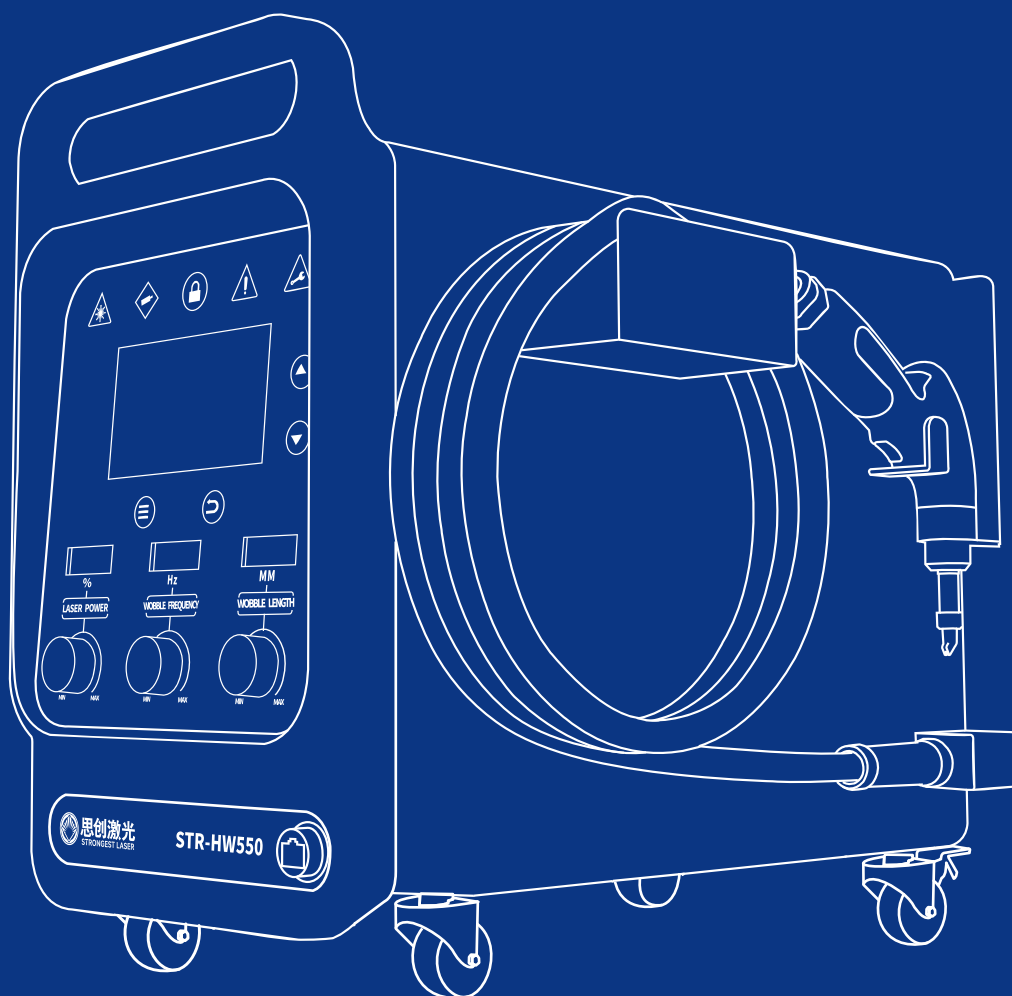


STRONGEST LASER



STRONGEST
LASER

STR-HW SERIES HANDHELD LASER WELDER USER GUIDE



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PREFACE

Welcome to use the STR-HW handheld laser welder series developed and produced by STR Laser. STR laser compiled this User Guide to help you better use and maintain your equipment. In case of any omission in this User Guide, such as unclear expression, incomprehensible expression, unclear explanation, etc., STR Laser sincerely welcome your opinions and suggestions to help us improve it continuously. Thank you again for using the products of STR Laser!

Before using this product, please read this User Guide carefully to familiarize yourself with the operation and maintenance of this product. STR Laser strongly recommends that all operators read the first chapter of this User Guide, "Safety Information" before operating the equipment.

This User Guide should stay with the product to provide existing users and all potential operators, users and owners with important operating, safety and other information.

Please read this User Guide carefully to prevent unnecessary risks from causing harms.

COMPANY PROFILE

Based on its core competence in high power fiber laser technologies, STR has always been committing itself to R&D and equipment production in such application fields as conventional laser welding, special laser hybrid welding and precision cutting. It is a "National High-Tech Enterprise" engaged in R&D, production, sales, and technical service.

Co-founded by industry elites in 2017, headquartered in Chengdu National Free Trade Pilot Zone, a high-tech industry cluster area, and boasting a proven and experienced R&D team consisting of experts well known inside China and abroad, including many doctorate holders and master degree holders, STR has rich experience in the research, development and production of high-power fiber lasers, and in enterprise management. Over the years, STR has progressed grown steadily, and currently has more than 200 employees. Its growing comprehensive strength has been ranking among the forefront of the industry, and attracting attention and investment from the industry and the capital market.

Strongest Laser started in 2017. Strongest Laser is headquartered in the high-tech industrial concentration of Chengdu National Pilot free trade zone. The company was jointly founded by industry elites. It has a professional technology R&D team consisting of well-known experts, doctors and masters at home and abroad, and has rich experience in R&D, production and management of high-power fiber lasers; Over the years, Strongest Laser has been developing steadily. At present, it has more than 200 employees. The comprehensive strength of the enterprise has been rising and ranks in the forefront of the industry. It has attracted the attention and favor of the industry and the capital market.

Benefiting from the national strategy of "intelligent manufacturing", taking industrial transformation as an opportunity and focusing on meeting the market demand for high-power laser technology applications, STR Laser develops and produces high-power fiber lasers and automation equipment for military and civilian use, and provide high-quality products and services to drive technological reform and product iteration in the industry and related sectors. STR's products cover industrial laser light sources (for cutting and welding), 3D additive manufacturing laser light sources, handheld laser welders, handheld laser cleaners, special welding automation equipment, precision cutting automation equipment, etc. They are widely used in the such sectors as aviation, space, security, automotive, medical industries, helping to facilitating the industrialization and large-scale development of STR Laser.

STR adheres to the service philosophy of "Customer First". Based on high-quality products, STR provides customers with fast responsive, accurate, and localized after-sales service through its own after-sales service system thus to realize a closed-loop management throughout the entire process from acceptance, dispatch to completion of after-sales service matters, improve after-sales management efficiency and customer satisfaction, and continuously bring better product experiences to customers.

For more information, welcome to visit the official website of STR Laser:

<http://www.strlaser.com>

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Chapter 1 Overview

1.1 Introduction

The handheld welding system of STR Laser integrates laser light source, cooling module, welding gun and control module, and outputs 1080nm laser. Because 1080nm laser is invisible light, operators should be aware of the danger of laser and operate the equipment according to the User Guide to avoid personal injury.

The Strongest Laser's handheld welding system has been strictly tested before leaving the factory, and it is fully safe to operate the equipment per the instructions in this User Guide. Before using the equipment, the operator shall carefully read this User Guide and operate, store and transport the equipment in accordance with the requirements of this User Guide.

1.2 Application Scope

The Strongest Laser's handheld welding system is suitable for welding various metals, including stainless steel, galvanized steel, carbon steel, aluminum, copper, etc. Its common applications are as follows:

- hardware product processing
- sheet metal processing
- equipment maintenance
- household appliances
- automotive body processing
- aerospace and transportation industry
- building and pipeline processing
- advertising, home appliances and other applications

1.3 Designation of Product Models



1. STR stands for Strongest Laser
2. HW stands for handheld welder
3. Part of the Code indicates Product Specifications

Figure 1-1 Designation of Product Models

The Strongest handheld laser welding system falls into three specifications:

- STR-HW550: super performance version
- STR-HW450: high performance version
- STR-HW350: Standard Version

1.4 Product Packaging and Unpacking

The handheld welding system is packaged within a cardboard box secured with PET packing strip, as shown in the following figure:

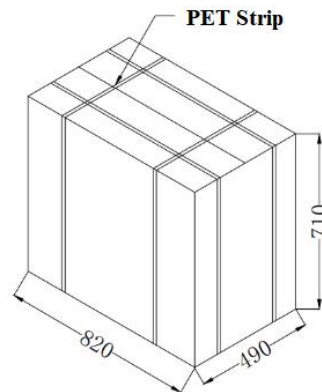


Figure 1-2 Schematic Diagram of Product Packaging

To unpack the unit from the cardboard box, cut off the packing strip, take out the foam board first and then remove the external box. See the following figure for details:

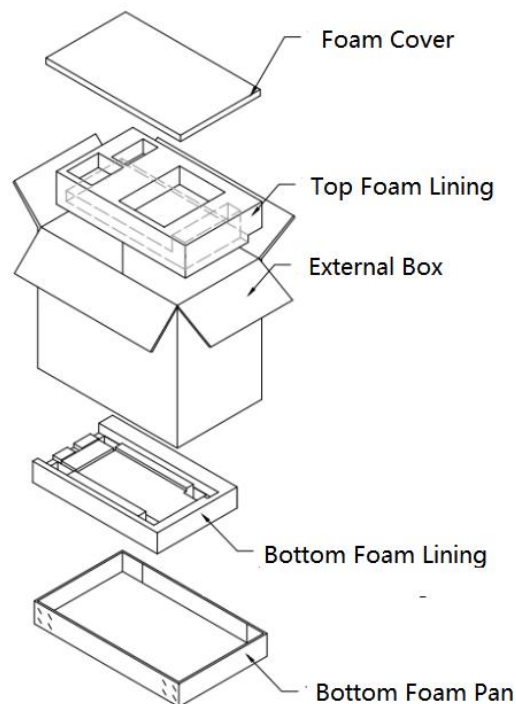


Figure 1-3 Illustration of Product Unpacking

Chapter 2 Safety Information

2.1 Laser Safety Level

The STR-HW laser welder series of STR Laser output invisible laser radiation with a wavelength of 1080nm or near 1080nm, According to the definition in IEC/EN 60825-1, lasers in such series belong to Class 4 laser products.

2.2 Hazard Sources

Table 2-1 Hazard Sources of Laser System

Category	Remarks
Beam Hazard	The lasers' output features high power density, which can cause local high temperature to the illuminated part. Improper use may cause fire or personal injury.
Secondary Reflection Hazard	Part of the laser energy is reflected during laser welding, which may cause damage to human eyes.
Non Beam Hazard	Mechanical injury, electrical injury, high temperature injury, etc.

2.2.1 Beam Hazard

The high temperature caused by the laser radiation can instantly coagulate or vaporize proteins, thereby causing damage to biological tissues.

The most vulnerable parts of human body are eyes and skin.

Of all organs of the human body, eye is the one most vulnerable to laser. The IR radiation emitted by the laser is very harmful to the human eye. It will burn the retina, causing loss of vision and even blindness. STR Laser strongly recommends that you wear qualified and safe safety goggles any time you operate the laser.

Laser illumination on the skin can cause burns, rashes, blisters, and pigmentation, even the destroy subcutaneous tissues completely.

2.2.2 Secondary Reflection Hazard

During welding operation, part of the laser will be reflected around by the face of weld. Although the scattered laser energy has been greatly reduced, it may still cause damage to the eyes. STR Laser recommends that during welding operations, there should be no unauthorized person nearby, and qualified and safe safety goggles should be worn if observation is required.

2.2.3 Non Beam Hazard

STR-HW handheld laser welder series are powered by 220V AC. Ensure that the power supply has been connected to the protective ground, otherwise it may cause equipment damage and personal injury.

When handling and servicing the STR-HW handheld laser welder series, attention should be paid to the risk of crushing or cutting caused by falling of some heavy or sharp objects.




During welding, sparks will be generated, so it is necessary to avoid sparks splashing to nearby combustibles. Otherwise, fire may be caused.

During welding, the metal temperature will rise. Please wear protective gloves to avoid scalding.

2.3 Safety Warning Signs

Safety warning signs during laser operation are show in Table 2-1 below.

Table 2-1 Warning Signs for Laser Safety

	<p>Warning: The voltage of the AC power supply of the laser system is high. If the operation is improper or the laser system is not properly grounded, there is a risk of electric shock.</p>
	<p>Warning: This sign indicates laser radiation, which has been affixed to the output end of the laser system.</p>
	<p>Class 4 laser products can cause damage both to the eyes and to the skin. High power laser light can burn the skin, and in some cases, even scattered laser light can cause damage to the eyes and skin, and cause a fire or an explosion.</p>

2.4 Laser Radiation Protection

2.4.1 Requirements for Laser Radiation Protection

Because the laser radiation with a wavelength of 1080nm light emitted by the laser is invisible radiation of high power, even the scattered light can still cause irreversible damage to the eyes. Therefore, laser safety glasses shall be the type that can shield the eyes from the damage of laser radiation in its entire wavelength range. When operating laser equipment, the operator shall wear proper laser safety glasses according to the wavelength of the laser radiation and shall wear all the time during the operation.

2.4.2 Laser Protection Equipment

Laser safety glasses are only effective for specific wavelengths.

The following information shall be taken into account when selecting the proper laser safety glasses:

- (1) Laser characteristics: output wavelength and power of laser;
- (2) Optical Density (OD): the larger the OD value, the stronger the protection capability of laser protective glasses can provide;
- (3) Visible Light Transmittance (VLT): If VLT value is less than 20%, laser safety glasses shall be worn in a well-lit environment;

(4) Frame Style: whether to wear prescription glasses and temple size are factors that shall be considered when selecting the frame style suitable to the wearer.

STR Laser recommends protective equipment products from the following suppliers: Thorlabs, LaserVision, Kentek Corporation, Rochwell Laser Industries, etc. This recommendation is only for informational purpose and STR Laser assume no liability for any problems arising from the use of the recommended products from the above suppliers.

2.4.3 Laser Protection Measures

Technical measures:

- Welding interlock circuit: the welding interlock circuit is used to ensure that the laser can be output only when the welding gun contacts the workpiece to be welded; when the welding gun is not in contact with the welding surface, the laser emission is automatically terminated;
- Safe operation area: provide laser processing room, laser shield and curtain;
- Key management: implement lock out for the equipment or laser operation room;

Management measures:

- Formulation of rules and regulations: areas involved in laser radiation will be strictly controlled and operation instructions are formulated to ensure laser system safety;
- Supervision and inspection mechanism: regularly check the facilities to ensure its normal operation and check the safety rules and regulations to ensure they are feasible and implemented properly;
- Personnel safety training: develop and maintain a training and assessment mechanism to ensure the employee of the user meet the safety requirements and strengthen their safety awareness.

2.5 Safe Operation of Equipment

2.5.1 Requirements for Laser Welding Operation Environment

To ensure the safety of laser welding operation, appropriate external warnings should be used, including but not limited to laser safety signs, interlocking devices and other hazard prevention measures. The interaction between the laser and the working surface will produce gas, sparks and debris due to high temperature, which may pose additional safety hazards. The corresponding operators shall undergo proper examination and training, and be familiar with and master the conventional safety specifications for laser operation.

STR Laser recommends that your operation of the laser welding equipment shall meet the following requirements to extend its service life:

(1) Each STR-HW series handheld laser welder integrates a cooling system, and the heat is discharged from the bottom and top space. Do not block the bottom and top space. Otherwise the output performance of the laser system may be affected due to the decline of heat dissipation performance;

(2) Use and store the equipment under the specified ambient temperature and humidity conditions to avoid equipment damage; If the equipment shuts down due to

overheating, please stop using it and ask for help from Strongest Laser.

Note: Please operate the equipment carefully to avoid accidental damage to the equipment.

2.5.2 Safety Instructions for Operation Area

(1) The intensity of output laser of STR-HW series handheld laser welders is enough to burn skin, clothing and paint, and ignite volatile substances, such as alcohol, gasoline, ether, etc. Therefore, during operation and use, it is prohibited to stack items in the operation and processing area and the flammables shall be isolated from the laser operation and processing area.

(2) During laser welding, a small amount of harmful dust and toxic gas will be generated. The workplace should be properly equipped with ventilation and dust collection devices, such as exhaust fans and industrial vacuum cleaners. Employees should wear appropriate masks for protection.

2.5.3 Instructions to Optical Operation

STR Laser strongly recommends that you read the following operating instructions before operating the equipment:

(1) Protective glass shall be installed during welding to avoid contamination of the focusing lens inside the hand-held welding gun;

(2) The protective glass is a consumable item, which will lead to poor welding effect and large sparks after being dirty. Please replace the protective glass in time;

(3) When replacing the protective glass, avoid polluting the internal focusing lens;

(4) The armored optical fiber cable contains optical fibers. Do not trample or crush the armored cable. Otherwise, the optical fiber may be damaged;

(5) Do not drag the armored optical fiber cable forcefully. Otherwise, the optical fiber may be damaged;

(6) During welding operation, the workpiece clamp with work lead shall be attached to the welding surface, and if you don't want the welder to output laser, don't connect the workpiece clamp to the workpiece. Otherwise, a closed circuit will be formed, causing the welder output laser unexpectedly during non-welding operation;

(7) In order to avoid injury caused by secondary reflection laser, welding operator shall wear safety goggles during welding operation;

(8) If the equipment is not operated in a strict manner according to the instructions in this User Guide, the protective device and performance of the welder may be weakened, for which STR will not provide warranty.

Note:

⊙ In case the protective glass is dirty, the temperature of the protective glass will rise, and the accumulative effect in this state for a long term may cause damage to the internal optical path. Please replace the protective glass in time;

⊙ Please be careful during laser welding operation to avoid the hot phenomenon or molten metal particles that may appear from causing harm.

Warning:

- ◎ Reasonably select safety protection equipment according to the laser output power and wavelength;
- ◎ Do not directly stare the laser welding gun, and ensure to wear safety goggles during all operation.

2.5.4 Instructions for Electrical Operation

STR Laser strongly recommends that you read the following operating instructions before operating the handheld laser welder:

- (1) When using the handheld laser welder, please ensure that the equipment is well grounded; otherwise the housing may be charged and may cause personal injury;
- (2) Ensure the power supply connected to the equipment is connected to its protective ground before putting into use;
- (3) When using the equipment, ensure that the input power supply meets the requirements and the wiring is correct. Any wrong wiring method may cause personal injury or equipment damage; During use, attention should be paid to electrical safety to prevent electric shock injury. The power supply must be switched off when installing and moving the laser. Always wear insulating gloves during electrical operation. Perform maintenance after power-off. In case of electrical injury, correct treatment measures shall be taken to prevent secondary injury;
- (4) This product has no parts, components or assemblies that need to be repaired by the user. All maintenance operations need to be completed by professionals of STR Laser;
- (5) Do not remove the housing of the welder, disassemble the laser or damage the relevant labels without authorization, there will be a risk of electric shock or burns;
- (6) Any product disassembled without permission will void the warranty terms for the Product.

2.5.5 Other Safety Precautions

- (1) Keep the working area well illuminated and work with lights on to prevent pupil dilation and increasing the risk of eye injury;
- (2) When handling equipment, it is necessary to wear protective gloves, anti-smashing safety shoes and other protective equipment;
- (3) Please operate the equipment in strict accordance with this User Guide, otherwise any damage to the equipment will void the warranty terms for the such product;
- (4) Operators shall wear gloves during welding to avoid burns caused by splashed sparks and high temperature on the metal surface;
- (5) The product has no built-in replaceable parts, and the equipment maintenance should be carried out by the professionals of STR Laser. In order to prevent electric shock, please do not damage any labels on the equipment or uncover the housing without permission. Otherwise any damage to the product will void the warranty terms for the such product.

Chapter 3 Welder Description

3.1 Accessories of the Welder

The shipping list of STR-HW series welders is as follows:

Table 3-1 Shipping List of a STR-HW Series Welder

Shipping List	S/N	Item	QTY	Remarks
	1	STR-HW series handheld welder	1 pcs	\
	2	Product Manual	1 pcs	\
	3	User Guide	1 pcs	\
	4	Power supply cable	1 pcs	5 m
	5	Wire feeding control line	1 pcs	\
	6	Work lead	1 pcs	10 m
	7	Wire feeding bracket	1 pcs	\
	8	Protective glass	5 pcs	\
	9	Nozzle tip	3 pcs	One for feeding 0.8 - 1mm wire, one for 1.2 - 1.6 mm wire feed nozzle, one for flat welding
	10	Safety goggles	1 pcs	\
11	Welding gloves	1 pcs	\	

3.2 Product Specifications

The main specifications of STR-HW series welders are as follows:

Table 3-2 Product Specifications

Item	STR-HW550	STR-HW450	STR-HW350
Weight (Base unit)	45kg	43kg	43kg
Dimensions	673mm (L) × 505mm (H) × 310mm	673mm (L) × 505mm (H) × 310mm	673mm (L) × 480mm (H) × 310mm
Operating temperature	-20 - 55 °C	-20 - 55 °C	-20 - 55 °C
Operating humidity	0% - 90%	0% - 90%	0% - 90%
Storage temperature	-20 - 60 °C	-20 - 60 °C	-20 - 60 °C
Shape of welding gun	Integrated welding gun	Integrated welding gun	Integrated welding gun
Length of armored cable	5 m (cable of 10 m can be customized)	5 m (cable of 10 m can be customized)	5 m (cable of 10 m can be customized)
Weld penetration for aluminum (single side welding)	0 - 5mm	0 - 4mm	0 - 3mm
Weld penetration for stainless steel (single side welding)	0 - 6mm	0 - 4mm	0 - 3mm
Weld penetration for carbon steel (single side welding)	0 - 6mm	0 - 4mm	0 - 3mm
Weld penetration for galvanized sheet (single side welding)	0 - 6mm	0 - 4mm	0 - 3mm
Number of preset process package	40	30	24
Number of customized process package	20	20	20

3.3 Description of Welders



Figure 3-1 View of Welder

Table 3-3 Welders Features

S/N	Feature	Feature Functions
1	Air outlet	The air outlet is located on the top of the welder housing
2	Front panel	The front panel is the main control panel of the welder
3	Welding gun	The welding gun is coiled and attached on the side of the welder housing
4	Air inlet	The air inlet is located on the bottom of the welder housing
5	Foot pad (Caster optional)	The welder can be equipped with four casters for easy movement

3.4 Front Panel



Figure 3-2 Front Panel View

Table 3-4 Front Panel Features

S/N	Feature	Feature Functions
1	Indicators	From left to right: EMISSION, GAS, INTERLOCK, WARNING, ERROR: (1) EMISSION indicator: It turns yellow when emitting laser, and turns off when not emitting laser; (2) GAS indicator: It turns yellow when the gas pressure is insufficient, and it turns off when the gas pressure is normal; (3) INTERLOCK indicator: It turns yellow when abnormal contact occurs between the welding gun and the workpiece, and it turns off when contact is normal; (4) WARNING indicator: It turns yellow when the ambient temperature and humidity are abnormal, and it turns off when ambient temperature and humidity are normal; (5) ERROR indicator: It turns red when the welder is in fault and it turns off when it is normal.
2	LCD	The non touch screen displays the name of the process package, error information of the welder and operation tips.
3	Process Package Selector Buttons	Select welding process package.
4	Function Buttons	Perform function operation according to the LCD operation prompt
5	Digital Display Tubes	From left to right: the one above LASER POWER displays laser output power percentage, the one above Wobble Frequency displays the wobble frequency and the one above Wobble Length displays wobble length.
6	Adjusting Knob	From left to right, the one below LASER POWER is used to adjust laser output power percentage, the one below Wobble Frequency is used to adjust the wobble frequency and the one below Wobble Length is used to adjust wobble length.
7	Ethernet Port	RJ-45 connector for Ethernet communication.

3.5 Rear Panel

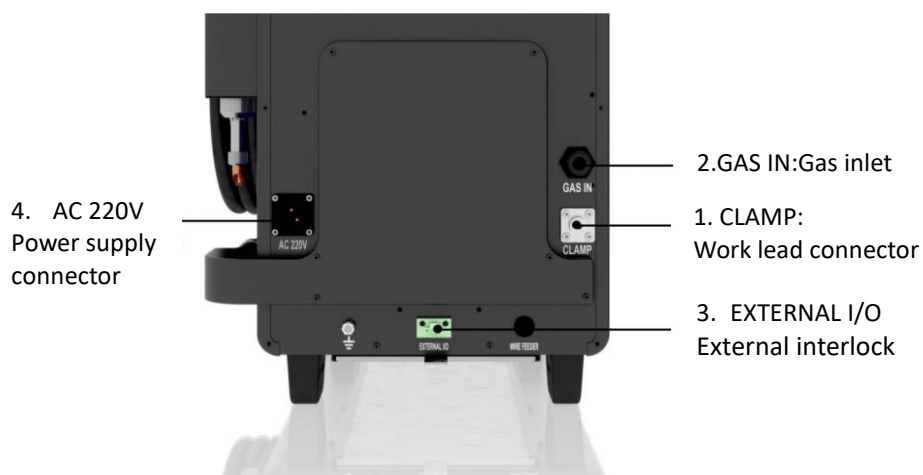


Figure 3-3 Rear Panel View

Table 3-5 Rear Panel Features

S/N	Feature	Functions
1	CLAMP	Used to attach work lead to the workpiece
2	GAS IN	12mm quick connector for welding gas input
3	EXTERNAL I/O	Used to connect external interlocking protection device. The welder can work normally only after the interface is short circuited
4	AC 220V	Used to input 220V, single-phase AC

3.6 Welding Gun

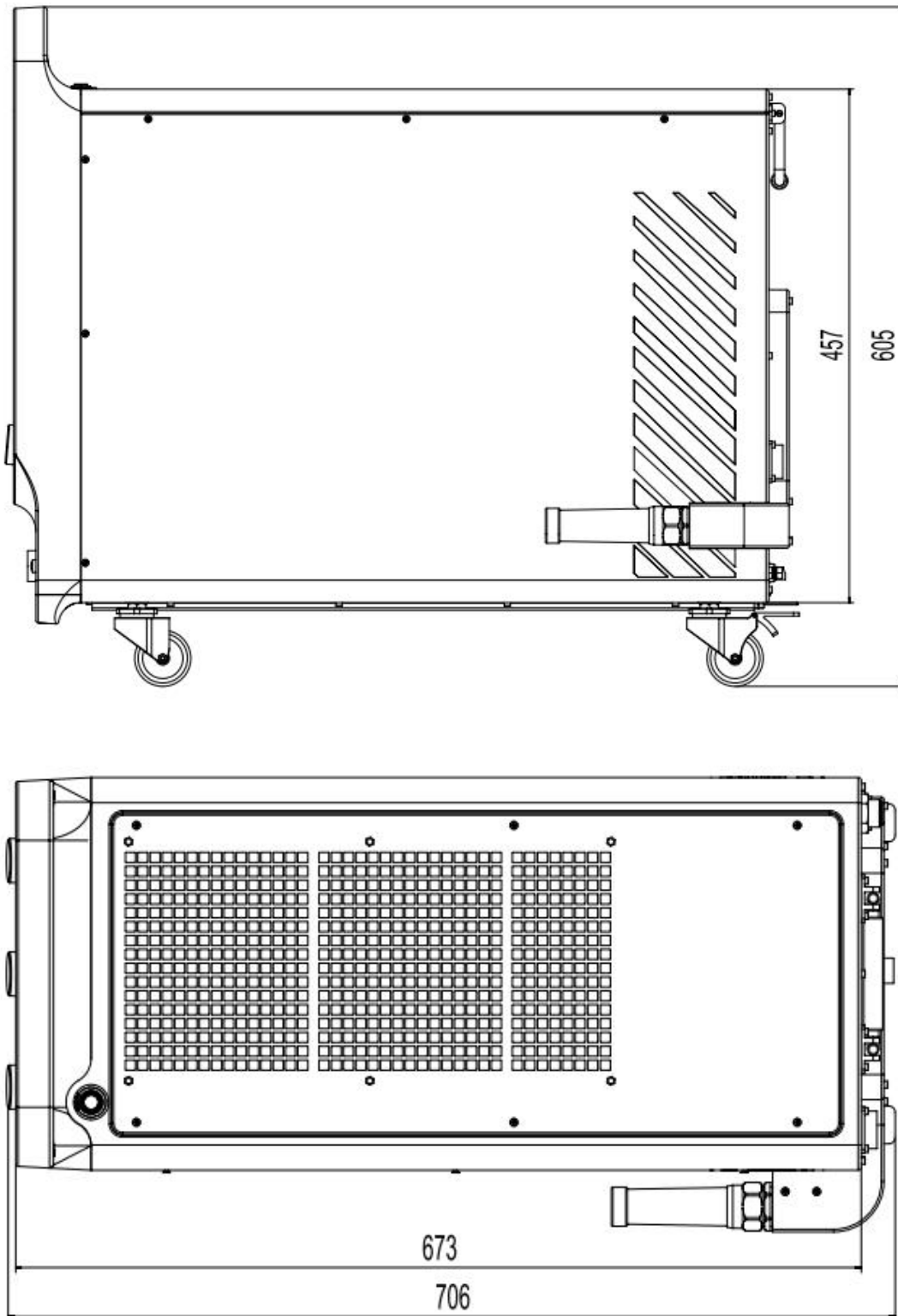


Figure 3-4 Welding Gun View

Table 3-6 Welding Gun Features

S/N	Feature	Functions
1	Nozzle tip	Output welding gas; During welding, the nozzle tip shall be in contact with the workpiece; The nozzle tip is replaceable;
2	Laser output button	When the laser output conditions are met, press this button to output laser; Release the button to stop outputting laser;
3	Protective glass	Used to prevent external dust from entering the optical path; it is a consumable item and should be replaced regularly;
4	Status indicator	When the laser output conditions are met, it turns green; When outputting laser, it turns red.

3.7 Dimension Drawing of the Welder



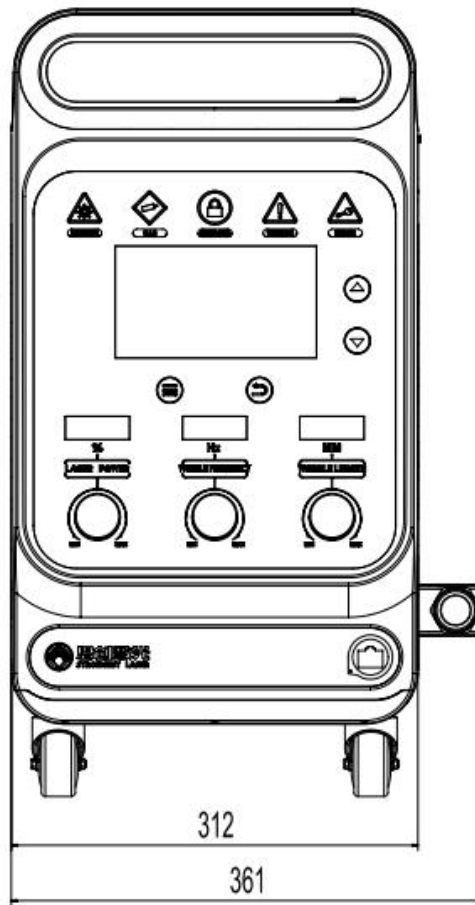


Figure 3-7 Overall Dimensions of Welder

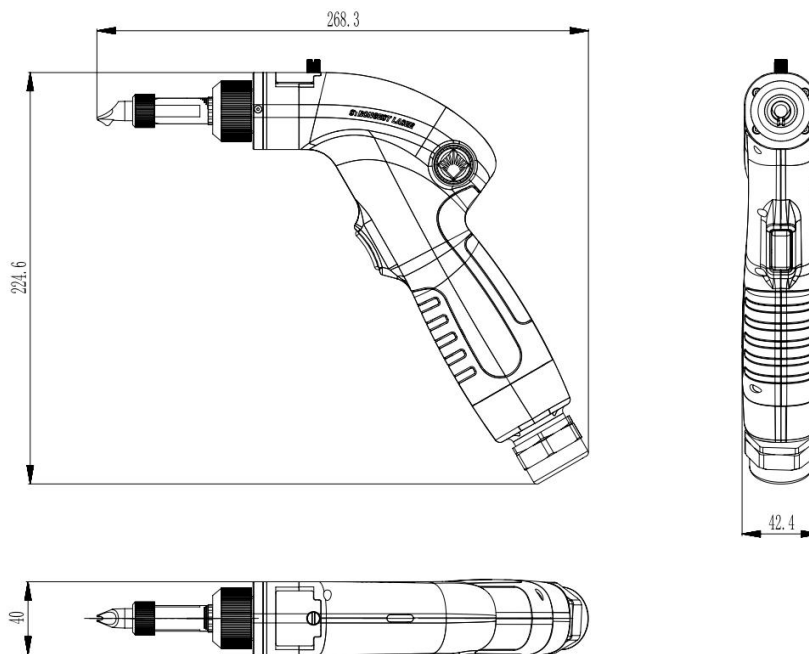


Figure 3-8 Dimensions of Welding Gun

Chapter 4 Setup of the Welder

4.1 Preparation Before Setup

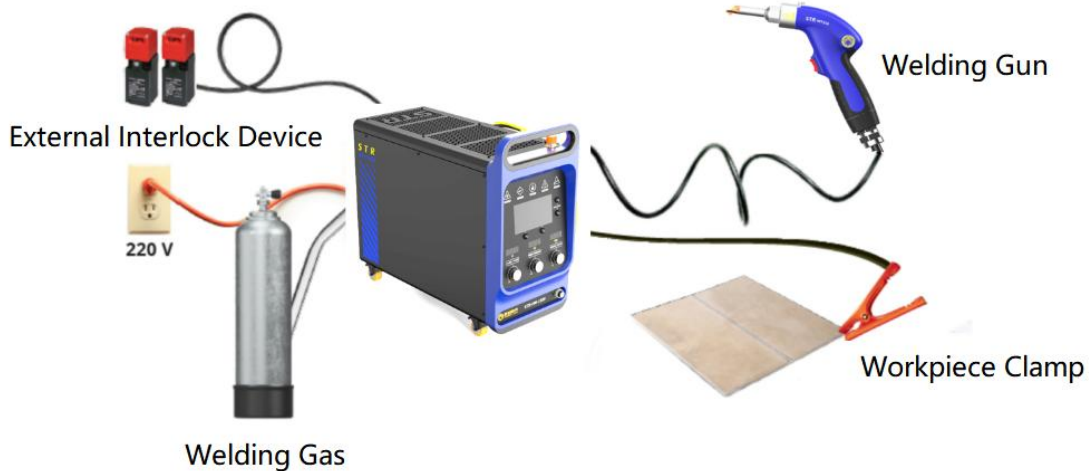


Figure 4-1 Typical Setup of the Welding System

Setup Description:

(1) External interlock device connection: the welder is provided with an external interlock connector for connecting external interlock safety devices (such as safety pedal and external emergency stop lamp); Only when the interlock connector detects a closed circuit, the equipment can normally output laser. If there is no external interlock safety device, please short circuit the external interlock connector.

(2) 220V power supply: the welder is powered by 220V AC. to ensure the safety, connect the welder with a ground wire.

(3) Welding gas: Welding gas is input through the $\Phi 12$ quick connector on rear panel.

(4) Welding gun: the welding gun is integrated with the welder base unit and cannot be disassembled.

(5) Work lead: before welding, attach workpiece clamp to the workpiece or the workpiece fixture that is electrically conducting with the workpiece.

4.2 Setup Space and Heat Dissipation Airflow



Figure 4-2 Airflow Direction and Setup Space

Precautions:

- (1) Air inlet at the bottom: the air inlet is provided at the bottom of the welder. Please ensure that the space under the welder is unobstructed.
- (2) Air outlet at the top: the air outlet is provided at the top of the welder. Please ensure that the space above the welder is unobstructed.
- (3) Setup space: at least 10cm space shall be reserved above, to the left and right sides of the welder.

4.3 Connecting Work Lead and Gas



Figure 4-3 Work Lead Connector



Figure 4-4 Gas Inlet Connector

The work lead is secured with M8 screws.

Gas inlet connector is a $\Phi 12$ quick connector that meets GB (China's national standard). The input gas pressure should be between 0.15Mpa and 0.3MPa.

4.4 Connecting External Interlock Signals



Figure 4-5 External Interlock Signal Connector

Connect the external interlock safety device as required. If there is no external safety device, the connector shall be short circuited.

4.5 Connecting External Power Supply



Figure 4-6 Power Supply Connector

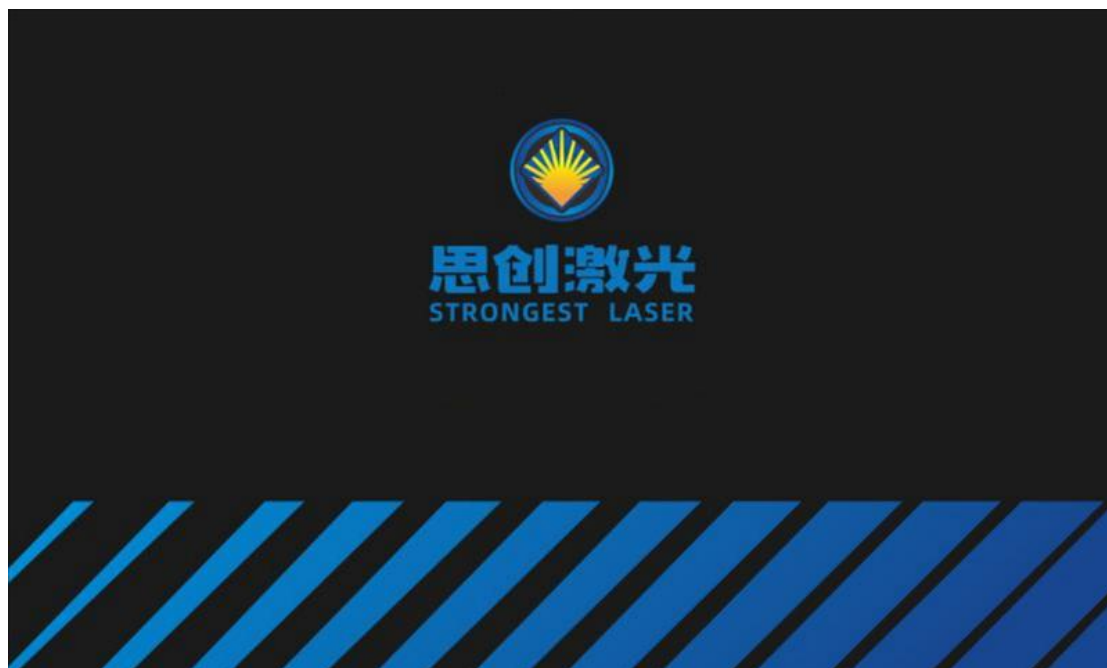
Note: please connect the welder a ground wire when the welder is working.

4.6 Startup of Welder

- (1) Prepare for equipment installation according to 4.1 - 4.5;
- (2) Start 220V power supply;
- (3) Press the Startup button at the top right of the welder, as shown in the following figure:



- (4) After pressing the startup button, the LCD enters the startup interface, as shown in the following figure:



- (5) After the startup is completed, the LCD enters the operation interface. At this time, the startup is completed and the welder can work normally.



4.7 Shut Down the Welder

Follow following steps to shut down the welder:

- (1) Release the Laser Output button of the welding gun to stop outputting laser;
- (2) Remove the workpiece clamp;
- (3) Pop up the Startup button to shut down the welder;
- (4) Stop inputting gas;
- (5) Turn off the power supply of the welder.

Chapter 5 Operating Features of the Welder

5.1 Front Panel Indicator Information



Figure 5-1 Front Panel Indicators

- (1) EMISSION indicator: it displays whether the welder is outputting laser. It turns yellow when outputting laser; otherwise it turns off;
- (2) GAS indicator: It turns yellow when there is no gas input or the air pressure is insufficient;
- (3) INERTLOCK indicator: It turns yellow when the interlock circuit is not closed due to disconnected work lead or no contact of welding nozzle tip with the workpiece;
- (4) WARNING indicator: It turns yellow when the working ambient temperature and humidity exceed the safe range;
- (5) ERROR indicator: It turns red when the welder fails.

5.2 LCD Information

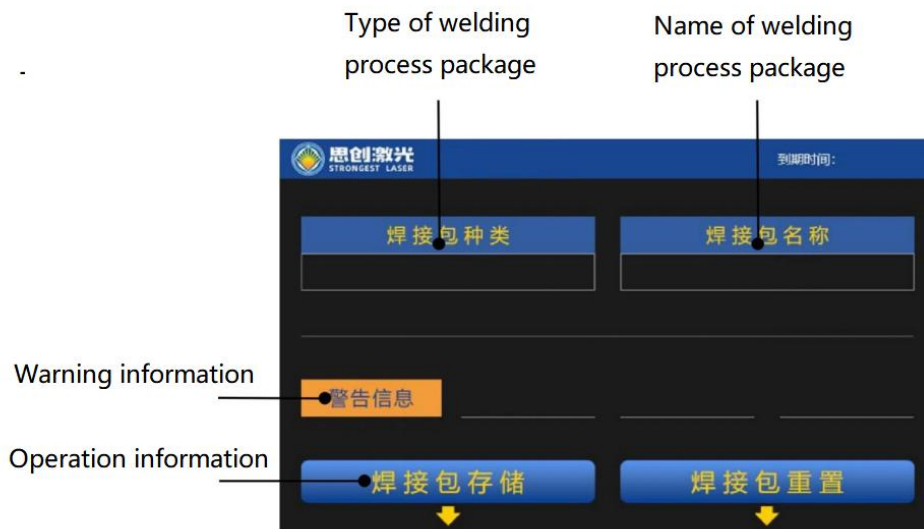


Figure 5-2 LCD Information Display

- (1) Welding process package type: by default, the welder has five welding process package types: aluminum, carbon steel, galvanized steel, stainless steel, and custom process package; Except for User-Defined Process Package, other types are factory built-in process packages;
- (2) Process package name: the name of the process package. The user-defined process package name can be set by the customer;

(3) Warning information bar: displays the current warning information of the welder;

(4) Operation information: displays the functions of the operation buttons below.

5.3 Features for process Package Switching



Figure 5-3 Switching Buttons of Process Packages

The operation of switching process package is as follows:

- (1) Short press a Previous button: switch to the previous process package;
- (2) Short press the Next button: switch to the next process package;
- (3) Long press the Previous button: switch to the previous process package type;
- (4) Long press the Next button: switch to the next process package type.

5.4 Operating Buttons



Figure 5-4 Operating Buttons

According to the LCD prompts, the functions of the operating buttons are as follows:

- (1) Left button: Press it to store the welding package, i.e., store the parameters of active welding package;
- (2) Right button: Press it to reset the parameters of active welding package parameters to the default parameters;

After operation, a window will pop up for confirmation. Press the left button again to confirm the operation, and press the right button again to cancel the operation.



Figure 5-5 Operation Confirmation

5.5 Power Adjustment

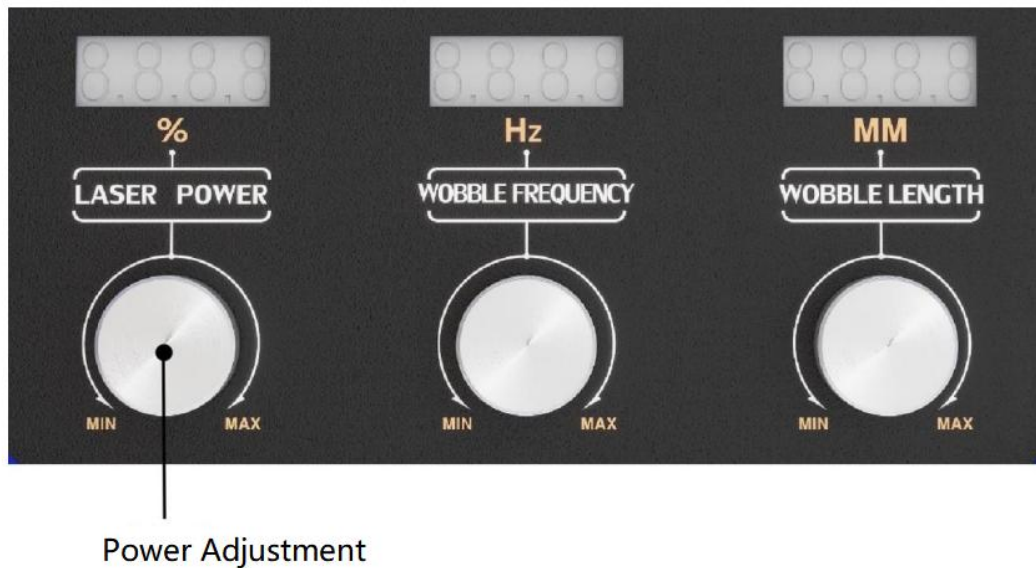


Figure 5-6 Power Adjustment

The digital display tubes will display the power percentage of the active process package. The operation of adjusting the power as follows:

- (1) Rotate the knob clockwise and the power percentage will be increased;
- (2) Rotate the knob counterclockwise and the power percentage will be decreased;

The range of power adjustment is 0%, 10% -100%. When the power percentage is 0%, there will be no laser output.

5.6 Wobble Frequency Adjustment

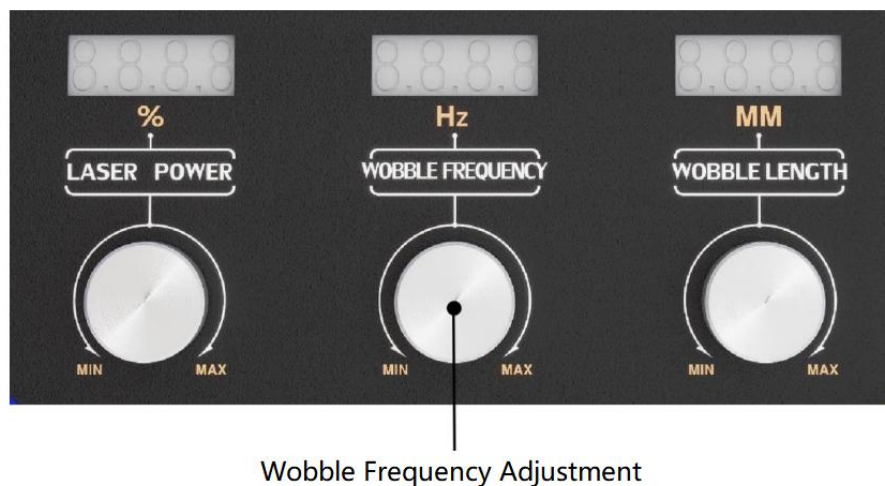


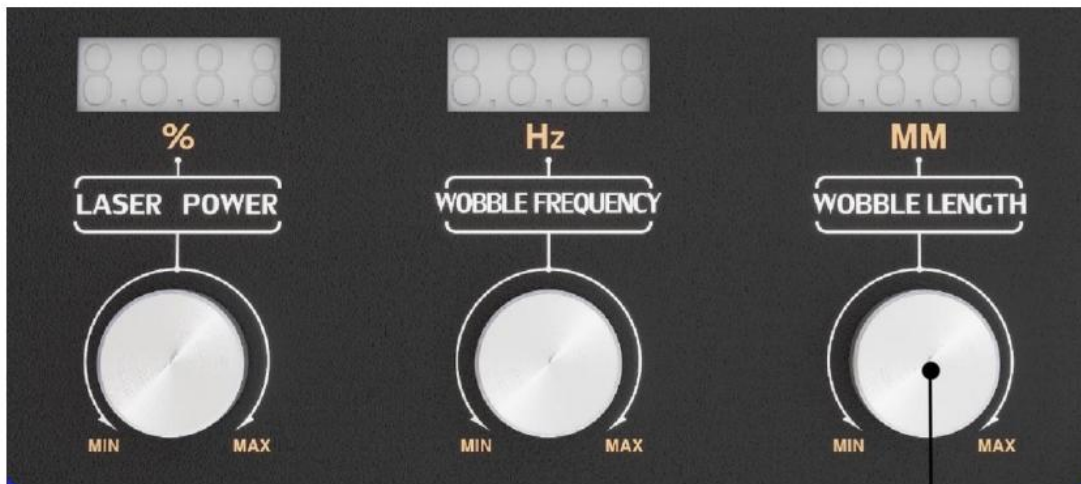
Figure 5-7 Wobble Frequency Adjustment

The digital display tube will display the wobble frequency of the active process package; Wobble frequency adjustment operation is as follows:

- (1) Rotate the knob clockwise and the wobble frequency will be increased;

(2) Rotate the knob counterclockwise and the wobble frequency will be decreased;
The range of wobble frequency adjustment is 0 - 200hz. When the wobble frequency is 0Hz, there will be no wobble.

5.7 Wobble Length Adjustment



Wobble Length Adjustment

Figure 5-8 Wobble Length Adjustment

The digital display tube will display the wobble length of the active process package;
Wobble length adjustment operation is as follows:

- (1) Rotate the knob clockwise and the wobble length will be increased;
- (2) Rotate the knob counterclockwise and the wobble length will be decreased;

The range of wobble length adjustment is 0 - 5.0 mm. When the wobble length is 0, there will be no wobble.

Chapter 6 Welding

6.1 Key Safety Features

6.1.1. Safety Interlock of Nozzle Tip and Work Lead

During welding, only when the nozzle tip and the work lead form a closed circuit, the laser is allowed to output. Before welding, the work lead should be attached to the workpiece. When the nozzle tip is not in contact with the welding surface, the welder will automatically stop outputting laser. When the work lead is not attached to the workpiece, the laser outputting operation is invalid.

6.1.2. Gas Pressure Protection Interlock

The gas pressure detection device is built in the welder. When the welding gas is not connected to the welder or the input gas pressure is less than 0.1MPa, the laser output operation is invalid; When the input gas pressure decreases during welding, the fault will be triggered and the laser output will stop automatically.

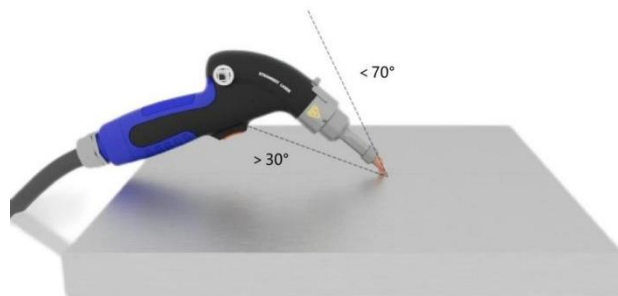
6.1.2. External Safety Interlock

The welder is provided with an external safety interlock connector, which can be used to connect safety devices such as safety pedal and external emergency shutdown device.

6.2 Quick Welding by Utilizing Process Package

Follow these steps to weld quickly:

- (1) Complete the welding system setup and connection as described in Chapter 4;
- (2) Startup the welder as described in Chapter 4;
- (3) Elect the appropriate process package as described in Chapter 5;
- (4) Contact the nozzle tip of the welding gun with the welding operation surface, and press the laser output button on the welding gun to began welding;



(5) In order to achieve the best welding effect, the included angle between the welding gun nozzle tip and the welding surface is controlled between 30 and 70 ° during welding;

(6) In order to prevent stray light from causing damage to human eyes, safety goggles should be worn.

6.3 Use and Replacement of Welding Nozzle Tips

The welder is provided with a variety of welding nozzle tips for users to replace; The steps for installing the copper nozzle tip are as follows:

- (1) Insert the copper nozzle into the air tube;
- (2) Put on the locking cap;
- (3) Tighten up the locking cap.



Figure 6-1 Schematic Diagram of Nozzle Tip Replacement

6.4 Use and Replacement of Protective Glass

During long-term welding, the protective glass is susceptible to damage caused by dust pollution; After the protective glass is damaged, the welding effect will be reduced and the temperature at the front part of the welding gun will rise. Therefore, when the welding quality is found significantly reduced, the protective glass should be pulled out for inspection. If it is damaged, it should be replaced. Just unscrew the retaining screw of the protective glass on the welding gun and the protective glass can be pulled out for replacement. Refer to the following figure for details.

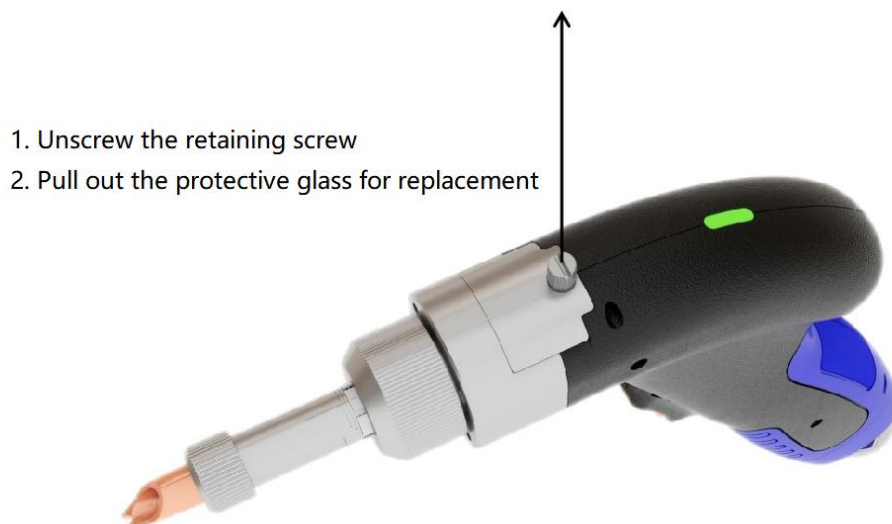


Figure 6-2 Replacement Operation of Protective Glass

6.5 Use and Cleaning of the Filter Screen

During the long-term use of the welder, the filter screen at its bottom is susceptible to buildup of a large amount of dust, resulting in the decline of heat dissipation effect and temperature failure; The operator shall regularly pull out the filter screen for cleaning. Refer to the following figure for the removal and installation of the filter screen.

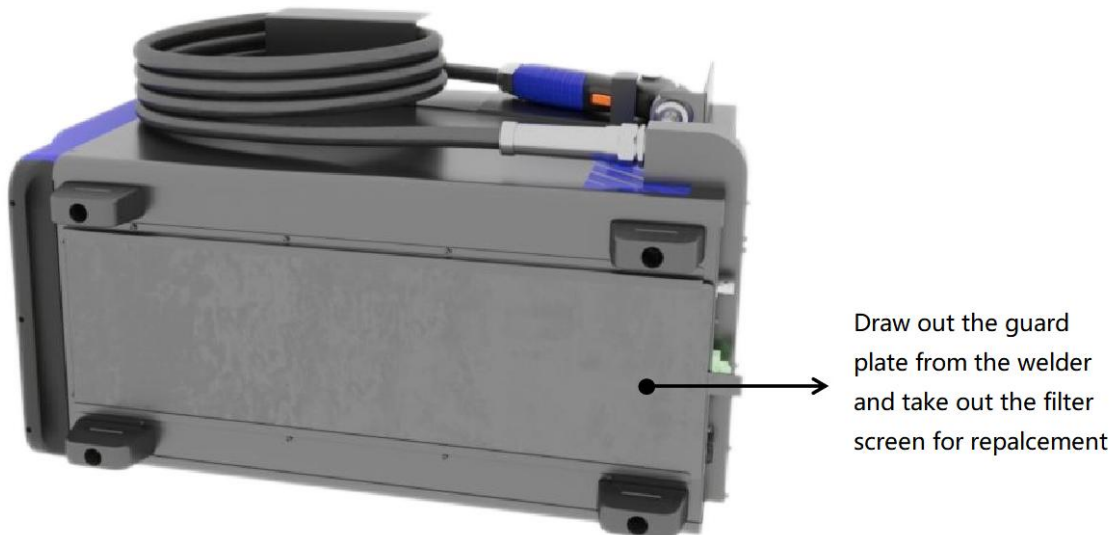


Figure 6-3 Schematic Diagram for Replacing Filter Screen

6.6 Use and Replacement of Feeder Tube Holder

Step 1: Remove the copper nozzle tip

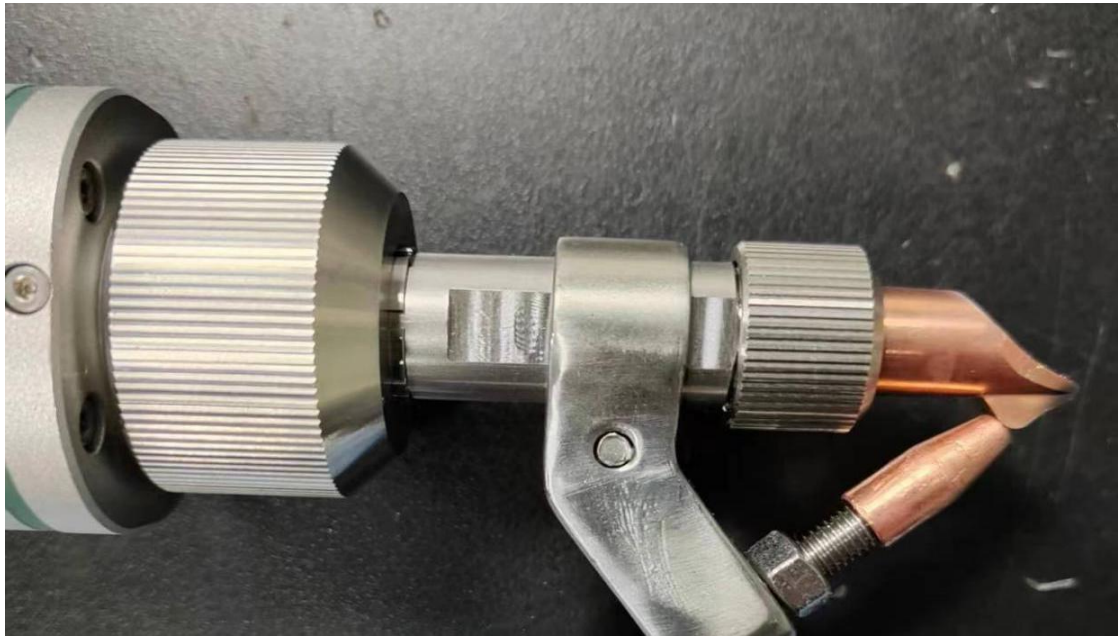


Step 2: Put on the feeder tube holder



Step 3: Reinstall the copper nozzle tip and adjust the wire feed guide nozzle to a proper position





Step 4: Secure the feeder tube holder

Chapter 7 Defining Welding Process Package

7.1 Preset Process Package

The welder has various preset process packages, all of which have been verified and can be directly accessed for use.

Table 7-1 Details of Preset Process Packages in STR- HW 550 Handheld Welder

Material	Aluminum	Stainless Steel	Carbon Steel	Galvanized Sheet
Thickness	1mm- wire feed	1mm- wire feed	1mm - wire feed	1mm - wire feed
	1mm	1mm	1mm	1mm
	2mm - wire feed	2mm - wire feed	2mm- wire feeding	2mm- wire feed
	2mm	2mm	2mm	2mm
	3mm - wire feed	3mm - wire feed	3mm - wire feed	3mm - wire feed
	3mm	3mm	3mm	3mm
	4mm - wire feed	4mm - wire feed	4mm - wire feed	-
	4mm	4mm	4mm	-
	5mm - wire feed	5mm - wire feed	5mm - wire feed	-
	5mm	5mm	5mm	-
-	6mm- wire feed	6mm- wire feed	-	
-	6mm	6mm	-	

Table 7-2 Details of Preset Process Packages in STR- HW 450 Handheld Welder

Material	Aluminum	Stainless Steel	Carbon Steel	Galvanized Sheet
Thickness	1mm - wire feed	1mm - wire feed	1mm - wire feed	1mm - wire feed
	1mm	1mm	1mm	1mm
	2mm- wire feed	2mm- wire feed	2mm- wire feed	2mm- wire feed
	2mm	2mm	2mm	2mm
	3mm - wire feed	3mm - wire feed	3mm - wire feed	3mm - wire feed
	3mm	3mm	3mm	3mm
	4mm - wire feed	4mm - wire feed	4mm - wire feed	-
	4mm - no wire feed	4mm	4mm	-

Table 7-3 Details of Preset Process Packages in STR- HW 350 Handheld Welder

Material	Aluminum	Stainless Steel	Carbon Steel	Galvanized Sheet
Thickness	1mm - wire feed	1mm - wire feed	1mm - wire feed	1mm - wire feed
	1mm	1mm	1mm	1mm
	2mm - wire feed	2mm - wire feed	2mm - wire feed	2mm - wire feed
	2mm	2mm	2mm	2mm
	3mm - wire feed	3mm - wire feed	3mm - wire feed	3mm - wire feed
	3mm	3mm	3mm	3mm

7.2 Quickly Setting of Customized Process Packages

The product provides 20 customized process packages, which can be set and used by users themselves.

Welder operator can quickly set customized welding process packages by using the features on the front panel. The specific steps are as follows:

- (1) Use the process package switch button to access any customized welding process package; customized welding packages adopt DC output mode by default;
- (2) Use the knobs on front panel to adjust the power, wobble frequency and wobble length of the user-defined welding process package;

(3) After the parameter adjustment is completed, use the function button to store the process package parameters;

The process package parameters will not be lost after storage even in case of power failure. User only need to switch to the customized process package next time.

7.3 Detailed Setting of Customized Process Package

The user can set all parameters of the customized process package in detail through the Wechat APP of STR; Refer to the following figure for details;

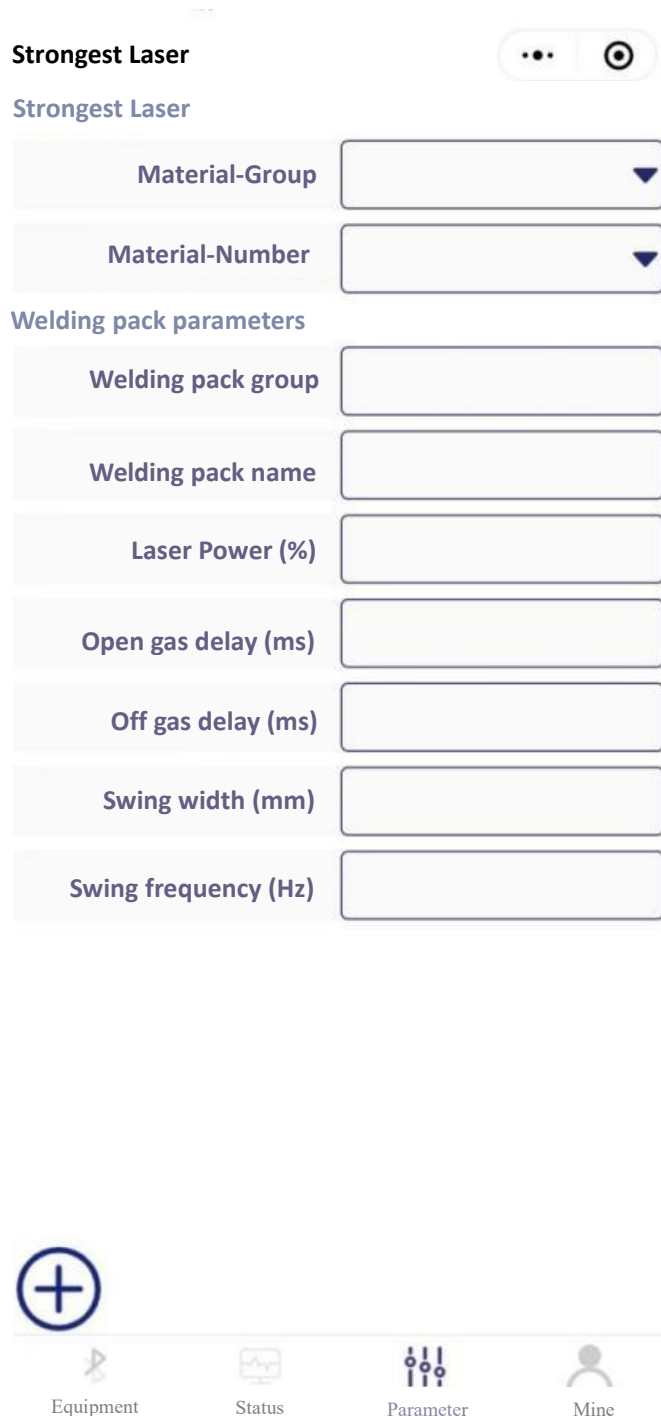


Figure 7-1 Setting Process Package Parameters via STR’s Wechat APP

The specific setting process is as follows:

- (1) Use Wechat to scan the QR code on the welder and enters the STR's APP;
- (2) Open the bluetooth of mobile phone, enter the "Device" interface of APP, and connect the device;
- (3) Enter the Parameter interface of the APP and select the corresponding welding package group and change;
- (4) Change the name or parameters of the process package in the column of "Active welding package parameters".

7.4 Welding Mode and Process Parameters

STR-HW welder series provide four welding process modes:

- (1) Continuous emission mode: output laser continuously;
- (2) Pulse emission mode: output the laser according to the specified frequency and duty cycle;
- (3) Spot welding mode: output a single laser for specified period and of specified parameters;
- (4) Continuous spot welding mode: output the spot welding laser of specified times.

7.4.1. Process Parameters under Continuous Laser Output Mode

S/N	Parameter Name	Parameter Definition
1	Laser output power	Percentage of laser output power used by process package, %
2	Wobble frequency	Wobble frequency of Laser output used by process package, Hz
3	Wobble length	Wobble length of light output used by process package, in 0.1mm
4	Gas output delay	Air output delay used by process package, in ms
5	Gas shut-off delay	Gas shut-off delay used by process package, in ms
6	Power ramping-up time	Time when laser output is ramping up, in ms
7	Power coasting-down time	Time when laser output is coasting down, in ms
8	Wire feeding speed	Wire feeding speed when supported by dedicated wire feeder of STR Laser, in cm/min
9	Wire feeding delay	Wire feeding delay when supported by dedicated wire feeder of STR Laser, in ms

7.4.2. Process Parameters Under Pulse Laser Output Mode

S/N	Parameter Name	Parameter Definition
1	Laser output power	Percentage of laser output power used by process package, %
2	Wobble frequency	Wobble frequency of Laser output used by process package, Hz
3	Wobble length	Wobble length of light output used by process package, in 0.1mm
4	Gas output delay	Air output delay used by process package, in ms
5	Gas shut-off delay	Gas shut-off delay used by process package, in ms
6	Laser output frequency	Pulse repetition frequency of laser output, Hz
7	Laser output duty ratio	Pulse duty cycle of laser output, %
8	Wire feeding speed	Wire feeding speed when supported by dedicated wire feeder of STR Laser, in cm/min
9	Wire feeding delay	Wire feeding delay when supported by dedicated wire feeder of STR Laser, in ms

7.4.3. Process Parameters under Spot Welding Laser Output Mode

S/N	Parameter Name	Parameter Definition
1	Laser output power	Percentage of laser output power used by process package, %
2	Wobble frequency	Wobble frequency of Laser output used by process package, Hz
3	Wobble length	Wobble length of light output used by process package, in 0.1mm
4	Gas output delay	Air output delay used by process package, in ms
5	Gas shut-off delay	Gas shut-off delay used by process package, in ms
6	Power ramping-up time	Time when laser output is ramping up, in ms
7	Power coasting-down time	Time when laser output is coasting down, in ms
8	Laser output duration for Spot welding	Laser output duration for Spot welding
9	Wire feeding speed	Wire feeding speed when supported by dedicated wire feeder of STR Laser, in cm/min
10	Wire feeding delay	Wire feeding delay when supported by dedicated wire feeder of STR Laser, in ms

7.4.4. Process Parameters under Continuous Mode

S/N	Parameter Name	Parameter Definition
1	Laser output power	Percentage of laser output power used by process package, %
2	Wobble frequency	Wobble frequency of Laser output used by process package, Hz
3	Wobble length	Wobble length of light output used by process package, in 0.1mm
4	Gas output delay	Air output delay used by process package, in ms
5	Gas shut-off delay	Gas shut-off delay used by process package, in ms
6	Power ramping-up time	Time when laser output is ramping up, in ms
7	Power coasting-down time	Time when laser output is coasting down, in ms
8	Laser output duration for Spot welding	Laser output duration for Spot welding, in ms
9	Interval for spot welding	Interval between two spot welds when there is no laser output, in ms
10	Spot welding times	Repetition times of spot welding
11	Wire feeding speed	Wire feeding speed when supported by dedicated wire feeder of STR Laser, in cm/min
12	Wire feeding delay	Wire feeding delay when supported by dedicated wire feeder of STR Laser, in ms

Chapter 8 Fault Information and Location

8.1 Fault Display

If any fault occurs to the welder, the corresponding indicators will go on, and the LCD screen will display the fault information as shown in the figure below.



Figure 8-1 Fault Displayed on LCD

8.2 Fault Reset

After the fault occurs, press any operation button to reset the fault. When the fault is reset, the LCD will give a prompt.

After resetting, if the fault has been cleared, the LCD screen will give a prompt that the resetting is successful, and the welding operation can be continued; If the fault remains, the resetting fails, and the LCD will give a prompt that the resetting fails.

8.3 Use APP to View Detailed Fault Information

You can open the monitoring interface of the APP to view the detailed fault information, as shown in the figure below.

Strongest Laser



Status

- Laser
- Interlocked
- Gas short

Warning

- The ambient temperature is excessively
- The ambient temperature is too high
- The environmental humidity is too high

Malfunction

<ul style="list-style-type: none"> <input type="radio"/> Abnormal heat dissipation system <input type="radio"/> Exception of gas pressure <input type="radio"/> temperature and humidity abnormal <input type="radio"/> Torch system abnormal <input type="radio"/> operating temperature Abnormal <input type="radio"/> The environmental humidity is too high 	<ul style="list-style-type: none"> <input type="radio"/> Initialization timeout <input type="radio"/> Fan system anomaly <input type="radio"/> Remote interlocking abnormal <input type="radio"/> Optical path abnormal <input type="radio"/> Device event locking wire <input type="radio"/> Feeder Exception
---	--

Wire feeding

START

STOP

Exasper ate.

START

STOP



Figure 8-3 Using APP to View Detailed Fault Information

8.4 Abnormalities and Troubleshooting

Table 8-1 Equipment Abnormalities and Location

S/N	Category	Abnormalities	Actions & Remarks
1	Warnings	Ambient temperature too high	Warning is sent out when the ambient temperature is approaching the upper limit
2		Ambient temperature too low	Warning is sent out when the ambient temperature is approaching the lower limit
3		High ambient humidity	Warning is sent out when the ambient humidity is approaching the upper limit
4	Faults	Abnormality has occurred to heat dissipation system	Abnormality has occurred to heat dissipation system inside the welder; Reset the welder to clear the abnormality. If the abnormality cannot be cleared, please contact after-sales personnel
5		Initialization timeout	The startup time of the welder is timeout, reset the welder to clear the abnormality. If the abnormality cannot be cleared, please contact the after-sales personnel
6		abnormal gas pressure	The input gas pressure is insufficient. Please check the input gas pressure and reset the fault
7		Abnormality occurs in fan system	The fan is faulty. After checking that the air inlet and outlet for no blockage, reset the fault
8		Abnormal temperature and humidity	Ambient temperature and humidity exceed the safety range. Please reset the fault in an ambient with suitable temperature and humidity.
9		Abnormality occurs in remote interlock	Remote interlock signal is disconnected. Please check the remote interlock signal connection and reset the fault
10		Abnormality occurs in welding gun system	Check protective glass of the welding gun for proper installation or any damage; Correct any improper installation or repair any damage to clear the fault
11		Abnormality occurs in optical path	Restart the welder. If any fault occurs again during welding, please contact after-sales personnel
12		Abnormal operating temperature	Check the air inlet and outlet for any blockage, clear the filter dust and reset any fault
13		Device time locking	This fault occurs when the welder exceeds the allowable service time, please contact after-sales personnel to unlock it
14		Abnormal driving power supply	If the power supply of the equipment is abnormal, this fault occurs. Reset the fault after it is abnormal. If the abnormality cannot be cleared, please contact the after-sales personnel
15		Abnormality occurs in wire feeder	The supporting STR Laser wire feeder suffers malfunction. Please check the wire feeder

Chapter 9 Warranty

9.1 General Terms

STR Laser provides warranty for any product it supplied that are defective due to materials or workmanship during the warranty period as specified in the contract, and warrant the user that under normal use, the product meet the relevant quality and specification requirements mentioned in the documents of the product.

STR Laser provides repair services or replace any faulty products it supplied due to materials or workmanship during the warranty period as specified in the contract. Such product involving repair services or replacement will be still covered by the warranty in the remaining warranty period of the original product.

STR Laser reserves the right, at its options, to repair or replace any products it supplied to which material or technical problems occur during the warranty period.

Important Information:

© STR Laser has not granted, does or will not grant any third party or individual the right to repair or replace any product that it supplied to the user.

9.2 Warranty Limitations

Any product, parts thereof, and/or any device are not covered by warranty terms against following issues:

(1) Any damage to any product and/or any parts thereof (including optical fibers) caused by alteration, opening, disassembling, improper assembling and/or modification by any person other than the qualified professionals certified by STR Laser;

(2) Any damage to lasers directly or indirectly caused by faults of user's software or any interfaces

(3) Any damage caused by misuse, negligence, etc., of the user or due to any accident;

(4) Any damage caused by use beyond specifications, improper installation or improper maintenance.

(5) Any damage caused by abuse or non-compliance with the information and warnings in the Product Manual;

(6) Any damage caused by improper installation, improper maintenance or use for unintended purpose or under other abnormal operating conditions not specified in this Manual.

Within the scope of the warranty, Buyer shall make a written request within 31 days of the date when the product problem is identified. This warranty does not involve any third parties (including the otherwise specified buyer, end user or customer), nor does it cover any parts, equipment or other products not produced by STR Laser.

Note:

© Customer is obliged to understand User Guide and operation instructions and operate the product in accordance therewith. Any product suffering any damage due to the wrong operation is not covered by this warranty. Accessories, consumables, etc. are also not covered by this warranty.

9.3 Technical Support

All servicing and repair activities, if necessary, on any components, parts or assemblies of Laser strike vehicle shall be performed by qualified persons.

In case that any fault occurs to any product in the process of using it, the qualified technical personnel of STR Laser should be notified in time for troubleshooting such fault.

Any product returned to STR Laser for repair or replacement shall be placed in the original packaging provided by STR Laser. Otherwise, STR Laser is entitled to paid repair service of any product suffering any damage caused thereby.

When the user receives the product from STR Laser, please check whether the product is intact and damaged. In case any abnormality is found, user shall contact the carrier or STR Laser in time.

STR Laser will continue to develop new products. The product information listed in this User Guide is subject to change without prior notice. The technical parameters as defined in the contract prevail.

The abovementioned warranty and service terms stated by STR Laser are for the user's reference only, and the formal service and warranty terms as agreed in the formal contract prevail.

STR Laser reserves the copyright of this User Guide and may make changes thereto from time to time without prior notice.

Redefining Handheld Laser Welding

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