

# SWAN Series

## Air-cooled Handheld Laser Welding Machine

### User's Manual V1.0



Note: 1. PENTA Laser reserves the right to update and modify the design specifications and manual, which are subjected to change without notification.

2. The figures in this manual are for reference only.

# HW 800-A/HW 1200-A Hand-held Air-cooled Laser Welding Machine User Manual

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# Preface

Thank you for buying HW 800-A/HW 1200-A hand-held air-cooled laser welding machine (hereinafter referred to as laser welding machine) made in our company.

This manual provides the users with the instruction of installation and debugging, function setting, operation specifications, error diagnosis, and device maintenance. Please read this user manual carefully before installing, so as to ensure correct installation and operation for laser welding machine, and give full play to its superior performance. Please keep properly and send the manual to user.

Our company conducts product development and innovation continuously. If the contents, parameters and pictures in this user manual are inconsistent with the real object, the actual product shall prevail. We may make any change without prior notice. The company has the right of final interpretation of the user manual.

# Safety Precautions

## Safety Definition

In order to use this hand-held laser welding machine safely and correctly, and prevent harm to you or others and property damage, this manual adopts various warning signs for instructions. Please follow strictly after full understanding.



**CAUTION** Please operate as requirement, otherwise it may result in death or serious injury.



**DANGER** Please operate as requirement, otherwise it may result in moderate or minor injury or damage to property.



**WARNING LA** This sign represents laser radiation. Please do a good job in laser protection.

## Laser Precautions



- This series of laser welding machines output  $1080\pm 10\text{nm}$  wave band of laser;
- The output laser power density is large, resulting in the local high temperature to the irradiation site. Improper use may cause fire or personal injury;
- During laser welding, part of the laser energy is reflected, resulting in the damage to the reflection area and human eyes;
- Laser light on skin can cause burning, erythema, blister, pigmentation, and even completely destroy the subcutaneous tissue;
- When operating laser welding machine, select laser safety glasses according to laser wavelength output of laser machine, and ensure that the operator always wears them;
- The higher the optical density value, the stronger the protective capability of laser protective glasses;
- It is forbidden to look straight at the welding head or align at others with the tip of welding torch. Wear qualified and safe laser protective glasses before laser operations;
- The visible light transmittance of laser protective glasses is less than 20%, so they must be used in the environment with good lighting;
- To ensure the safety use of torch. Laser is only output when torch is in contact with plate; When the torch leaves the welding surface, laser emission is automatically stopped;
- Set up a laser operation room, light barrier screen and curtain in the safety working area;
- Relevant operators shall be trained and assessed, familiar with and grasp conventional safety specifications of laser operation;
- Strictly control the areas involving laser radiation, and formulate the guidelines for laser safe operation.

## Installation Precautions



- During the installation, repair and maintenance of laser welding machine, it is necessary to turn off the main power. Installation, repair and maintenance when the welding machine is powered on can have fatal consequences. For example, high-voltage electric shock can result in cardiac arrest, burn, or other serious injuries;
- Please install it on an incombustible object otherwise it may result in fire disaster;
- Do not place near combustibles materials, otherwise it may result in fire disaster;
- Ensure that the area around the machine is clean, orderly and free of oil, and pile up workpieces, tools and wastes according to regulations;
- It is forbidden to install in an environment with explosive gases, otherwise it may result in explosion;
- Wiring must be done by professionals, otherwise it may result in electric shock;
- This equipment is powered by single-phase 230Vac. When using it, please ensure the input power supply is connected to an effective protective ground, otherwise it may cause equipment damage and personal injury;
- HW 1200-A: L, N, PE cable specifications must be greater than or equal to 4mm<sup>2</sup>;
- HW 800-A: L, N, PE cable specifications must be greater than or equal to 2.5mm<sup>2</sup>;
- Ensure that input power is completely disconnected before wiring. Otherwise it may result in electric shock;
- Install the shell before powering on the device. Do not touch the terminal with hands, otherwise it may result in electric shock;
- Parts should be replaced by a professional. Do not leave thread ends or metal objects in the machine. Otherwise it may result in fire disaster;
- After replacing the control panel, it is necessary to set the parameters correctly before running. Otherwise it may result in the damage of property;
- Cables must be wrapped with insulating tapes and aren't allowed to expose. Otherwise it may result in electric shock;
- Keep the lighting in the operating room in good condition, and ensure no strong vibration, strong electromagnetic field equipment interference within 20m around the equipment.



- When handling, moving and maintaining this series of laser welding machines, to be careful with safety protection. For some parts with large weight and sharp edges and corners, pay attention to the risk of smashing or cutting caused by falling heavy objects;
- To ensure the security of laser welding, it is necessary to use proper external warnings, including but not limited to laser safety signs and interlocking devices;
- Do not install near to places where water droplets may splash. Otherwise it may result in property damage;
- Do not drop foreign matters such as screws, gaskets and metal rods into the welding machine. Otherwise it may result in fire disaster and property damage;
- Keep the working environment bright, turn on the light to prevent pupil dilation and avoid from increasing the risk of eye damage;
- The ambient temperature shall be between -10 and 40°C to ensure that welding machine is in the best working condition. Keep the room temperature stable, install air conditioning. The relative humidity should be below 70%, dry;
  - To ensure the clean air of welding machine operating room, customer shall install the ventilation and smoke exhaust system according to the site conditions after installation and debugging of equipment.

## Precautions for Use



- Operators must get pre-job training, grasp the structure and performance of this laser welding machine, be familiar with the operation procedures and obtain the license qualification, and understand the knowledge of safe operation and welding skills before welding;
- Wear labor protection articles according to regulations. Wear labor protective glasses when operating. Laser emission on non-processed products and human body isn't allowed. When the laser welding machine is turned on, the operator shall not leave the post without authorization or entrust someone with custody. If necessary, stop the machine;
- It is prohibited to place paper, cloth or other flammable materials near unprotected laser beams. Please put fire extinguishers near the workbench;
- When any abnormality is found during the operation of the equipment, it is necessary to stop the equipment from emitting laser light and running at the first time to minimize the abnormal damage, and it is strictly prohibited to dismantle the laser, etc. without communicating with the manufacturer;
- If the equipment is not used for more than 30 minutes, please turn off the power supply of the laser equipment according to requirements;
- Do not touch the electrically charged parts, otherwise there is a risk of electric shock, and it is prohibited to use cables with insufficient cross-sectional area, exposed conductors, or damaged cables;
- Do not remove the machine casing or cover plate during use to prevent electric shock or equipment abnormalities;
- Please use undamaged gloves with good insulation and use the sound insulation equipment to avoid noise;
- Pay attention to safety protection in high-place operation;
- When welding in a narrow or confined space, the welding personnel must accept the supervision of the inspectors and fully ventilate or use respiratory protection appliance, otherwise it may result in asphyxia due to lack of oxygen;
- Do not weld pressure vessels such as gas pipes with gas, sealed tanks with gas. Do not weld near or in the vicinity of combustible materials;
- The emergency stop button takes precedence over any other control operation and allows the entire machine to be powered down;
- In case of operational error, release button of the hand-held welding torch immediately and press the emergency stop button immediately.



- The requirements of operational environment are as follows:
  - Installation environment: smooth, no vibration and impact; Working environment temperature: -10 ~ 40°C;
  - Transport and storage temperature: -20 ~ 55°C;
  - Working humidity: <70%RH;
  - The dust, metallic dust and corrosive gases in ambient air can't exceed normal content;
  - Keep the working environment bright, turn on the light to prevent pupil dilation from increasing the risk of eye damage.

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# Chapter 1 Product Overview

## 1.1 Product Introduction

Penta Laser HW 800-A/HW 1200-A hand-held air-cooled laser welding machine has integrated air-cooling system, laser welding torch and control system, with stable output of  $1080\pm 10\text{nm}$  band laser. It is able to weld various metal materials, including carbon steel, stainless steel, galvanized plate, aluminum alloy, etc. It is applied to hardware, construction materials, kitchenware, automotive, aerospace and other fields.

## 1.2 Features of Laser Welding Machine

### 1.2.1 Unique Advantages

- Stable and reliable
  1. Select industrial-grade lasers with adequate power and not over-stated;
  2. Utilize industrial-grade electrical and optical control solutions for stable laser power output and minimal power fluctuations;
  3. Optimize pump source design to minimize laser power attenuation.
- Efficient and Portable
  1. Light is ready to emit immediately after powering on, reducing pre-use waiting time;
  2. No need for a chiller, making maintenance easier and lowering equipment failure rates;
  3. Compact size and lightweight design facilitate easy movement and transport.

### 1.2.2 Product Performance

- Superior performance
  1. With two modes of continuous and pulse, it is capable of a maximum welding depth of 3mm;
  2. With beautiful, deformation-free welds that reduce grinding time, it is highly efficient and saves both time and labor, and the efficiency of one laser welding machine is equivalent to the efficiency of four units of TIG welding machines;
  3. With a gas pressure detection function, it prevents welding quality issues or equipment damage caused by abnormal gas pressure;

4. With an abnormal power supply voltage alarm, it avoids damage caused by incorrect power connections.
- Simple operation
1. Industrial-grade display screen, simple operation of touch screen, simple and efficient human-computer interaction;
  2. Support user-defined, suitable for hand-held welding.

### 1.3 Diagram of Laser Welding Machine

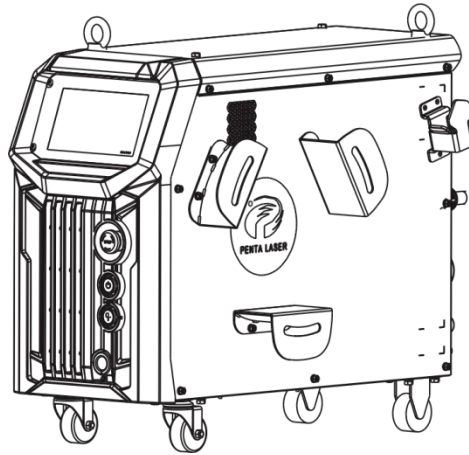


Figure 1-1 Diagram of laser welding machine

### 1.4 System Composition

Welding machine system consists of laser main machine, wire feeder, gas supply system, safety ground lock signal cable, wire feeding signal control cable, wire feeding hose, welding torch and combined control cable. As shown in Figure 1-2.

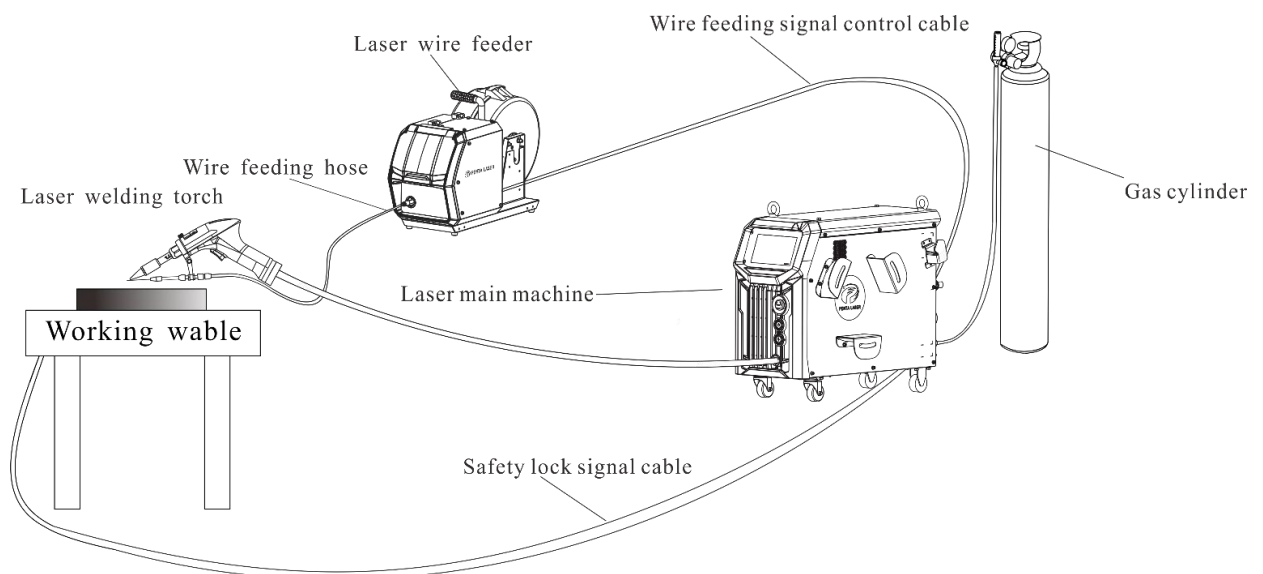


Figure 1-2 Connection diagram of HW 800-A/HW 1200-A hand-held fiber laser welding system

## 1.5 Model Explanation

The models of welding power source are shown in Figure 1-3.

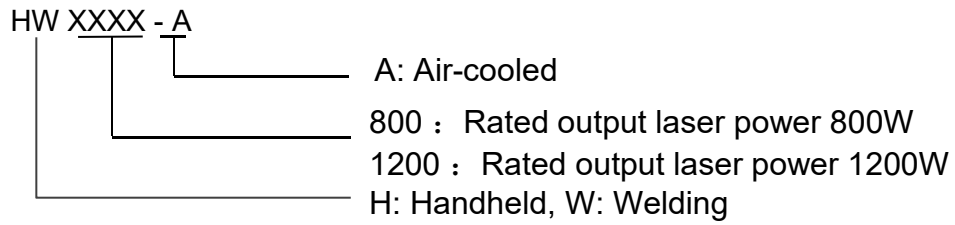


Figure 1-3 Diagram of welding machine models

\* Note: The symbol in "( )" is optional, indicating different types of laser welding machine.

## 1.6 Configuration Description

Refer to Appendix I System Configuration Table.

## 1.7 Specification and Dimensions

Dimensions of welding machine are shown in Table 1-1:

Table 1-1 Welding machine models and dimensions

Name	Model	Dimension (Length*width*height) mm	Net weight (kg)
Hand-held Laser welding machine	HW 800-A HW 1200-A	646*340*568	≤50

The dimensions of main machine are shown in Figure 1-4.

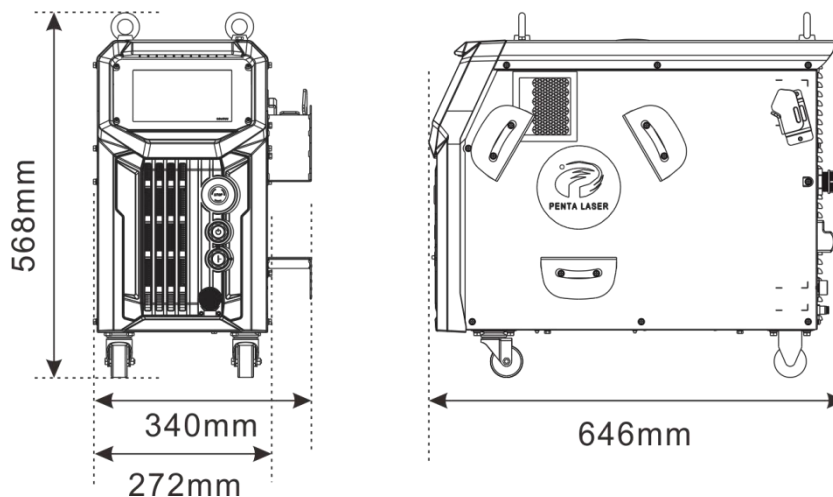


Figure 1-4 Dimensions of welding main machine

# Chapter 2 Installation and Wiring

The requirements, operation procedures, and precautions for laser welding machine installation are described in this chapter.

## 2.1 Unpacking Inspection

1. Before unpacking, please confirm whether the outer packing is intact;
2. After unpacking, please confirm whether all components of welding machine are complete and their models are consistent with the order;
3. In case of missing or wrong parts, please contact with distributor in time;
4. Do not use front and rear handles of machine for lifting.

## 2.2 Installation Requirements

- Site requirements

Laser welding machine must be installed in an independent space of no less than 10m<sup>2</sup> (according to the actual configuration). The ground is horizontal, hard, anti-vibration, and laser protection signs are pasted on the door.

- Environmental requirements

1. Keep the lighting in the operating room in good condition, and ensure no strong vibration, strong electromagnetic field equipment interference within 20m around the welding machine;
2. The ambient temperature shall be between - 10 and 40°C to ensure that the welding machine is in the best working condition. Keep the room temperature stable, install air conditioning;
3. Relative humidity should be below 70%, dry;
4. To ensure the clean air of the equipment operating room, the customer shall install the ventilation and smoke exhaust system according to the site conditions after installation and debugging of equipment.

- Power demand:

1. The power supply is single-phase 230Vac. When using the equipment, please ensure that it is connected to an effective protective ground;
2. The capacity of distribution cabinet must be at least 1.5 times of the rated input of laser welding power supply;

3. The PE grounding must be reliable;
4. HW 1200-A: L, N, PE cable specifications must be greater than or equal to 4mm<sup>2</sup>;
5. HW 800-A: L, N, PE cable specifications must be greater than or equal to 2.5mm<sup>2</sup>.

## 2.3 Electrical Connection Step

### Steps

1. Welding torch installation (Refer to 2.3.1 Welding Torch Installation);
2. The control cable connection of wire feeder (Refer to 2.3.2 Connection of wire feeding signal control cable);
3. Safety ground lock cable connection (Refer to 2.3.3 Safety ground lock cable connection)
4. Protective gas hose connection (Refer to 2.3.4 Protective gas connection);
5. Connection of power input cable (Refer to 2.3.5 Connection of power input cable).

### 2.3.1 Installation of welding torch

#### Steps

1. Pull out the black rubber plug of welding torch head, loosen the round nut, insert the calibration tube and tighten the round nut;
2. Align the copper welding tip with the calibration tube and tighten it;
3. Align the wire feeding bracket with the screw hole under the torch head, and use the hex screws to tighten;
4. Take out a nut and a patch at the outlet of wire feeding hose, and place the end of the wire outlet into the wire feeding bracket, and fasten with the newly removed patch and nut;
5. Tighten the wire nozzle and the straight tube of guide wire, string the lock nut and the straight tube of wire guide into the end of wire outlet, tighten the nut with a wrench until the straight pipe of the guide wire does not shake. As shown in Figure 2-1.

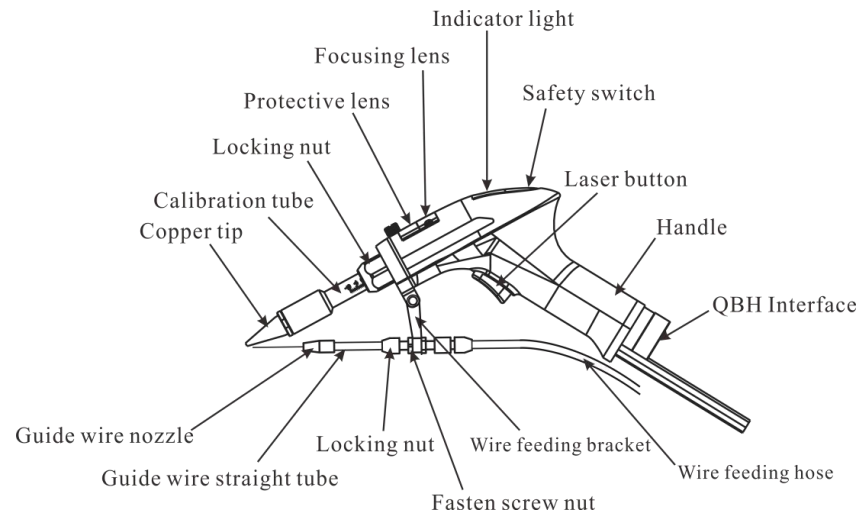



Figure 2-1 Installation diagram of welding torch

 Note

1. When using or storing welding torch, handle it with care to avoid impacts or falls that could damage fragile components like the motor and lens;
2. Since the combination control cable of welding torch has optical fiber, it is necessary to avoid tying, bending, twisting, improperly pulling, or stepping on the cable. Otherwise, it will cause the damage of optical fiber;
3. If welding torch is off-operation for more than 4 hours, the copper tip should be sealed with tape;
4. The welding torch is equipped with status indicator lights: 'green' indicates laser emission, 'orange-yellow' indicates standby, and 'red' indicates a fault.

## 2.3.2 Connection of Wire Feeding Signal Cable

**Steps**

1. Connect the wire feeder signal control cable to the control cable connector and tighten it, as shown in Figure 2-2;

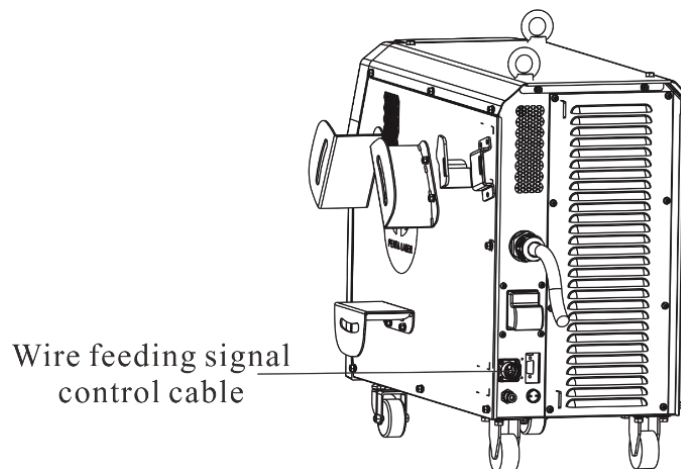


Figure 2-2 Connector for wire feeding signal control cable diagram

2. Insert the other end into the socket on the back side of wire feeder and tighten it. The wire feeder control cable connection is finished, as shown in Figure 2-3;

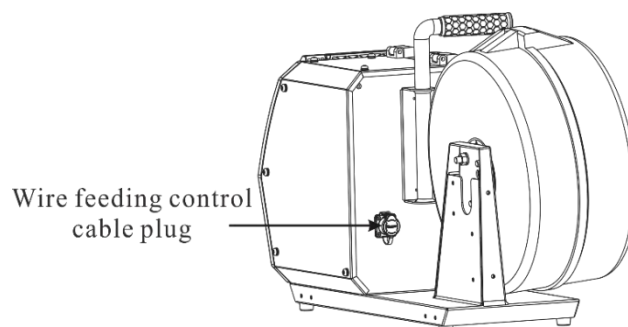


Figure 2-3 Diagram of back-side connector of wire feeder

### 2.3.3 Connection of Safety Ground Locking Cable

Steps

Fix one end of the safety ground lock cable to the safety ground lock cable connector of the welding machine, and connect the other end to the work-piece to complete the connection of the safety ground lock cable. As shown in Figure 2-4.

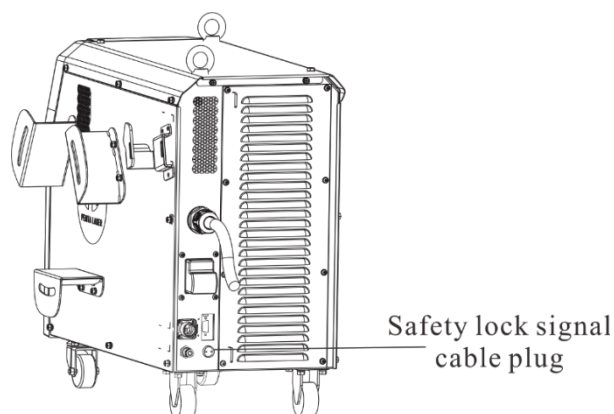


Figure 2-4 Diagram of safety ground lock cable connector

### 2.3.4 Protective Gas Connection

Steps

Connect one end of the gas hose to the gas hose connector on the fixed plate of welding machine, connect the other end to the gas hose interface of the gas meter end, and tighten the hose clamp of gas hose to complete the connection of gas hose. As shown in Figure 2-5.

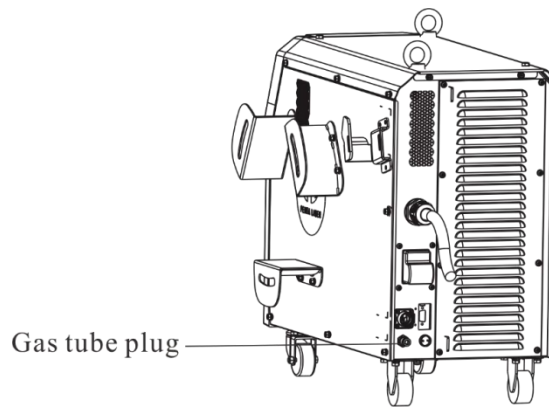


Figure 2-5 Diagram of gas hose connector

 **Note**

1. For welding carbon steel and stainless steel, nitrogen provides better protection, while argon is more effective for welding aluminum alloys;
2. The gas hose at the end of welding machine and the gas meter must be tightened to avoid air leakage.

### 2.3.5 Connection of Power Input Cable (single phase 220 Vac)

Steps

This equipment operates on single-phase 220Vac power. Please ensure that the input power is connected to an effective protective ground; otherwise, it may lead to equipment damage and personal injury. The power connection is shown in Figure 2-6.

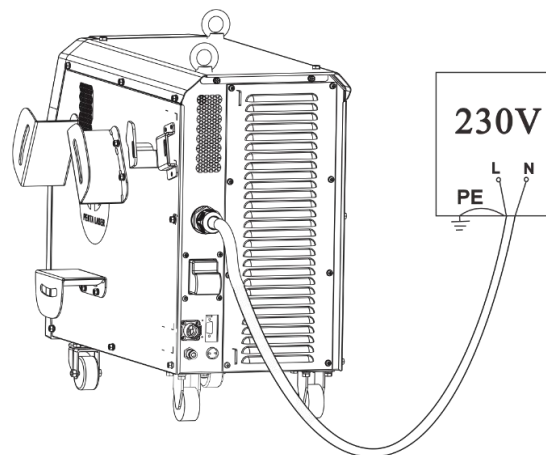



Figure 2-6 Power input connection diagram

 **Note**

1. HW 1200-A: L, N, and PE cable specifications must be greater than or equal to 4mm<sup>2</sup>; HW 800-A: L, N, and PE cable specifications must be greater than or equal to 2.5mm<sup>2</sup>; otherwise, they will not meet safety standards and may pose certain safety risks.
2. Do not connect the power supply directly to a household power strip.
3. If the input cables are connected incorrectly (e.g., connected to 2 phases of 380Vac), the machine will trigger its protection mechanism: the machine will not power on, and the built-in buzzer will alarm.

# Chapter 3 Function Description and Operation

## 3.1 Home Page

The front page of the control panel for the laser welding system provides two display modes: **Simple mode** and **professional mode**.

The professional mode includes richer curve adjustment styles and parameter setting styles;

The simple mode focuses more on intuitive operation and concise functions.

When the laser welding system is used for the first time, the system enters simple mode by default.

### 3.1.1 Home Page (Easy Mode)

In the **simple mode**, the user can quickly select welding materials, welding wire diameter, plate thickness and among other process settings, from the control panel. The system's built-in database can then be directly accessed for welding operations. According to the actual welding effect, the user can also finely adjust the welding parameters and wire feeding speed according to the percentage based on the database to ensure the optimal welding effect.

The design of the control panel in the simple mode is clean and intuitive, as shown in Figure 3-1, with the functional details provided in Table 3-1.

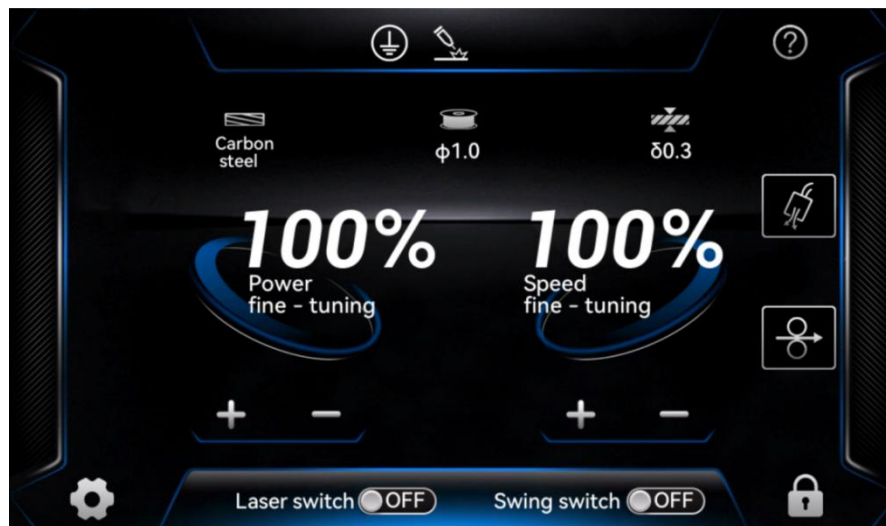


Figure 3-1 Control Panel Home Page (Simple Mode)

Table 3-1 Control Panel Home Page (Simple Mode) Function Explanation

Name	Parameter description	Notes	Default
Welding material	The welding wire material used during the process. <b><u>*This parameter does not affect welding when self-fusing welding is used.</u></b>	Carbon steel, stainless steel, aluminum alloy	Carbon steel
Wire diameter	The diameter of the welding wire used. <b><u>*This setting option is available in wire feed welding mode.</u></b>	Φ0.8, Φ1.0, Φ1.2, Φ1.6	Φ1.0

Plate thickness	Thickness of the workpiece used by the user for welding	0.3mm, 0.4mm, 0.6mm, 0.8mm, 1.0mm, 1.5mm, 2.0mm, 3.0mm, 4.0mm,	1.0mm
Power Fine Adjustment	Users can control the <b>laser power</b> and <b>wire feed speed</b> by adjusting the percentage, based on the system's built-in default recommended power. Fine adjustments can be made upwards or downwards.	50%-120%	100%
Speed Fine Adjustment			
Laser switch	ON: Laser Output Allowed OFF: Laser Output Forbidden	It can be turned on or off manually. The laser switch should be turned on before welding. If welding is not performed for a long time, the laser switch should be turned off. After turning off the switch, no enable signal will be sent to the laser. In this case, the wire feeding and gas output functions can be tested by simulation.	Off
Swing switch	ON: Galvanometer swings, laser outputs as a line OFF: Galvanometer does not swing, laser outputs as a point	When turning off the red indicating light, motor stops swinging, and the red light is a point for adjusting the center position.	Off

### 3.1.2 Home Page (Professional Mode)

In professional mode, the control panel offers more comprehensive functions and parameter adjustment options, suitable for users with professional skills. In this mode, all parameters are set in different display styles: Curve display style and Parameter display style. Users can precisely control over all welding parameters to meet the needs of complex welding processes.

In both display styles, the default home page of the system is the **welding parameter page**. Users can click the option box in the upper left corner to select the page to enter, as shown in Figure 3-2.

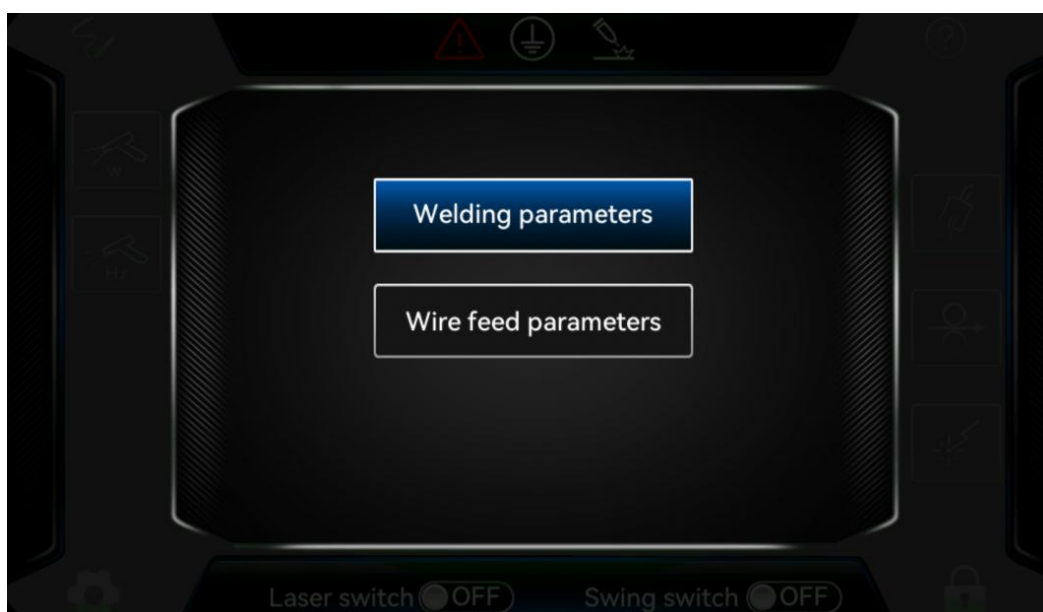


Figure 3-2 Control Panel (Professional Mode • Parameter Style) Homepage: Parameter switching

### 3.1.2.1 Welding Parameters

Figure 3-3 and Figure 3-4 respectively show the layout of the welding parameter page in the two display styles, and the description of each parameter is shown in Table 3-2.



Figure 3-3 Control Panel (Professional Mode • Parameter Style) Homepage: Power Parameters

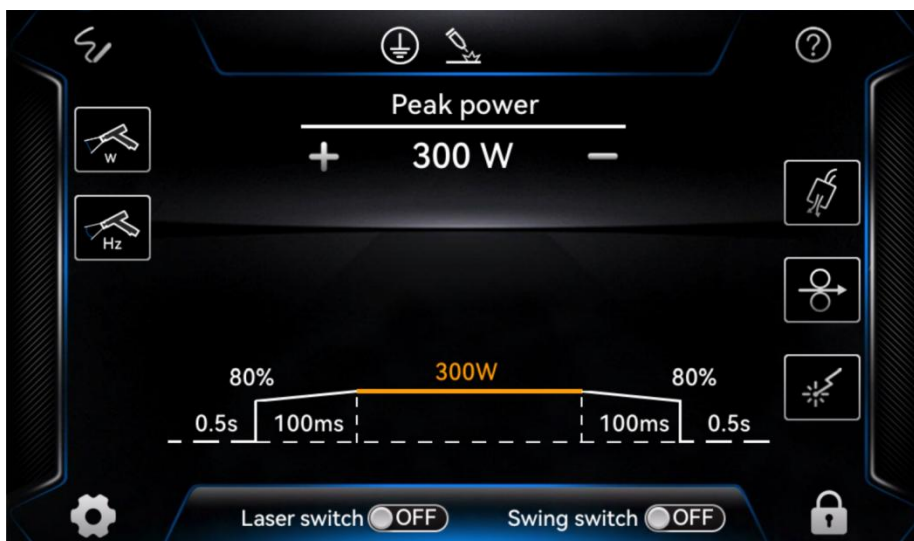


Figure 3-4 Control Panel (Professional Mode • Curve Style) Homepage: Power Curve

Table 3-2 Control Panel Homepage (Professional Mode) • Welding Parameters Page Description

Name (Unit)	Parameter description	Notes	Range	Default
Scanning width (mm)	The width covered by the laser beam during welding	The scanning width affects the coverage area of the welding area, and a wider width improves the welding seam formation in large gap welding.	0.00-6.00	1.00
Scanning Frequency (Hz)	The speed at which the laser beam swings.	High setting Suitable for fast processing and fine welds. Low setting Suitable for deeper and wider molten pools.	0-300	50
Peak power (W)	The laser power continuously output during welding	Maximum output power is automatically limited to the welding machine's power rating.	/	800
Turn-on optical power (%)	Light output starting power, the set value is the percentage of peak power	The starting power is typically set as the base power for continuous welding and is crucial for weld depth and quality.	0-150	80

Turn-off optical power (%)	Light output ending power, the set value is the percentage of peak power	The off-power is usually set to a lower value to gradually reduce the laser energy, preventing sudden cooling of the molten pool and welding defects. Laser Off power >100% enhances the post-weld breakage effect.	0-150	100
Ramp-up time (ms)	The time for the laser power to gradually rise from the off state to the target power.	Ramp-up time helps prevent overheating or splashing at the start of welding, improving quality.	0-1000	100
Ramp-down time (ms)	The time for the laser power to gradually decrease from the target power to the off state.	Ramp-down time helps slow down the cooling rate of the molten pool, preventing cracks or internal defects in the weld and improving quality.	0-1000	200
Pre Gas (s)	The time for the protective gas to flow before welding starts,	Pre-flow Time helping to remove oxides or impurities from the welding area; At the same time, the protective gas is formed to prevent the welding seam from being oxidized.	0.0-5.0	0.2
Post-flow delay (s)	The time for protective gas to continue flowing after welding ends.	Post-flow delay helps cool the molten pool and maintain protective gas over the weld to prevent oxidation.	0.0-5.0	0.2
Welding Duration (ms)	Welding time per cycle <b>*Intermittent mode only</b>	/	0.0-1000	150
Welding Interruption time (ms)	Dwell time per cycle <b>*Intermittent mode only</b>	/	0.0-1000	50

### 3.1.2.2 Wire Feeding Parameters

Figure 3-5 and Figure 3-6 respectively show the **feed parameters page** in both display styles, with each parameter explained in Table 3-3.

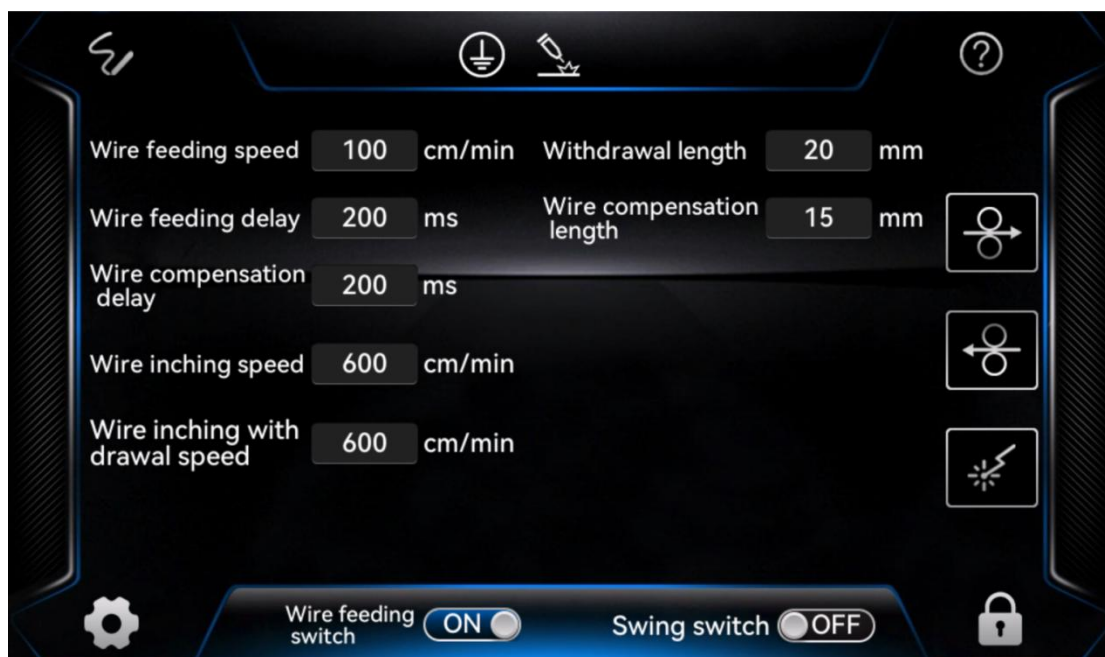


Figure 3-5 Control Panel (Professional Mode • Parameter Style) Homepage: Wire Feeding Parameters

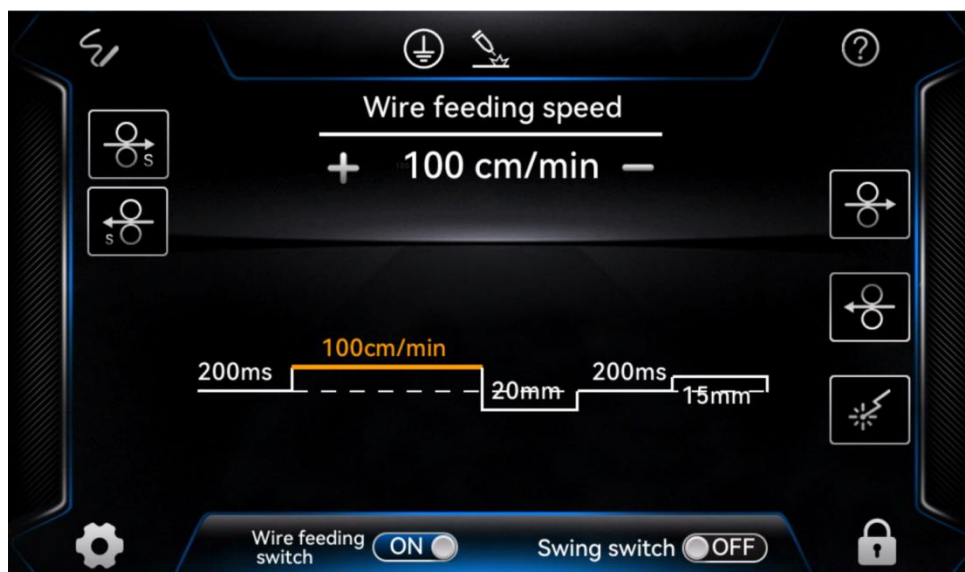


Figure 3-6 Control Panel (Professional Mode • Curve Style) Homepage: Wire feed curve

Table 3-3 Control Panel Home Page (Professional Mode)-Wire Feed Parameters Page

Name (Unit)	Parameter description	Notes	Range	Default
Wire feed speed (cm/min)	The speed at which the wire is fed to the welding area.	The wire feeding speed directly affects the weld penetration and filling effect. Too fast speed will cause the weld to bulge, and too slow speed will lead to insufficient weld fusion.	15-150	100
Wire feeding delay (ms)	The delay before wire feed starts after welding begins.	A higher value is suitable for fine welds, and a lower value is suitable for deeper and wider molten pools.	-1000-1000	100
Retract length (mm)	The distance and length of the wire retracted after welding ends.	Retraction length is used to prevent the welding wire from sticking to the molten pool, facilitating the initial operation of the next welding. The reasonable Retract length shall not only ensure the broken wire after welding, but also avoid the possibility of insufficient welding wire at the beginning of welding due to excessive withdrawal of welding wire.	0-100	20
Wire Feed Delay (ms)	The delay time for the wire feed compensation after the retraction ends.	The wire feed delay is used to avoid interference between the wire feed action and the unfinished retraction, which could cause the wire to oscillate unstably. A reasonable wire feed delay can prevent positional deviation and wire deformation caused by repeated movement of the wire.	0-2000	200
Wire Feed Length (mm)	The additional length of wire fed in the opposite direction after the retraction ends.	Wire feed length compensates for potential insufficient wire at the beginning of the new welding cycle due to wire breakage caused by the previous retraction, ensuring stability of the molten pool and the quality of the weld.	0-100	15

Pulse Cycle (ms)	Cycle time per pulse wire feed <b>*Pulse mode only</b>	Pulse cycle determines the wire feed frequency, which significantly impacts the stability of the molten pool and the weld bead shape in pulse-feed welding processes.	100-1000	200
Pulse duty cycle (%)	The proportion of wire feed time within the entire pulse cycle. <b>*Pulse mode only</b>	Duty cycle affects the average feed speed and the weld bead filling. A higher duty cycle is suitable for larger molten pools, while a lower duty cycle is better for fine welding.	10-90	50
Smoothness	Affects whether the wire feed machine outputs the welding wire at a more stable pulse speed <b>*Pulse mode only</b>	High smoothness results in a feeding style closer to continuous feeding, with less pronounced fish-scale patterns on the weld. Lower smoothness creates clearer fish-scale patterns with noticeable stop-and-go feeding.	0-100	50






### 3.1.3 Status Bar

The status bar in the laser welding system displays the welding status. Icons appear when the corresponding function is enabled and disappear when it is disabled. Among these, the safety lock and welding status icons are permanent icons. The layout is shown in Figure 3-7, and the function description of the display icon is shown in Table 3-4.



Figure 3-7 Control Panel • Status Bar

Table 3-4 Control Panel • Status Bar • Icon Descriptions

Category	Icons	Meaning	Notes
Fault Alarm		There is a warning message currently	Click to pop up the fault information window
Safety ground lock		Workpiece not grounded	/
		Workpiece grounded	
Laser Emission Status		Laser not emitting light	/
		Laser emitting light	

### 3.1.4 Quick Control Buttons

The quick control (Fast Control) buttons include several commonly used buttons for quickly operating the welding system. They are permanently located on the **right sidebar** and **bottom space of the interface**, as shown in Figures 3-8 and 3-9. The functions of these shortcut keys are described in Table 3-5.

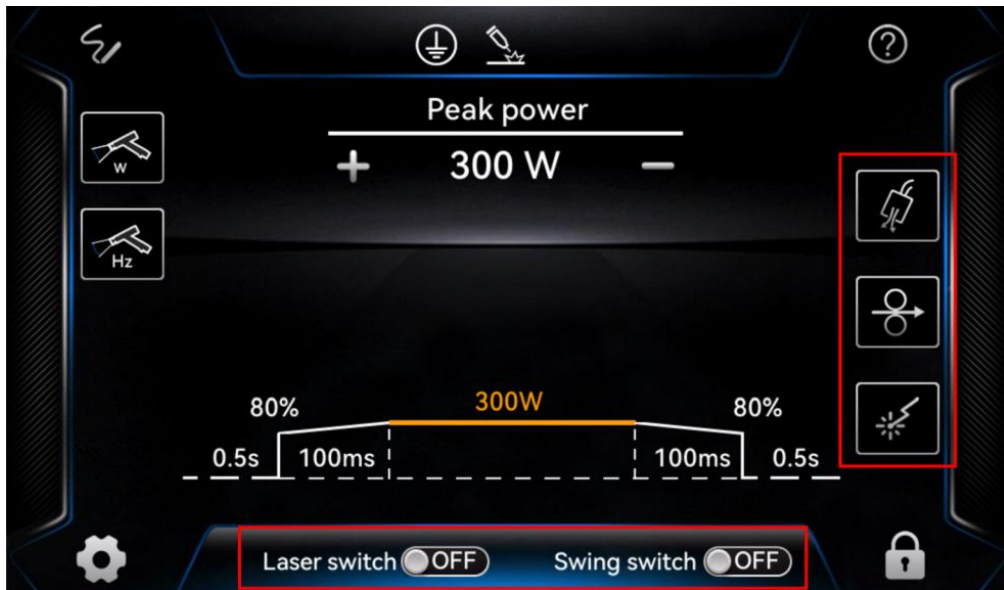


Figure 3-8 Control Panel • Homepage Quick Control Buttons: Welding Parameters

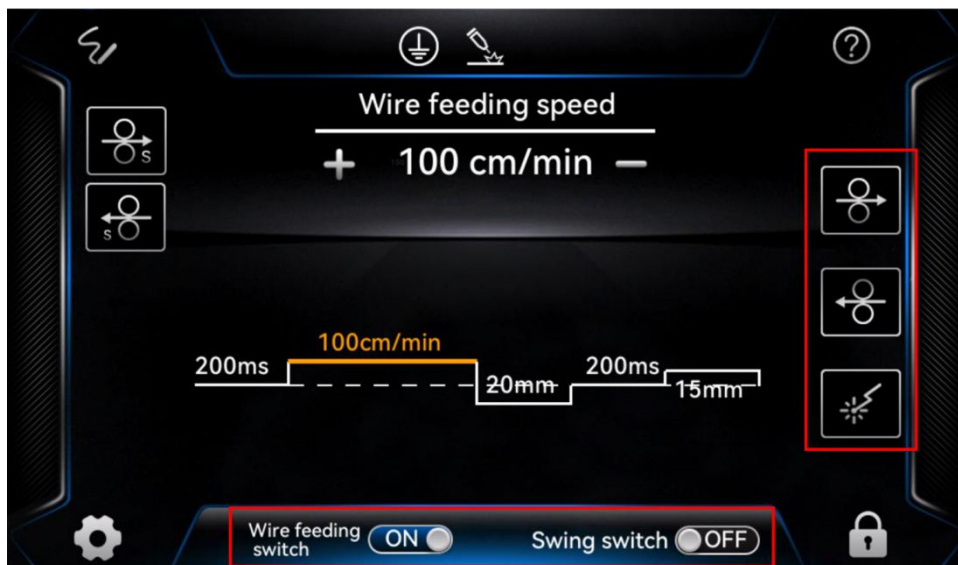












Figure 3-9 Control Panel • Homepage Quick Control Buttons: Wire Feeding Parameters

Table 3-5 Control Panel • Quick Control Keys • Icon Descriptions

Name	Icons	Meaning	Notes
Gas Detection		Briefly activates gas delivery to check and verify the gas circuit connectivity and protection gas status.	1) Press again to stop gas detection 2) Automatically stops after 30 seconds
Jogging Wire Feed		In the non-welding state, manually controls the wire to feed a short distance.	1) Press and hold to continuously feed wire, release to stop wire feeding. 2) Jogging wire feed speed can be adjusted in the settings page.
Process parameters		Click to enter the process parameter setting and saving page	/
Screen Lock		Temporarily disable touch and button operation of control panel, parameters cannot be changed	Unlock according to the prompt on the panel.

Laser switch	 	ON: Laser Output Allowed OFF: Laser Output Forbidden	When the laser switch is turned off, it enters the welding state, gas and wire feed processes can be simulated, but no laser output occurs.
Swing switch	 	ON: Galvanometer swings, laser outputs as a line OFF: Galvanometer does not swing, laser outputs as a point	This switch is only used for visual adjustment of welding gun parameters, <b><u>it does not need to be on during welding.</u></b>
Wire feeding switch	 	ON: Filler wire welding OFF: Autogenous welding	It is used to switch the current welding type. This button is consistent with the welding type button in the mode switching page and is added to the home page for easy operation.

## 3.2 Process Library

The welding equipment is equipped with a rich expert process database for users to select and import. By selecting the corresponding welding material, wire diameter, and plate thickness combination, users can quickly match the process data. Additionally, the process library provides 20 custom channels for users and 100 custom channels for administrators (available only for group-controlled models), enabling users to quickly save and import their best-tuned processes.

The process library mainly stores factory preset and user-defined process parameters, which are divided into default process packages and custom process packages. Users can select and use the corresponding process packages by themselves. In the default process package, each process combination is matched with the process parameters that have been debugged by our company. Users can directly call the parameters for use. In a custom process package, users can select a process channel and save the adjusted process parameters to the selected channel. These saved process parameters can be imported for future use.

### 3.2.1 Default Process Package

The default process package page is shown in Figure 3-10. The parameter box on the left allows users to select the process combination, while the parameter box on the right displays the corresponding process parameters for the selected combination. Clicking "Call" will apply the current process parameter set.

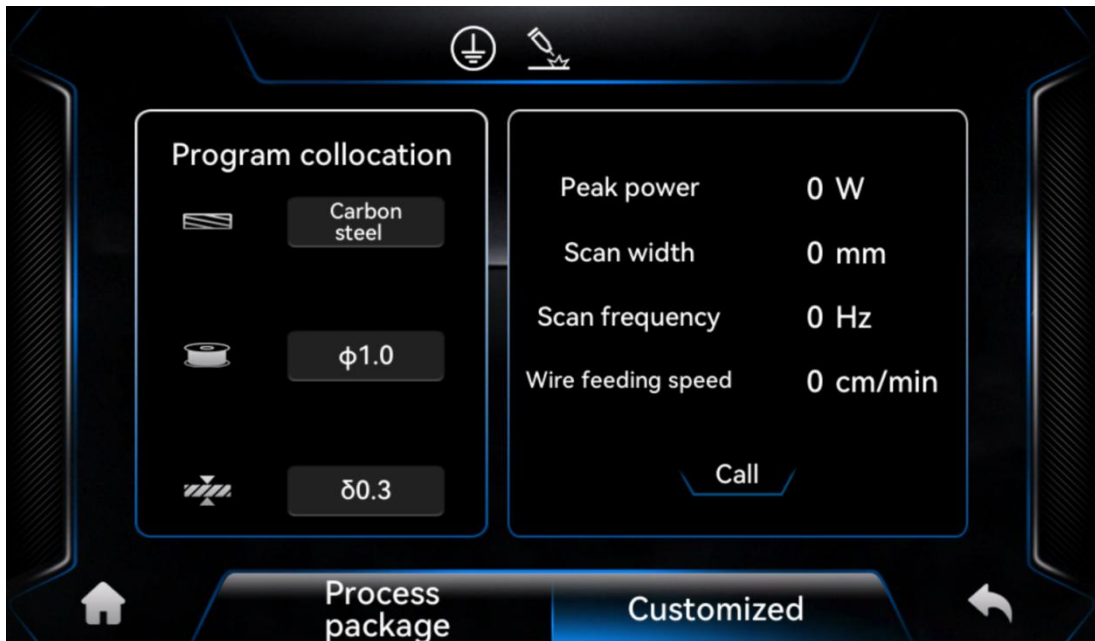


Figure 3-10 Control Panel • Process Page • Process Package

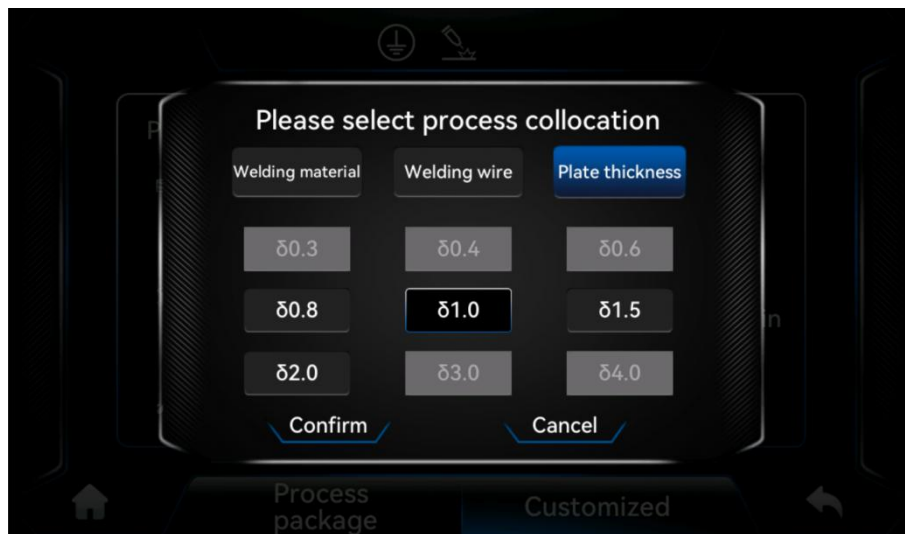


Figure 3-11 Control Panel • Process Page • Process Package • Process Collocation Select

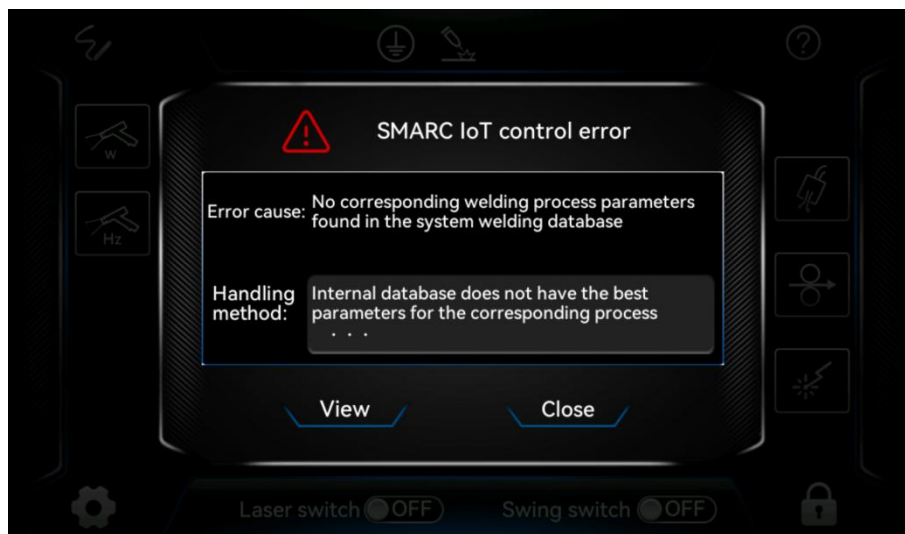


Figure 3-12 Control Panel • Process Page • Process Package • NO JOB Params Warning

### 3.2.2 Custom Process Package

The custom process package page is shown in Figure 3-13. The parameter box on the left selects the corresponding process channel, while the parameter box on the right displays the current process parameters stored in that channel. Clicking "Save" will save the current process parameters to the channel. Click "Call" will apply the process parameter set from the selected channel.

Below the process channel, the welding material, wire, and plate thickness combinations corresponding to the current channel are displayed. User can select a group of process combinations for the parameters set by the user on the home page, and save them as additional information within the channel.

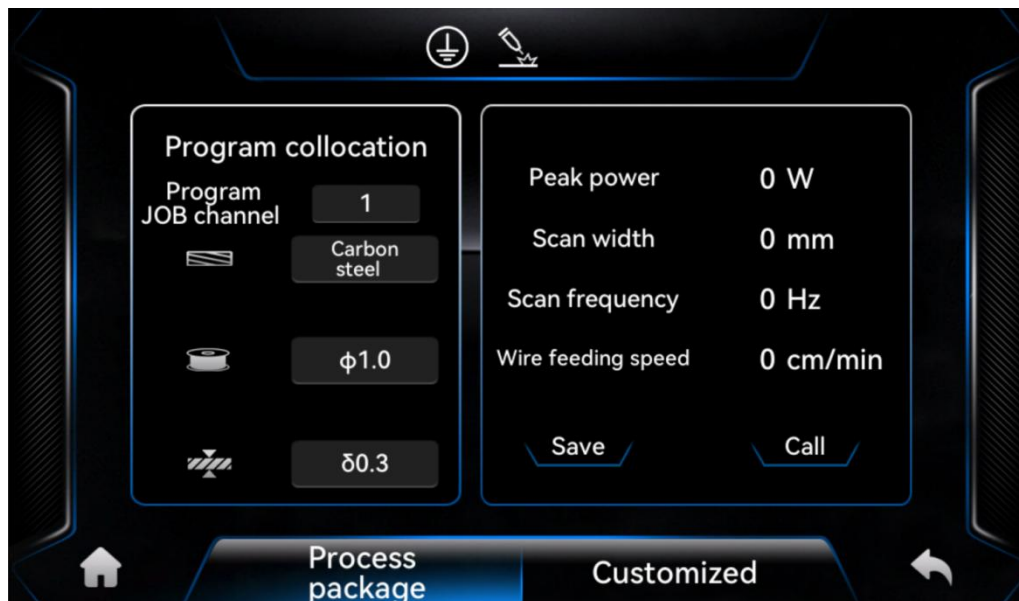


Figure 3-13 Control Panel • Process Page • Custom Process Package

## 3.3 Settings Page

The settings page of the control panel serves as an essential operational entry point for the laser welding system. Users can set and monitor various functional parameters here. Based on different functional needs, the page is divided into three modules: System parameters, functional parameters and monitoring page.

When using the system for the first time, the setting page is navigated to the **system parameter** column by default.

### 3.3.1 System Parameter

The **system parameter page** provides users with comprehensive system information query function, including device information, software version check, fault records, time settings, help information, and language switching, as shown in Figure 3-14.

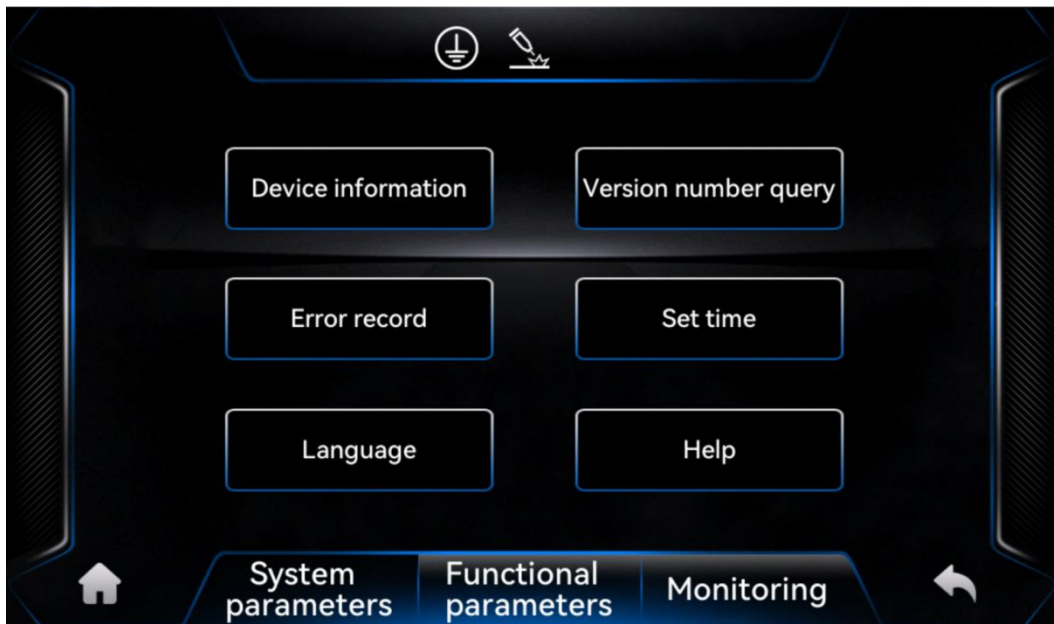


Figure 3-14 Control Panel • Settings Page • System Parameter

### 3.3.1.1 Equipment Information

This page provides users with key status information and convenient operation options of the laser welding machine, helping users fully understand the current operating status and authorization of the equipment, as shown in Figure 3-15.

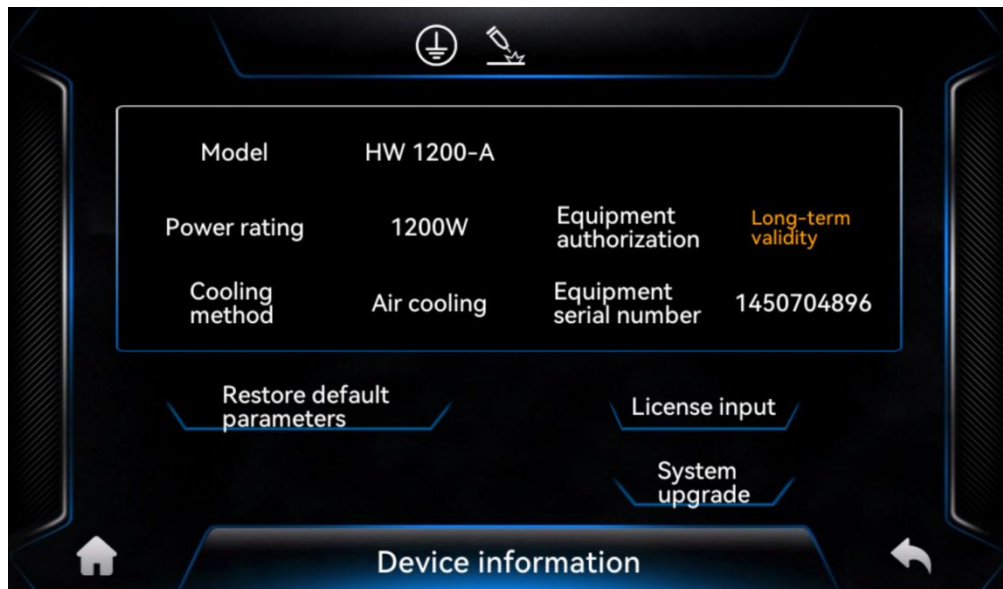


Figure 3-15 Control Panel • Settings Page • System Parameter • Equipment Information

This page also provides the following function options to facilitate the user to quickly complete important operations, as shown in Table 3-6.

Table 3-6 Functional Option Descriptions

Name	Parameter description
Restore factory software	Restore device parameters and settings to factory default status
License input	Verify and update the user authorization license information, complete the device activation, and enjoy the use of fully open and unrestricted functions

Restore default parameters	Restore device parameters to factory default status, applicable to situations such as abnormal parameter adjustment or need for reconfiguration
System Upgrade	Allows users to install system updates via a USB device, enabling the latest feature upgrades and performance optimizations.

### 3.3.1.2 Version Number Query

This page displays the current software version of the device, allowing users to quickly determine the operational version of the device. This information is useful for system upgrades and technical support, as shown in Figure 3-16. This page applies primarily used to:

- Check whether the current system main program and other hardware firmware are running in the latest version;
- Provide accurate version information for technical support and maintenance personnel for problem diagnosis and upgrade recommendations.



Figure 3-16 Control Panel • Settings Page • System Parameter • Version Number Query

### 3.3.1.3 Fault Record

This page records and displays all the abnormal information and alarm records generated during the operation of the equipment. Users can troubleshoot issues and faults that occur during use, and it also provides key information for the technical support team to guide the user in resolving issues, as shown in Figure 3-17.



Figure 3-17 Control Panel • Settings Page • System Parameter • Fault Record

### 3.3.1.4 Help Page

This page provides the user with a description of the functions of the device and answers to frequently asked questions, which is convenient for the user to quickly start and resolve issues, as shown in Figure 3-18. This page applies primarily used to:

- Users can refer to the help page whenever they encounter issues during operation.
- The FAQ section provides quick solutions, reducing reliance on technical support.;
- Learn how to use the device's functions and optimize the operational process.

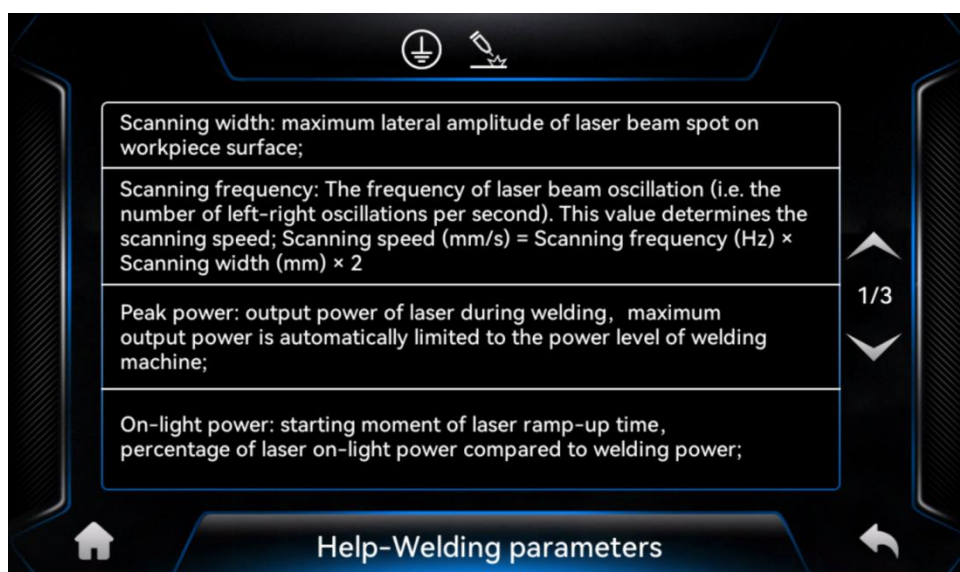


Figure 3-18 Control Panel • Settings Page • System Parameter • Help Page

### 3.3.1.5 Language

This page allows the user to select their preferred language, enabling users from different linguistic backgrounds to operate the system more easily. The layout of this page is shown in Figure 3-19.



Figure 3-19 Control Panel • Settings Page • System Parameter • Language

### 3.3.1.6 Time Settings

This page allows users to set the current time of the system, providing convenience for users in different regions to use the local time. By clicking on the time on the left side of Figure 3-20, users can set the time, which will remain accurate even after power loss.

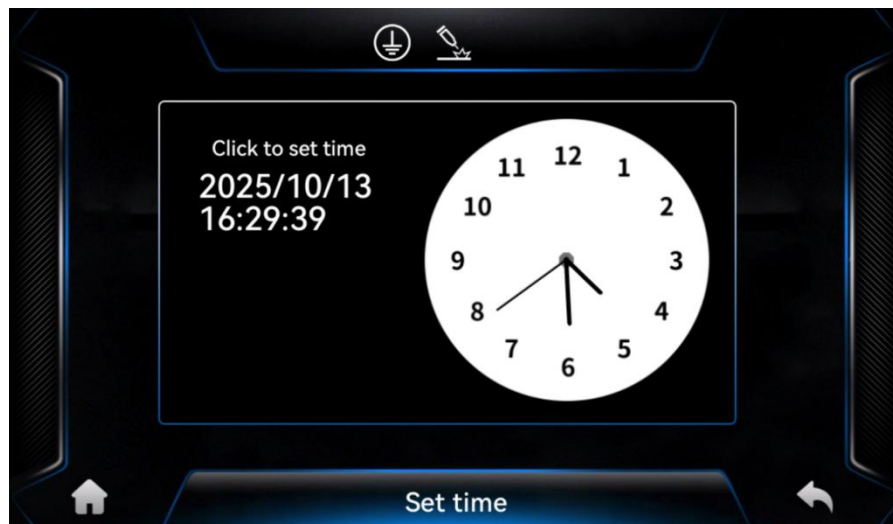


Figure 3-20 Control Panel • Settings Page • System Parameter • Time Settings

#### Note

This time is Universal Time.

### 3.3.2 Functional Parameters

The **function parameter page** provides the user with a detailed parameter setting options for enabled function modules, making it easier for users to adjust and optimize the working parameters of each module, as shown in Figure 3-21. On this page, users can independently configure the following function modules, as shown in Table 3-7.

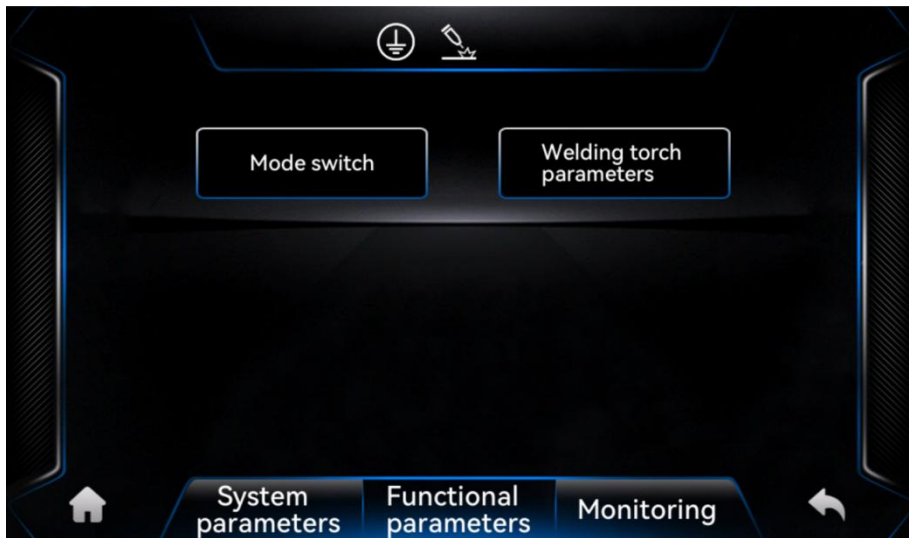


Figure 3-21 Control Panel • Settings Page • Function Parameters

Table 3-7 Function Module Descriptions

Name	Parameter description
Mode switch	Access sub pages of Mode Settings to adjust the system's Work mode to suit different welding scenarios.
Welding Gun Parameters	Set welding torch related parameters for software adjustment of motor position offset

### 3.3.2.1 Mode switch

This page allows the user to change the operation modes of the current welding machine and wire feed machine, set the welding and feeding types, and switch between "Simple Mode" and "Professional Mode" on the home page, as well as adjust the "Curve Style" and "Parameter Style" displayed in Professional Mode. The layout of this page is shown in Figure 3-22 and Figure 3-23. The descriptions of various parameters are outlined in Table 3-8.



Figure 3-22 Control Panel • Settings Page • Mode Switching • Page 1



Figure 3-23 Control Panel • Settings Page • Mode Switching • Page 2

Table 3-8 Control Panel • Setting Page • Mode Switch Option Description

Name	Options Available	Meaning	Notes
Work mode	Welding	Switch the welding machine into welding operation mode, cleaning work mode or cutting work mode	Currently, only the welding operation mode is enabled.
	Cleaning		
	Cutting		
Operation Mode	Simple Mode	Switch between operation modes on the home page.	Simple mode offers easy operation. Professional mode allows full control over all laser welding parameters.
	Professional mode		
Home Page Display Style	Curve	Switch between two display styles in professional mode	The curve display style provides an intuitive view of how parameters affect the welding process. The parameter display style shows all parameters at once for easy monitoring.
	Parameters		
Gas pressure alarm switch	ON	Switch for checking whether air pressure is abnormal	Turn on to check air pressure
	Off		Turn off to not check air pressure
Welding Type	Filler wire welding	Whether to enable the welding wire filling function during welding	If there is a communication error with the wire feed machine, you can switch to autogenous welding and continue welding without filler wire.
	Autogenous welding		
Welding mode	Continuous welding	/	Intermittent welding is used for fish scale pattern welding
	Intermittent welding		
Wire feeding mode	Continuous wire feeding	/	Pulse wire feeding is generally used to meet special welding process requirements
	Pulse wire feeding		

Gas pressure alarm switch	ON	Allow or prohibit gas pressure alarm	/
	Off		

### 3.3.2.2 Welding Gun Parameters

This page allows the user to adjust the motor's position offset via software, as shown in Figure 3-24.

The parameters are shown in Table 3-9.

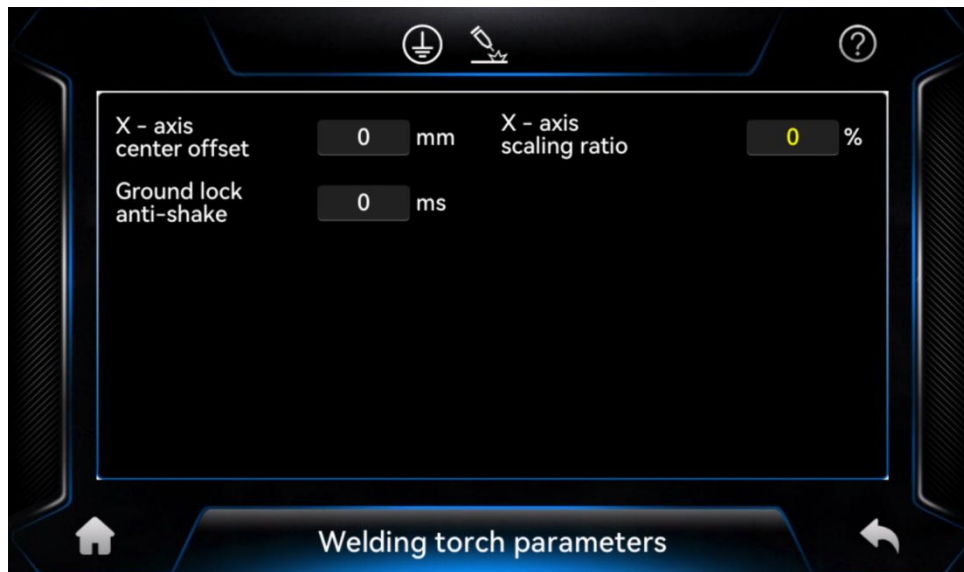


Figure 3-24 Control Panel • Settings Page • Welding Gun Parameters

Table 3-9 Control Panel • Setting Page • Mode Switch Option Description

Name	Parameter Range	Meaning	Notes
X-axis center offset	±3mm	Correct the left-right offset of the red light center; Negative values shift left, positive values shift right.	Adjust this when red light cannot safely exit from the copper nozzle.
X-Axis Scale Ratio	1%-400%	Used to proportionally scale the scanning width; Typically used for normalizing the scan width with the actual width.	/

### 3.3.3 Monitoring Page

This page allows the user to view the input and output signals of the current welding machine, which helps to check the welding machine's status and troubleshoot any issues based on the information provided, as shown in Figure 3-25.

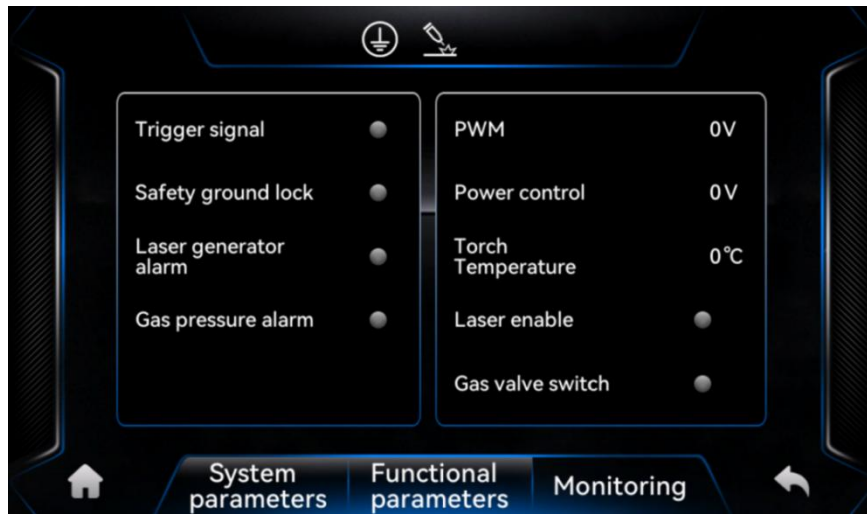


Figure 3-25 Monitoring Page Information

## 3.4 Operation Procedure

### 3.4.1 Power On/Off Procedure

Power-on Procedure

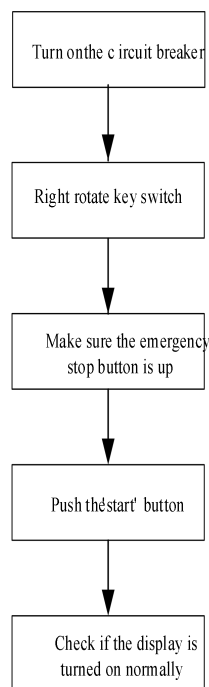


Figure 3-26 Power-On Flow Chart

Power-Off Procedure: Only need to turn off the air switch. In case of emergency, press the emergency stop button immediately to shut down.

#### Note

Before starting the machine, ensure that the electrical wiring is completed. For specific connection steps, see [2.3 Electrical Connection Steps](#).

### 3.4.2 Process Operation Procedures

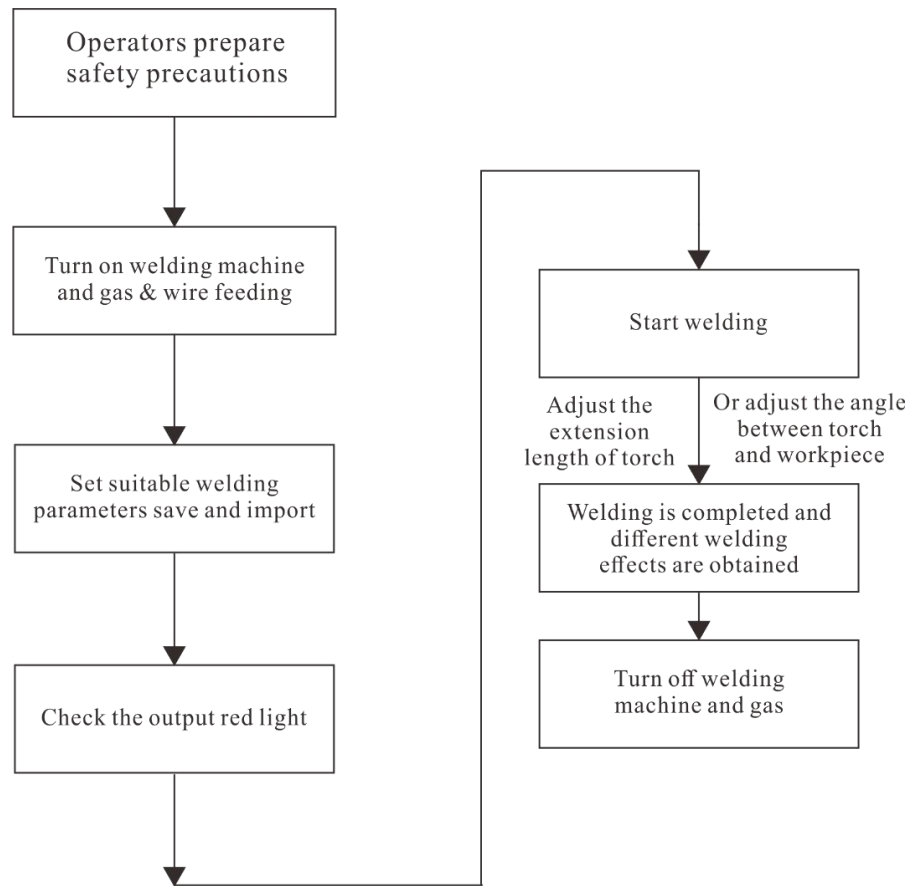


Figure 3-27 Process Operation Flow Chart

 **Note**

1. Press the welding torch switch to output laser, and release it to stop the laser (do not aim at people or flammable objects);
2. It is recommended that the angle of the welding torch for flat plate butt welding be 45–60° with the plate surface;
3. For right-angle welds, the welding torch should form a 45° angle with the vertical plate, and use the included angle of the two plates as a support to push forward or pull backward at a constant speed;
4. When inserting the workpiece into the gun nozzle, there is usually a deviation of a few millimeters in the focal length, so the extension length of the gun nozzle should be adjusted accordingly.

# Chapter 4 Fault Diagnosis

## 4.1 Fault Analysis

Table 4-1 Fault Analysis

Fault segment	Fault Type	Fault Description	Fault Resolution
Illegal Authorization Fault	board issue	U1/U2 board is not allowed for use.	Contact the manufacturer to replace the board
	APP Validation	U1/U2 APP execution failure	The APP code is invalid, contact the manufacturer to update the software.
	Mismatch Failure	U1/U2 hardware and software mismatch.	Contact the manufacturer to update the correct software version
	Upgrade Error	U1 Upgrade Failed	1) Please check if the communication line terminal is securely connected. 2) Try to re-download the upgrade file; 3) Contact the manufacturer;
		U2 Upgrade Failed	1) Re-download the upgrade file. 2) Contact the manufacturer;
		U2 Board Check APP Jump Failure	Upgrade the U2 board APP software.
/	RTC battery power Loss	Replace the RTC battery and re-obtain the authorization.	
Communication Error	CAN	U2-U1 CAN Communication Error	1) Please check if the communication line terminal is securely connected. 2) Replace the communication connection cable; 3) Disconnect the wire feed machine communication line, use the switch signal line to control the wire feed machine;
		U2-IAP CAN Communication Error	1) Please check if the communication line terminal is securely connected. 2) Replace the communication connection cable;
	SCI	U1-HMI1/U2-HMI2 RS232 Communication Error	1) Please check if the communication line terminal is securely connected. 2) Replace the communication connection cable;
	I <sup>2</sup> C	U1/U2 EEPROM operation failure	/
	USB	USB drive not detected	Check if the USB drive or interface is damaged
		USB drive disconnected	Reinsert the USB drive and restart the machine.
File Read Error		Check the USB flash disk or replace the upgrade file	

		Unsupported Device	Replace the USB drive
		Upgrade file not detected	Check upgrade file name and file format
		Upgrade File Error	Replace with the correct upgrade file.
	SPI	U2 SPI Flash disconnected or ID mismatch	Contact the manufacturer to replace the Flash
		U2 SPI Flash Storage Data Error	Re-download the upgrade file or contact the manufacturer.
Electrical fault	/	Main unit bus overvoltage	Contact the manufacturer
	/	Main unit bus undervoltage	Contact the manufacturer
	/	Wire feed machine bus overvoltage	Contact the manufacturer
	/	Wire feed machine bus undervoltage	Contact the manufacturer
	/	Wire feed machine bus overcurrent	Contact the manufacturer
	/	Wire feed motor overcurrent	Contact the manufacturer
Hardware faults	/	Safety lock disconnected	Welding stops when the safety ground lock is disconnected
	/	Laser alarm	Use the APP connection to check for alarm issues
	/	Gas pressure alarm	Please check for gas leakage or lack of gas contact
	/	Motor overheating	Due to prolonged welding, wait for a period of time after stopping welding and check if the alarm persists. If so, please contact the manufacturer.
	/	Collimating Lens overheating	Due to prolonged welding, wait for a period of time after stopping welding and check if the alarm persists. If so, please contact the manufacturer.
	/	Protective lens overheating	Due to prolonged welding, wait for a period of time after stopping welding and check if the alarm persists. If so, please contact the manufacturer.
/	Gun body overheating	Check the protective lens or focusing lens for burnout	

# Chapter 5 Maintenance

## 5.1 Daily Inspection and Cleaning

---

### Safety warning

Daily inspection must be conducted after turning off the power supply of the user's distribution box and the power supply of laser welding machine to avoid personal injuries such as electric shock and burn. (For the appearance that doesn't contact with a conductor, daily inspection isn't required.)

---

- Notice for use
  1. Daily inspection is very important to keep the high performance and safe operation of laser welding machine;
  2. Check the machine housing and cables daily, and clean or replace if necessary;
  3. To ensure the high performance of the welding machine, please select the parts provided or recommended by the original manufacturer(Penta Laser).

## 5.2 Regular Inspection and Cleaning

---

### Safety Warning

1. Regular inspection must be performed by professionals to ensure safety;
  2. Regular inspection must be conducted after turning off the power supply of the user's distribution box and the power supply of the device to avoid personal injuries such as electric shock and burn.
- 

- Operating instruction

In order to prevent semiconductor components and circuit boards from being damaged by static electricity, please wear anti-static devices or touch the metal parts of enclosure to remove static electricity before touching the conductors and circuit boards in the machine;

- Regular inspection plan

1. Regular inspection must be performed to ensure the long-term normal use of the welding machine;
2. Pay attention to regular inspection, including internal inspection and cleaning of the welding machine;
3. In general, regular inspection is performed once every six months. If there is a lot of dust or oily smoke at the welding site, regular inspection must be performed once every three months;
4. Recommended regular inspection plan is shown in Table 5-2.

Table5-1 Regular inspection schedule(the year of XXXX)

No.	Scheduled inspection date	Actual inspection date	Inspector
1	XXXX-XX-XX		
2	XXXX-XX-XX		
3	XXXX-XX-XX		
...	...		

- Content of regular inspection

Table5-2 Regular inspection and cleaning content

Item	Regular inspection and cleaning
Fan/Heat sink	Remove dust and sundries regularly
Copper tip	Regularly clean the slag of the copper nozzle and replace the copper nozzle
Guide wire nozzle	Check and replace the guide wire nozzle regularly
Protective lens	Regularly check the protective lens of laser are dirty or damaged. If they are dirty, please clean them in time. If they are damaged, please replace them in time

### 5.3 Cleaning and Replacement of Laser lens

- Cleaning of laser lens

In installation and cleaning process of lens, sticky matters, finger marks or oil droplets will affect the light transmittance of lens, reducing the service life and affecting the quality of laser processing, so following measures must be taken:

1. Do not install lens with bare fingers. Wear powder-free finger stalls or rubber/latex gloves;
2. Do not use suction apparatus to avoid scratching the surface of lens;
3. Do not touch the film and mirror surface when picking up the lens. You should hold the edge of lens and put the lens on the lens paper;
4. Avoid talking over the lens, and keep all contaminants away from the work environment as much as possible;
5. The lens shall be cleaned in a dust-free environment as much as possible.

- Main maintenance tools

Main maintenance tools: Blowing balloons, anhydrous alcohol, lint-free cloth, lint-free cotton swabs.

- Replacement of protective lens

According to the laser welding process characteristics, it is necessary to regularly maintain lenses. If the welding effect is poor, replace the protective lens as shown in Table 5-3.

Table5-3 Protective lens replacement steps

Operating requirements and steps	Operating instructions
Preparation before operation	Prepare a dust-proof non-stick tape or textured paper, anhydrous absorbent cotton (fine cotton), anhydrous alcohol, finger stalls or rubber gloves, and lens wiping paper
	Wash your hands with clean water and dry with an alcohol cotton, and wear gloves
Environmental requirements	Relatively dusty places
Lower protective lens operation	Loosen the screws of the protective lens drawer and remove the protective lens drawer assembly. Seal the lens chamber with masking tape to prevent dust from entering, then rotate and remove the lens retaining ring to replace the lower protective lens
Upper protective lens operation	Remove the upper protective lens drawer assembly. Seal the lens chamber with masking tape to prevent dust from entering, then rotate and remove the lens retaining ring to replace the upper protective lens
Lens installation	Install the protective lens pressing ring, tear off the textured paper, wipe the inside of the hatch and cover with a cotton ball with alcohol, rapidly insert the protective lens support into the protective lens compartment, tighten the screw to complete the replacement of protective lens

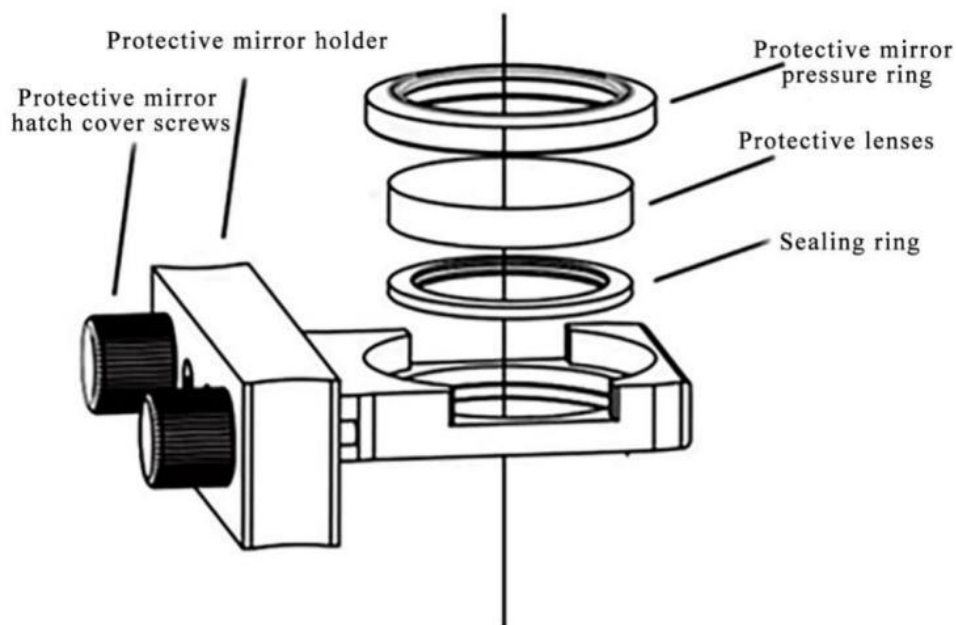



Figure 5-1 Protective lens diagram of welding torch

 Note

1. If the protective lens are polluted, they must be wiped with the lens wiping paper dampened with anhydrous alcohol; if there are obvious burning points on surface of protective lens, they must be replaced directly;
2. If there is any scratch or deformation of pressing seal, it must be replaced immediately.

● Replacement of focus lens

If the welding performance is poor, check whether the protective lens are dirty, and replace the focus lens in time, as shown in Table 5-4.

Table5-4 Replacement steps of focus lens

Operating requirements and steps	Operating instructions
Preparation before operation	Prepare a dust-proof non-stick tape or textured paper, anhydrous absorbent cotton (fine cotton), anhydrous alcohol, finger stalls or rubber gloves, and lens wiping paper
	Wash your hands with clean water and dry with an alcohol cotton, and wear gloves
Environmental requirements	Relatively dusty places
Operation of lens removal	Loosen the fixing screws and pull out the focus lens drawer assembly. Cover it with masking tape to prevent dust from entering. Rotate and remove the focus lens retaining ring for lens replacement. When installing, ensure the convex side of the lens is facing the copper nozzle
Lens installation	Lock the pressing ring of focus lens, tear off the textured paper, put the focus lens drawer back into the lens compartment, lock the fixing screws to complete the replacement of focus lens

#### Note

1. If focus lens are polluted, they must be wiped with the lens wiping paper dampened with anhydrous alcohol; if there are obvious burning points on the surface of focus lens, they must be replaced directly;
2. The focusing lens has a specific orientation. The convex side of the lens (the side with the smaller diameter) should face towards the copper nozzle.

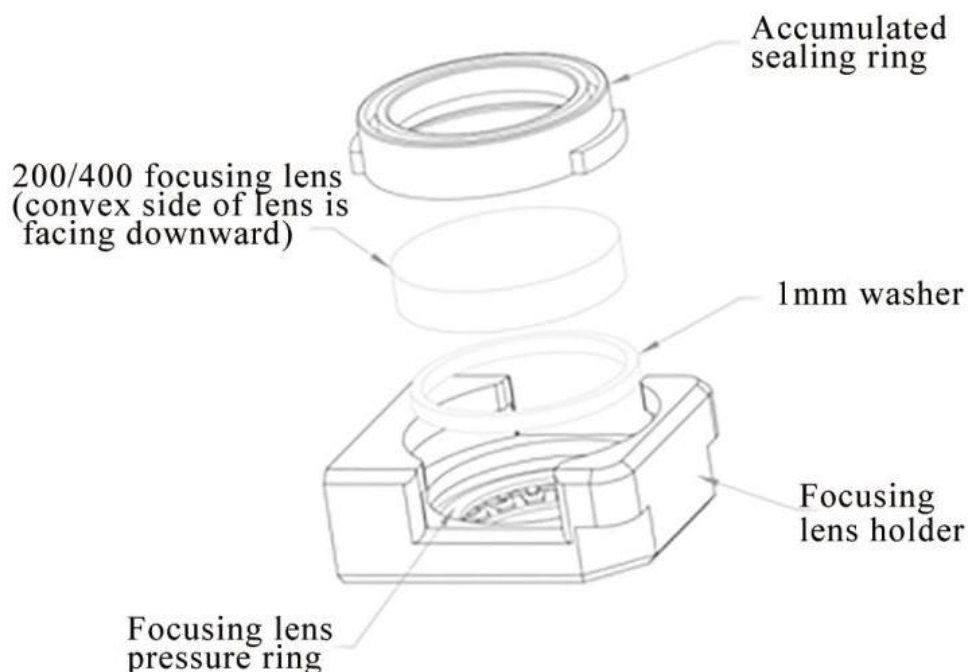


Figure 5-2 Diagram of focus lens of welding torch

## 5.4 Red Light Correction

When the red light cannot emit from copper nozzle, do not output light to prevent burning out the copper nozzle, and adjust as follows:

1. Software fine tuning (left and right fine tuning)

Click to enter setting interface, change the laser center offset value, negative value to the right, positive value to the left. For the latest version, the maximum adjustable value is +3/-3. If the laser center offset value cannot be adjusted by this method, you shall use the mechanical adjustment.

2. Mechanical adjustment (up and down, left and right)

Remove the cover from the handle and take out the indicator light cover plate. You will see the adjustment screws. Adjust them as shown in the following diagram:

Twisting these two screws loose allows you to adjust the left-right position of the red light

Twisting these two screws loose allows you to adjust the up-down position of the red light

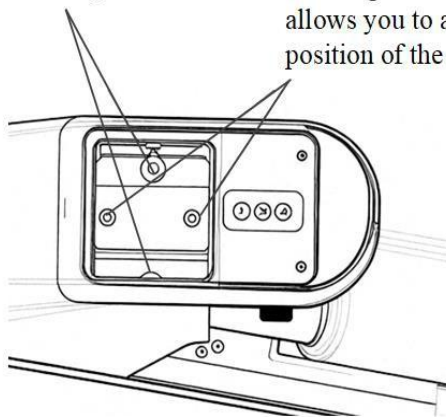


Figure 5-3 Red Light Mechanical Adjustment Diagram

# Chapter 6 Warranty

## 6.1 Comprehensive Terms

Penta Laser provide warranty services for products with defects caused by materials or production processes in the contract warranty period, and ensuring that the product meets the relevant quality and specification requirements specified in the document in normal use.

Penta Laser provide maintenance and replacement services for products with defects caused by materials or production processes in the contract warranty period. The repair or replacement of product within the scope of warranty shall still be performed according to the remaining warranty period of the original product.

Penta Laser has the right to selectively repair or replace any product with material or technical problems during the warranty period.

## 6.2 Warranty limitation

Machines and parts (including fiber optic connectors) are not covered by warranty in the following circumstances:

1. Damage to the machine and its parts (including optical fiber) which is caused by tampering, opening, disassembly, misassembly and modification by professionals not specified by Penta Laser;
2. Laser generator damage which is indirectly caused by the failure of software or interface of user;
3. Damage caused by misuse, negligence or incident;
4. Use beyond the specification range, wrong installation and maintenance;
5. The damage that is caused by misuse or failure to follow the information and warnings in the ***User Manual***;
6. The damage that is caused by improper installation, maintenance, or other abnormal operating conditions not covered by this manual.

Within the scope of warranty, buyer must raise a claim in writing within 31 days from the date of discovery of problem. This warranty does not cover third parties (including specified buyer, final user or customer, and excluding the parts or other products not produced by Penta Laser).

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 Note

Users shall understand and comply with the operating instructions in user manual and operating specifications. The damage caused by wrong operation is not covered by warranty term. Accessories and optical fiber and other parts are not covered by the warranty scope.

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## 6.3 Technical Support

This product has no built-in accessories for user maintenance, so all maintenance shall be conducted by technical personnel specified by Penta Laser.

If there is any fault in the use of this product, immediately notify Penta Laser's technical personnel in time to deal with the problem.

All repaired or replaced products must be put in the original packaging box provided by Penta Laser, otherwise, Penta Laser has the right to refuse to repair any product damage arisen from this.

When receiving the products, user shall check whether the products are complete and intact in time.

In case of any abnormal situation, please contact the carrier or Penta Laser in time.

Penta Laser will constantly develop new products. The product information listed in the manual may be changed without notice. For all technical parameters, the terms of the contract shall prevail.

The above warranty and service terms of our products are used for user reference only. For the formal service and warranty contents, the agreement in the contract shall prevail.

The copyright of this operating manual belongs to Penta Laser . It is subject to change without notice.

## 6.4 After-sales Service

- Maintenance

Please contact your local dealer in case of component repair or replacement. Please use parts and components provided by Penta Laser Welding Technology Co., Ltd.

The warranty period of this product is **12 months**, starting from the warranty card or purchase invoice. Abnormal use and artificial damage isn't included in the free warranty coverage.

# Appendix I Technical Specifications

Model	HW 1200-A	HW 800-A
<b>Optical characteristics</b>		
Output laser wavelength (nm)	1080±10nm	1080±10nm
Power stability (%)	±5%	±5%
Minimum light output power	200W	200W
<b>Output fiber cable parameters</b>		
Armored fiber length (m)	5m	5m
Output connector	QBH	QBH
Fiber bend radius (mm)	>200	>200
<b>Electrical characteristics</b>		
Rated input voltage/phase number	Single phase 230Vac (±15%)	Single phase 230Vac (±15%)
Input power frequency	50/60Hz	50/60Hz
Rated input power	4 kW	2.8 kW
Rated input current	18A	13A
Rated output laser power	1200W	800W
<b>Cooling specifications</b>		
Cooling method	Forced air cooling	Forced air cooling
Protective gas	Nitrogen or argon	Nitrogen or argon
Gas flow rate	10-20 L/min	10-20 L/min
<b>Others</b>		
Operating ambient temperature	-10~40°C	-10~40°C
Operating ambient humidity	<70% non-condensing	<70% non-condensing
Storage temperature	-20~55°C	-20~55°C

## Appendix II System Standard Configuration Table

Name	Model	Code	Qty	Standard/ Optional Configuration	Configuration	Notes
Laser welding machine	HW 1200-A	R06080039	1	Standard	●	Two models available, including the welding torch and combined control cable
	HW 800-A	R06080042				
Wire feeder	WF5-ET-MD	R06030112	1	Standard	●	/
Control cable of wire feeding signal	/	R13403136	1	Standard	●	3m
	/	R13402590	1	Optional	○	5m
Wire feeding spring tube	/	R29131751	1	Standard	●	3m
Wire feeding guide tube	/	R29131768	1	Standard	●	/
Gas hose	/	R29131286	1	Standard	●	3m
Safety ground lock cable	/	R13402287	1	Standard	●	5m
Protective lens	D20X3	R37060129	5	Standard	●	Spare 5 PCS
Copper tip accessory box	MLT01-PJH-001	37060178	1	Standard	●	Includes 6 copper tips, 1 taper adapter, 1 hose clamp, 1 graduated tube, and 1 wire feeding hook
Protective glasses	LP-ADY-3 900-1100nm	R37060095	1	Standard	●	/
Wire feeding spring tube (Aluminum wire feeding accessories)	/	R29131757	1	Optional	○	3m, choose for aluminum welding
Wire feeding guide nozzle (Aluminum wire feeding accessories)	ZK-76ZY01-Z-03A	R29130220	1	Optional	○	Choose for aluminum welding
Wire feeding rollers (Aluminum wire feeding accessories)	U-type: 0.8/1.0	R37020036	2	Optional	○	Choose for aluminum welding
	U-type: 1.2/1.6	R37020037	2	Optional	○	Choose for aluminum welding

Notes: ●Standard configuration , ○Optional configuration

# Appendix III Electrical Connection Diagram

