



HANDHELD LASER WELDING MACHINE
OPERATOR'S MANUAL

MODELS:LS-15000F/LS-20000F
G4J901 SC/A2

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1. Safety precautions

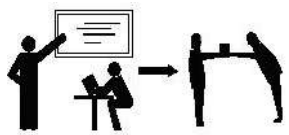
1.1 Safety warning symbols




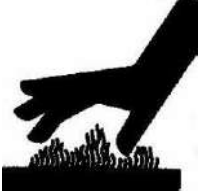

All safety warning symbols involved in the operation process of handheld laser welder include:

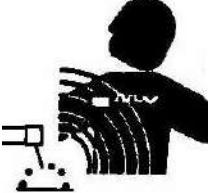


Symbol	Description
	Indicates laser radiation. There is a risk of laser radiation. Please take laser protection measures.
	Indicates electric warning. There is a risk of electric shock. Please follow the operation procedures.
	General precautions. Failure to follow the precautions may cause damage to or fault of the machine.
	The handheld laser welder is a Class 4 laser product. Please protect your eyes or skin from direct or scattered radiation.
	Indicates wearing protective glasses. Operators must wear qualified laser protective glasses in the 1080 nm band.

1.2 Precautions

 **Warning!** During welding, laser radiation, arc and welding smoke may cause harm to you and others, therefore, you shall take protection measures during welding operation. The laser wavelength range is 1070~1090 nm, which is invisible light, but these beams may cause irreversible damage to the eyes. Please be sure to wear qualified protective goggles. For details, please refer to the operator's safety protection guide that meets the manufacturer's accident prevention requirements.

	<p>Only qualified personnel should operate this machine!</p> <ul style="list-style-type: none"> ·Always use the appropriate personal protective equipment. ·The operator must be a special equipment operator with a valid "Metal Welding (Gas Cutting) Operation" certificate! ·Do not carry out any maintenance with the power on the machine
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	<p>Electric shock—May cause serious injury or even death!</p> <ul style="list-style-type: none"> ·Install grounding devices according to application standards. ·Do not touch any live parts with your exposed skin, wet gloves, or wet clothes. ·Be sure to be insulated from the ground and the workpiece. ·Ensure that the workstation is safe.
	<p>Fumes and gases—May be hazardous to your health.</p> <ul style="list-style-type: none"> ·Locate the equipment in a well-ventilated position and keep your head out of the fume. Do not breathe the fume. ·When welding, use ventilation or extraction devices to maintain a well-ventilated working environment.
	<p>Laser radiation and arc rays—May injure the eyes and burn the skin.</p> <ul style="list-style-type: none"> ·Wear approved safety glasses in 1080nm band under your helmet. ·Protect bystanders from hazards with suitable masks or shading curtains. ·As the laser is reflected by the mirror, ensure that no personnel without protective equipment stands in the reflection area.
	<p>Improper use and operation may lead to fire or explosion</p> <ul style="list-style-type: none"> ·Welding sparks may cause a fire. Please confirm that there are no flammable materials near the welding station and pay attention to safety and fire prevention. ·The fire extinguishing devices shall be ensured to be equipped nearby and the trained personnel proficient in using them shall be available. ·Do not weld closed containers. ·It is prohibited to use the machine for pipeline thawing. ·The output laser intensity of hand-held laser welder is enough to ignite inflammable and explosive articles, such as gasoline, gas, alcohol, etc. Make sure there are no inflammable and explosive articles around welding.
	<p>Hot workpieces can cause serious burns</p> <ul style="list-style-type: none"> ·Do not touch hot workpieces with bare hands. ·There should be a cooling time when using the welding torch continuously.
	<p>Noise--Excessive noise can cause damage to people's hearing.</p> <ul style="list-style-type: none"> ·Protect your ears by wearing ear shields or other hearing protectors. ·Warn bystanders that the noise can potentially harm their hearing.

	<p>Magnetic field affects cardiac pacemaker</p> <ul style="list-style-type: none"> · Before consulting a doctor, pacemaker users should stay away from the welding site.
	<p>Moving parts may cause personal injury</p> <ul style="list-style-type: none"> · Keep away from moving parts such as fans. · Various protective devices such as doors, panels, covers, and baffles, etc. should be tightly closed and put in place.
	<p>Fault--When encountering difficulties, seek professional help.</p> <ul style="list-style-type: none"> · For difficulties during installation and operation, please follow the relevant content of this manual for troubleshooting. · If you still cannot fully understand the content contained in the manual after reading, or cannot solve the problem as per the instructions in this manual, immediately contact your supplier or the service center of JASIC to seek professional assistance.

2. Product overview

The handheld laser welder is to achieve the purpose of welding by controlling the high energy laser beam to fuse the welding base material and the welding wire. Compared with traditional arc welding, laser welding enjoys such advantages as more delicate, more stable, lower heat input, more beautiful weld formation, few consumables, simpler operation and higher efficiency, which can meet the welding needs of various industries.

Performance features:

- All-in-one design, flexible and convenient. The compact all-in-one design covers a small area and is equipped with moving pulleys, which can be adjusted at any time according to the site requirements, making it convenient and flexible to use.
- In addition to the beautiful weld formation, and the heat input can be precisely controlled by finely adjusting the laser swing width, laser power, swing frequency, etc. to meet the welding strength, reduce the deformation of the workpiece, and achieve the optimal welding results.
- Reduce labor cost and material cost. The operation is less difficult, making it easy to get started; the welding speed is fast, enjoying high efficiency; the weld seam is beautiful, eliminating the need for later grinding; and the consumables are reduced.
- The human-machine interface is simple and easy to operate.

- Wide range of applications, basically suitable for welding all thin metal plates.

2.1 Technical parameters

2.1.1 Machine parameters

Table 2-1 Machine parameters

Name	Handheld laser welder			
Model	LS-15000F		LS-20000F	
Input power supply	AC220V (±10%) 50Hz	AC220V (±10%) 60Hz	AC220V (±10%) 50Hz	AC220V (±10%) 60Hz
Input power	5.8kW		7.8kW	
Conduction type	Optical fiber			
Laser type	Fiber laser			
Central wavelength	1080± 10nm			
Optical fiber	Core diameter: 25um; length: 12m ^[1] Connector QBH		Core diameter: 34um; length: 12m ^[1] Connector QBH	
Operating mode	Continuous or modulated			
Output power stability (25℃)	<±1.5% (2H)			
Output power	1500W		2000W	
Operating temperature range	-10℃~40℃ ≤7℃, Antifreeze should be used			
Storage temperature range	-20℃~+55℃			
Humidity	≤70% at 40℃; ≤90% at 20℃			
Laser cooling	Water-cooled			
Refrigerant	R-410A			
Water tank volume	8L			
Shield gas	Argon, nitrogen, compressed air (cutting)			
Machine body	Cabinet type			
Machine dimensions	773mm*410mm*737mm			
Machine weight	85kg		92kg	
Machine package size	865mm*475mm*1035mm			
Machine package weight	103kg		110kg	
Package size of wire feeder and accessories	890mm*320mm*430mm			

Package weight of wire feeder and accessories	17.3kg		
Gas pressure	Welding: >3bar; cutting: 4-7bar	Welding: >3bar; cutting: 4-7bar	Welding: >3bar; cutting: 4-7bar
Welding thickness	0.5~3mm	0.5~5mm	0.5~6mm
Welding gap	≤ Welding wire diameter		

[1]Exterior length of torch cable is about 9 meters.

2.1.2 Overall machine configuration

Table 2-2 Overall machine configuration

Model	Unit	Part Name	Type/Specification	Quantity	Unit
LS-15000F	Laser unit	Laser	BFL-CW1500-A 1500W	1	Set
		Water cooler	CWFL-1500ANW04 or CWFL-1500BNW04	1	Set
		Fiber and connector	Core diameter: 25um; length: 12m Connector QBH	1	Pcs
	Welding unit	Controller Laser welding torch Wire feeder	BW101-GS	1	Set
LS-20000F	Laser unit	Laser	BFL-CW2000-B 2000W	1	Set
		Water cooler	CWFL-2000ANW04 or CWFL-2000BNW04	1	Set
		Fiber and connector	Core diameter: 34um; length: 12m Connector QBH	1	Pcs
	Welding unit	Controller Laser welding torch Wire feeder	BW101-GS	1	Set

2.1.3 Laser parameters

Table 2-3 laser parameters

Parameter Item	BFL-CW1500-A	BFL-CW2000-B
Power supply	Single phase AC230V, 50/60Hz	Single phase AC230V, 50/60Hz

Power consumption	4.5kW	6.0kW
Power	1500W	2000W
Wavelength range	1080±10nm	1080±10nm
Optical fiber	Core diameter: 20um; length: 12m Connector QBH	Core diameter: 34um; length: 12m Connector QBH
Operating mode	Continuous or modulated	Continuous or modulated
Output power stability (25°C)	<±1.5% (2H)	<±1.5% (2H)
Power adjustment range	10%~100%	10%~100%
Maximum modulation frequency	5KHz	5KHz
Weight	<26Kg	<35Kg
Overall dimensions	80mm*402mm*346mm	80mm*402mm*346mm

2.1.4 Water cooler parameters

Table 2-4 Water cooler parameters

Parameter Item Model	CWFL-1500ANW04	CWFL-1500BNW04	CWFL-2000ANW04	CWFL-2000BNW04
Input power supply	Single phase AC230V 50Hz	Single phase AC230V 60Hz	Single phase AC230V 50Hz	Single phase AC230V 60Hz
Machine power	1.46kW	2.15kW	2.06kW	1.95kW
Temperature control accuracy	±1°C			
Electric auxiliary power	700W (room temperature)			
Refrigerant	R410A			
Water pump power	0.14kW	0.25kW	0.2kW	0.25kW
Water tank volume	8L			
Laser water nozzle connector	G1/2*Φ12 quick socket			
Water nozzle connector of weld head	G1/2*Φ6 quick socket			

Weight	36kg	38kg	41kg
Overall dimensions	357mm*728mm*445mm		

2.1.5 Welding unit

Controller

Table 2-2 Definition of controller wiring

Plug		Definition	Signal Type	Description
Power supply	1	-15V	Input	Connected to the -15V port of $\pm 15V$ switching power supply
	2	GND	Reference ground	Connected to the COM port of $\pm 15V$ switching power supply
	3	+15V	Input	Connected to +15V port of $\pm 15V$ switching power
	4	GND	Reference ground	Connected to the V- port of 24V switching power supply
	5	+24V	Input	Connected to the V+ port of 24V switching power supply
LCD screen	1	G	Reference ground	Power ground
	2	R	Sending end	Data exchange
	3	T	Receiving end	Data exchange
	4	V	Output	24V output voltage, providing 24V to the serial port display together with ①
Single interface 1	1	GND	Reference ground	Air pressure alarm signal input port; To enable (requires wiring), set the "Air Pressure Alarm Level" on the display screen settings page to be consistent with the actual air valve alarm level used.
	2	Gas pressure alarm signal	Input	
	3	GND	Reference ground	Water tank alarm signal input port; if required to be enabled (the wiring is required), set the "Water Cooler Alarm Level" on the display screen settings page to a value consistent with the actual water cooler alarm level used.
	4	Water tank alarm signal	Input	
	5	Reference ground		Connected to the workpiece, forms a loop with

		of safety ground lock		Pin 6 to prevent accidental light emission
	6	Safety ground lock		Connected to the blue wire of the three-core wire of the weld head
	7	Torch switch signal 1		Connected to the blown wire of the three-core wire of the weld head
	8	Torch switch signal 2		Connected to the black wire of the three-core wire of the weld head
Single interface 2	1	Reserved	Input	Reserved
	2	Reserved	Input	Reserved (synchronizing with Pin 4 gas valve signal)
	3	Shield gas valve-	Reference ground	Signal ground
	4	Shield gas valve+	Output	24V output, current >2A, built-in relay, directly connected to the gas valve.
	5	Wire feeding-		Feeding switch of wire feeder
	6	Wire feeding+		Feeding switch of wire feeder
Single interface 3	1	Laser abnormal signal	Input	Laser alarm signal
	2	Laser enable+	Output	Laser enable signal
	3	24V	Output	24V power supply pin, energized to output.
	4	GND	Reference ground	Reference ground (enabled, DA, common ground of Pin 3)
	5	Analog quantity+	Output	Connected to the analog quantity DA+ of the laser, 0~ 10V
	6	Radio frequency- (PWM-)	Output	Laser pulse width modulation signal-
	7	Radio frequency+ (PWM+)	Output	Laser pulse width modulation signal+

Welding torch

The model of the handheld laser welding torch is BW101-GS, and the parts are described as follows:



Figure 2-1 Handheld laser welding torch diagram

Table 2-3 Welding torch parts and model

Part Name	Model
Brass nozzle	
Graded tube	
Protective lens	D20*3
Focal lens	D20*4.75, F150
Reflector	
Collimation lens	D20*4.9, F60
1# and 3# water joint	Φ6
2# gas joint	Φ6

Wire feeder**Table 2-4 Wire feeder parameters**

Model	WF-22L
Input power supply	DC24V
Maximum weight of welding wire	20kg
Wire feeding diameter supported	0.8/1.0/1.2/1.6mm, 2.0/2.5mm customizable
Wire feed speed	25~600cm/min
Operating mode	Continuous mode, pulse mode
Installation environment	Level and free of vibration or shock
Overall dimensions	628mm*240mm*340mm
Weight	11.5kg

3. Control panel and functions

3.1 Overview of welding mode panel

The operation interface is divided into four parts, including Homepage, Technology, Settings, and Monitoring.

3.1.1 Home interface of touch screen

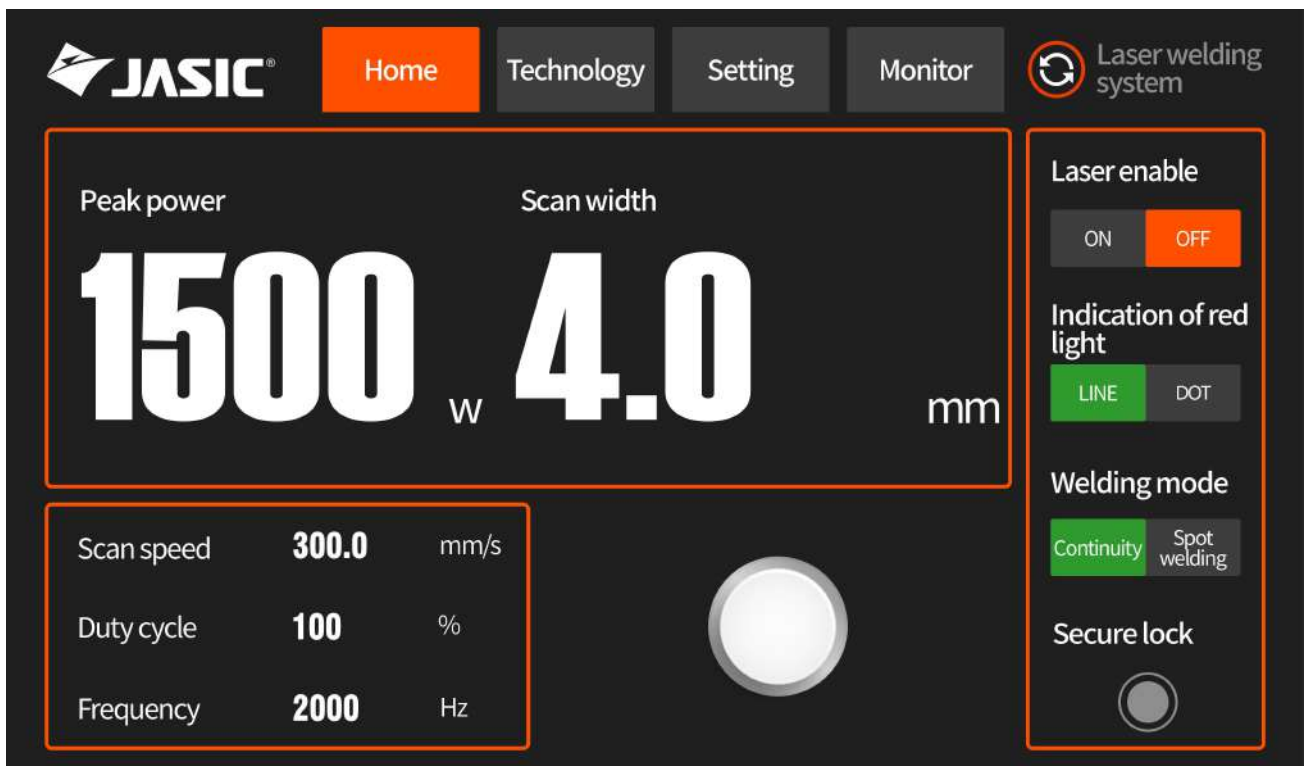





Figure 3-1 Home interface of welding mode

- 1) This interface shows the current technical parameters (which cannot be modified in this interface) and real-time alarm information.
- 2) When the enable is turned off, no enable signal will be sent to the laser, which can be used to test the gas outlet function. Turn off the red light indication and the motor stops working. At this point, the red light is a point, which is used to adjust the center position. Welding modes are divided into continuous welding and spot welding. When selecting spot welding, you need to set the spot welding type on the settings page.
- 3) The safety ground lock comes in grey and green. When the metal clip is clamped on the workpiece and the brass nozzle of the torch body contacts the workpiece, Pins 5 and 6 of the signal interface 1

are connected and the safety ground lock indicator light is green. At this point, press the laser enable button on the panel and then press the trigger to achieve light emission.

- 4) Click the  in the upper right corner to switch between cleaning modes

- 5)  is the light emission indicator icon, which is white when no light is emitted. When the laser

emission is normal, the icon turns orange 

- 6) Set the scanning width to 0 and replace the brass nozzle for cutting to perform cutting operations. The cutting control logic is the same as welding, and press the trigger while connecting the safety ground lock.

3.1.2 Technology interface

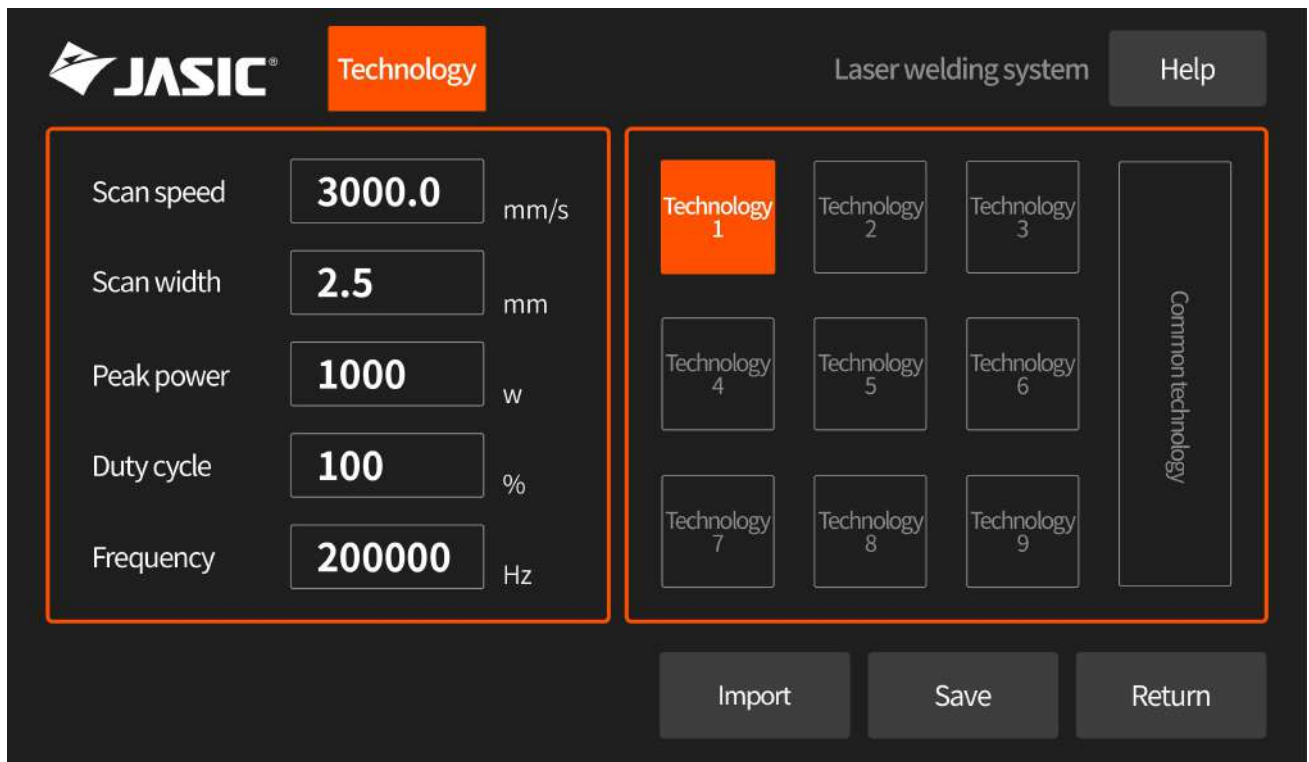


Figure 3-2 Technical interface of welding mode

- 1) The technology interface contains the debugging technology parameters, which can be modified by clicking the box; after modification, click OK to save it in the quick technology; and click Import to

import the technology for use (Modify - Save - Import).

- 2) The scanning speed range is 2-6000mm/S and the scanning width range is 0~6mm. The scanning speed is limited by the scanning width, and their relationship is: $10 \leq \text{scanning speed}/(\text{scanning width}^2) \leq 1000$. If the limit is exceeded, it will automatically change to the limit value. When the scanning width is set to 0, the machine does not scan (i.e., point source) (most common scanning speed: 300 mm/S, width: 2.5 -4mm).
- 3) The peak power needs to be less than or equal to the laser power on the parameter page. For example, if the laser power is 1000W, this value shall be not higher than 1000.
- 4) The duty cycle range is 0~100 (100 by default, usually no changes are needed).
- 5) The suggested pulse frequency range is 5-5000Hz (2000 by default, which is often not changed.)
- 6) Click the HELP button on the top right to get more description of relevant parameters.
- 7) After modifying the parameters, you can check whether the import is successful on the homepage.

Technical references (The reference is based on the actual data and the following list is for reference only.)

Table 3-1 Recommended technical parameters

Material	Thickness (mm)	Welding wire diameter (mm)	Laser Power (W)	Weave width (mm)	Wire feed speed (cm/min)
Stainless steel/carbon steel	0.5	0.8	250~ 350	1.4± 0.2	60~ 80
Stainless steel/carbon steel	1	0.8&1.0&1.2	350~ 780	2.5± 0.6	60~ 80
Stainless steel/carbon steel	1.5	0.8&1.0&1.2	400~ 780	2.5± 0.6	60~ 80
Stainless steel/carbon steel	2	0.8&1.0&1.2	450~ 1000	2.5± 0.6	60~ 80
Stainless steel/carbon steel	2.5	1&1.2	500~ 1500	3± 0.4	40~ 80
Stainless steel/carbon steel	3	1&1.2	700~ 1500	3± 0.4	40~ 80
Stainless steel/carbon steel	4	1&1.2	700~ 1500	3± 0.4	40~ 80
Stainless steel/carbon steel	5	1.6	1200~ 1700	3.5± 0.4	40~ 60
Stainless steel/carbon steel	6	1.6	1200~ 2000	3.5± 0.4	40~ 60
Stainless steel/carbon steel	6	1.6	2000~ 3000	4.5± 0.4	40~ 60
Stainless steel/carbon steel	6	1.6	2000~ 3000	5± 0.4 (double wire)	40~ 60
Aluminum alloy	1	1&1.2	700~ 900	2.5± 0.5	50~ 70
Aluminum alloy	1.5	1&1.2	750~ 950	2.5± 0.5	50~ 70
Aluminum alloy	2	1&1.2	800~ 1000	2.5± 0.5	50~ 70
Aluminum alloy	2.5	1&1.2	800~ 1100	2.5± 0.5	50~ 70
Aluminum alloy	3	1&1.2	1000~ 1300	2.5± 0.5	50~ 70
Aluminum alloy	4	1&1.2	1000~ 1500	2.5± 0.5	50~ 70
Aluminum alloy	5	1.2	1000~ 1500	2.5± 0.5	50~ 70
Aluminum alloy	6	1.2	1000~ 1500	2.5± 0.5	50~ 70

Note: Default scanning speed: 300~500 mm/s; default duty cycle: 100%; default laser frequency: 2000 Hz; Aluminium welding wire material: ER5356.

3.1.3 Settings interface

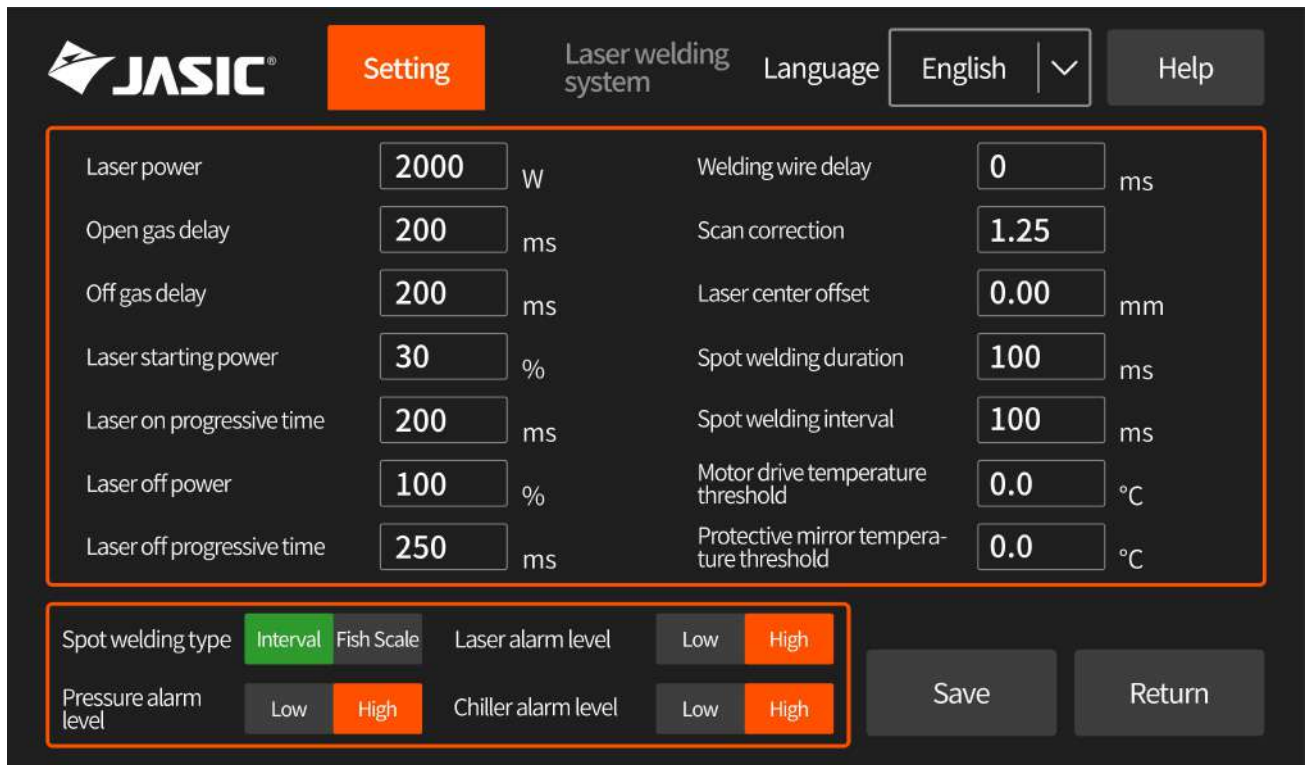


Figure 3-3 Setting interface of welding mode

This interface requires manual input of the password: 123456

- 1) Laser power is the maximum power of the laser used.
- 2) The gas switch-on/off delay time is 200ms by default, and the range is 0ms -3000ms.
- 3) When turning on the light, the light-on power gradually rises from N1% of technological power to the technological power; when turning off the light, the light-off power gradually reduces from the technological power to N2% of technological power.

As shown in the figure below:

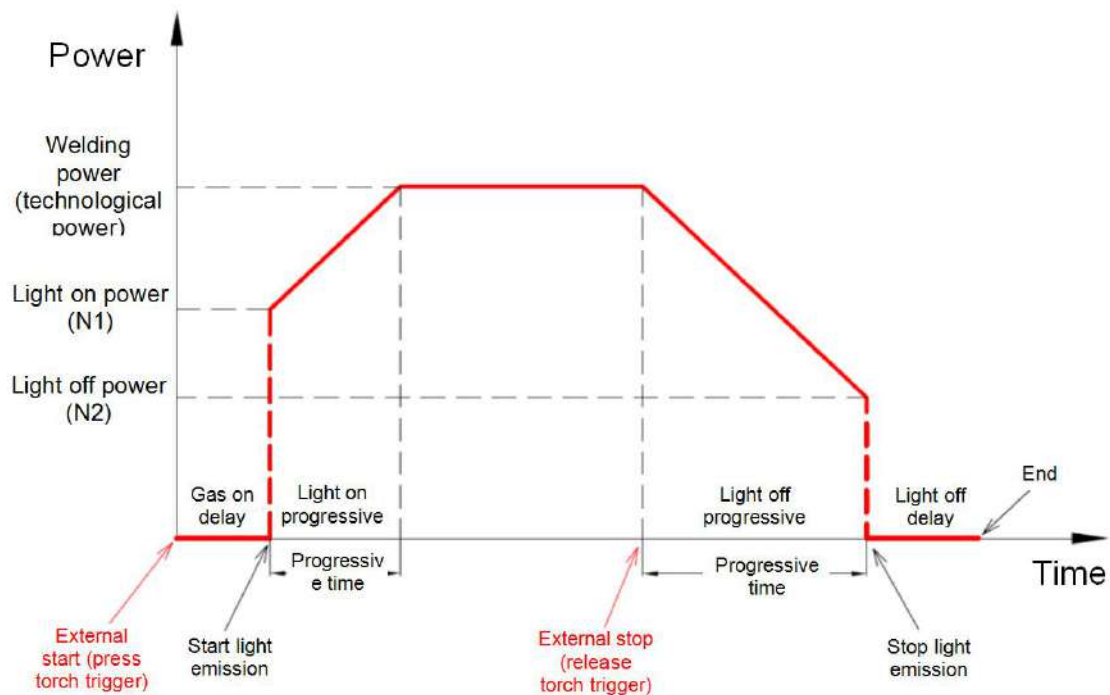


Figure 3-4 Welding time sequence

- 4) Wire feed delay compensation, i.e., the wire feed advance time relative to the light emitting signal, can be used in conjunction with the withdrawal function.
- 5) The maximum threshold value of the temperature alarm is 70°C. When the value is set to 0, no temperature alarm is detected.
- 6) Scan correction coefficient=target line width/measurement line width, which is within a range of 0.01 - 4. Generally set to 1.
- 7) The laser center offset is -3~3 mm, decreasing to the left, increasing to the right.
- 8) The spot welding duration is the light emission time when the trigger is pressed. Even if the trigger is released, the light will still be emitted according to the emission time.
- 9) The spot welding interval time is the light stopping time between two spot welds after the trigger is pressed.
- 10) The alarm level signal is set by default, masking alarm can directly change to the corresponding level detection.
- 11) Click the HELP button on the top right to get more description of relevant parameters.

3.1.4 Monitoring interface

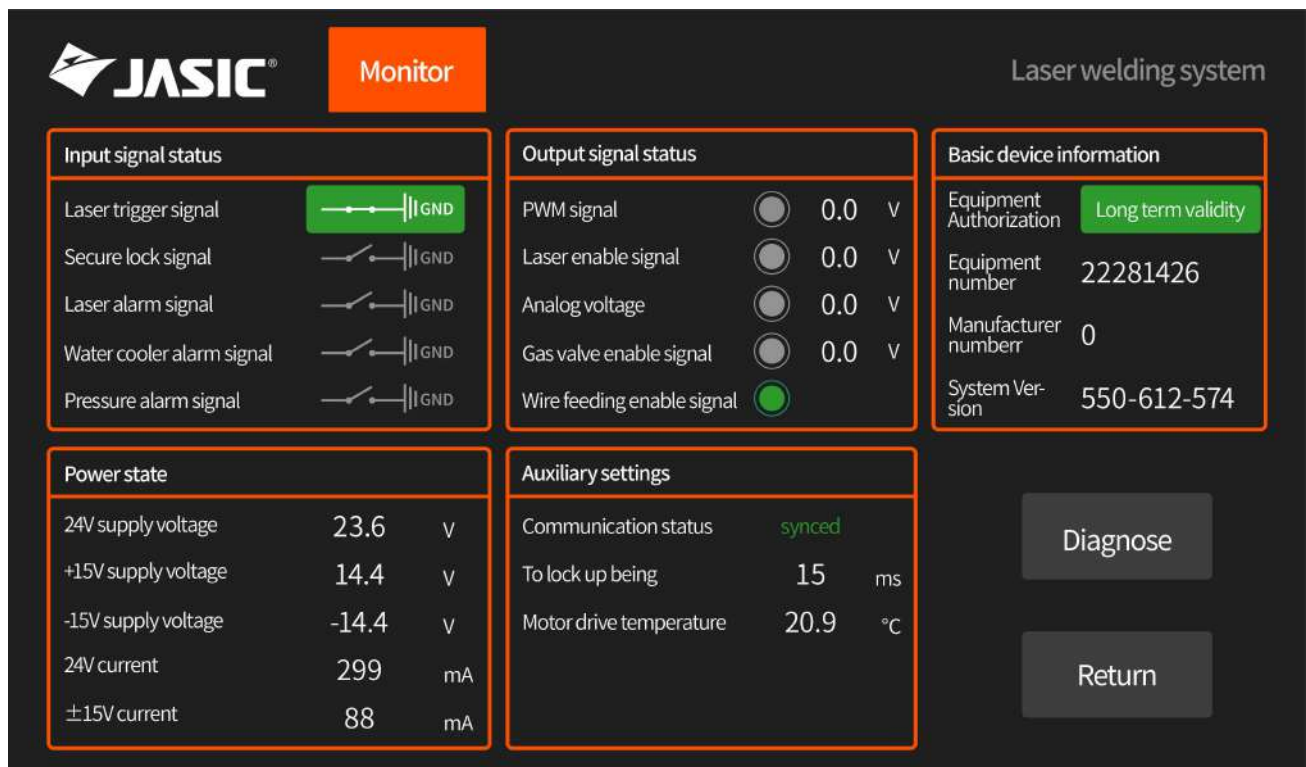


Figure 3-5 Monitoring interface of welding mode

This interface displays the status of each detection signal and device information.

Click on the Device Authorization to enter the authorization time interface. After entering the password, the system can be authorized for the available time of use. The authorization encryption and decryption methods are the same.

3.1.5 Diagnostic interface

You can click the diagnostic button on the detection interface to enter the diagnostic interface. The diagnostic interface is used to confirm whether each signal port has an output. Usually, the output value is the same as the detection value. In case of any inconsistency between the output value and detection value, indicate that the load is abnormal. When the laser does not emit any light, you can confirm by operating a single port and using the laser monitoring software or a multimeter for measurement whether the signal is sent.

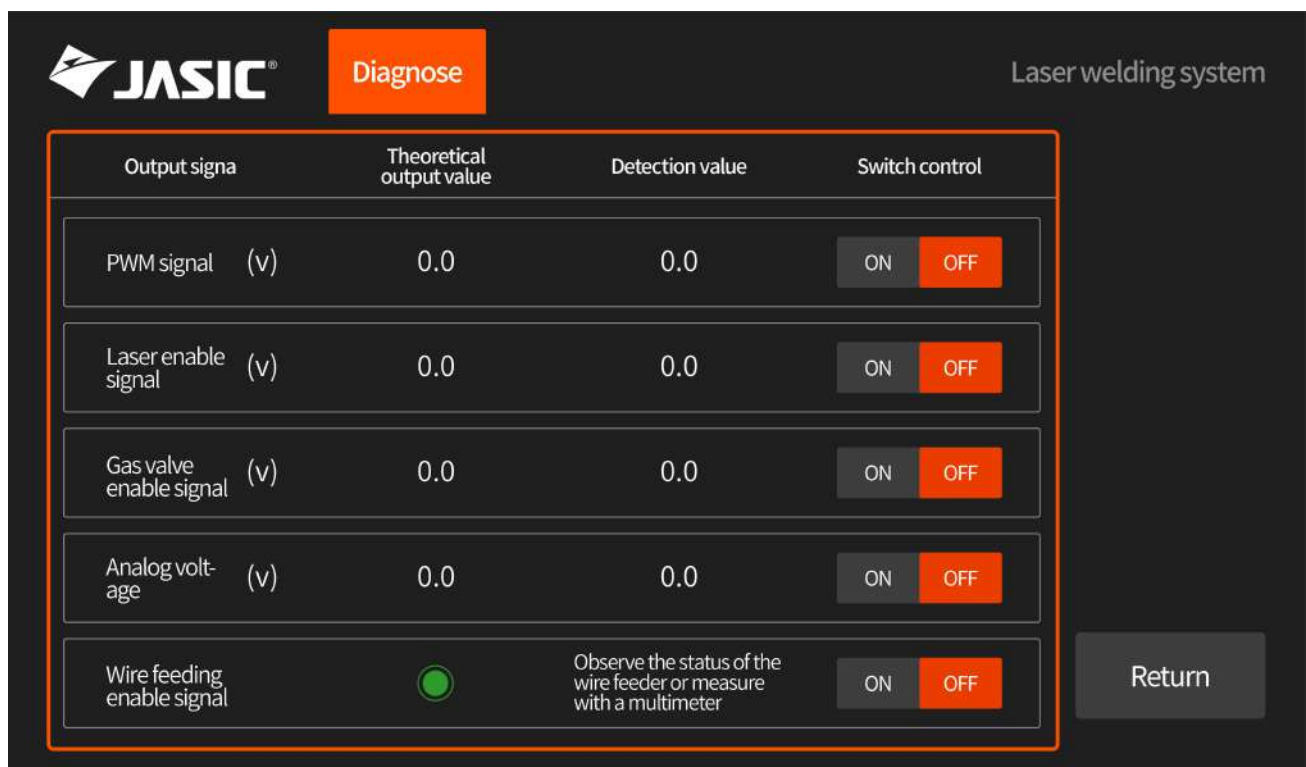


Figure 3-6 Diagnostic interface of welding mode

3.2 Description of welder front panel components



Figure 3 -7 Front panel schematic diagram

Power switch: The power control switch of the welder. Rotating it clockwise can turn on the welder.

Laser enablement: Controls the laser output. The indicator light comes on when this feature is on. The light can be emitted only when it is turned on at the same time as the operation interface "Laser Enablement".

Emergency stop switch: When an emergency occurs, press it to stop the welder and rotate it clockwise to reset.

3.3 Description of welder rear panel components



Figure 3 -8 Rear panel schematic diagram

Current leakage protection switch: controls the power input of the machine and has a short-circuit protection function.

Power cord: Means the machine power cord, which is connected to the single-phase AC 220V power. The earth wire must be reliably grounded.

Shield gas: The shield gas is supplied via a gas pipe during welding.

Torch cable: The outlet of the welding torch cable, through which the optical fiber, water pipe, gas pipe, and welding torch control wires are put.

Wire feeder: Insert a 7-pin aviation socket cable, connect it to the wire feeder to provide power and control the wire output of the wire feeder.

Earth wire pliers: Connect the earth wire pliers. During welding, the earth wire pliers clamp the workpiece to form a loop with the welding torch head to emit light.

3.4 Description of wire feeder control panel

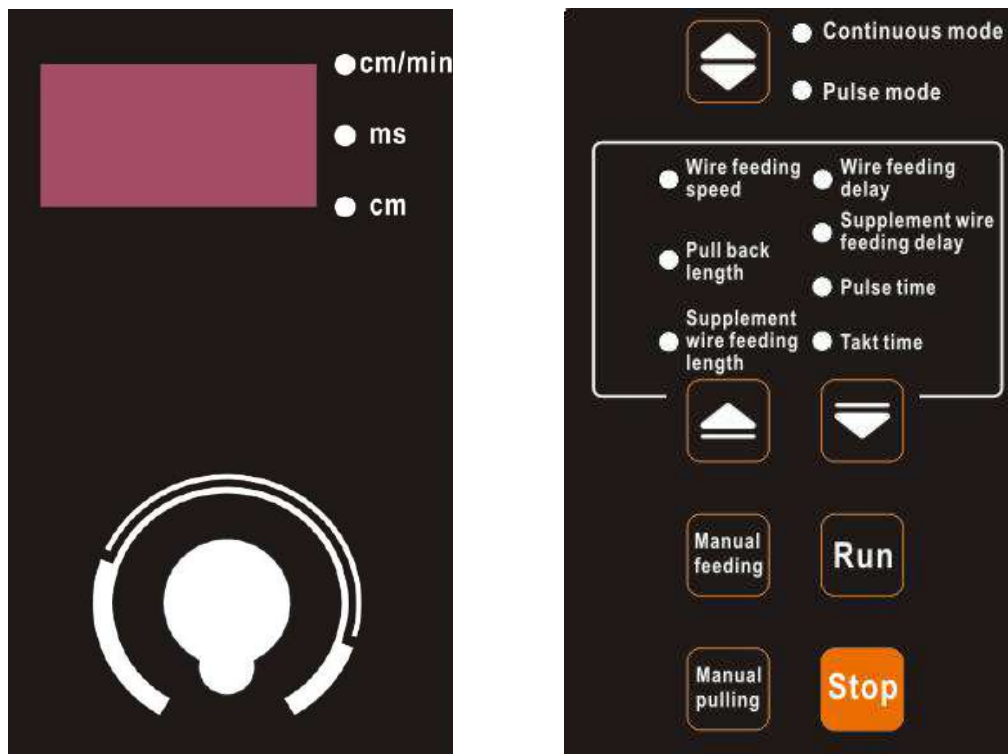



Figure 3-9 Wire feeder panel diagram

Table 3-2 Description of wire feeder panel functions

Functional Parameter	Description
Continuous and pulse modes	Click the button  to switch between "Continuous mode" and "Pulse mode". In "Continuous mode", the pulse time and interval time are disabled and the corresponding parameters cannot be adjusted; In "Pulse mode", the pulse time, interval time, and parameters can be adjusted.
Wire feed speed	Controls the wire feed speed during welding. The range is 25-600 cm/min and can be directly adjusted through the panel knob.
Manual wire feed	Controls the manual wire feed speed. It is generally used for daily debugging of the machine. Continuously press the "Manual wire feed" button and the motor will continue to feed the wire at the fastest speed. Release the button and the machine will stop feeding.
Manual withdraw	Controls the manual withdraw speed. It is generally used for daily debugging of the machine. Continuously press the "Manual withdrawal" button, and the motor will continue to withdraw the wire at the fastest speed. Release the button and the machine will stop withdrawal.
Run/Stop	Controls the wire feeder to switch the working state. Click "Stop" and the panel will display "——". At this point, the machine is in "Stop" state and the motor cannot feed or withdraw the wire. Click "Run" and the panel will display the set wire feeding speed. At this point, the machine is in "Run" state and the motor can feed the wire

normally.

3.5 Description of wire feeder rear panel components

Power switch: controls the power input of the wire feeder.

Control cable: Connected to the machine so that it can provide power and welding torch signals to the wire feeder.

4. Installation

4.1 Installation requirements

4.1.1 Installation environment requirements

Read the following precautions when selecting an installation environment.

- Avoid installing the machine in an environment where there is dust or metal powder;
- Avoid installing the machine in an environment where there is corrosive or explosive gas;
- Ensure that the working environment is at a temperature between -10°C and 40°C. If it is used in an environment with a temperature lower than 7°C, antifreeze should be used to protect the coolant from being frozen;
- The machine should be used in an environment of humidity lower than 90% without any condensation water droplets;
- The altitude shall be no more than 1000m;
- The inclination of machine should not exceed 10°. When the machine is placed on a slope, additional fixing measures should be taken to prevent the machine from sliding;
- There is no obvious vibration or impact;
- Please consult and confirm with JASIC's customer-service personnel first for any special erection requirements.

4.1.2 Installation space requirements

The laser welder shall be at least 30 cm away from walls or other objects.

4.2 Electrical connection

Precautions:

- All electrical connections should be completed by experienced and qualified personnel.
- Turn off the power switch of the power distribution box before the wiring to ensure safety.
- Always use reliable standard cables.
- Do not operate with wet hands.
- Do not place heavy objects on cables.
- Water supply pipes and house steel bars may not be reliably connected to the ground. Please do not use them for safety grounding.
- Each machine shall be equipped with a gas switch or fuse.

4.2.1 Connection of power cord



Warning! Electric shock may cause death! After the power is off, there is still a high voltage in the equipment. Thus, do not touch the live parts of the equipment.



Warning! The power supply of the machine must be connected by an experienced and qualified electrician.



Warning! Do not ground the live wire (blue, brown, and black) of the power cord, and do not connect the earth wire (yellow-green) to the live wire!

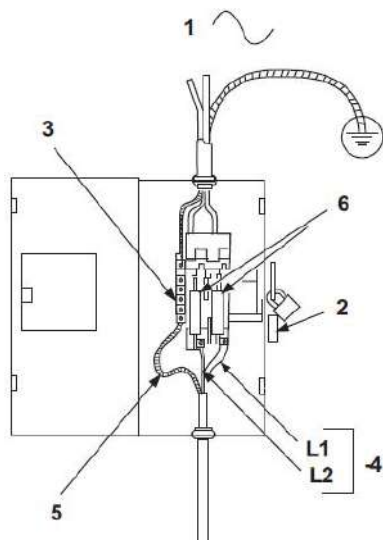


Warning! Excessive input voltage may damage the equipment!

- 1) Connect the power source to the suitable power distribution box according to the voltage grade of machine. Meanwhile, ensure that the supply voltage deviation is within the allowable range.
- 2) When extension cord is required, it is recommended to use power cords with larger cross-sectional area to reduce the voltage drop. An excessively long cord may affect normal operation of the system. Therefore, please use the recommended cord length.

- Ensure that the switch of the power distribution box is off during the connection of the input power cord.
- Connect the input power cord of the machine to the output of the power distribution box reliably.

Distribution box wiring



- 1) Single-phase AC power input: 220V;
- 2) Power switch of distribution box;
- 3) Earthing terminal row;
- 4) The machine should be connected with a power cord with the specification of 3*4mm² or above.
- 5) Yellow-green earth wire (connected to the ground!);
- 6) Fuse: The machine should be provided with a fuse of not less than 60A.
- 7) Please connect the power cords in the way shown in the figure or other correct ways, with the main power supply being off.

Note: Do not operate with electricity!

- The machine can only be wired by a professional electrician.

Figure 4-1 Wiring diagram of single-phase distribution box ● Do not connect two machines to the same distribution box.

4.3 Connection of safety ground lock

Before the welding, connect the aviation socket of the safety ground lock to the interface on the rear panel of the machine, and clamp the alligator clip of the safety ground lock to the workpiece. The torch head will emit laser only when the laser enablement signal is valid and the torch head is in contact with the workpiece and the torch switch is pressed.

4.4 Gas connection

During the welding, a kind of inert gas should be used to cool the torch head and protect the weld seam. The purity and pressure of inert gas shall be guaranteed. Generally, nitrogen and argon gases are used as the shielding gas, with the purity of not less than 99.99% and the inlet gas pressure of greater than 80 kpa. The gas is injected into the gas inlet on the rear panel of the machine through the $\Phi 6$ mm gas hose, and the gas flow should be $\geq 15\text{L}/\text{min}$.

4.5 Wire feeder assembly

4.5.1 Internal assembly of wire feeder

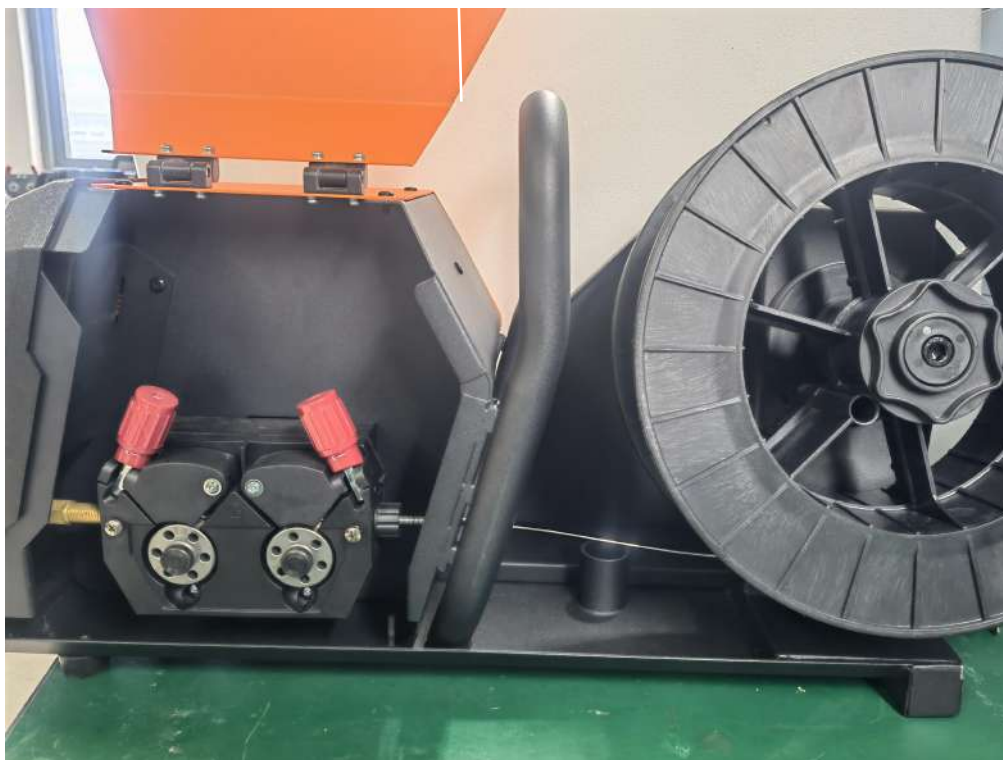


Figure 4-2 Interior of wire feeder

Step 1: Select proper wire feed roller according to the welding wire diameter

- 1) Release two preload adjustable press rods;
- 2) Unscrew the nut of wire feed roller and remove it;
- 3) Replace with proper wire feed roller, put the side of the corresponding wire feeding trough facing inward, and then tighten the nut.

Step 2: Install the wire spool. Note that the welding wire must be led out from the wire spool, insert the wire spool on the spool shaft, and pass the welding wire through the wire feed roller. The welding wire must be placed in the slot and then clamped. The welding wire should be ordinary welding wire ranging from 5 kg to 25 kg, but flux-cored wire should not be used.

Step 3: Adjust the press rod pressure to stably send out the welding wire.

4.5.2 Wire feeder connection

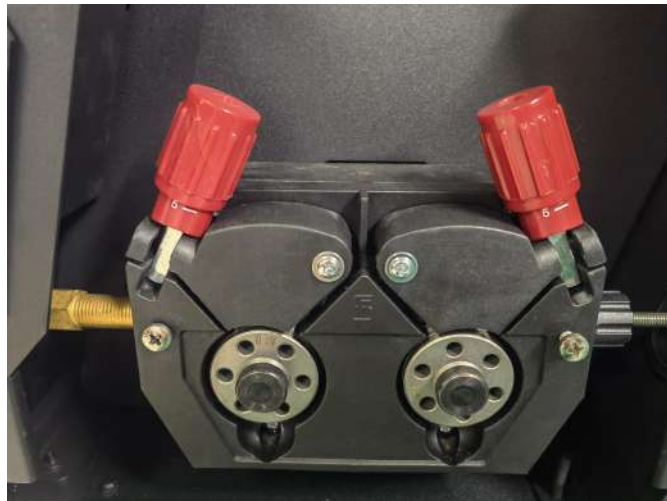


Figure 4-3 Assembling of wire feeding brass nozzle

Step 1: Connect the wire conduit. Loosen the locking screw to insert the brass nozzle of the wire conduit onto the wire feeder, pass the welding wire through the brass nozzle and tighten the screw fixing the brass nozzle.

Step 2: Assemble the wire conduit on the torch head bracket and tighten the nut; adjust the length of wire conduit to extend to the welding brass nozzle.

Step 3: Connect the control line of the wire feeder. Insert the 7-pin connector plug of the control line into the 7-core socket on the rear panel of the wire feeder and tighten it. Then, insert the other end into the wire feeder interface on the rear panel of the machine.

Step 4: After the above steps are finished, turn on the power supply of the machine, switch on the wire feeder, and manually feed a wire and make it come out of the wire guide nozzle.

Note: 1) Do not direct the wire guide nozzle at any person or equipment during the wire feeding to avoid personal injury.

2) Avoid bending the wire guide tube to avoid affecting the wire feeding.

4.6 Switching operation guide

After connecting the overall system, check again for any errors or omissions before startup.

- 1) Open the gas cylinder valve and adjust the gas flow.
- 2) Turn on the switch of the power distribution box, the switch of the rear panel of the machine, and the switch of the wire feeder in turn.
- 3) Turn on the power switch and emergency stop switch on the front panel. At this time, the machine will start, and the panel will light up. After startup, check whether the machine and water tank operate normally and have any alarms.
- 4) Press the manual wire feeding button of the wire feeder to make the welding wire come out of the wire guide nozzle.
- 5) Disable the laser enablement button to check if the red light is in the center of the brass nozzle and right to the wire.
- 6) Welding can be carried out after setting welding parameters and wearing protective equipment.
- 7) After welding, disable the laser enablement button, turn off the power switch on the front panel, the rear panel switch, the power distribution box switch, and then the gas cylinder valve in turn.
- 8) Place the welding torch lightly on the torch holder.

Warning!



- **When the wire feeder manually feeds the wire, do not direct the guide wire nozzle to people or equipment to avoid puncture.**
- **When adjusting the red light, it is forbidden to enable the laser enablement button, to avoid causing injury by light emission.**

5. Precautions

5.1 Precautions



Warning! Dropping may cause machine damage or personal injury. Please handle the machine in accordance with the handling and placement labels on the machine, and use a cart or similar tools with an appropriate load-bearing capacity for handling.

- 1) Machine lifting method: The machine can be lifted by fork lift or crane. As the machine is not equipped with lifting rings, special attention should be paid to fixing method when using crane for lifting.
 - 2) Input cable specification: A cable of 3×4mm² or above should be used to connect the power distribution box and machine. The power distribution box must be equipped with a breaker or fuse of not less than 60A.
 - 3) Protective earth lead connection: Be sure to connect the yellow-green wire in input cable of the machine to the protective ground.
 - 4) Cooling method: The water tank is provided with a cooling fan. The air inlet and outlet of the machine cannot be blocked during its use to ensure the machine is ventilated well.
 - 5) The inclination of the machine should not exceed 10°. Otherwise, it is prone to tipping over. When the machine is put on a slope, additional fixing measures should be taken to prevent the machine from sliding.
 - 6) The operation environment of the machine should meet the following requirements:
 - a) Air temperature range:
During the welding, the temperature range is -10°C ~+40°C. When the ambient temperature is lower than 7°C. During the transportation and storage, the temperature range is -20°C ~+55°C.
- Note: When using a water cooler, pay attention to prevent it from being used or stored at the solidification temperature of the coolant; when storing at a low temperature, the coolant should be drained first!**
- b) Relative air humidity: not more than 70% at 40°C and not more than 90% at 20°C.
 - c) The dust, acid, corrosive gas, or substances in the surrounding air should not exceed the normal content, except for these substances produced in the welding process.
- 7) The bottom of the equipment is equipped with rollers. When the equipment is put at a place, the rollers should be locked to avoid damage or personal injury due to the equipment movement.
 - 8) Do not put hands, hair, tools, etc. near the live devices in the machine when it is energized, such as fans, so as to avoid personal injury or damage to the machine.
 - 9) Avoid water or water vapor from entering the inside of the machine. If such condition occurs, the

inside of the machine should be dried. Then, the insulation of the machine (including between the connection nodes and between the connection points and the enclosure) shall be measured with a megohmmeter. Only when it is confirmed that there is no abnormal situation can the welding work be continued.

- 10) The welder and welding torch can only be operated according to their duty cycle.
- 11) The bending radius of the welding torch cable should not be less than 20 cm to avoid fiber breakage.
- 12) Care for the torch: Rough operation of welding torch is easy to cause wire breakage, water leakage (gas leakage), and lens damage inside the torch; when not in use, it should be carefully and reliably placed in the torch holder.
- 13) Poor flow meter or gas hose connection will lead to gas leakage or reduced gas flow at the front of the nozzle, so the gas protection effect will be reduced, and the weld gas pores are prone to appear.
- 14) There should be windproof measures in windy workplaces, otherwise, it will blow away the protective gas and form gas pores.
- 15) Clean the oil, rust, paint, water and other conductive substances attaching on the base metal surface to be welded; otherwise, it will become pores and cracks, and can not obtain good welding effect.
- 16) During manual wire feeding and inching, do not direct the guide wire nozzle to people or equipment to avoid puncture.
- 17) Do not replace the wire feed roller when the wire feeder is powered on to avoid being crushed.



Warning! The machine is equipped with an abnormal temperature protection circuit. When the water temperature is too high/low, the machine will trigger an alarm and automatically stop the light emission.

6. Maintenance

6.1 Maintenance and replacement of the protective lens and focal lens

The protective lens of the welding torch head needs regular maintenance and wiping to avoid dust or stains. If there is debris on the surface of the lens, it will affect the light emission and lead to a decrease in welding performance, or even burn the lens.

6.1.1 Tools required

Rubber gloves or finger cots

Lens cleaning cloth

Non-woven cotton swab

Textured tape (width: 5 cm)

Anhydrous ethanol (purity $\geq 99\%$)

6.1.2 Operation steps

- 1) Cut off the power supply of the machine;
- 2) Wear rubber gloves or finger cots, open the lens protection cover, and take out the protective lens base;
- 3) Immediately close the lens protection cover to prevent the dust from ingress into the device;
- 4) Wipe the surface of the protective lens with a cotton swab dipped with some anhydrous ethanol;
- 5) If damaged lenses are found, replace them timely with new ones;
- 6) Install the protective lens bracket into the welding head, pay attention to the installation direction, and close the lens protection cover.



- **Please perform lens maintenance or replacement in a dust-free environment!**
- **Do not touch the surface of the protective lenses with your fingers!**
- **Do not blow debris on the surface of the lens with your mouth!**
- **If the white energized sealing ring under the lens is scratched or deformed, it must be replaced immediately!**

6.2 Maintenance of water cooler

The main function of the water cooler is to cool the laser and welding head, so that the laser and welding head can maintain in a constant temperature working condition. Therefore, proper and regular maintenance is the key to ensure the normal work of the machine. At the same time, the circulating water of the water cooler must use distilled water. Due to the water quality problems, there are still certain minerals, dust and other impurities in the circulating water, and the dust in the environment may also enter the circulating water in some operation links. The deposition of these impurities can lead to the blockage of water systems (such as metal filter, welding head, laser, QBH), which can seriously affect the welding results or even burn out the optical components. The accumulation of dust and other debris in the environment on the radiator and water pump of water cooler will lead to poor heat dissipation, resulting in poor cooling, burned compressor, or burned water pump, which will also directly affect the welding results or cause the machine not to work. Therefore, the daily maintenance of the water cooler is particularly important.

Please refer to the maintenance instructions for water cooler and regularly maintain the cooling system of the laser welder (cleaning machine).

Maintenance of water cooler:

Maintenance Period	Content	Target
Daily	1. Check whether the temperature setting of the water cooler is normal (set temperature: $25\pm 1^{\circ}\text{C}$).	Ensure that the temperature of the cooling water supplied to the laser is normal.
	2. Check whether the water circuit seal, water temperature and water pressure of the water cooler meet the requirements.	Ensure proper operation of the equipment and prevent water leakage.
	3. Keep the working environment of the water cooler dry, clean and ventilated.	Contribute to the proper operation of the water cooler.
Monthly	1. Remove the dirt on the surface of the water cooler with neutral cleaner or high quality soap. Do not clean the system with benzene, acid, abrasive powder, steel brush, or hot water.	Ensure that the surface of the water cooler is clean.
	2. Check whether the condenser is blocked by dirt. Please use compressed air or brush to remove the dust from the condenser.	Ensure the normal operation of the condenser.

	3. You can use vacuum cleaner, air gun and brush to remove the dust on the filter. After cleaning, if the filter is wet, please shake it to dry and then install it back.	Prevent poor heat dissipation from causing poor cooling, and burning out the water pump and compressor.
	4. Check the water quality of the tank and follow up.	Good water quality can ensure the normal operation of the laser.
	5. Replace the cooling water (distilled or purified water) and clean the metal parts of the water tank and water circuit.	
Quarterly	1. Check electrical parts (such as switches, terminals, etc.) and wipe clean with a dry rag.	Ensure that the surface of the electrical parts of the water cooler is clean to extend the service life.
	2. When the machine is used in winter, replace the antifreeze and clean the metal parts of the water tank and water circuit.	Ensure that the laser operates normally.

Precautions:

Cooling water should be deionized or distilled water, and tap water is strictly prohibited. The cooling water and filter element of the water cooler should be replaced regularly every month. Adding 5% -10% anhydrous alcohol to the water cooler can effectively prevent the production of micro-organisms in the water, thus making the product more reliable.

When the laser is used in summer, pure water should be used as the cooling water to protect the water circuit of the water cooler from corrosion resulted from long-term use of the antifreeze.

When the laser is used in winter with an ambient temperature below 7 °C, it is required to protect the internal water circuit of the laser and the water cooler from being frozen. An appropriate amount of antifreeze should be added to the cooling water for protection. The freezing point of the antifreeze must be 5 °C lower than the minimum ambient temperature

The water inside the equipment and QBH should be emptied timely before the machine is out of service for a long period. Otherwise, the water remained in the equipment for a long period may cause damage to the laser. When the water inside the QBH is drained, the air pressure must be less than 0.1MPa. Excessive air pressure should be avoided to protect the optical fibre from being damaged.

When the laser is used in summer, it is required to prevent any internal condensation. Once the cooling temperature of the water cooler drops below the dew point of the laser's internal environment, the moisture in the air will be condensed onto the electrical and optical modules. If no measures are taken, the moisture will be condensed on the outer surface of the laser. Once the condensation is visible on the laser housing, it indicates that the moisture is already condensed in the laser. In this case, the machine should be powered off and stopped, and the working environment of the laser should be improved.

To reduce the risk of condensation, connect the clean and dry compressed air line from the CDA on the back panel of the laser and inject the clean and dry compressed air into the inside of the laser. The air pressure should be kept at 0.1MPa. It is prohibited to use the compressed air containing water or oil.

7. Troubleshooting of common malfunctions

S N	Fault Location	Symptoms	Reasons	Troubleshooting
1	Welder	No response after start up	The input voltage is insufficient; the power cord is damaged or in poor contact; or the emergency stop button on the panel is pressed.	Ensure that the input voltage conforms to the requirements, the power cord is properly connected, and the emergency stop button is released.
2	Water cooler	Water cooler overheat alarm	The internal coolant temperature exceeds the set value.	In case of overheat, please stop welding, disable the laser enablement button, and continue welding after the alarm is removed.
3			Insufficient water level leads to overheat.	Check the coolant level of water cooler, which should be in the standard area.
4	Welding torch	No light emission after pressing the torch trigger	The enablement button or the laser button on the display is not enabled; or the earth clamp is not clamped.	Enter the diagnosis interface, and check the various parameters, to ensure that all preparation signals are normal and the safety ground lock is connected.
5			The permission to use the controller has expired.	Contact the manufacturer to provide a password for reactivation.
6		Welding torch protective lens often burn out	The welding method is not correct, and the laser reflection causes damage to the lens.	The welding torch should be welded at 45 degrees to the plate, not perpendicular to plate.
7			Parameter settings are incorrect during high-power welding.	During high-power welding, upslope and downslope parameters shall be enabled.
8			The environment where the welder is located is too dusty and the lens is contaminated with dust, resulting in burnout.	The welding machine should be stored in a room with little dust, and the nozzle should be protected from dust when the welding torch is not in use.
9			Laser weakened during welding	Damage to the protective lens causes the laser to fail to gather properly.
10		Brass nozzle burnt	Laser light is not in the center; or the focal length adjustment of the graded tube is not appropriate.	Check whether the red light emission position and spot size are normal. If the position is not right, adjust the red light; if the spot size is not appropriate, adjust the focal length of graded tube.

11	Wire feeder	No wire feeding after pressing the torch trigger	The wire feeder is not connected to the welder or the signal cable is damaged.	Ensure that it is properly connected to the welder. If the signal cable is damaged, replace it.	
12			The wire conduit is blocked or knotted; the wire conduit is bent too small; or the pressure of the pinch roller is incorrect.	Straighten out the wire conduit to ensure smooth feeding, prevent the bending angle from being too small, and increase the pressure of the pinch roller.	
13					
14		Unstable wire feed speed or unsmooth wire feeding	The wire feed roller does not match the welding wire model; or the wire feed roller is deformed or damaged.	Replace the wire feed roller.	
15			The welding parameters do not match the wire feed speed.	Adjust the welding parameters or wire feed speed.	
16			The wire conduit material or size does not match the welding wire.	Replace the wire conduit.	

8. After-sales service

8.1 Warranty card

Each machine is provided with a warranty card. Please fill in the relevant information.

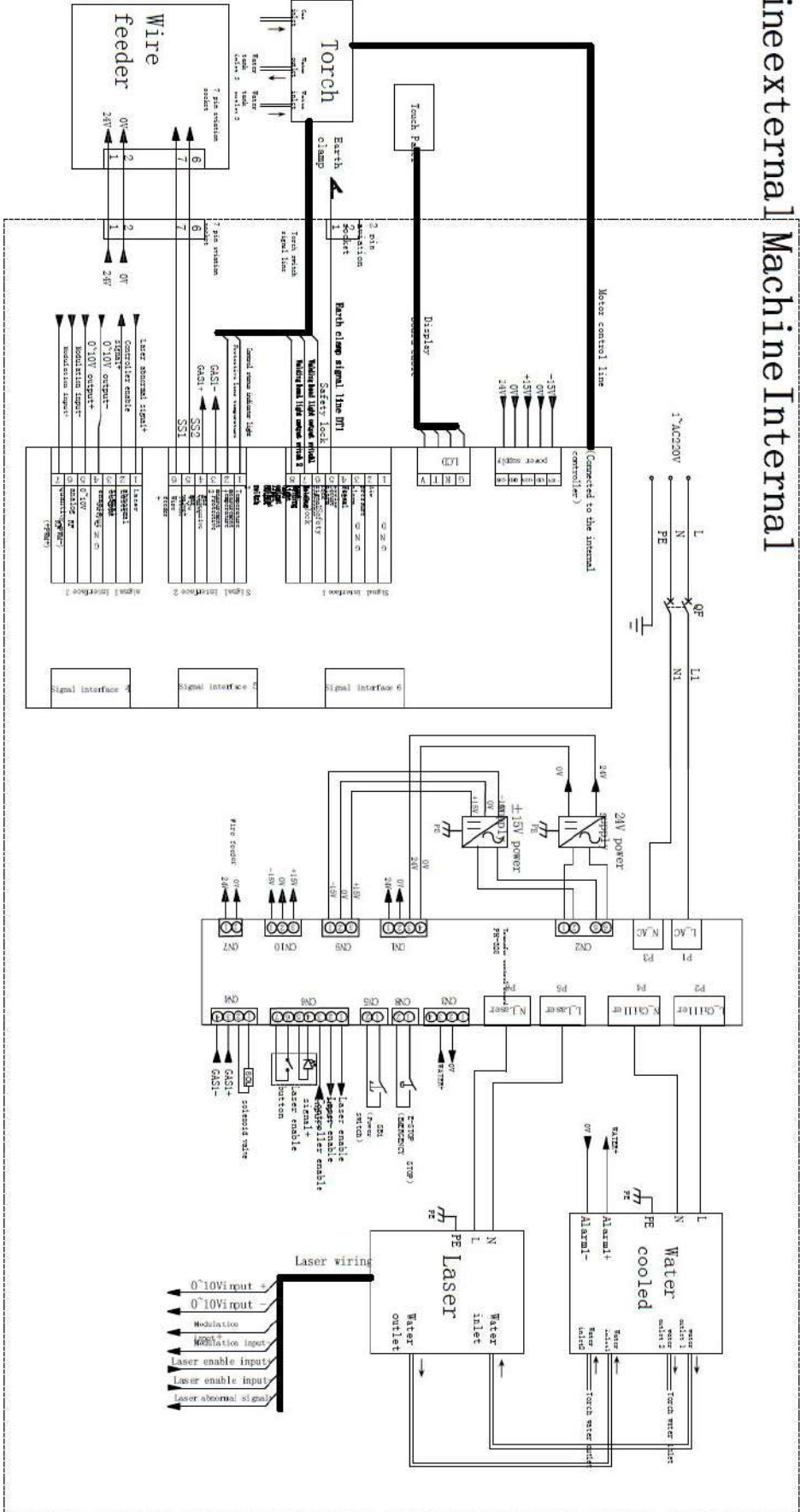
Read and keep the warranty card carefully.

8.2 Repair

Perform preliminary troubleshooting or record malfunction according to 7. Troubleshooting of common malfunction. To repair or replace the device, contact your nearest dealer. Please use accessories or consumables provided by Shenzhen JASIC Technology Co., Ltd.

Appendix 1: Wiring diagram

machine external | Machine Internal





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