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SUP20S Fiber Laser Hand-Held Plumb Joint

Instruction Manual v3.01

Wuxi Chao Qiang Wei Ye Technology Co., Ltd

无锡超强伟业科技有限公司



Thank you for choosing the Handheld Welding System of Chao Qiang Wei Ye. This user manual provides you with important information on safety, operation, maintenance and other aspects. Please read this user manual carefully before using the product.

To ensure safe operation and optimal product operation, please observe the following precautions and warnings as well as other information in this manual.

I. Overview

This manual covers the general description of basic installation, factory setting, operation and maintenance of SUP series plumb joints.

The Super Plumb Joint is a handheld welding and cutting joint introduced in 2019. The product includes a handheld welding gun and self-developed control system with multiple safety alarms as well as automatic safe power off and light cut-off settings. The product can be adapted to fiber lasers of all brands; optimized optical and water-cooled design allows the laser head to work stably at 2000W for a long time.



Product Features

- Basic features: the self-developed control system with multiple safety alarms is smaller in size, flexible in operation and easy to get started.
- More stable: since all parameters are visible, the whole machine state can be monitored in real time, problems can be avoided in advance and also can be checked and solved more conveniently, ensuring the stable work of the plumb joint.
- Technology: since all parameters are visible, the welding quality is perfect, the deformation is small, and the penetration is high.
- Stable parameters and high repeatability: with a defined air pressure of nozzle and lens state, the technology parameters must be repeatable as long as the laser power is stable. This greatly improves efficiency and also reduces operator requirements.

1.1 Operating Environment and Parameters

Supply Voltage (V)	220 ± 10% V AC 50/60Hz
Placement environment	Smooth, free from vibration and impact
Temperature of Working Environment	10~40
Humidity of Working Environment	< 70
Cooling Method	Water-Cooling
Applicable Wavelength	1064nm (± 10nm)
Applicable Power	≤ 2000W
Collimation	D20*5/F60
Focus	D20*4.5/F150
Reflection	30*14 T2
Specifications of Protective Glasses	18*2
Maximum of Support Pressure	10bar
Vertical Adjustment Range of Focus	± 10mm
Adjustment Range of Spot	Line 0-5mm
Weight	SUP15S 1.25KG / SUP20S 0.8KG

1.2 Note the Information

- 1) Ensure reliable grounding before power supply.
- 2) The laser delivery is connected to the plumb joint. Please check it carefully to prevent dust or other contamination, and use special lens paper when cleaning it.
- 3) If the equipment is not used according to the method specified in this manual, it may be in abnormal working condition and cause damage.
- 4) When replacing the protective glasses, please ensure proper protection.
- 5) Attention please: for the first time, when the red light cannot come out of the copper nozzle, the light must not come out

II. Installation

2.1 Definition of Controller Wiring

plug	definition	types of signal	Explanation and instruction	
power supply	-15V	input	Connect to $\pm 15V$ switching power supply-	
	GND	Reference ground	Connect to $\pm 15V$ switching power supply 0V (it must be connected and cannot be suspended)	
	+15V	input	Connect to $\pm 15V$ switching power supply+	
	GND	Reference ground	Connect to 24V switching power supply 0V (it must be connected and cannot be suspended)	
	+24V	input	Connect to 24V switching power supply+	
LCD	G	Reference ground	In which V (blue) stands for 24V power supply, and G (white) stands for power ground, which may cause the screen to be unlit and burn out in severe cases. T (brown) R (black) is directly connected with TR line of external display screen. If the connection is reversed, the screen cannot set interaction nor connect the external serial display screen.	
	R	sending end		
	T	receiving end		
	V	Output		
Signal interface 1	1	GND	Reference ground	Signal ground
	2	alarm signal of air pressure	input	The alarm level polarity can be set in the background.
	3	GND	Reference ground	Signal ground
	4	alarm signal of water tank	input	The alarm level polarity can be set in the background.
	5	Reference ground of Secure lock		Connect the workpiece and form a loop with pin 6 to prevent accidental light emission.
	6	Secure lock		Connect the blue line of phumb joint.
	7	Light-emitting switch of phumb joint		Connect the brown line of phumb joint.
	8	Light-emitting switch of phumb joint		Connect the black line of phumb joint.
Signal interface 2	1	GND	Output	Power ground
	2	reserve	Output	Controllable 24V (current < 2A, synchronized with the control signal of protective gas valve)
	3	Protective gas valve-	Reference ground of Output	Connect the negative valve (relay built-in).
	4	Protective gas valve+	Output 24V	Connect the positive valve (relay built-in).
	5	wire feed-	Short-circuit Pin 6 work	Wire feeding control switch (short-circuit works)
	6	wire feed+	Short-circuit Pin 5 work	Wire feeding control switch (short-circuit works)
Signal interface 3	1	Abnormal signal of laser	input	After receiving the laser alarm signal, the alarm level polarity can be set in the background.
	2	Laser out enable	Output	Connect laser enable+
	3	24V output	Output	24V power supply pin
	4		Reference ground	Reference ground (DA, common ground for enabling and 24V of pin 3)
	5	analog quantity	Output	Connect the external power of the laser to a given analog quantity, DA+
	6	Radio frequency -(PWM-)	Output	Connect negative modulating signal of laser pulse width
	7	Radio frequency +(PWM+)	Output	Connect positive modulating signal of laser pulse width

2.1.1 Power Supply End of Controller

The power supply uses a 5P connector and is powered by the supplied 24V and 15V switching power supply

Please note that the 15V switching power supply distinguishes between positive and negative, V1 to 15V+, V2 to 15V-, and any COM on the 15V switching power supply to pin 2, GND!

Please note that the switching power supply must be grounded!

2. 1. 3 Signal Interface 1 of Controller

Pin ①/② is the alarm signal input of air pressure. If you want to enable it (need to be wired), please set the air pressure alarm level to high in the background, otherwise it is low.

Pin ③/④ is the alarm signal input of water tank. If you want to enable it (need to be wired), please set the air pressure alarm level to high in the background, otherwise it is low.

Pin ⑤ is the reference ground for safe locking, and it is directly connected to the machined workpiece with a wire.

Pin ⑥ is the safety lock of the plumb joint, which is connected with the blue wire of the three-core wire. When the plumb joint touches the workpiece, the safety lock is on at this time.

Pin ⑦ is the exit switch of the plumb joint, which is connected to the brown wire of the three-core wire.

Pin ⑧ is the light-emitting switch of the welding head, which is connected to the black line of the three-core wire. When the trigger is pulled, the trigger button is on.

Please note that the output signal of the subsequent port will be issued only when there is no alarm and the safety ground lock and trigger button signals are on.

2. 1. 4 Signal Interface 2 of Controller

The signal interface 2 uses 6P interface, and the air valve is related to wire feeding.

Pin ①/② are reserved pins, outputting 24 V when powered on.

If pin ③/④ is the valve 24V output, it should be connected to the valve (when pin 3/4 is not available, pin 1/2 can be used, but a jumper is required).

Pin ⑤/⑥ is the signal wire of the wire feeder, connecting the signal port of the wire feeder, regardless of positive and negative.

2. 1. 5 Signal Interface 3 of Controller

Pin ① is the laser alarm signal input +. If you want to enable (need to be wired), please set the air pressure alarm level to high in the background, otherwise it is low.

Pin ② is enable+, which is connected to the enable+ of laser.

Pin ③ is 24V output, and it will output 24V+ directly after power on.

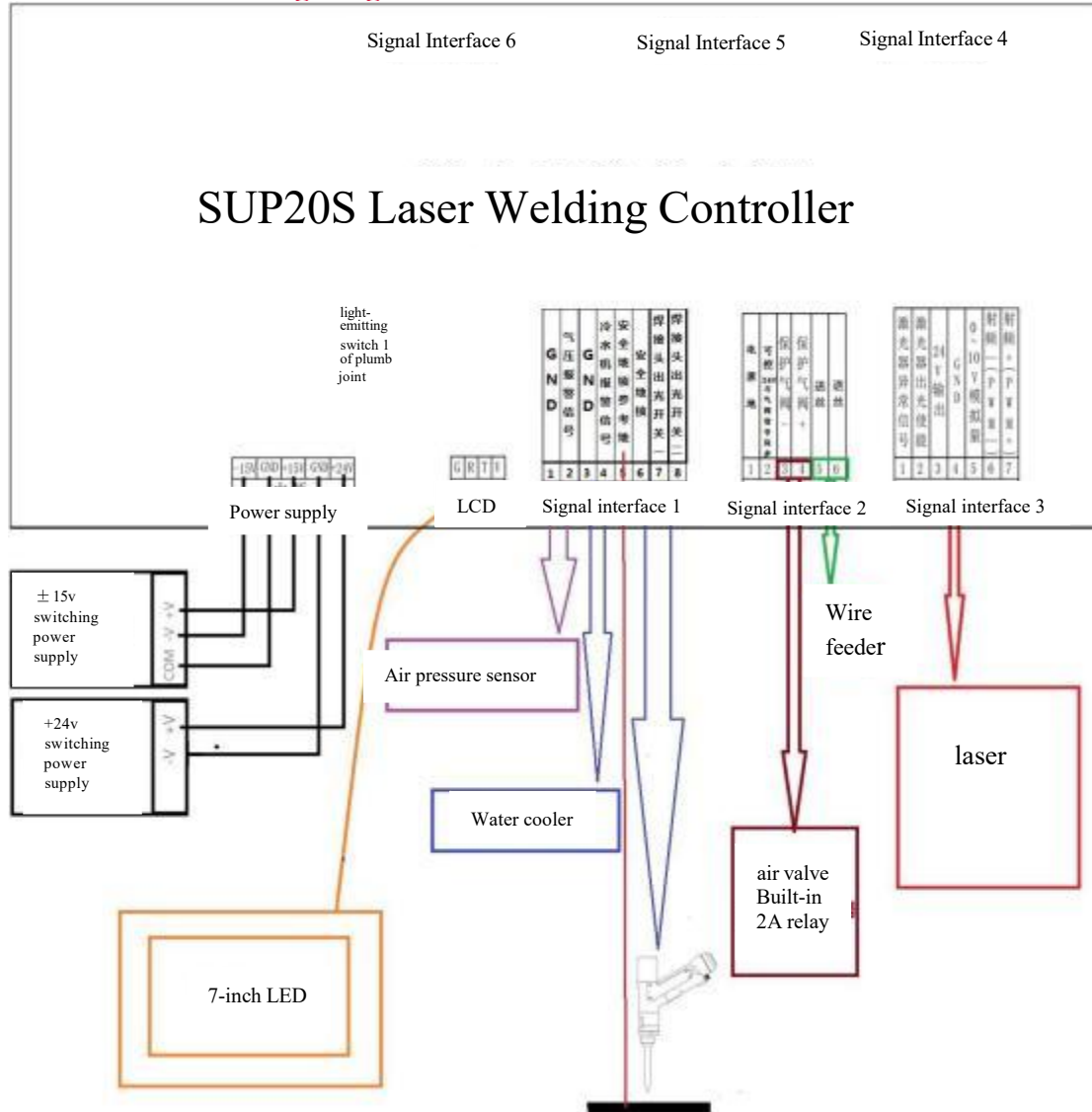
Pin ④ is a common ground (reference ground for pins 1/2/3/5).

Pin ⑤ is the analog quantity + output and the analog quantity is given.

Pin (vi) is the PWM-modulation signal.

Pin (7) is the PWM+ modulation signal.

2.2 Controller Wiring Diagram



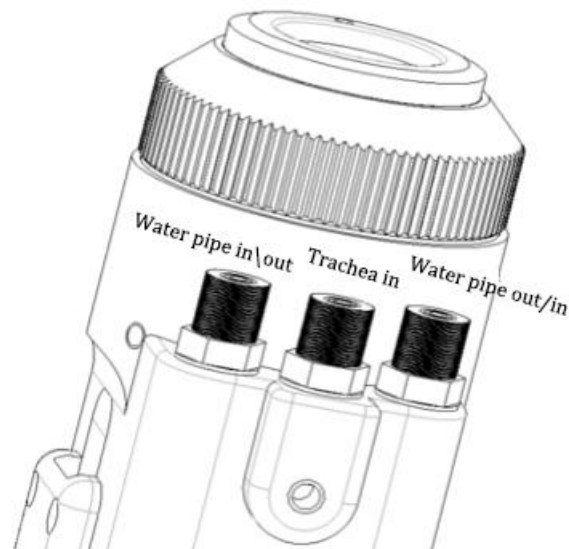
Attention: COM terminal of $\pm 15V$ switching power supply and - V(0V) terminal of +24V switching power supply should be connected to GND and fully connected with workpiece. The shell of the switching power supply must be grounded, otherwise, there may be abnormalities such as safety lock alarm and no light output.

2.3 Optical Input Interface

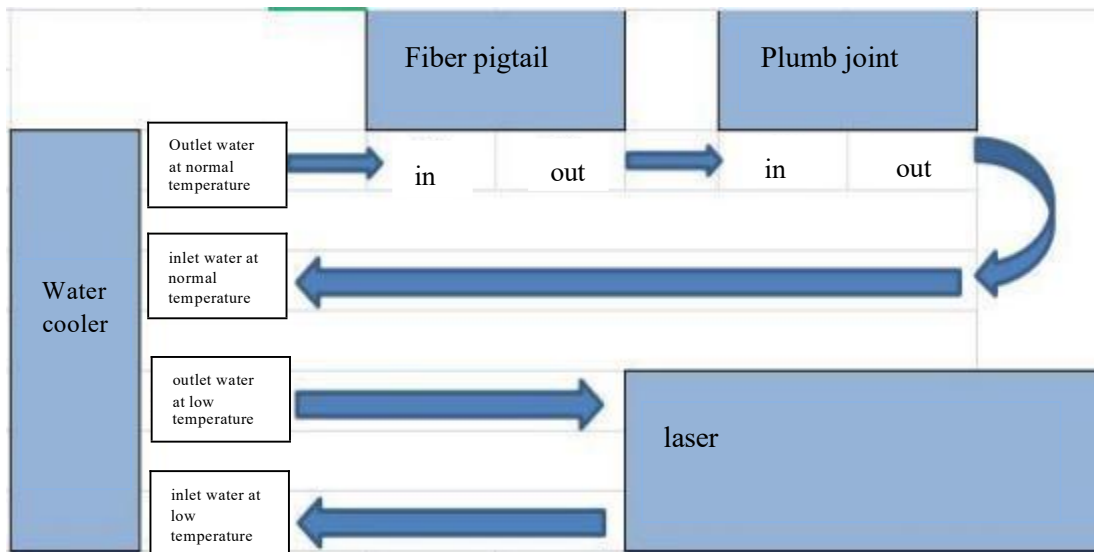
SUP welding joint is suitable for most industrial laser generators, and commonly used optical fiber joints include IPG, Ruike, Chuangxin, Feibo, Tottenham, Japt, Keplin, etc. Optical devices must be kept clean, and all dust must be removed before use. When inserting optical fiber, the cutting head must be rotated 90 degrees to be placed horizontally, and then the optical fiber is used to prevent dust from falling from the interface. Installation method (applet)

2.4 Protective Gas and Water Cooler Interface

Hoses with an outer diameter of 6MM and an inner diameter of 4MM can be installed at water pipe and air pipe interfaces. The air inlet is in the middle, and the water inlet and outlet pipelines are on both sides (regardless of the inlet and outlet direction), as shown in the following figure:



The cooling system is divided into the water section of the plumb joint and of the fiber pigtail, which are connected in series, as shown in the following figure.



2.5 Connection Interface between Welding Gun and Control Box

The welding gun is connected with the control box by three wires, including two cores of motor power line, five cores of motor signal line, and three cores of safety lock and trigger button line.

The motor power/signal lines (two black ones) are directly connected to the motor part of the plumb joint and can be disassembled (two options are available: 1. Open the motor cover and side plate of the hand-held welding gun 2. Open the control boxes; both are plugs)

Removable aerial plugs are used for the three-core wires of safety lock and trigger button: safety lock and button wires, including 1 blue, 2 black and 3 brown (connected to 6/7/8 pins of signal interface 1, see the wiring definition of control box above for details)

2.6 Installation of Wire Feeder

The two-core aerial plug at the tail of wire feeder is connected to the pin 5/6 of signal interface 2.

For the specific installation method, refer to the following:

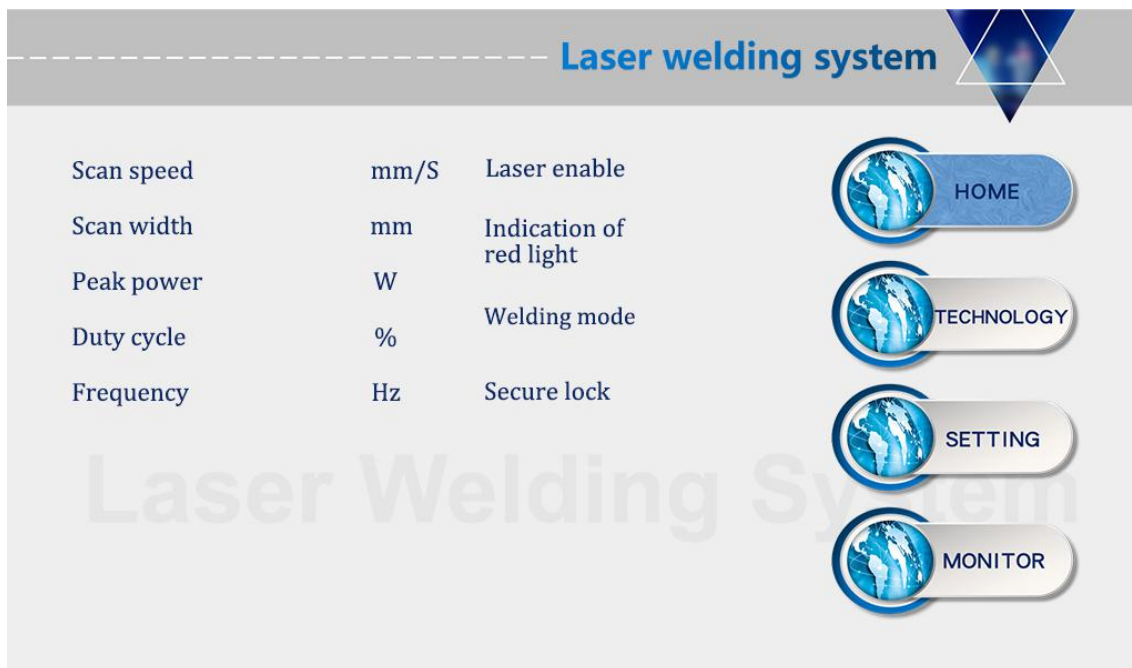
Click: [installation instructions of wire feeder \(small program\)](#)

III. Control Panel and Operation Guide (the following is V3.3 version)

3.1 Operation Summary and Operation Guide

The operation panel of SUP series is mainly composed of touch screen and control box. The touch operation interface mainly has several parts such as home, technology, setting and monitoring.

3.1.1 The Main Screen of Touch Screen's Operation



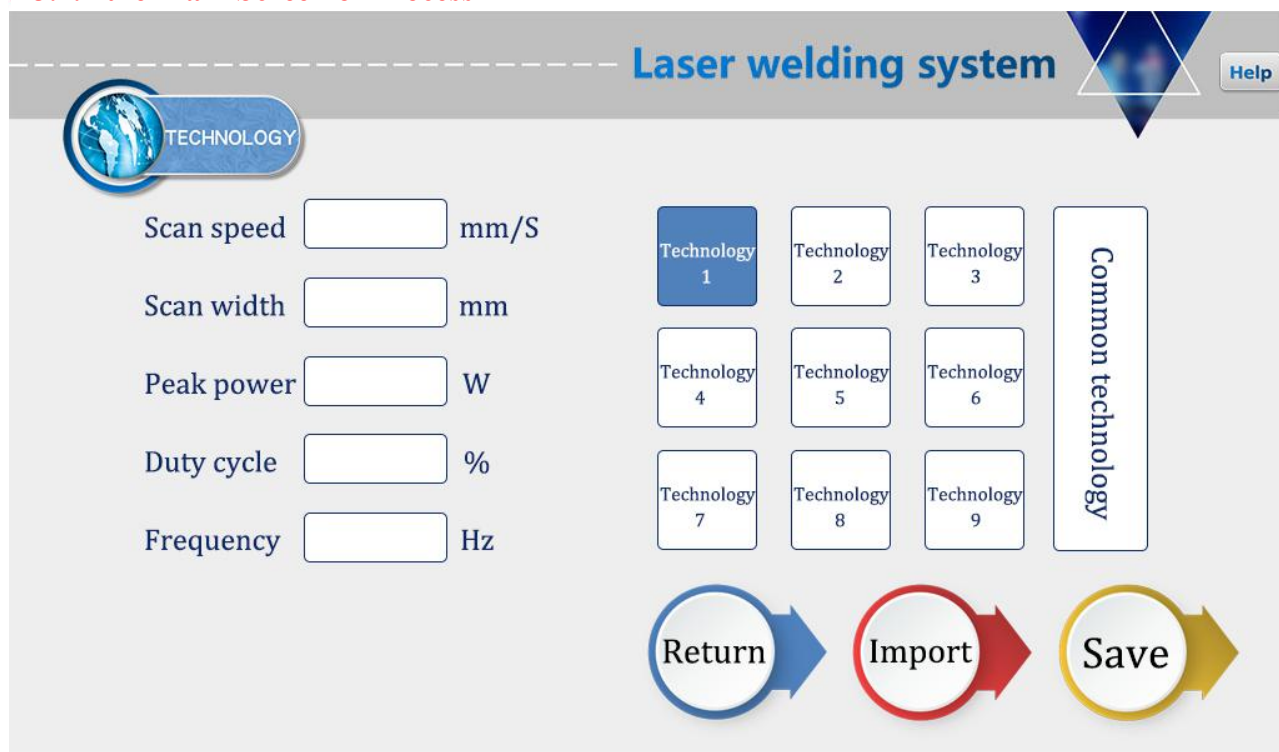
① This interface allows you to see the current technology parameters and instant alarm information.

① The laser enable and indication red light is ON when the power is on.

② The safety ground lock is usually gray in color and turns green machinable when the plumb joint touches the machined workpiece.

④ **Continuous welding mode is selected by default. When it is set to spot welding, it can emit light intermittently and be used for spot welding operation, which is convenient for controlling the spot welding time due to bad man-made. This function needs to be set as required (V3.3 version is above functions).**

3.1.2 the Main Screen of Process

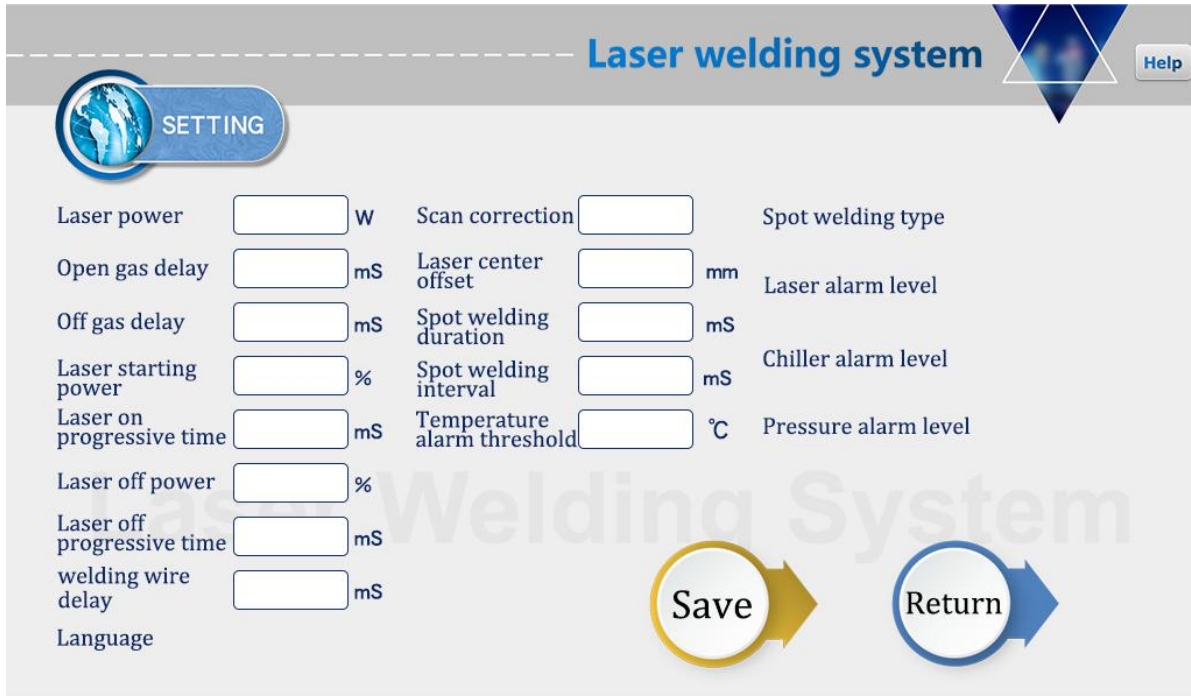


- ① The technology interface contains debugging technology parameters, which can be modified by clicking the box. After modification, click OK, and then save it in the shortcut technology. When using it, click Import (Modify-Save-Import).
 - ② The scanning speed range is 2-6000mm/S, and the scanning width range is 0^5mm. Scanning speed is limited by scanning width, and the limiting relationship is: $10 \leq \text{scanning speed} / (\text{scanning width} * 2) \leq 1000$. If it exceeds the limit, it will automatically become the limit value. When the scanning width is set to 0, it will not scan (that is, point light source) (the most commonly used scanning speed is 300mm/S, and the width is 2.5mm).
 - ③ The peak power should be less than or equal to the laser power on the parameter page (if the laser power is 1000W, this value is not higher than 1000).
 - ④ The duty ratio ranges from 0 to 100 (the default value is 100, which usually does not need to be changed).
 - ⑤ The pulse frequency range is suggested to be 5-5000Hz (the default value is 2000, which usually does not need to be changed).
 - ⑥ Click the HELP button on the upper right to get more explanations of relevant parameters.
- Technology reference (subject to practice, the following is for reference only)

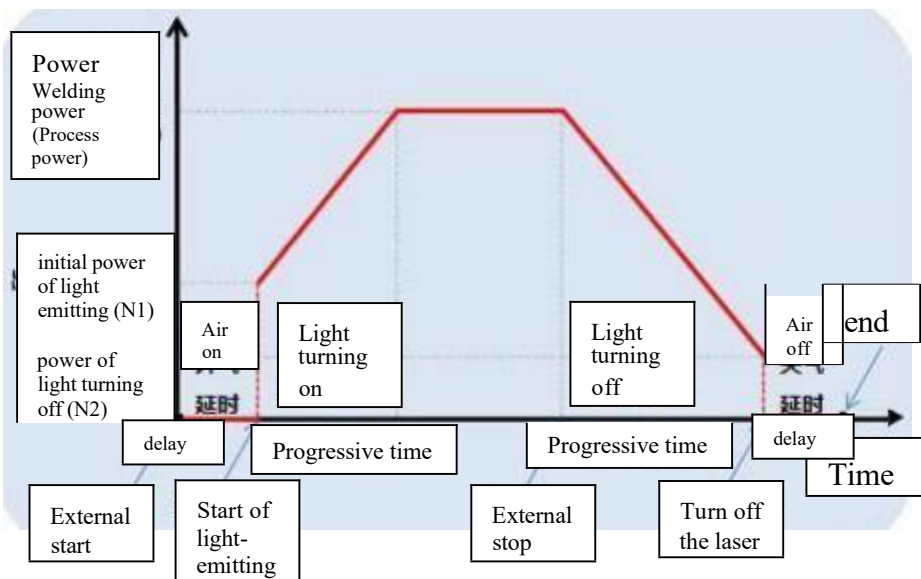
material	Material thickness	送丝速度mm/s	扫描速度mm/s	扫描宽度mm	功率w	占空比%	脉冲频率hz	焊丝mm
不锈钢	1mm	90mm/s	300mm	2.5mm	400W	100%	1000hz	1.0mm
不锈钢	2mm	75mm/s	300mm	3.0mm	700W	100%	1000hz	1.2mm
不锈钢	3mm	60mm/s	300mm	3.5mm	900W	100%	1000hz	1.6mm
碳钢	1mm	90mm/s	300mm	2.5mm	400v	100%	1000hz	1.0mm
碳钢	2mm	75mm/s	300mm	3.0mm	650v	100%	1000hz	1.2mm
碳钢	3mm	60mm/s	300mm	3.5mm	900v	100%	1000hz	1.6mm
铝	2mm	60mm/s	300mm	2.5mm	700v	100%	1000hz	1.0mm
铝	3mm	60mm/s	300mm	3.0mm	900v	100%	1000hz	1.2mm

3.1.3 Set the Operation Main Screen

Password 123456

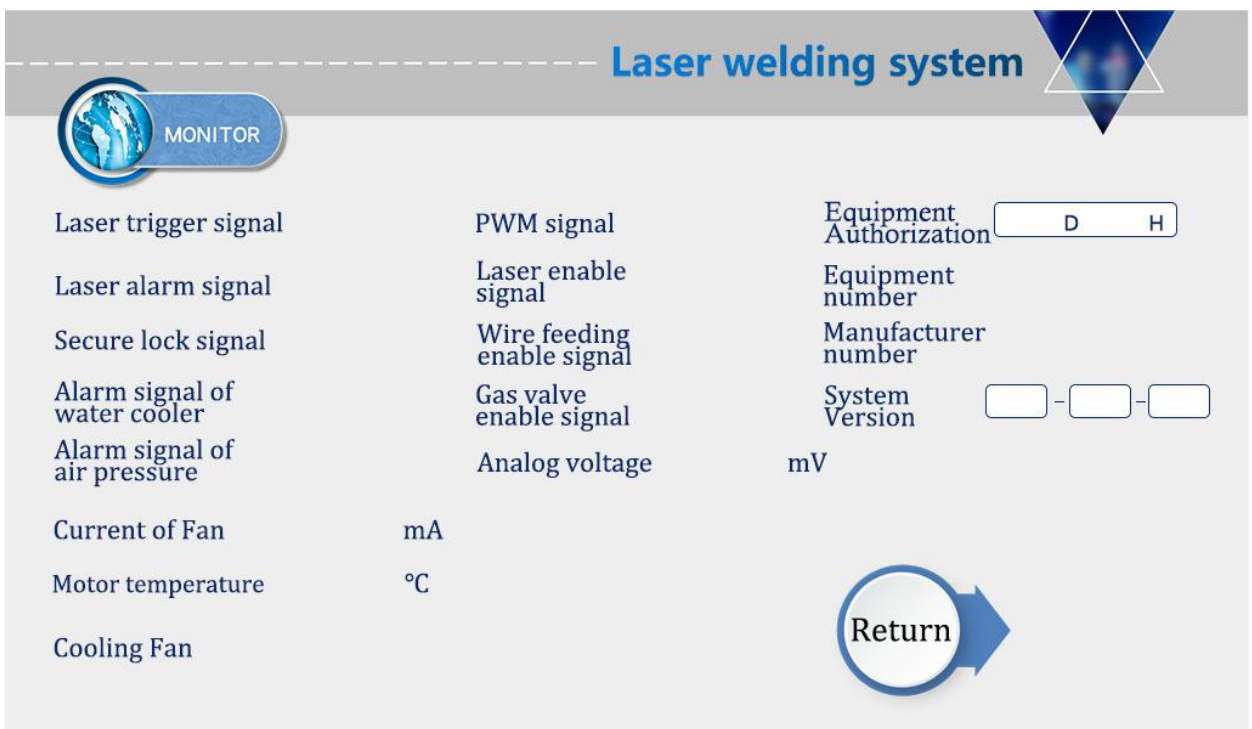


- ① The laser power is the maximum power of the laser used.
- ② The switching gas delay is 200ms by default, and the range is 200ms-3000ms.
- ③ The light is turned on from N1 percent of the process power to 100%; the light is turned off from 100% of the process power to N2; (as shown in the figure below).



- ④ Feeding delay compensation, i.e., the feeding advance time relative to the outgoing light signal, can be used in conjunction with the pullback function.
- ⑤ The maximum temperature alarm threshold value is 70°C. When the value is set to 0, the temperature alarm is not detected.
- ⑥ The scanning correction coefficient ranges from 0.01 to 4, and the target line width/measured line width of the coefficient is generally 1.25.
- ⑦ The laser center shifts from -3 mm to 3 mm, decreasing to the left and increasing to the right.
- ⑧ The alarm level signal is the default, and the shielding alarm can be directly changed to the corresponding level detection.
- ⑨ **The duration of spot welding is the light emitting time after pulling the trigger, that is, even if the button is released, the light will still be emitted according to the time spent (V3.3 version is above functions)**
- ⑩ **Spot welding interval time is the stop light time between two spot welding after pulling the trigger button (V3.3 version and above function)**
- ⑧ Click the HELP button on the top right to get more explanations of the relevant parameters.

3.14 the Main Interface of Monitoring



The screenshot shows the 'Laser welding system' monitoring interface. At the top, there is a 'MONITOR' button with a globe icon. The main area displays various system parameters and their current values:

- Laser trigger signal
- Laser alarm signal
- Secure lock signal
- Alarm signal of water cooler
- Alarm signal of air pressure
- Current of Fan: mA
- Motor temperature: °C
- Cooling Fan
- PWM signal
- Laser enable signal
- Wire feeding enable signal
- Gas valve enable signal
- Analog voltage: mV
- Equipment Authorization:
- Equipment number
- Manufacturer number
- System Version: - -

A large blue arrow button labeled 'Return' is located at the bottom right of the interface.

This interface displays the condition and equipment information of each detection signal.

Click equipment authorization to enter the interface of authorized service time, and enter the password to authorize the system for usable service time.

Authorized encryption is consistent with decryption method: system decryption method (applet).

IV. Maintenance

4.1 Maintenance and Replacement Methods of Protective Lenses:

① The processing characteristics of laser welding requires regular maintenance of the lens. If the welding is found to be poor, check the protective lens. If the protective lens is dirty, it needs to be replaced in time.

② The cleaning technique of the lenses is extremely important, poor cleaning can lead to degradation of the lens performance in light cases and damage to the lenses in heavy cases. Therefore, it is important to be very careful when cleaning the lenses.

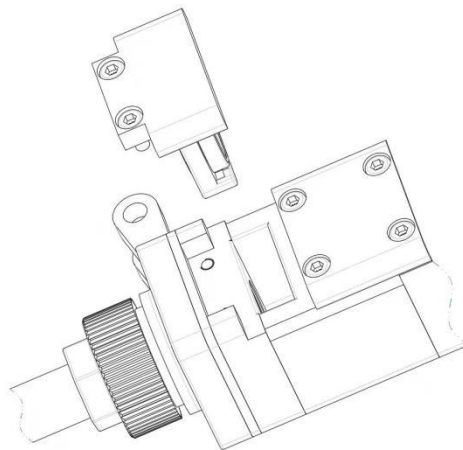
③ Before operation, wash and dry your hands with detergent, and wipe your hands dry again with a cotton sticky with alcohol.

④ Before cleaning, prepare a blow-up balloon (leather tiger), a set of clocks and watches, a set of dustproof non-stick tape, anhydrous degreasing cotton (fine cotton), more than 99% industrial alcohol, finger gloves or rubber gloves, and mirror paper.

⑤ Remove the cover screw of protective mirror in a relatively dust-free place, pull out the support of protective mirror, and check the protective lens. If the protective mirror is polluted, it must be wiped clean with absolute alcohol. (If there is obvious burning point on the surface of the protective lens, it should be replaced directly.)

⑥ Then check the white power storage sealing ring under the protective lens. (If there is any scratch or deformation of the power storage sealing ring, it cannot be used, and it must be replaced immediately.)

⑦ Wipe the bin opening and the inside of the bin cover with a cotton ball dipped in alcohol, quickly insert the protective mirror bracket into the protective mirror bin, and lock the screws.



When the red light cannot completely come out of the copper nozzle, it needs to be adjusted manually to prevent the copper nozzle from burning out.

Please note: the first time you use it, when the red light cannot come out from the copper nozzle, be sure not to give out light.

2 As shown in the figure below, at this time you cannot see the red light completely out of the copper nozzle.



2. We need to remove the back cover so that we can see four adjustment screws, and adjust the center according to the video.

③ Finally, this effect can be achieved like this.



④ The slight left-right deviation can be set by setting the laser center offset of the panel.

V. Handling of Common Exceptions

5.1. Alert Laser/Water Cooler/Air Pressure Alarm

- ① If the above alarm occurs without using the alarm signal, please change the alarm level.
- ② If the alarm signal is used, check whether the alarm of the corresponding equipment or the high and low levels of the alarm signal are set incorrectly.

5.2. Screen does not Light Up / No Response to Click

- ① The screen is not bright. If the controller is powered on (the fan is turning), check whether the four-core wires between the controller and the screen are wired correctly, and whether the 24V voltage between the first pin and the fourth pin is normal.
- ② If clicking fails in normal use, check whether the whole machine is caused by too high temperature.
- ③ If you can't input by clicking, check whether the four-core wires between the controller and the screen are connected correctly, and whether the second pin and the third pin are normal. See 2.1.2 LCD screen of the controller for details.
- ④ Newly installed devices with no response to click may be the system version does not match, re-flash the program can be. As for SD card, please ask our company.

5.3. No Light

- ① Monitoring interface can exclude other alarms. When the plumb joint touches the workpiece to be processed, the safety ground lock is shown in green, then it can be processed; if it is gray, then check whether the connection of the safety ground lock is normal.

That is, check that all preparation signals are normal.

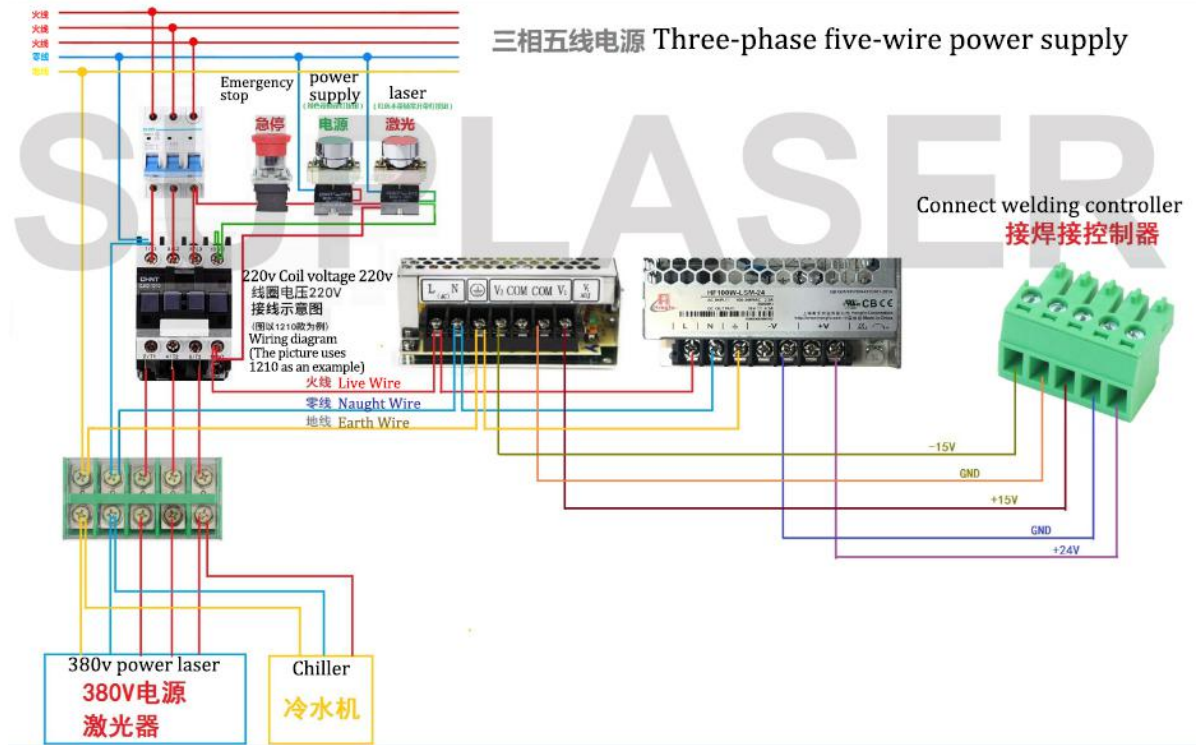
Usually, the failure of the outlet wire to emit light is caused by laser failure or wiring problem. If it does not vent gas or send wire, it may be a signal preparation problem. See 2.1.3 Controller Signal Interface 1 for details.

5.4. Light Suddenly Stops Emitting during Processing

The monitoring interface checks whether the safety lock and other alarms are normal and whether the temperature exceeds the temperature alarm threshold.

5.5. Red Light Deviation

See 4.2 Adjustment Method of Laser Center for details.



Wiring reference of three-phase power supply for laser welding machine

Note: Two-phase or three-phase electricity depends on the power supply required by the laser and water chiller, not the amount of harness

Warning: Please don't move/install the machine without permission. Please contact our company before preparation to provide the definition of power supply for the whole machine after sale, and the whole machine must be grounded!!!

SUPLASER



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