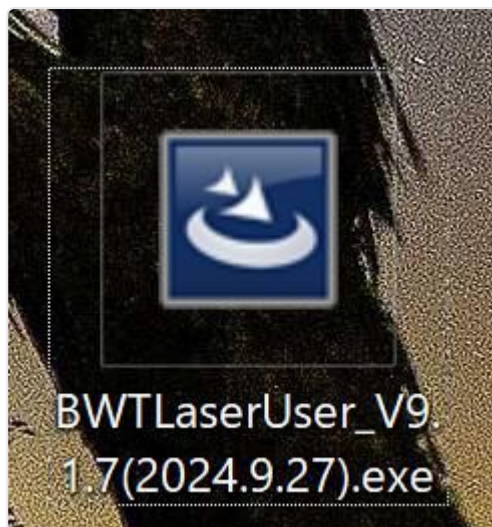
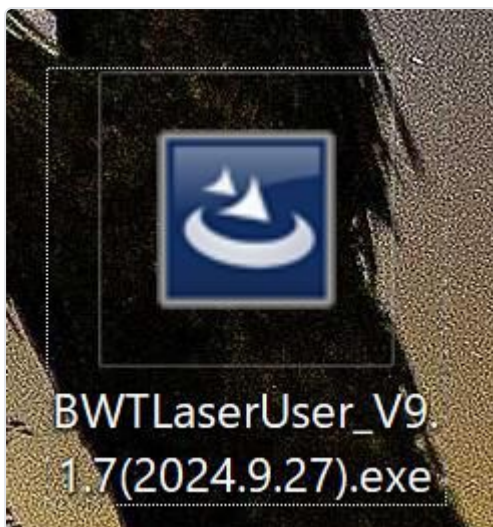


Installing the laser source application

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

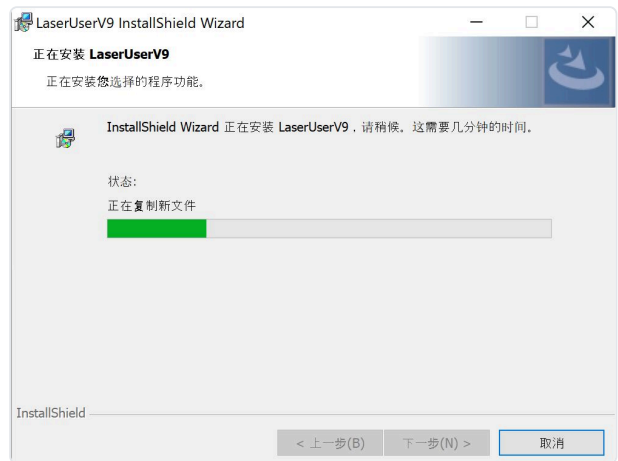
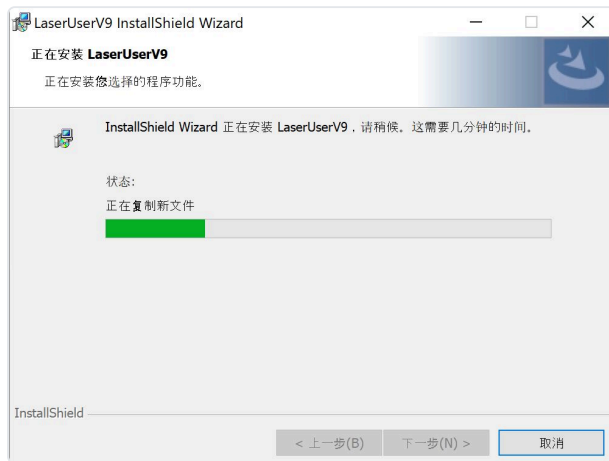
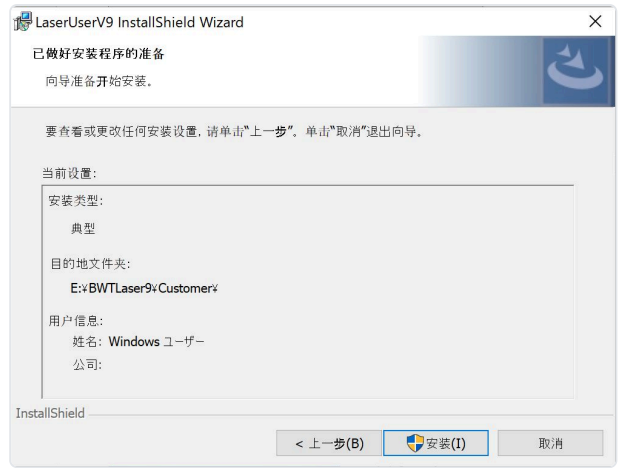
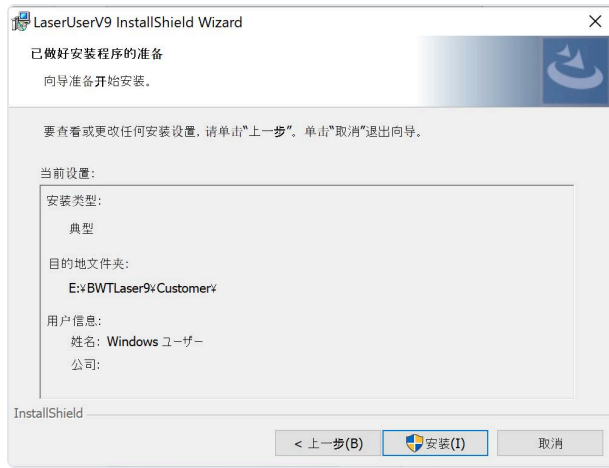
Click the exe file downloaded from the website to install the application.

1. Open the file and begin installing the application. Click "下一步" (Next) to proceed.
2. Click "下一步" (Next) to proceed. (You can specify the destination folder here.)



1. Click "安装" (Install) to proceed. The installation will begin.
2. 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. The D-sub socket is on the rear of the laser source. Plug in the connector.

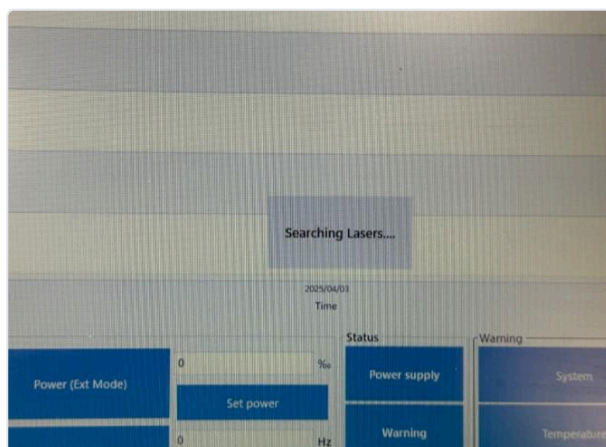
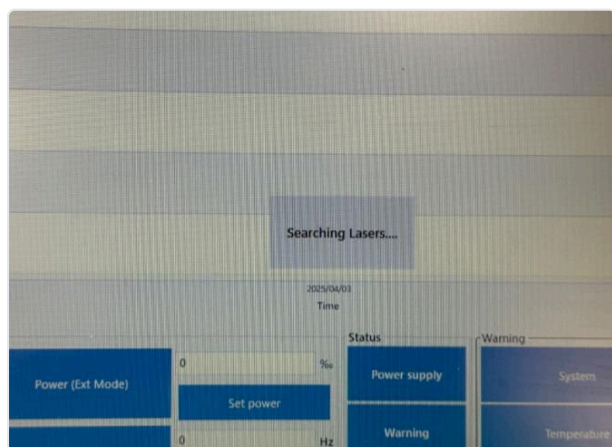
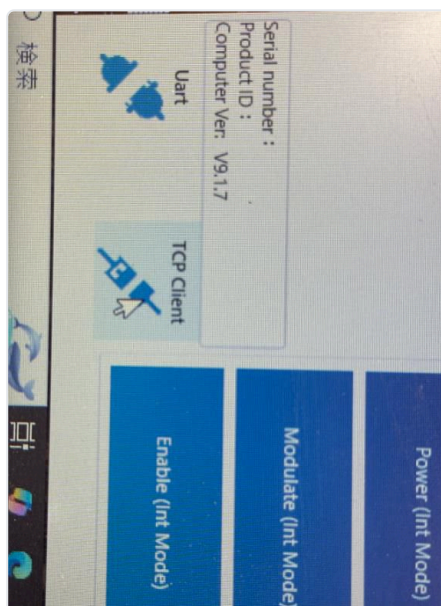
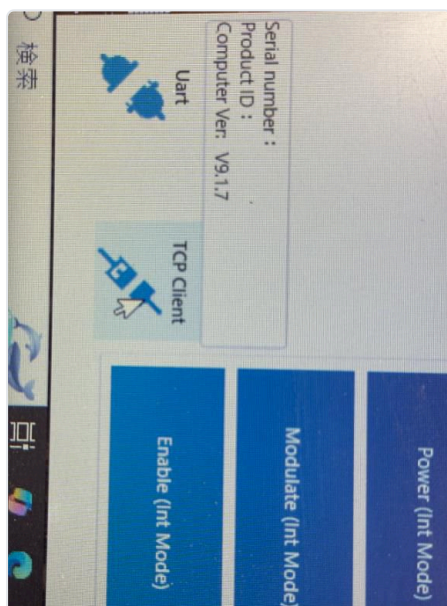




Click the application icon shown on the desktop to launch it.

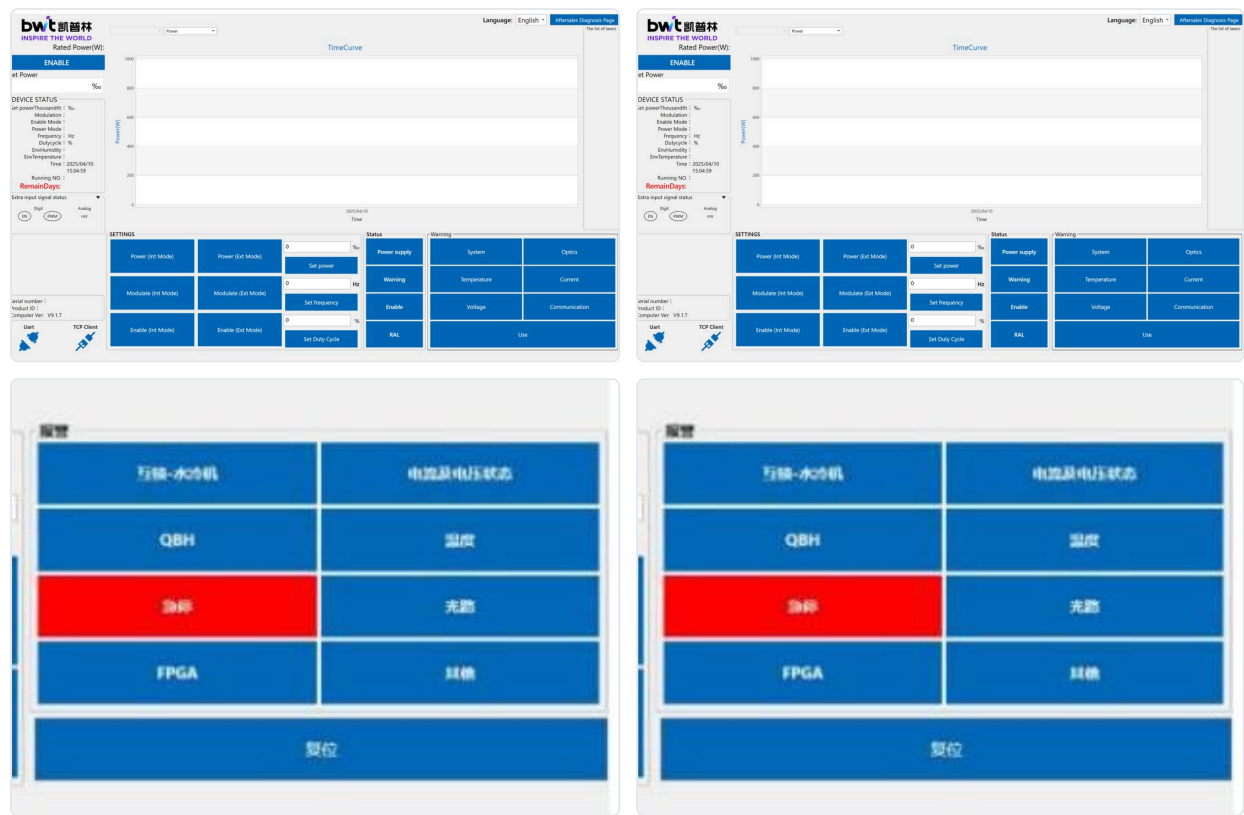
If the screen is displayed in Chinese, use the language switch at the top right of the screen to change it to English.

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



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

If it is shown in red as in the figure below, a fault 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 Sat, Sun, and public holidays)

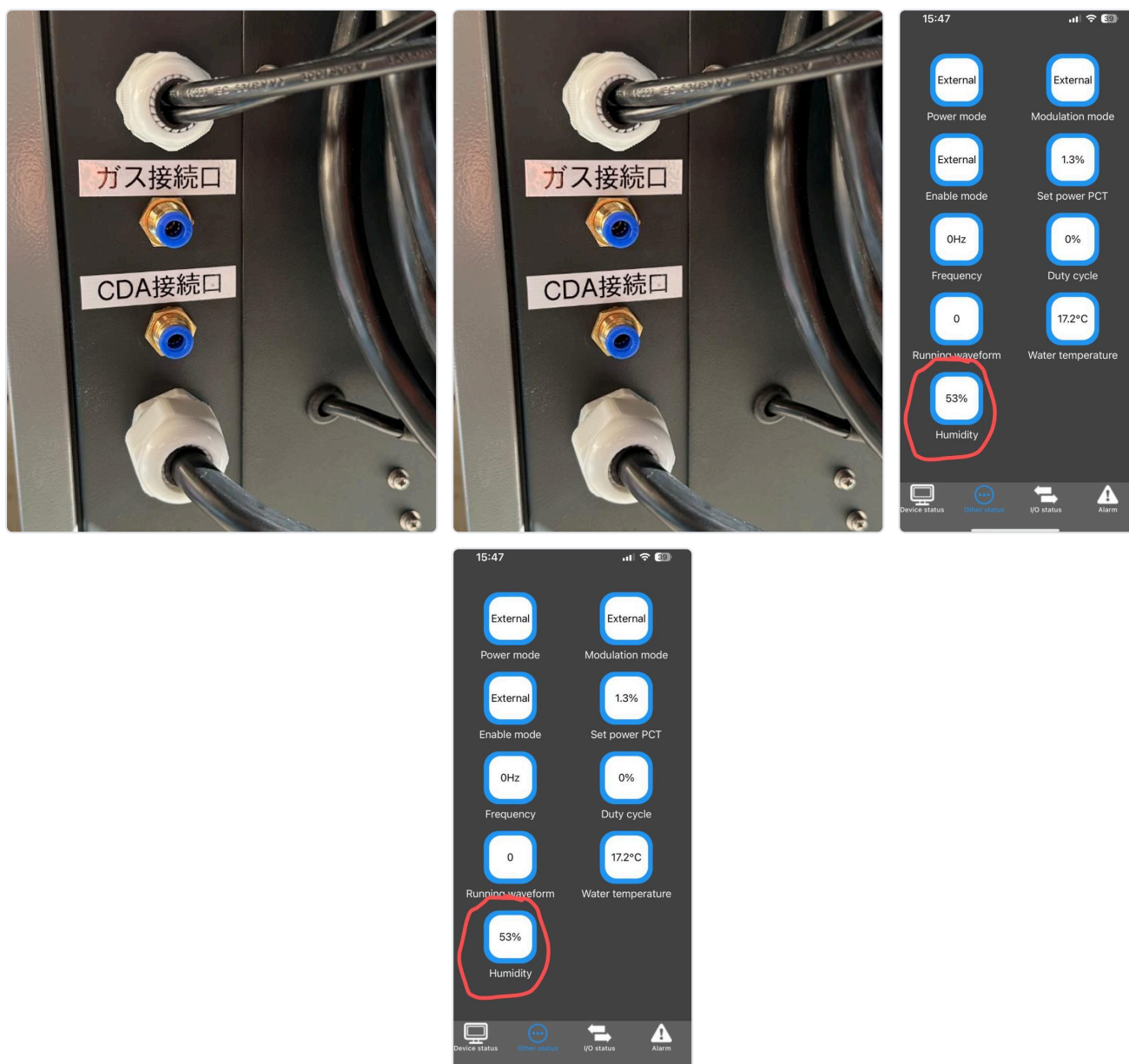
10-3 If Condensation Forms in the Laser Source

The humidity inside the laser source must be lowered. Connect the gas tube you are using to the "CDA port" on the rear of the machine and feed in nitrogen gas or dry air (clean air). Pay attention to the gas pressure while working.

10-3-1 Procedure

1. Turn off the power of the laser source.
2. Attach a gas tube with an outer diameter of 6 mm to the CDA port.
3. Prepare nitrogen gas or clean air (air dryer + particle filtration 5 μm or finer + mist filter 0.1 μm or finer).
4. Set the gas pressure below 0.1 MPa.
5. Feed the gas for about 10–20 minutes.

6. Check the "humidity" value in the laser source application. Confirm that the value has dropped to 60% or below.



10-4 Support Contact

If you cannot resolve a problem, or a fault has occurred and you need support from our staff, please contact us at the 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 Sat, Sun, and public holidays)

Supplementary Document: "Protective Housing and Interlocks"

— Response to the JARWA Equipment Examination Checklist —

Submitted to	Japan Automobile Body Repair Association (JARWA)
Submitted by	Rinsyundou Co., Ltd. (Sunmax Laser)
Product	Fiber laser welding machine RSD-SUNMAX-FL-LCW-PRO S type
Examination item addressed	③-1 Protective housing and interlocks
Date of submission	May 26, 2026

1. Purpose of This Document

This document explains how this product implements the item pointed out in the "Fiber Laser Welding Machine Examination Checklist" dated May 26, 2026 — "Protective housing and interlocks: an enclosure that can withstand a Class 4 laser, with a mechanism that prevents covers from being opened carelessly."

2. Conclusion (Key Points)

Protective housing	A metal cabinet body (sealed structure) that withstands a Class 4 laser. Houses the laser source unit and electrical systems.
Interlocks	The side door and top door are equipped with lockable handles. The covers cannot be opened carelessly — they cannot be opened without the administrator's key.

3. Implementation Details

3-1. Protective Housing (Enclosure That Withstands a Class 4 Laser)

In this product, the laser source unit, power supply unit, cooling system, and related components are sealed inside a metal cabinet (steel-plate main enclosure) that withstands a Class 4 laser.

Component	Description
Main enclosure	Sealed steel-plate cabinet (front, sides, top, and rear all constructed of metal panels)
Internal components	Laser source unit / power supply / cooling system / control boards
External labeling	Model label "SunmaX laser LCW-1500W" and warning labels affixed
Heat dissipation	Ventilation slits on the sides and rear (structure through which laser light cannot pass)

[Photo ①] Main enclosure (SunmaX laser LCW-1500W)



3-2. Interlocks (Prevention of Careless Opening by Means of Keys)

To prevent careless access to the high-power laser unit inside, the protective housing of this product is equipped with lockable handles (locking handles with cylinder locks) on the side door and the top door.

Location	Equipment	Function
① Side door	Locking handle with cylinder lock	Restricts access to the internal laser source and power supply unit. Cannot be opened without the key.
② Top door	Locking handle with cylinder lock	Restricts access to the internal control and cooling sections. Cannot be opened without the key.
Key management	Kept by the laser equipment administrators	Primary: Mr. Sato (佐藤 高良) / Deputy: Mr. Igawa (井川 卓真) keep the keys under strict control; no one other than authorized personnel can open the doors.

[Photos ②③④] Locked doors (side door and top door): ② side door locking handle, ③ top door locking handle, ④ overall view of top door and control panel



As described above, this product has a "metal enclosure that withstands a Class 4 laser" and an interlock structure in which "the covers cannot be opened without a key," and therefore satisfies the requirements

of the JARWA equipment examination guidelines for "protective housing and interlocks."

3-3. Other Supplementary Interlock Mechanisms

In addition to the locked doors above, the product has the following mechanisms to further enhance safety during operation.

No.	Mechanism	Description	Reference
①	Key control (laser source key)	The laser cannot emit unless the laser power key (laser source key) is turned clockwise. The machine cannot be started if the key is removed.	User manual P17 / P22
②	Emergency stop button	Pressing the power OFF / emergency stop button on the front of the machine immediately and forcibly stops laser emission.	User manual P21 / P57 / P97
③	Earth clip continuity detection	If the earth clip is not electrically connected to the workpiece, the laser will not emit even if the trigger is pressed.	User manual P17 / P32 / P101
④	Nozzle tip contact detection	The laser does not emit unless the nozzle tip of the laser gun is in contact with the workpiece (emission stops the instant it is lifted away).	User manual P17 / P65 / P81
⑤	Trigger setting (double-click)	By default, laser emission requires two clicks of the trigger, preventing unintended emission due to accidental operation.	User manual P119

4. Supplement: Prevention of External Leakage by a Controlled Area

Furthermore, to ensure safety when using the laser gun (torch), the work area is enclosed with laser-blocking sheets / dedicated partitions (Class 4 rated) to create a laser controlled area from which laser light cannot leak outside.

Component	Description	Reference
Laser controlled area	Laser-blocking sheets (compliant with IEC/EN 60825-1, PEL>4000W/cm ² , Class 4 rated)	Attachment: "Laser blackout curtain specifications / catalog"
Controlled area signage	"Laser Controlled Area", "Laser Safety Glasses Required", and "Beware of Reflected Light" signs posted in the work area	Attachment: "Laser controlled area signage" / equipment examination ② photos
Appointment of administrators	Primary: Mr. Sato (佐藤 高良) / Deputy: Mr. Igawa (井川 卓真)	Attachment: "Laser equipment administrator notice"

5. Summary (Correspondence with JARWA Requirements)

JARWA requirement	Implementation in this product
Enclosure that withstands a Class 4 laser	Sealed steel-plate cabinet body. Houses the laser source, power supply, cooling system, and controls.
Mechanism that prevents covers from being opened carelessly	Side door and top door equipped with lockable handles (cylinder locks). The keys are kept under strict control by the administrators (Primary: Mr. Sato / Deputy: Mr. Igawa), and no one other than authorized personnel can open the doors.

May 26, 2026

Rinsyundou Co., Ltd. (Sunmax Laser)

Representative Director: Eiji Hayashi (seal)

End of document.