



4 IN 1 HANDHELD LASER WELDING MACHINE (1500W/2000W/3000W)

USER GUIDE

Shenzhen Horizon Laser Technology Co.,Ltd.

Company Profile

Shenzhen Horizon Laser Technology Co., Ltd is a new high-tech enterprise integrating technical services, technology promotion, laser equipment modular design, sales and integration services. Horizon Laser has many senior technical experts (Covering machine tool design, optics, automation integration, laser process development) from well-known laser companies. Horizon laser is mainly committed to promoting laser processing technology, popularizing laser applications, and reducing the asymmetry of client information through modular sales and integration services of laser equipment, and strives to achieve an satisfaction for customers to buy and use.

More information , please visit our website :

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1. General Safety Information

Thank you for choosing a handheld fiber laser welding machine from Horizon Laser Technology Co., Ltd. This user guide provides you with important safety, operation, maintenance and other information. Therefore, please read this user guide carefully before using this product. To ensure safe and optimum operation, please note the following cautions, warnings and other information in this manual.

1.1. Laser Safety Class

This series of fiber lasers belongs to Class IV (Class 4) laser products, with an output laser power exceeding 1500W (depending on the model) and a wavelength range of 1060nm to 1100nm, which falls under invisible light. Direct or indirect exposure to the laser can cause harm to the eyes or skin, and looking directly at the laser can result in irreversible damage to the retina and cornea. Horizon Laser strongly recommends that you always wear qualified and safe protective glasses when operating the laser.



laser safety eyewear or glasses must be worn

1.2. Optical Safety


If there is dust on the end cap or protective lens of the laser output head (QBH), the end cap or lens will be burned when the light is emitted, and even the fiber cable will be damaged.

1.3. Electrical Safety

- (1) Please ground the device using the PE wire in the power cord, and ensure that the grounding is secure and reliable. Make sure the instrument is properly grounded through a protective conductor of the AC power cable, or else some fault may be caused including laser alarm, light malfunction or unsteady working.
- (2) If the rear panel air switch frequently trips, you need to contact the manufacturer as soon as

possible to ensure the safe use of the equipment.

- (3) Ensure that the AC power supply voltage is stable.

	<p>WARNING: Refers to a potential Electrical Hazard to human body; It requires a procedure that, if not correctly followed, may result in bodily harm to you and/or others. Do not proceed beyond the WARNING sign until you completely understand and meet the required conditions.</p>
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1.4. Additional Safety Information

- (1) Do not look directly at the welding gun output port while the equipment is in operation.
- (2) Do not use the equipment in dim or dark environments.
- (3) Strictly follow the operating instructions in this product manual. otherwise, any damage to the equipment will not be covered under warranty.
- (4) There are no user-serviceable parts inside this product. All repairs should be performed by qualified professionals. To prevent electric shock, do not damage labels or remove covers. otherwise, any damage to the product will not be covered under warranty.

2. Product Introduction

2.1. Product Introduction

The handheld laser welding machine is a high-power laser welding device newly launched by Horizon Laser Technology Co., Ltd. The entire machine features a compact structure and easy mobility, catering to a wider range of application scenarios. Its handheld mode facilitates the welding of products such as boilers, cabinets, doors, windows, and advertising characters, making laser welding possible for outdoor operations. It is set to replace the majority of applications traditionally served by electric welding and argon arc welding.

The complete set of the handheld laser welding equipment mainly integrates a fiber laser, a handheld welding gun, a wire feeder, a laser control system, and a safe light emission system into one unit. It can deliver stable and uninterrupted light emission for welding, enabling butt welding, lap welding, seal welding, seam welding, and spot welding of products.

2.2. Product Principle

The laser generates a beam, which is transmitted through an optical fiber and focused into a high-energy-density laser within the welding gun. This laser acts on the material to be processed,

and with the assistance of shielding gas (to prevent oxidation of the material), it liquefies the material to form a specific molten pool, thereby achieving the purpose of welding.

2.3. Product Advantages

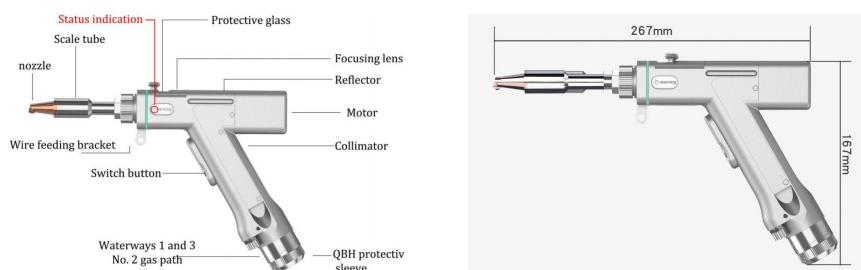
- Welding speed is fast, several times faster than TIG welding.
- Weld width can be adjusted from 0 to 6 mm, meeting different welding seam requirements.
- Welding thickness can reach up to 8 mm @ 3000W, suitable for various plate thicknesses.
- Supports both continuous welding and spot welding modes.
- Supports wire feeding welding function, ensuring full welds and eliminating concerns about joint gaps.
- Multiple welding parameters can be pre-stored and directly applied for welding different materials.
- The welding torch is lightweight and ergonomically designed, providing a comfortable grip and suitability for long-term handheld welding operations.
- Wide range of weldable materials, including stainless steel, carbon steel, aluminum, galvanized sheets, copper, and other metals.
- Welding is completed in one pass, with strong and smooth weld seams, eliminating the need for post-welding polishing.
- Low power consumption, minimal welding fumes, and virtually no consumables, resulting in low operating costs.
- Utilizes a fiber laser as the welding light source, with a lifespan of 100,000 hours and no power decay.
- Safe and reliable, with multiple laser emission protection measures to prevent accidental operation.
- Safety ground lock design ensures laser emission only when the torch is in contact with the workpiece.
- Gas detection system alerts if the gas cylinder is not open or the gas flow is low, preventing damage to the torch lens.
- Multiple alarm detection systems for the laser, chiller, and gas pressure, providing real-time monitoring of equipment status.
- Supports multiple languages, including Simplified Chinese, Traditional Chinese, English, Japanese, Korean, Russian, German, French, and more.

2.4. Product Structural

2.4.1. Machine Structure



2.4.2. Welding Head Structure



- **Copper Nozzle:** Customers can replace the nozzle according to different welding processes (e.g., concave corner nozzle, convex corner nozzle, wire feeding nozzle, etc.).
- **Scale Tube:** The focal length can be adjusted by sliding the adjustment rod forward or backward, with an adjustable range of $\pm 10\text{mm}$.
- **Wire Feeding Bracket:** Used to fix the wire feeding rod. When not in wire feeding mode, the rod can be detached from the bracket.
- **Status Indicator Light:** Green indicates normal operation. flashing red indicates a laser alarm or low gas pressure. steady red indicates that the protective lens or motor driver temperature is too high. If the red light appears, stop laser emission immediately and inspect the corresponding components.
- **Protective Lens Assembly:** If the protective lens is dirty, loosen the two screws, pull out the lens holder, and replace the lens. When the motor is not oscillating, check if there are black spots in the red light spot to determine if the protective lens is dirty.
- **Focusing Lens Assembly:** Focuses the laser beam into an extremely high energy density, then heats and melts the material to achieve welding.
- **Reflector and Motor:** The motor drives the lens to oscillate at high speed, shaping the laser's form and energy distribution, transforming the welding spot from a point to a line.
- **Trigger Button:** Used to trigger laser emission during handheld welding.
- **Gas Path:** Interface for welding shielding gas and internal air-cooling circulation of welding gun.
- **QBH Locking Sleeve:** Connects to the QBH output head of the laser. Ensure cleanliness during installation to avoid dust entering the gun body.

2.5. Technical Parameters

Device model	DPX-W1500	DPX-W2000	DPX-W3000
Laser type	Continuous fiber laser (wavelength 1080±3nm)		
Rated output power	1500W	2000W	3000W
Cooling method	Water cooling		
Power adjustment range	10%~100%		
Welding mode	Continuous welding, spot welding		
Adjustable weld width	0~6 mm		
Welding gun cable length	Around 9.0m		
Welding gun weight	0.75kg		
Product Size	L*W*H: 980*550*720mm		L*W*H: 990*675*940mm
Total Weight	98kg	103kg	128kg
Machine power consumption	<6.7kw	<8.4kw	<13kw
Operating Voltage	Single-phase three-wire 220VAC		Three-phase five-wire 380VAC
Working environment requirements	Temperature: 0~40℃, humidity <70%		
Safety light system	Safety ground lock: Only when the welding gun touches the workpiece can the light emission be controlled; Gas detection: If the gas bottle is not opened or the gas flow is low, the software will alarm; Welding gun firing button and laser shutter, double safety light output.		

2.6. Welding Performance

Device model	DPX-W1500	DPX-W2000	DPX-W3000
Stainless steel	≤4.0mm	≤6.0mm	≤8.0mm
Low-carbon steel	≤4.0mm	≤6.0mm	≤8.0mm
galvanized sheet	≤3.0mm	≤5.0mm	≤6.0mm
Aluminum alloy	≤3.0mm	≤4.0mm	≤5.0mm
Brass	≤3.0mm	≤4.0mm	≤5.0mm

2.7. Product Operation Panel

2.7.1. Machine Operation Panel



- Emergency stop: Press the "Emergency stop" switch, and the power supply of the whole machine is turned off; after releasing the emergency stop, press the "Start" button to power on the whole machine.
- Start: Turn on the entire machine power supply system. Press the "Start" button, and the left indicator light will light up after 20 seconds, and the device will be ready.
- Indicator: When the power supply of the whole machine is ready to start, the indicator light will display green.
- System touch screen: used to set laser power, frequency, duty cycle; weld width and swing speed of welding gun; delay of opening or closing gas for protection gas, etc.

2.7.2. Chiller Panel



Add water steps:

- (1) Turn off the equipment.
- (2) Unscrew the cap of the water inlet, add purified water, distilled water or deionized water to the water inlet, wait until the water level reaches the middle and upper range of the green NORMAL scale, then screw on the cap.
- (3) Under cold conditions in winter, antifreeze needs to be added to the chiller, $-2\sim-5^{\circ}\text{C} \rightarrow \text{Water} : \text{Antifreeze} = 8 : 2$, $-12\sim-15^{\circ}\text{C} \rightarrow \text{Water} : \text{Antifreeze} = 7 : 3$, $-22\sim-25^{\circ}\text{C} \rightarrow \text{Water} : \text{Antifreeze} = 6 : 4$.

After the temperature warms up, the water in the chiller needs to be replaced and pure water added again.

Notice:

- (1) Untreated tap water or well water must not be added to the chiller.
- (2) It is recommended to change the water inside the chiller every 3 to 6 months.
- (3) Chiller operation button: Set the temperature of low-temperature water and normal-temperature water. Low-temperature water supplies the laser, and the recommended setting is 24~26°C; normal-temperature water supplies the laser output head and welding gun head, and the setting temperature is recommended to be 27~28°C (welding). The equipment has been set at the factory. If the laser has a high humidity alarm, the low temperature water should be appropriately increased by 1-2°C).

2.8. Other Accessories

Shielding gas helps reduce oxidation of the weld seam, preventing it from turning yellow or black.

The quality of the shielding gas must comply with the ISO 8573-1:2010, Class 2.4.3 standard, and must be free of impurity particles, water, and oil.

Requirements for the use of auxiliary gas:

- (1) It is recommended to use argon or helium with a purity of $\geq 99.99\%$.
- (2) When using this equipment for welding, an "argon gas flow meter" should be added to the gas source, and the flow rate of the shielding gas must be greater than 10L/min (adjust the flow rate according to the actual welding effect). If the shielding gas flow is too small, it is easy to cause the damage of protective lens and even the laser. If the shielding gas flow is too large, it may cause the welding seam to sag or splash too much, resulting in poor welding. When using this equipment for cutting, a "nitrogen pressure reducing valve" should be added to the gas source, and the air pressure is required to be 0.6~1.2Mpa (according to the thickness and cutting speed to make a fine-tuned of air pressure), too small or too large air pressure may damage the welding head, and even the laser.



Argon gas flow meter (for reference)



Nitrogen pressure reducing valve (for reference)

3. Product Operation

3.1. Equipment Disassembly

The laser welding machine is a valuable item, and Horizon Laser recommends you to disassemble and assemble the box according to the following steps.

- (1) Place the packaging box containing the equipment on a level ground.
- (2) Open the main packaging box, remove the foam cover, and take out the accompanying items.
- (3) The welding gun and fiber optic cable are placed on the top panel of the equipment. Carefully remove them, ensuring the minimum bending radius of the fiber optic cable is greater than 200mm.
- (4) Ensure the equipment is placed in a dry, well-ventilated location. The front of the equipment and the operator's position should have clear, unobstructed access. There should be no risk of falling objects above the equipment, and the location should have proper drainage to prevent water accumulation.

Notice:

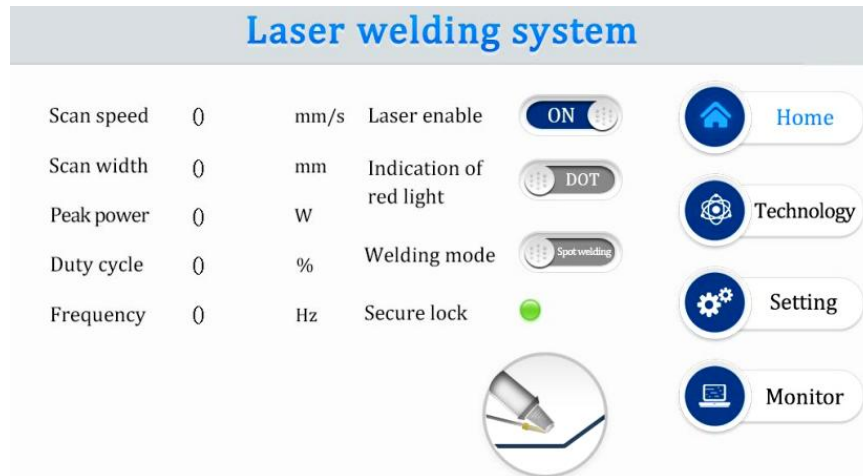
- (1) If you notice any damage to the outer packaging or internal components upon receiving the product, please contact the manufacturer or the designated agent immediately.
- (2) The handheld laser welding machine must remain upright during transportation, lifting, and use. laying it down is strictly prohibited.
- (3) Place the equipment away from sources of vibration.

3.2. Startup Steps

- (1) Connect the gas cylinder to the protective gas interface of the equipment. Recommended protective gases are argon or nitrogen, with a gas flow rate greater than 10 L/min. First, check the label on the welding gas cylinder to ensure it meets the requirements for the gas being used, such as purity and pressure.
- (2) Properly connect the power cable. Ensure the live wire and neutral wire are correctly connected according to the markings, and the ground wire is securely connected. Poor grounding may lead to equipment electric shock or interference with normal operation.
- (3) Release the "Emergency Stop" switch on the front panel and press the "Start" button. After about 20 seconds, the indicator light on the left will light green and the equipment will start normally (ensure that the chiller is running normally).
- (4) Make sure there is no alarm on the software interface, and the device is ready at this time.
- (5) After setting parameters such as laser power, welding width, swing speed, etc. on the operation

screen, open the software "Laser Enable".

- (6) Clam the "ground wire clip" onto the workpiece to be welded, the copper nozzle at the front of the welding gun contacts the workpiece, press the welding gun switch to get out of the light welding.
- (7) If wire feeding welding is required, connect the wire feeding signal wire to the wire feeding machine, assemble the wire feeding assembly, and adjust the wire feeding speed, wire return length and wire filling length on the wire feeding machine screen.



3.3. Shutdown Steps

- (1) Press the "Emergency Stop" button and the device power is turned off.
- (2) Close the gas valve on the protective gas cylinder.
- (3) Store the welding torch and ground clamp properly.

3.4. Precautions

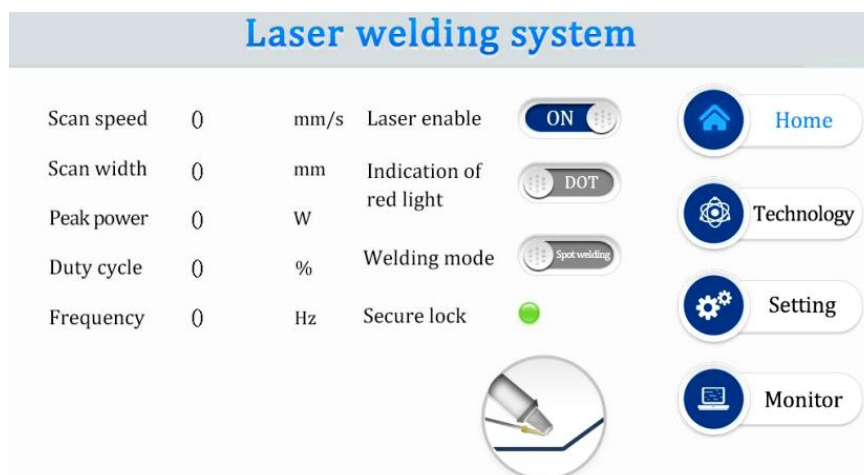
- (1) Ensure the power wiring is accurate and properly grounded to prevent electric shock from the chassis and avoid damage to equipment components.
- (2) Operators must take necessary protective measures, such as wearing laser safety goggles.
- (3) Hang the optical cable with a bending radius greater than 200 mm.
- (4) Handle the welding torch with care as it is a precision component. Avoid dropping or subjecting it to strong impacts.
- (5) Implement necessary protective measures in the work area, and it is recommended to isolate the work zone. Especially when welding highly reflective materials like copper or aluminum, tilt the welding torch to avoid perpendicular alignment with the workpiece, and ensure no one stands opposite the welding direction.

4. Control Panel Settings

The control operation interface is divided into four parts: home page, process, settings, and monitoring.

4.1. Welding Operation

4.1.1. Home



This interface allows you to view the current welding process parameters, real-time alarms and safe lock conduction information, switch laser enable, red light swing, spot welding and continuous welding mode selection. Click the icon in the upper right corner of the page to switch to the cleaning mode interface.

- (1) Laser Enable: Before emitting laser, the ready signal is turned on or off. When expelling the light, the "Laser Enable" button must be turned on. Turn off the "Laser Enable" button to test the functions of welding equipment such as blowing, wire feeding, etc., and monitor the operating status.
- (2) Indication red light: "Line" indication, used to preview the swing of the welding torch motor. The "point" indicates that the welding torch motor does not swing, which is used to check whether the light is in the center and to determine whether the welding torch lenses are dirty. "Line" or "Point" is only a preview function and does not affect the swing of the actual welding process.
- (3) Welding mode: The default is "continuous" mode, continuous light-out welding, suitable for most welding application scenarios. When set to "Point" mode, light welding will be released intermittently, and the spot welding parameters need to be adjusted in the "Settings" interface.
- (4) Safety lock: When the metal clamp is clamped on the workpiece, and the copper nozzle at the front of the welding gun contacts the workpiece, the indicator light is green, and press the button to emit light and welding. if the welding gun leaves the workpiece, the indicator light is gray, press the gun head button at this time, there will be no light (ground protection function to avoid the welding gun leaving the workpiece, and accidentally trigger the output laser, causing personal safety).

4.1.2. Technology

Select the process number, set the welding process parameters on the left, and click "Save" (10 sets of welding process parameters can be pre-stored, and the No. 8 process group is specially used for

double wire feeding). Select the corresponding process number when welding, and click "Import"
"That's it.

- (1) Scanning speed: refers to the swing speed of the motor inside the welding gun. Generally, thin plate welding can be used to increase the scanning speed appropriately. When welding thick plates, the speed should be adjusted appropriately. It is recommended to set 300mm/s.
- (2) Scan width: refers to the size of the welding spot, the adjustment range is 0~6mm. If the workpiece weld is large, the width can be increased appropriately.
- (3) Peak power: adjust the laser output power, that is, welding power, the upper limit is the total power of the restricted laser, and the lower limit is not less than 10% of the total power of the laser, otherwise no light may be emitted.
- (4) Duty cycle: The proportion of the light output time in the corresponding period of the set frequency is one cycle (depending on the requirements for welding depth, the duty cycle can be reduced appropriately when the thin plate is not penetrated, and the duty cycle is set to 100% in most welding scenarios).
- (5) Pulse frequency: The laser light output frequency must be adjusted with the "duty cycle". If the "duty cycle" is set to 100%, the frequency condition is invalid. When the "duty cycle" is less than 100%, pulse-out optical welding can be achieved by changing the pulse frequency.
(Example: duty cycle 80%, pulse frequency 2000Hz → period $T=1/2000=0.5\text{ms}$, light output time $t_1=0.5*80\%=0.4\text{ms}$, light stop time $t_2=0.1\text{ms}$, cycle repeated)

4.1.3. Setting

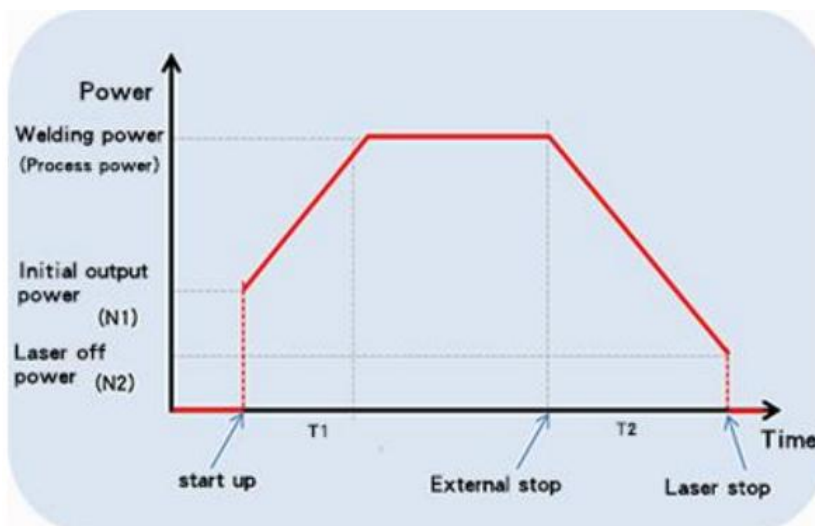
To enter this interface, you need to enter the password 123456. Be careful when modifying the parameters on the setting page. The factory defaults have been set.

Laser welding system

Setting
Help

Laser power	<input type="text" value="0"/> W	Scan correction	<input type="text" value="0"/>	Spot welding type	<input type="button" value="Interval"/>
Open gas delay	<input type="text" value="0"/> ms	Laser center offset	<input type="text" value="0"/> mm	Laser alarm level	<input type="button" value="Low"/>
Off gas delay	<input type="text" value="0"/> ms	Spot welding duration	<input type="text" value="0"/> ms	Chiller alarm level	<input type="button" value="Low"/>
Laser starting power	<input type="text" value="0"/> %	Spot welding interval	<input type="text" value="0"/> ms	Pressure alarm level	<input type="button" value="Low"/>
Laser on progressive time	<input type="text" value="0"/> ms	Motor drive temperature threshold	<input type="text" value="0"/> °C		
Laser off power	<input type="text" value="0"/> %	Protective mirror temperature threshold	<input type="text" value="0"/> °C		
Laser off progressive time	<input type="text" value="0"/> ms				
Welding wire delay	<input type="text" value="0"/> ms				
Language	<input type="button" value="中文"/>			<input type="button" value="Save"/>	<input type="button" value="Return"/>

- (1) Laser power: the total laser power of the welding equipment, the user is not allowed to change.
- (2) Open gas delay: Before lighting, open the protective gas in advance to protect the welding smoke from contaminating the protective lens. It is recommended to set it to 150ms~200ms. When the welding workpiece spatters a lot, the gas opening delay can be increased appropriately.
- (3) Off gas delay: After turning off the laser, delay and then turn off the shielding gas to protect the end weld from oxidation. It is recommended to set it to 200ms~300ms.
- (4) The functions of Laser starting power, Laser on progressive time, Laser off power, Laser off progressive time and other functions are shown in the figure below:



- (5) Welding wire delay: Wire feeding advance time relative to the light signal, not set by default. It is recommended to set the wire return length and patching wire length on the wire feeder screen.
- (6) Language: You can switch to other languages in the language selection bar. Currently, the standard version supports nineteen languages. If you need other language versions, please contact the manufacturer for customization.

- (7) Scan correction: Correction coefficient = target line width/measured line width, range 0.01~4. The default setting is 1.
- (8) Laser center offset: Used to adjust the concentricity of the laser center relative to the center of the copper nozzle. The adjustment range is -3mm~3mm. When the laser position is reduced, the laser position moves to the left. When the laser position is increased, the laser position moves to the right. If the laser position deviates up and down or left and right. If the movement is too large, you need to adjust the position of the welding gun motor. Consult the equipment manufacturer for specific methods.
- (9) Spot welding type: divided into two types: fish scale and discontinuous. Under the fish scale type, the light is turned off between spot weldings, but the gas and wire feed are not turned off. under the intermittent type, the light is turned off between intervals, and the gas and wire feed are also turned off. This can be achieved by setting the spot welding duration and spot welding spacing. Long weld.
- (10) Spot welding duration: In spot welding mode, after the welding gun switch is continuously triggered, the light emission time in each cycle.
- (11) Spot welding interval: In spot welding mode, after the welding gun switch is continuously triggered, the light stop time in each cycle.
- (12) Motor driver temperature threshold/Protective mirror temperature threshold: When the temperature reaches the threshold, the welding equipment will alarm and need to stop to check the motor or protect the lens. When set to 0, the temperature is not detected, and the upper threshold value is up to 70°C. It is not recommended to modify the factory default temperature threshold.
- (13) Laser alarm lever/Chiller alarm lever/Pressure alarm lever: Set the alarm signal to be on or off. It is set by factory default and cannot be modified by yourself.



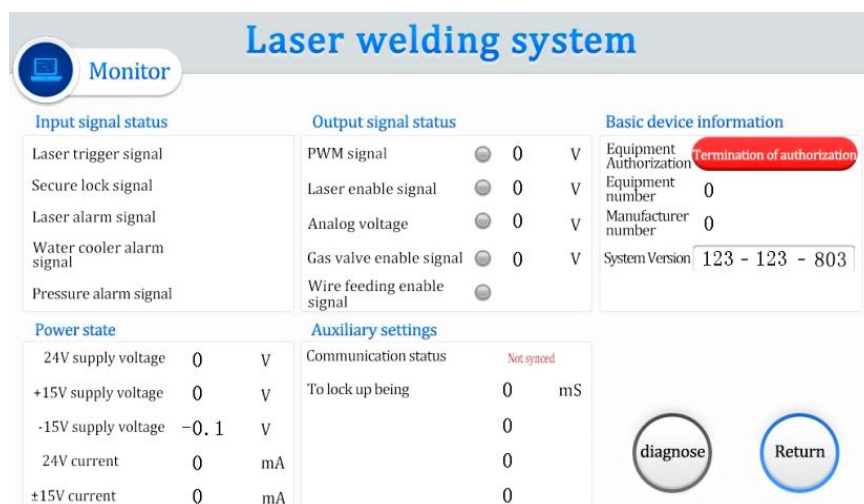
Fish scale type effect



Intermittent type effect

4.1.4. Monitor

This interface displays the status of each monitoring signal and device information. When the welding equipment does not emit light or the light emit is abnormal, you can view this interface to help troubleshoot the problem.



(1) Input signal status

- ① Laser trigger signal: Press the welding gun switch button, the status changes from gray to green.
- ② Secure lock signal: When the metal clip is clamped on the workpiece and the copper tip of the welding gun contacts the workpiece, the status changes from gray to green.
- ③ Laser/Chiller/Pressure alarm signal: Monitor the real-time level status of the corresponding interface input of the board.

(2) Output signal status

Press the welding gun switch button, the status indicator light changes from gray to green, and the voltage value is displayed in real time. (PWM/laser enable is 24V, analog = 10*current power/total power, valve enable is 24V)

(3) Basic device information

- ① Equipment authorization: Click to encrypt the usage time of the device. When the device is used for more than its set time, the authorization will be terminated and the system will stop working. The factory default is long-term validity. If you need encryption and decryption, please contact the equipment manufacturer.
- ② Equipment number: Three groups of numbers, the first group is the hardware version, the second group is the program version of the microcontroller, and the third group is the touch screen version.

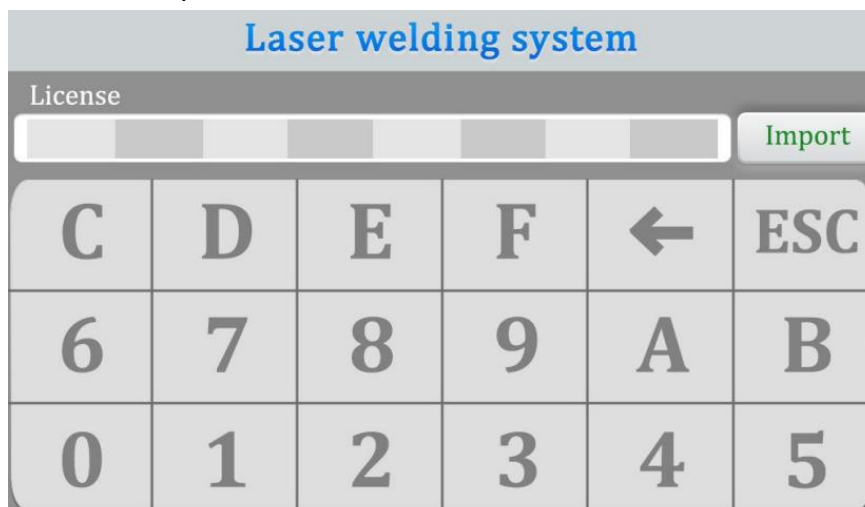
(4) Power state

Displays the real-time power supply voltage and current of the device. The power supply voltage can help troubleshoot power failures.

(5) Auxiliary setting

- ① Communication status: Indicates the communication between the touch screen and the motherboard. If there is no synchronization, check whether the screen connection cable is normal.
- ② To lock up being: Used to deal with poor contact of the safety ground lock, the range is 0~300ms.

Click the "Device Authorization Box" and set the parameter range on the password page, as shown below. The password is "ffffffaa300", where "ffffffaa" represents the ground lock anti-shake parameter and cannot be changed, and "300" represents 300ms. The effect is that when the trigger signal is normal and the safety lock signal is disconnected for less than 300ms, the light will continue to emit light. Used to weld materials with poor surface properties resulting in unstable conductivity (such as rust). Not modified by default.



Laser welding system					
License					Import
C	D	E	F	←	ESC
6	7	8	9	A	B
0	1	2	3	4	5

③ Motor driver temperature/Protective lens temperature: Monitor the real-time temperature of the corresponding components. The motor driver temperature affects the motor swing performance. If the equipment is in an environment with poor heat dissipation, it will cause the temperature to rise abnormally, affect the laser scanning speed, and then lead to a decrease in weld quality. . The temperature of the protective lens reflects the working status of the lens and helps determine whether the protective lens is damaged.

(6) Diagnose

Click the Diagnosis button to enter the diagnostic interface. It is used to measure whether there is actual output signal at each signal port. Usually the output value is consistent with the detection value. When inconsistent, the load is abnormal, such as when the laser does not emit light, by switching a single port and using the laser host computer software or multimeter measurement, it can truly reflect whether the control board signal is output.

Laser welding system			
diagnose			
Output signal	Theoretical output value	Detection value	Switch control
PWM signal (V)	0	0	
Laser enable (V)	0	0	
Gas valve enable (V)	0	0	
Analog voltage (V)	0	0	
Wire feeding enable	<input type="radio"/>	Observe the status of the wire feeder or measure with a multimeter	
Return			

4.2. Cutting Operation

Laser welding system			
Scan speed	0	mm/s	Laser enable
Scan width	0	mm	Indication of red light
Peak power	0	W	Welding mode
Duty cycle	0	%	Secure lock
Frequency	0	Hz	
<div> <div>ON</div> <div>DOT</div> <div>Spot welding</div> <div></div> </div> <div> <div>Home</div> <div>Technology</div> <div>Setting</div> <div>Monitor</div> </div>			

Cutting and welding share the same operating interface.

When cutting, set the scanning width to 0, that is, the red light is a point. When replacing the cutting copper nozzle, be sure to ensure that the red light comes out completely from the center of the copper nozzle, otherwise the copper nozzle may be burned.



Use nitrogen, and replace the gas source with a nitrogen pressure reducing valve. The air pressure is required to be 0.6~1.2Mpa. Sufficient air pressure can ensure the effect of cutting the back of the workpiece. It is necessary to ensure that the ground lock is safely turned on during laser cutting operations. It is recommended to cut thickness less than 2mm.

4.3. Cleaning Operation

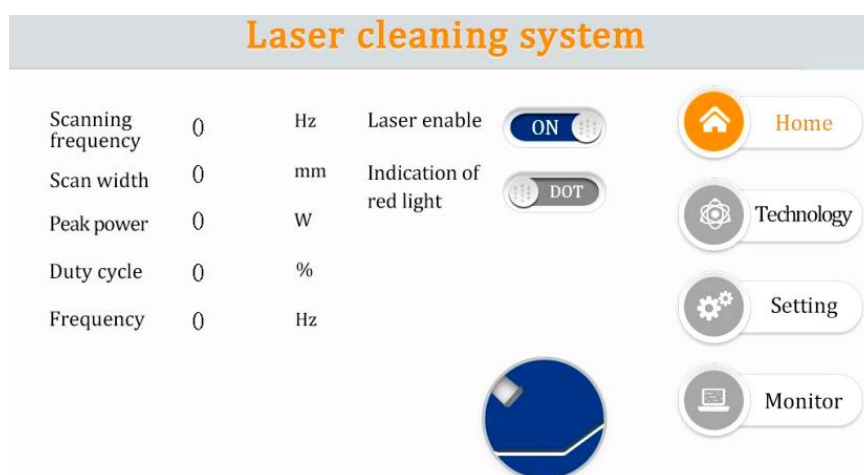
Before cleaning and emitting light, the focusing lens of the welding gun needs to be replaced with a special focusing lens for cleaning (flat surface facing up, convex surface facing down), and in the cleaning setting interface, select the focusing lens with the corresponding focal length.



Remove the locking part at the front of the welding gun. SUP23T needs to loosen the locking screw on the side to take out the chuck.



4.3.1. Home



This interface can view the current cleaning process parameters, real-time alarm information, switch laser enable, and red light swing. Click the icon in the upper right corner of the page to switch to the welding mode interface.

- (1) Laser enable: Before launching the laser, the ready signal is turned on or off. When the light is emitted for cleaning, the "laser enable" button needs to be turned on. Turn off the "Laser Enable" button to test the device's air blowing and other functions and monitor the operating status.
- (2) Indication of red light: used to preview the swing of the welding gun motor. "Point" indicates that the welding gun motor does not swing. It is used to check whether the light is in the center position and to determine whether the welding gun lens is dirty. "Line" indication, preview cleaning track.

4.3.2. Technology

Select the process number, set the cleaning process parameters on the left, click "Save" (3 sets of cleaning process parameters can be stored in advance), select the corresponding process number when cleaning, and click "Import".

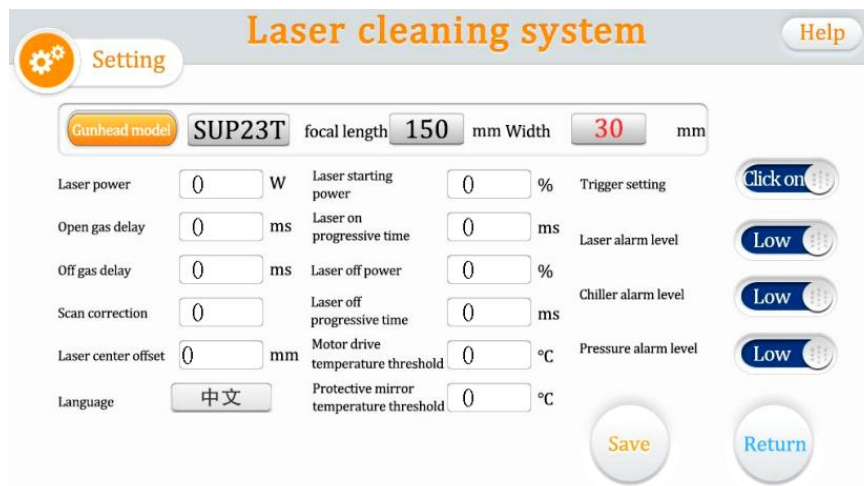


The screenshot shows the 'Laser cleaning system' control interface. On the left, there are five input fields for parameters: Scanning frequency (0 Hz), Scan width (0 mm), Peak power (0 W), Duty cycle (0 %), and Frequency (0 Hz). To the right of these fields are three buttons: 'Common technology', 'Technology1' (highlighted in orange), and 'Technology2'. At the bottom, there are three circular buttons: 'Import' (red), 'Save' (yellow), and 'Return' (blue). A 'Help' button is located in the top right corner of the interface.

- (1) Scanning frequency: The swing speed of the motor inside the welding gun. The greater the cleaning width, the greater the scanning frequency required. The scanning frequency range is 10-100Hz.
- (2) Scan width: cleaning size, maximum cleaning size 30mm@F150, 60mm@F400, 120mm@F800.
- (3) Peak power: adjust the laser output power, that is, the cleaning power. The upper limit is controlled by the total power of the laser, and the lower limit is not less than 10% of the total power of the laser, otherwise there may be no light.
- (4) Duty cycle: In the period corresponding to the set frequency, the light emitting time accounts for the proportion of one cycle (the duty cycle can be appropriately reduced when cleaning thin plates, and the duty cycle is set to 100% in most cleaning scenarios).
- (5) Frequency: laser light output frequency, which must be adjusted together with the "duty cycle". If the "duty cycle" is set to 100%, the frequency condition is invalid. When the "duty cycle" is less than 100%, pulse light cleaning can be achieved by changing the pulse frequency.
(Example: duty cycle 80%, pulse frequency 2000Hz → period $T=1/2000=0.5\text{ms}$, light emission time $t_1=0.5*80\%=0.4\text{ms}$, light stop time $t_2=0.1\text{ms}$, the cycle repeats)

4.3.3. Setting

To enter this interface, you need to enter the password 123456. Be careful when modifying the parameters on the setting page. The factory defaults have been set.



Laser cleaning system

Setting

Gunhead model: SUP23T focal length: 150 mm Width: 30 mm

Laser power: 0 W Laser starting power: 0 % Trigger setting: Click on

Open gas delay: 0 ms Laser on progressive time: 0 ms Laser alarm level: Low

Off gas delay: 0 ms Laser off power: 0 % Chiller alarm level: Low

Scan correction: 0 Laser off progressive time: 0 ms Pressure alarm level: Low

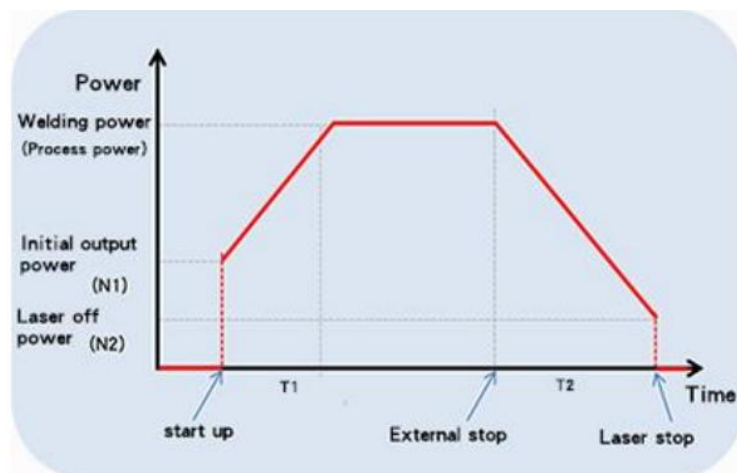
Laser center offset: 0 mm Motor drive temperature threshold: 0 °C

Protective mirror temperature threshold: 0 °C

Language: 中文

Save Return

- (1) Laser power: the total laser power of the device, the user is not allowed to change it.
- (2) Open gas delay: Before emitting light, open the protective gas in advance to protect the cleaning smoke from contaminating the protective lens. It is recommended to set it to 150ms~200ms. When the cleaning workpiece splashes heavily, the gas opening delay can be appropriately increased.
- (3) Off gas delay: After turning off the laser, delay and then turn off the protective gas. It is recommended to set it to 200ms~300ms.
- (4) Scan correction: Correction coefficient = target line width/measured line width, range 0.01~4. The default setting is 1.
- (5) Laser center offset: used to adjust the laser center position, reduce the laser position and move to the left, increase the laser position and move to the right. if the laser position deviates up and down or left and right too much, you need to adjust the position of the welding gun motor. Please consult us for specific methods. Equipment manufacturers.
- (6) Language: You can switch to other languages in the language selection bar. Currently, the standard version supports nineteen languages. If you need other language versions, please contact the manufacturer for customization.
- (7) The functions such as light-on power, light-on gradual time, light-off power, and light-off gradual time are shown in the figure below:



- (8) Motor temperature threshold/protective mirror temperature threshold: When the temperature reaches the threshold, the cleaning equipment will alarm and the machine needs to be shut down to check the motor or protective mirror. When set to 0, the temperature is not detected, and the upper threshold value is up to 65°C. It is not recommended to modify the factory default temperature threshold.
- (9) Trigger setting: Single-click light cleaning by default, you can also set double-click light cleaning.
- (10) Laser alarm level/chiller alarm level/air pressure alarm level: Set the alarm signal to be on or off. It is set by factory default and cannot be modified by yourself.

4.3.4. Monitor

This interface displays the status of each monitoring signal and device information. When the device does not emit light or the light emit is abnormal, you can view this interface to help troubleshoot the problem.



- (1) Input signal status
- ① Laser trigger signal: Press the welding gun switch button, the status changes from gray to green.
- ② Laser/chiller/air pressure alarm signal: monitor the real-time level status of the corresponding interface input of the board.
- (2) Output signal status

Press the welding gun switch button, the status indicator light changes from gray to green, and the voltage value is displayed in real time. (PWM/laser enable is 24V, analog = $10 \times \text{current power} / \text{total power}$, valve enable is 24V)

(3) Basic information of equipment

① Device authorization: Click to encrypt the usage time of the device. When the device is used for more than its set time, the authorization will be terminated and the system will stop working. The factory default is long-term validity. If you need encryption and decryption, please contact the equipment manufacturer.

② System version: three groups of numbers, the first group is the hardware version, the second group is the program version of the microcontroller, and the third group is the touch screen version.

(4) Power status

Displays the real-time power supply voltage and current of the device. The power supply voltage can help troubleshoot power failures. There are two switching power supplies of 24V and $\pm 15V$ inside the cleaning equipment.

(5) Auxiliary state

① Communication status: Indicates the communication between the touch screen and the motherboard. If there is no synchronization, check whether the screen connection cable is normal.

② Motor driver temperature/protective mirror temperature: Monitor the real-time temperature of the corresponding components. The motor driver temperature affects the motor swing performance. If the equipment is in an environment with poor heat dissipation, it will cause the temperature to rise abnormally, affect the laser scanning speed, and then lead to a decrease in cleaning quality. . The temperature of the protective lens reflects the working status of the lens and helps determine whether the protective lens is damaged.

(6) Diagnosis

Click the Diagnosis button to enter the diagnostic interface. It is used to measure whether there is actual output signal at each signal port. Usually the output value is consistent with the detection value. When inconsistent, the load is abnormal, such as when the laser does not emit light, by switching a single port and using the laser host computer software or multimeter measurement, it can truly reflect whether the control board signal is emitted.



5. Troubleshooting And Methods

No.	Fault	Solutions
1	Alarm of laser source	(1) Check whether the laser has red light. If there is no red light output, please contact the manufacturer. (2) Check whether the cooling temperature and water flow of the cold water machine are normal. (3) Connect the laser computer software to check the alarm type, and the temperature alarm needs to check whether the cooling and water flow of the cold water mechanism are normal. (4) When installing the QBH, it is necessary to check whether the laser output head QBH and the welding gun are tightly inserted. (5) Laser lock machine alarm, please contact the manufacturer.
2	Alarm of chiller	(1) Check whether the water chiller is on. (2) Check the alarm type of the chiller screen. If the chiller is short of water, pure water must be added to the normal scale. (3) The chiller air cooler alarms and clean up the dust in the filter screen inside the chiller. (4) The water chiller leaks, check the source of the leak, and contact the manufacturer.
3	Alarm of gas pressure	(1) Check whether the air source valve is open and whether the air pressure and flow rate meet the requirements (flow rate is greater than 10L/min). (2) If there is air leakage inside the equipment, check the source of the air leakage and contact the manufacturer.
4	No emission of laser beam	(1) Check whether the equipment has an alarm and handle it according to the alarm type. (2) Check whether the welding gun lens is dirty, and remove the copper nozzle to confirm whether there is red light output. (3) Enter the "Monitoring" page of the welding equipment software, and when pressing the switch button, check whether the input signal status "laser trigger signal" and "safety ground lock signal" are normal. Check whether the output signal status "PMW" and "Laser Enable" voltage are 24V, and whether the analog quantity has a voltage value.
5	Weakening of laser energy	(1) Check whether the protective lens of the welding gun is dirty and whether the copper nozzle blocks the laser output. (2) Readjust the focus of the welding gun to ensure that the welding energy is maximum when the gun tip touches the workpiece. Readjust the focus of the welding gun to ensure that the welding energy is maximum when the gun tip touches the workpiece.
6	The protective lens frequently damaged	(1) It is recommended that the gas flow rate be greater than 10L/min. (2) It is recommended that the angle between the welding gun and the workpiece be less than 70 degrees, and vertical angle welding is strictly prohibited.
7	Welding copper tip is too hot	(1) Slight fever is normal. (2) When welding aluminum materials, it is normal for the copper tip to heat up. (3) Confirm whether the laser is in the center of the copper nozzle and whether the welding gun lens is dirty.
8	Device indicator light flashes randomly	(1) Check whether the equipment is well grounded, and measure the voltage between the live wire and the ground wire, and the voltage between the neutral wire and the ground wire. (2) Check whether there are large electrical equipment around the equipment, check whether the power supply voltage is stable and whether there is interference.

6. Daily Maintenance

No.	Maintenance parts	Maintenance content	Maintenance cycle
1	Gas lines, gas pipes and joints	Check whether they are tight and whether they are damaged	A month
2	Welding gun protection lens	Replace it	According to the actual situation
3	Laser center position	Use red light to check whether it is in the center of the nozzle.	Start-up inspection. welding abnormality inspection

Maintenance and replacement of protective lenses:

- (1) The red light output by the welding gun is extended far away and illuminated on the white paper to check whether there are black spots in the red light.
- (2) Before replacing the protective lens, please clean your hands with detergent and wash your hands again with a lint-free cloth with absolute alcohol.
- (3) Loosen the two screws on the protective mirror compartment cover in a relatively dust-free place (office), pull out the protective mirror holder, cover the welding gun drawer opening with masking paper, and check the protective lens in a brightly lit place. If the lens has obvious black burning spots, it should be replaced immediately. If there is dust on the surface of the protective lens, use a lint-free cloth or lint-free cotton swab dipped in a small amount of absolute alcohol and wipe the lens clean in one direction.
- (4) After maintenance or replacement, use a lint-free cloth or lint-free cotton swab dipped in a small amount of anhydrous alcohol to wipe the cover and bracket. Finally, insert the protective mirror bracket into the welding gun drawer opening and tighten the two screws.

