

THANKS FOR PURCHASING OUR PRODUCT

**FR-LA-1000**  
**FR-LA-1500**  
**FR-LA-2000**  
**FR-LA-3000**

**Fiber Continuous Laser Handheld 4 IN 1 Machine**



# **OPERATION INSTRUCTIONS**

note: 4 IN 1:

Laser welding

Laser cutting





Laser weld bead smooth cleaning

Laser rust cleaning

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# Preface

Thank you for purchasing a Fiber Continuous Laser Handheld 4 IN 1 Machine from our Co., Ltd. If you are using this product for the first time, please read this manual carefully before installation and use. Please read carefully the contents marked "Danger", "Warning" and "Caution" in this manual, and carefully identify the Safety signs to ensure the safety of you and the people around you and the correct use of the equipment.

Logo	Signal language	Description
	<b>High Hazard Warning</b>	<b>Danger!</b> Beware of electric shock. Electrical safety precautions may cause the risk of electric shock and cause personal injury.
	<b>Hazard Warning: Beware of Laser</b>	<b>Warning!</b> Watch out for lasers. Note the content of laser radiation. There is a danger of laser radiation. Please take laser protective measures
	Be careful!	<b>Be careful!</b> Be careful. General hazard symbols, if you do not follow the instructions, it may cause damage and malfunction of the equipment
	Hazard Warning: Watch out for fires.	<b>Warning!</b> Watch out for fires. Pay attention to the content of fire safety, which may cause fire. Pay attention to fire prevention.



**When the laser welding machine is powered on, it is prohibited to turn the laser output head towards the direction of someone, Prohibit the laser output head from shining on the mirror surface of highly reflective materials.**



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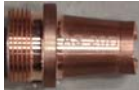


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## Quick Installation Operation Guide

4 IN 1	Operating System	configuration
Laser welding (page 15)	Laser welding system	Factory default configuration
Laser cutting (page 19)		Replace with cutting nozzle 
Laser weld bead smooth cleaning (page 19)		Replace with AS-20D nozzle 
Laser rust cleaning (page 20)	Laser cleaning system	Replace with Focusing lens  and Cleaning nozzle 

## I. Product overview

FR-LA- series "fiber continuous laser hand-held 4 in 1 machine" is composed of integrated cabinet, fiber laser, refrigeration water circulation system, laser control system and hand-held welding joint. This product is widely used in metal advertising word welding, stainless steel engineering welding, sheet metal cabinet welding and large sheet metal structure welding

Laser welding is a new type of welding method and one of the important aspects of laser material processing technology. Laser welding is mainly aimed at the welding of thin-walled materials and precision parts. The welding process belongs to heat conduction type, that is, laser radiation heating workpiece surface, surface heat diffusion through heat transfer guide internal diffusion, by controlling the laser pulse width, energy, peak power and repetition rate parameters to melt the workpiece and form a specific molten pool. It can realize spot welding, butt welding, stack welding, seal welding, etc., with high depth-to-width ratio, small weld width, small heat affected zone, small deformation, fast welding speed, flat and beautiful weld, high quality of weld, no porosity, accurate control, small focus, high positioning accuracy and easy automation. High power CO<sub>2</sub> and high power YAG lasers have opened up a new field of laser welding, obtained deep welding based on the small hole effect, and have been widely used in machinery, automobile, steel and other industrial sectors.

## II. Main technical parameters:

model	FR-LA-1000	FR-LA-1500	FR-LA-2000	FR-LA-3000
Electricity requirements	1~220V± 10%, 50/60Hz	1~220V± 10%, 50/60Hz	1~220V± 10%, 50/60Hz	3~380V± 10%, 50/60Hz
Laser wave length	1080nm ± 5			
Laser output power	1000W	1500W	2000W	3000W
work pattern	Continuous wave or modulation			
Beam quality	M2<1.2	M2<1.2	M2<1.5	M2<1.5
output power stability	± 2%			
Power	≤ 6KW	≤ 8KW	≤ 9KW	≤ 13KW
refrigerating system	Custom-made industrial double-temperature double-control chiller			
Fiber length	5m~10m customizable			
Welding thickness range	≤ 2mm	≤ 2mm	≤ 3mm	≤ 4mm
Cutting thickness range	≤ 1.5mm			
Applicable materials	Carbon steel, stainless steel, galvanized sheet, aluminium and aluminium alloy			
weld joint requirements	<0.2mm			
Pressure or flow rate of gas	0.3Mpa~0.5Mpa(Air,N <sub>2</sub> ) or 15L/min(Ar)			
Fiber optic interface	QBH			
speed of welding travel	0~120mm/S			
Overall size	1000*600*1260			
Overall weight	200kg			

### III. Working conditions and working environment

**1, working conditions:** supply voltage: 1~ AC 220 V $\pm$ 10% (FR-LA-1000,1500,2000)

3~AC 380V $\pm$ 10% (FR-LA-3000)+N+PE

Frequency :50/60 Hz

Reliable protective grounding.

#### **2. working environment:**

a)please use in the surrounding temperature 10 °C ~40 °C , the surrounding humidity environment  $\leq$ 70%,

no sharp temperature change place.

Please also avoid the following places :

- garbage, dust, oil fog places ;
- vibration and shock places; places that can
- touch drugs; places near high frequency interference sources; places
- easy to dew;
- in high concentration environments such as CO<sub>2</sub>、 NOX 、 SOX

b)when the ambient temperature drops below 0 °C , the water in the equipment will freeze and the equipment may be damaged. Use to ensure that there is no ice inside the equipment.

c) If the temperature changes sharply, the YAG crystal end face and the optical lens will be exposed, stains and fog spots, be sure to prevent sharp environmental, if difficult to avoid, please use the equipment after ensuring no condensation.

### IV. Installation considerations :



#### **4.1 Safety Warning Mark**

Laser output window, do not watch or contact the laser beam. The mark is affixed to the lifting arm of the welding machine.

● the product is a laser-like product, lasers can produce dangerous diffuse reflection, use such lasers to be particularly careful. Has a wavelength of 4 Laser radiation beyond 400 nm~700 nm. Eyes are exposed to direct or scattered laser light, visual intensity may lead to retinal damage, visual impairment or visual loss. The skin is exposed to direct laser or scattering, and the intensity of visual exposure may result in erythema, carbonation, pigmentation, ulcers, scars or subcutaneous tissue damage

The mark is affixed to both sides of the beam expanding mirror arm of the welding machine.

● laser cavity high-voltage discharge electrode, pay attention to safety to prevent electric shock, should be overhauled by trained professionals.

- cooling water must be deionized water or pure distilled water and keep clean. Pay attention to freezing below the degree 5.

- Make sure that the water level in the tank is in the marked position before starting the machine, check the water level of the tank every week and change the water according to the requirements, otherwise the equipment may not work properly or even damage the equipment.

Clean the surface of the tank as required, otherwise it may cause leakage and electric shock

- water level in the tank should be ensured in the marked position before starting the machine, the water level of the tank must be checked weekly, otherwise it may cause the equipment not to work properly the equipment damage

#### **4.2 safety management warning**

a) do not watch or contact the laser beam (whether using protective glasses or not). Do not touch the laser or diffuse laser output from the device, otherwise it will cause blindness or burns.

b) non-professional personnel are forbidden to disassemble, repair and modify the equipment by themselves. If the electric shock or fire caused by the above reasons, please be responsible for the consequences. Conduct safety knowledge education and command production process for field operators. Do not perform operations other than maintenance as indicated in the instructions.

c) please use the specified wire, cable, if the use of insufficient capacity wire, cable or connection method is incorrect, will cause fire or electric shock.

d) power equipment must be grounded by a third party, otherwise it may cause electric shock in case of failure or leakage.

e) the use of pacemaker personnel do not approach the equipment, welding machine will produce magnetic field, affecting the normal operation of the pacemaker.

f) prohibit the use of this equipment for other than metal processing, if there are other processing requirements, please choose our other special equipment.

g) in the area where there may be direct or indirect laser radiation, a baffle is set up to distinguish it from other areas, and a label is made to the area for safety 3 full warning, and no unrelated personnel are allowed to enter.

#### **4.3 Laser safety notice**

laser welding machine adopts closed laser light path design, which can effectively prevent the leakage of laser radiation. During the operation of the laser welding machine, please note the following:

a) during the normal operation of the laser, no parts and articles shall be added to the welding machine. This welding system shall not be used in the open state of the seal cover.

b) in the maintenance output laser, do not touch the parts that are not related to the

maintenance, and please use the high temperature resistant light absorber, diffuse body as the baffle to prevent laser leakage.

c) laser processing or after the end of processing, the workpiece is still in a high temperature state, do not touch the workpiece immediately.

#### **4.4 Electrical Safety**

a) Do not damage power lines and cables. Do not step, twist, pull the cable. Cable damage can cause electric shock, short circuit, fire.

b) there are coke odor, abnormal sound, abnormal heat, smoke and other abnormal phenomena, please turn off the power supply to stop, and immediately contact the company, otherwise there is a risk of electric shock, fire and so on.

c) equipment should avoid the existence of foreign bodies, especially metal or conductive objects, to prevent short circuit or failure.

d) this equipment is not used in wet environment, the electrical part may cause electric shock or short circuit.

e) must cut off the welding machine power when replacing the laser xenon lamp.

f) Do not power equipment when it does not need to work.

#### **4.5 Material Safety Notice**

a) For stains outside the system, wipe them with dry or slightly wet cloth and, if necessary, with diluted neutral detergent or alcohol. Please do not use special solvents, gasoline, etc., otherwise it will cause structural deformation or surface discoloration.

b) avoid placing liquid containers on the chassis. Water spills can damage insulation and corrosive liquids corrode equipment.

#### **4.6 Fire Safety(extinguishing and protection)**

a) It is forbidden to pile up flammable and explosive materials and sundries around the machine. There is a spark spatter during welding, and a fire will occur when combustible.

b) Flammable and explosive materials shall not be placed on the optical path or where the laser beam may shine. If the laser beam is irradiated on flammable and explosive materials, it may cause fire or explosion.

c) Do not cover blankets, cloth and other textiles on the equipment during use to avoid fire caused by equipment heating.

d) If the machine is on fire or explosion, be sure to cut off all power and use carbon dioxide or dry powder fire extinguishers; or use dry sand to extinguish flames.

## **V. Installation and commissioning**

### **5.1 Delivery Inspection**

#### **5.1.1 Out-of-the-box Notes**

- Please keep the original packing box for the equipment
- please check the packing list for random accessories, if the random accessories are not complete, please contact us at the address on the warranty list

#### **5.1.2 to check the contents**

- First of all, please check the machine shell for obvious defects.

- if the random accessories are not complete or the whole machine has obvious defects, please contact us at the address on the warranty.

### 5.2 Confirm installation environment

- Main power supply:

power grid fluctuation < 5%(if power supply, use 5 line system: there should be a zero line, three fire line, a ground line )

power supply frequency:50/60 Hz , voltage should be consistent with the input voltage after the machine

The ground wire of the power network meets the requirements of the national standard of the machine room

- If the power supply of the circulating is power supply, use 5 line system: there should be a zero line, a fire line and a ground wire

power supply frequency ,50/60 Hz 220V ( 380V) 20A

grid ground wire meets the requirements of the national standard

- cooling water:

deionized water or pure distilled water and keep clean

### 5.3 Installation, fixing methods and precautions

a) Main cabinet pendulum position, adjust the basic level of the table, lock the foot, such as the right;

b)Install welding torch cable support rod, as shown on the right, install the upper part of Feng host. Install and lock with four fastening bolts;

c) connect the main power cord, the water pipe from the main engine to the chiller has been connected, the power cord of the chiller has been connected, the water tank has been added to the water tank (internal circulating water tank, chiller water tank has been connected, water process reference appendix or read the installation manual for laser chiller);

d) turn on the mainframe power supply, turn on the chiller power supply, adjust the light path properly to start working.

#### **During installation, please note the following:**

a) Please designate personnel with sufficient knowledge and experience in laser and laser devices as equipment administrators.

b) this equipment must be installed in a fixed level without tilt, the device tilting or dumping



will cause failure.

c) the installation and adjustment of the system by the company's professionals to complete.

d) switch, button please be careful with hand operation, random operation or with screwdriver, pen tip and other objects will cause equipment failure or damage.

e) Switch, button, etc. Please be careful to operate one by one in order to avoid switching multiple switches at the same time to cause equipment failure.

f) outer plate and lid are connected with ground wire and equipment body respectively. After removing the outer plate and lid, if you restore the original position, be sure to reconnect the ground wire. Do not clip the ground wire between the outer board and the main body of the equipment during installation to prevent the impact of the optical path.

## **5.4 Optical System Debugging**

### 5.4.1 Note for Debugging

- the coating layer of optical elements is easy to be contaminated by dust, try to avoid the exposure of optical elements to air.

- if the laser hits a nearby target, avoid smoke contact with the optical elements on the optical base.

- do not touch the surface of the optical element by hand, if necessary, must bring a thin film finger sleeve.

- If optical elements need to be wiped, use high purity anhydrous ethanol and optical mirror paper.

- take the eyeglass and optical lens, only contact its edge.

- before moving the eyeglass or optical lens, pay attention to observe the installation direction of the eyeglass or optical lens.

- welding or dimming should wear protective glasses to avoid looking directly at the laser.

- avoid eyes in the diode laser light path, if necessary, must turn off the diode laser power.

- observing the burning shape or red light position of phase paper during dimming, the light should be stopped and the light locking switch should be turned off.

- Before open the upper cover of the chassis or operate the pump chamber, the air switch of the power box must be turned off. After waiting for 5 minutes and measuring the voltage between the positive and negative electrodes of the energy storage box with a multimeter, the voltage should be reduced below 5V.

### 5.4.2 laser spot adjustment

a) the adjustment of the target laser spot is mainly to adjust the total reflection lens, the parallelism of some reflection lenses and the perpendicularity between them and the laser rod by using the red indicator light to make the spot energy maximum, and the red light is coaxial with the laser.

b) the beam expanding mirror and the focusing mirror

the spring force is stuck on the focusing mirror sleeve, and the beam expanding mirror is pushed away from the focusing mirror sleeve, and can be removed. Focus sleeve by thread on 45° reflector seat, counterclockwise rotation can be rotated.

## VI. Boot workflow

1. Confirm that the external contact is normal, open the rear part of the equipment air switch ;  
2. Check that the emergency stop switch is open normally, confirm that the key switch is turned on, then the machine power indicator lighting up ;



3. Make sure the equipment is on, press the chiller(watertank) switch,check that the water cooler is running normally, if there is leakage or the water cooler is not working, please check the power off ;

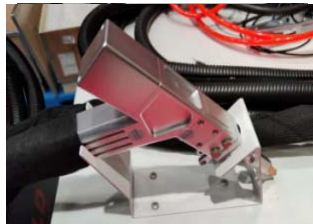
4. Turn on the laser and select the external control mode (if there is a difference in the laser brand, please ask our laser related technicians before the first boot);

5.After the laser self-test process (laser self-test process within about 30 seconds, please wait patiently) can operate the device on the touch screen;

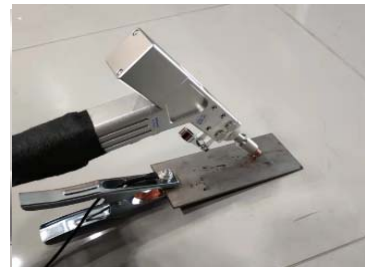
6. adjust the first parameter on the touch screen to the need of welding, click on the interface " start" and then connect the protective ground wire clamp to the welding product, you can weld through the touch button on the handheld gun;



Fiber optic support frame



Handheld torch holder



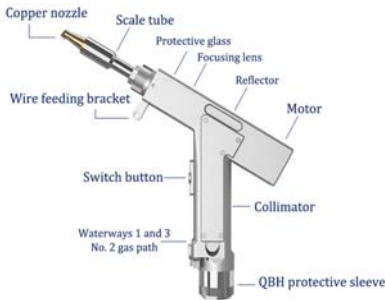
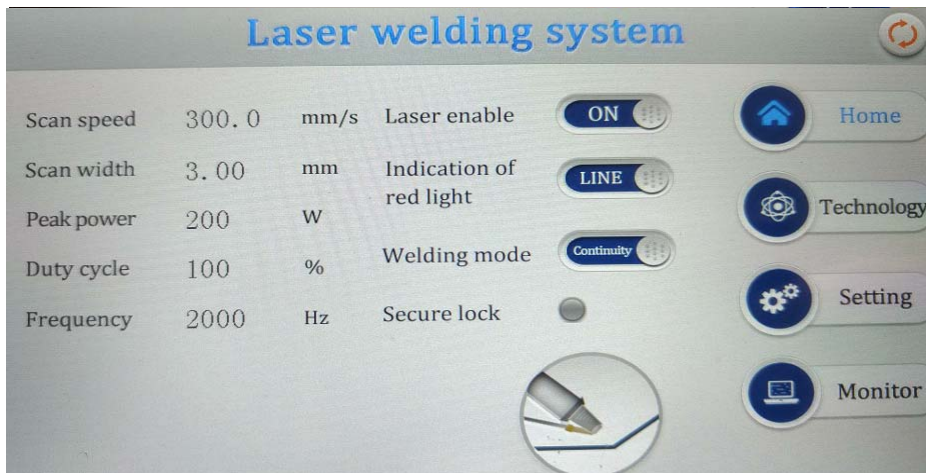
Ground wire clamps must be attached to work during welding

**Note: must ensure that the protective gas connected, very important, if there is no protective gas, easy to damage the welding torch.**

**Press the panel gas detection button to adjust the flow of protective gas.**

7.When working and stopping work, please pay attention to the fiber is not more than 60 the degree of bending, redundant fiber hanging on the fiber support;

8. work from the handheld welding gun rack, stop work or stop work, please hang the welding torch on the support to avoid unnecessary losses.



Handheld welded joint

T1 Handheld welded joint K1

### safety protection

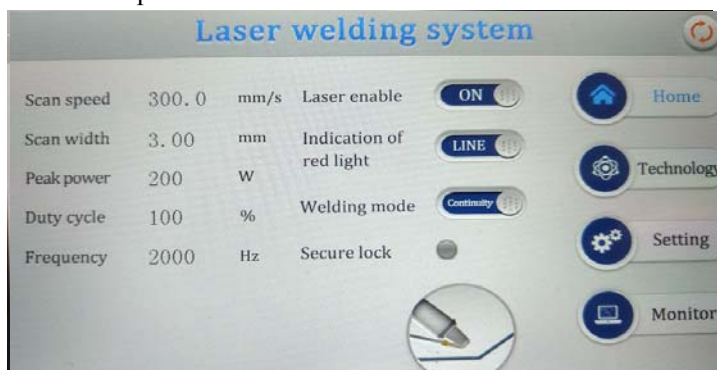
- a. in the process of laser welding, please wear protective gloves and laser protective glasses;
- b. the working process is strictly prohibited to the gun head to people, stop use or temporary suspension of use, please click on the interface to close the button.
- c. When welding some high-verse materials, please pay attention to the high-temperature reflection area. (aluminium sheet, copper sheet, galvanized sheet)

## VII. Control panel and operation guide

### 7.1 Operation summary and operation guide

The operation panel of SUP series is mainly composed of touch screen and control box. Touch the main page, process, setting, and monitoring of the operation interface.

#### 7.1.1 Touch screen operation main screen



- ① In this interface, you can see the current process parameters and instant alarm information.
- ② The laser is enabled and the indicator red light is ON when it is turned on.
- ③ The safety lock is usually gray, and when the welding head touches the workpiece, it becomes green and can be processed.
- ④ Welding mode selection, the default is continuous. When it is set to spot welding, it can emit light intermittently for spot welding operation, which is convenient for controlling the spot welding time due to human error. This function needs to be set as needed

### 7.1.2 Process operation main screen



- ① The process interface contains the process parameters for debugging, which can be modified by clicking the box. After the modification is completed, click OK, and then save it in the shortcut process. When using it, click Import (Modify-Save-Import).
- ② The scanning speed range is 2-6000mm/S, and the scanning width range is 0^5mm. The scanning speed is limited by the scanning width. The limitation relationship is:  $10 \leq \text{scanning speed} / (\text{scanning width} * 2) \leq 1000$ . If it exceeds the limit, it will automatically become the limit value. When the scan width is set to 0, it will not scan (ie point light source) (the most commonly used scan speed: 300mm/S, width 2.5mm).
- ③ The peak power must be less than or equal to the laser power on the parameter page (for example, the laser power is 1000W, then the value is not higher than 1000).
- ④ Duty ratio range 0~100 (default 100, usually do not need to change).
- ⑤ The recommended pulse frequency range is 5-5000Hz (the default is 2000, usually it does not need to be changed).
- ⑥ Click the HELP button on the upper right to get more related parameter explanations.

Process reference (subject to actual conditions, the following is for reference only)

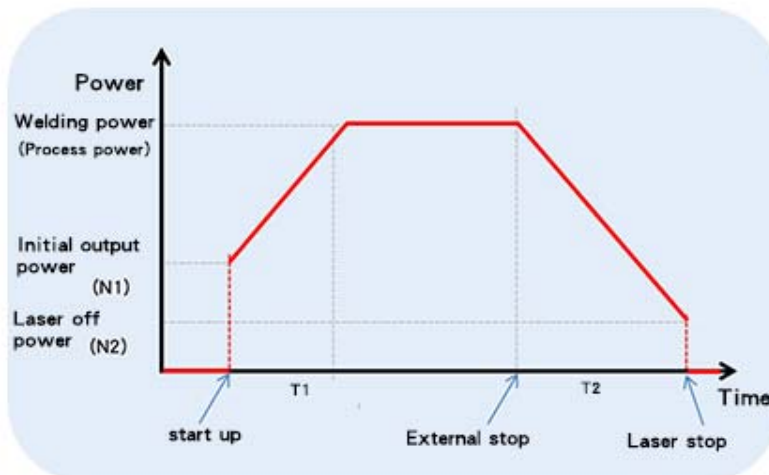
Material	Material thickness	Wire feeding speed	Scan speed	Scan width	Power	Duty cycle	Pulse frequency	Welding wire
Stainless steel	1mm	90m/s	300mm	2.5mm	400W	100%	1000hz	1.0mm
Stainless steel	2mm	75m/s	300mm	3.0mm	700W	100%	1000hz	1.0mm
Stainless steel	3mm	60m/s	300mm	3.5mm	900W	100%	1000hz	1.0mm
Carbon steel	1mm	90m/s	300mm	2.5mm	400W	100%	1000hz	1.0mm
Carbon steel	2mm	75m/s	300mm	3.0mm	600W	100%	1000hz	1.2mm
Carbon steel	3mm	60m/s	300mm	3.5mm	900W	100%	1000hz	1.6mm
Aluminum	2mm	60m/s	300mm	2.5mm	700W	100%	1000hz	1.0mm
Aluminum	3mm	60m/s	300mm	3.0mm	900W	100%	1000hz	1.2mm

### 7.1.3 Set operation main screen

Input: Password 123456, Press OK to enter the interface



- ①The laser power is the maximum power of the laser used.
- ②The switch air delay defaults to 200ms, and the range is 200ms-3000ms.
- ③When the light is turned on, it will gradually increase from N1% of the process power to 100%; when the light is turned off, it will gradually increase from 100% of the process power. To N2; (as shown in the figure below).



④ Wire feeding delay compensation is the wire feeding advance time relative to the light signal, which can be used in conjunction with the withdrawal function.

⑤ The maximum temperature alarm threshold is 70 °C . When the value is set to 0, the temperature alarm will not be detected.

⑥ Scan correction coefficient range 0.01~4, coefficient target line width/measurement line width: generally 1.25.

⑦ Laser center offset -3~3mm, reduce it and move it to the left, increase it and move it to the right.

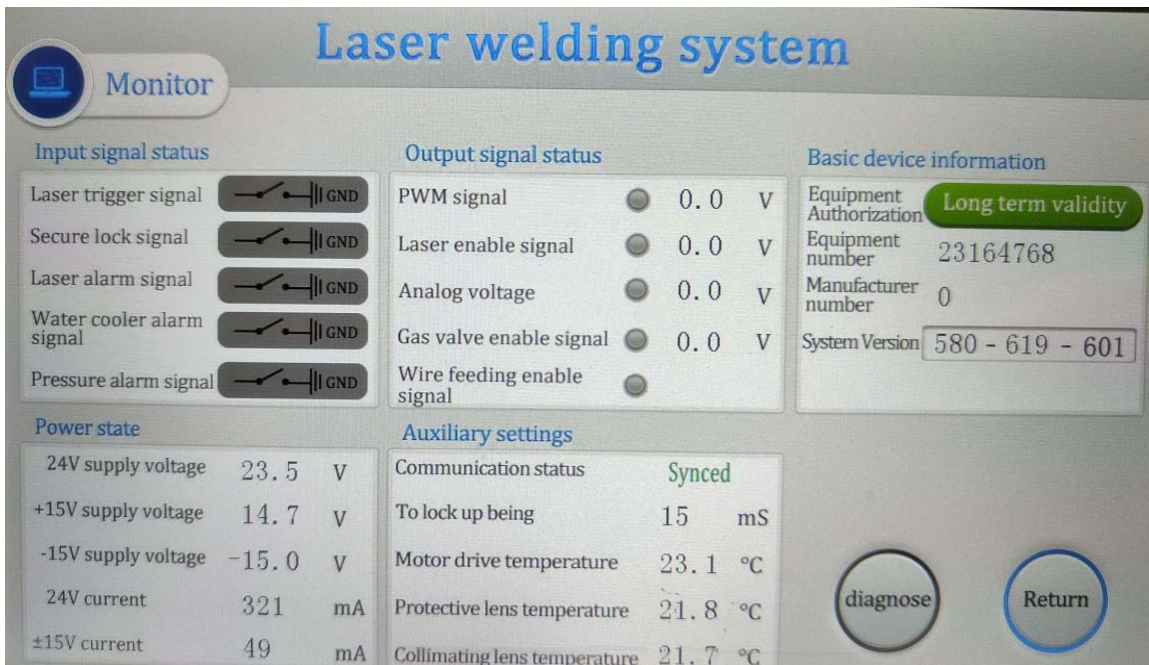
⑧ The alarm level signal is the default, and the shielded alarm can be directly changed to the corresponding level detection.

⑨ Spot welding duration is the light emitting time after pulling the trigger, that is, even if the button is released, the light will still be emitted according to the time spent.

⑩ Spot welding interval time is the stop light time between two spot welding after pulling the trigger button .

⑪ Click the HELP button on the upper right to get more related parameter explanation.

#### 7.1.4 Monitoring main interface



This interface shows the status of each detection signal and device information

#### 7.2 How to maintain and replace protective lenses:

① The processing characteristics of laser welding require regular maintenance of the lens. If

the welding effect is found to be poor, check that the protective lens is dirty, and the protective lens should be replaced in time.

② The cleaning technology of the lens is extremely important. If it is not cleaned well, the performance of the lens will be reduced, and the lens will be damaged if it is not cleaned. Therefore, you must be very careful when cleaning the lenses.

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

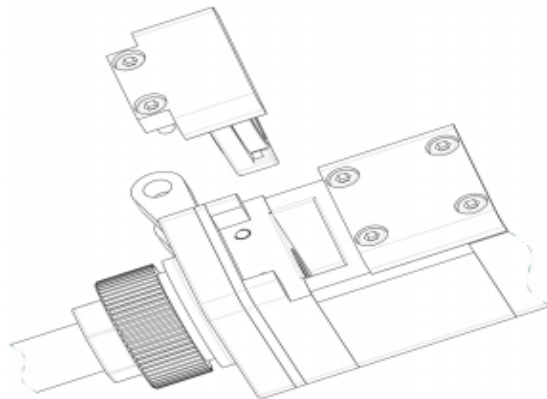
④ Before cleaning, prepare a balloon (leather tiger), a set of clocks, dust-proof non-stick tape, anhydrous absorbent cotton (fine cotton), more than 99% industrial alcohol, finger cots or rubber gloves, and lens cleaning paper.

⑤ Remove the screws of the protective lens compartment cover in a relatively dust-free place, pull out the protective lens holder, and check the protective lens. If the protective lens is contaminated, it must be wiped clean with lens cleaning paper dipped in absolute alcohol. (If there are obvious burning spots on the surface of the protective lens, it should be replaced directly.)

⑥ Then check the white accumulating sealing ring under the protective lens. (If there is any scratch or deformation of the accumulating sealing ring

They cannot be used and must be replaced immediately.

⑦ Use a cotton ball dipped in alcohol to wipe the mouth of the compartment and the inside of the compartment cover, quickly insert the protective lens holder into the protective lens compartment, and tighten the screw.



### 7.3 Laser center adjustment method (oblique viewing angle)

When the red light cannot completely come out of the copper nozzle, manual adjustment is required at this time to prevent the copper nozzle from being burnt Please note: When using for the first time, when the red light cannot come out from the copper mouth, be sure not to emit light

① As shown in the figure below, no red light can be seen completely coming out of the copper

mouth at this time



②. We need to remove the back cover, you can see four adjustment screws, adjust the center according to the video

③. Finally, this effect can be achieved



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

## 7.4 Laser welding

### Operating System: Laser welding system

7.4.1 If the system is in "Laser cleaning system", Follow the diagram below to operate



7.4.2 Refer to 7.1 for parameter adjustment, Welding nozzle used "AS-12,BS-16,CS-12,ES-12, FS-16,C ",According to the actual situation, please refer to the packing list



1. Inner corner nozzle AS-1.2



2. Inner corner nozzle BS-1.6



3. Outer corner nozzle CS-1.2



External corner welding diagram



Internal corner welding diagram



Flat welding diagram

7.4.3 Connect as shown in the figure below

Laser enable  ON The switch can be soldered when ON, but cannot be soldered when OFF

Scan width 3.00 mm Do not set it to 0, otherwise it will be difficult to weld



#### 7.4.4 Installation of wire feeder

##### 7.4.4.1、 Installation of welding wire disc

a. The welding wire is a regular welding wire, which can be installed from 5KG to 30KG, but do not use flux cored welding wire

b. Adjust the force of the roller through the inner hexagon to ensure it is not too tight or loose, and there is no jamming during wire feeding (usually no adjustment is necessary)

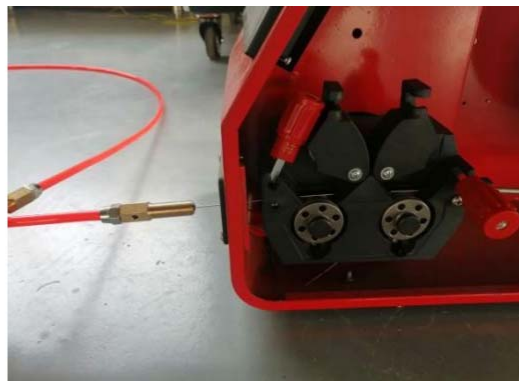
After adjustment, cover the cover cap (as shown in the following figure)



##### 7.4.4.2、 Installation of wire feeding wheel

a. There are a total of 4 wire feeding wheels (0.8/1.0; 1.2/1.6), with different models on both sides, corresponding to different core diameters. Please be sure toCorresponding installation (2 for 1 group), if installing 1.2 welding wires, the side marked with 1.2 on the wire feeding wheel is on the outside (as shown in the following figure).

b. During installation, be sure to clamp the welding wires in the slot and then clamp them again (as shown in the following figure)



##### 7.4.4.3、 Installation of wire feeding tube

a. After placing the wire into the wire feeding tube, insert it, and then tighten the screw (as shown in the right figure above)

b. When installing the wire feed pipe, first remove the copper nozzle on the end that

comes out and match it with the corresponding copper nozzle (As shown in the left figure below )



#### 7.4.4.4、 Signal and power supply part

a. At the rear of the wire feeder, there are two aviation plugs, of which two cores are wire feeding signals connected to the wire feeding interface of the cabinet. This signal is a short circuit signal, that is, the wire feeding is often closed and not a 24V input

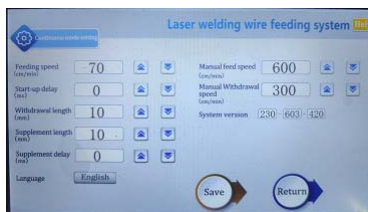
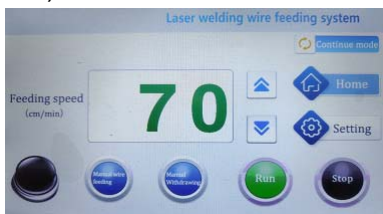
b, Another three core aviation plug serves as the power supply, with a 220V power supply (as shown in the right figure above)

#### 7.4.4.5、 Operation panel

a. The numerical display on the homepage shows the wire feeding speed, which can be adjusted by pressing the up and down keys. Please keep it running while using it

b. Manual wire feeding: After pressing and holding, the wire feeding machine starts to feed wire. The manual wire feeding speed depends on the background settings

c. Manual withdrawal: After pressing and holding, the wire feeder starts to withdraw. The manual withdrawal speed depends on the background setting (As shown in the left figure below)



d. After completing all settings on the settings page, click on "Save" (as shown in the right figure above)

e. Set the wire feeding speed on the page to the default wire feeding speed, that is, after changing it here, the machine will still remain on and off unchanged

f. Start delay: not set by default

g. Pullback length and wire repair length: set according to actual usage When the wire

feeding is stopped, the system will first retract a certain distance and then feed the wire at a certain distance. This function is mainly used for wire breakage. When the wire is still outside at the beginning of each welding, please set the withdrawal length to be greater than the repair wire length.

7.4.5 Check if the gas is normal. After all settings are completed, press the gun switch to perform welding.

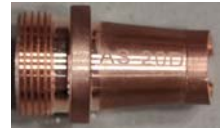
## 7.5 Laser weld bead smooth cleaning

**Operating System: Laser welding system**

7.5.1 If the system is in "Laser cleaning system", refer to 7.4.1 to operate

7.5.2 Refer to 7.1 for parameter adjustment, Welding nozzle used "AS-20D"

7.5.3 Connect as shown in the figure below, press the gun switch to perform



weld bead smooth cleaning.

Laser enable	<input checked="" type="checkbox"/>	ON	The switch can be soldered when ON, but cannot be soldered when OFF
Scan width	3.00	mm	Set to slightly wider than the weld bead

## 7.6 Laser cutting

**Operating System: Laser welding system**



1. There should be no flammable or explosive materials in the cutting area.



2. The cutting spot should not come into contact with human parts, otherwise there is a risk of serious burns.

3. Within the range of the light spot below the cutting workpiece, a 3mm or more

iron plate or sink must be laid.

7.6.1 If the system is in "Laser cleaning system", refer to 7.4.1 to operate

7.6.2 Refer to 7.1 for parameter adjustment, nozzle used "cutting"

7.6.3 Connect as shown in the figure below, press the gun switch to perform Laser cutting



Laser enable	<input checked="" type="checkbox"/>	ON	The switch can be soldered when ON, but cannot be soldered when OFF
Scan width	0.00	mm	Set to 0

## 7.7 Laser rust cleaning

### Operating System: Laser cleaning system

7.7.1 If the system is in "Laser Welding system", Follow the diagram below to operate



7.7.2 Replace the "cleaning nozzle" according to the following diagram

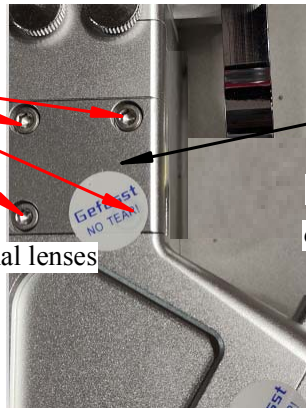
Remove the Scale tube



7.7.2 Replace the "focusing lens (Φ20X4.5)" according to the following diagram

a). Use an Allen wrench to remove these 4 screws,

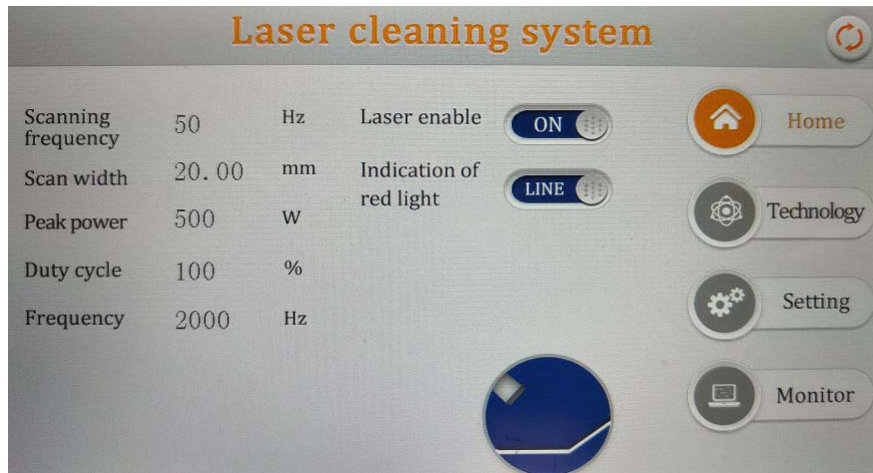
b). take out the original internal lenses



c). Put this lens in

d). Cover the shell and tighten the screws

### 7.7.3 Touch screen operation main screen



① In this interface, you can see the current process parameters and information.

② The laser is enabled and the indicator red light is ON when it is turned on.



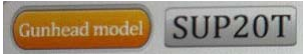
③ No safety lock, the laser spot should not come into contact with human parts, nor should it be directed towards any part of the human body or other animals, otherwise there is a risk of serious burns.

④ Welding mode selection, the default is continuous. When it is set to spot welding, it can emit light intermittently for spot welding operation, which is convenient for controlling the spot welding time due to human error. This function needs to be set as needed

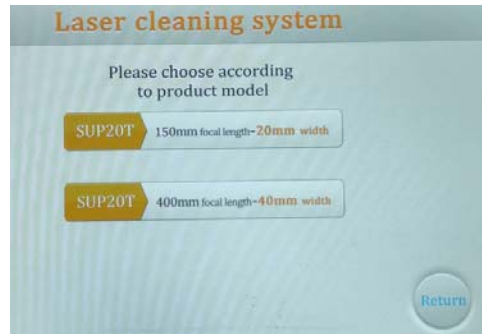
### 7.7.4 Process operation main screen



① The process interface contains the process parameters for debugging, which can be modified by clicking the box. After the modification is completed, click OK, and then save it in the shortcut process. When using it, click Import (Modify-Save-Import).

② The scanning speed range is 10-100mm/S, and the scanning width range is 0~20mm or 0~40mm or 0~120. The scanning speed is limited by the scanning width.  The scanning Max. width is determined by the selected gunhead model. When the scan width is set to 0,

it will not scan (ie point light source).



③ The peak power must be less than or equal to the laser power on the parameter page (for example, the laser power is 1000W, then the value is not higher than 1000).

④ Duty ratio range 0~100 (default 100, usually do not need to change).

⑤ The recommended pulse frequency range is 5-5000Hz (the default is 2000, usually it does not need to be changed).

⑥ Click the HELP button on the upper right to get more related parameter explanations.

#### 7.7.5 Set operation main screen

Input: Password 123456, Press OK to enter the interface



① Please set the max. scan width according to the actual gunhead model and focal length of the focusing lens.

② The laser power is the maximum power of the laser used. please fill in the actual laser power value.

③ The switch air delay "open gas , off gas" defaults to 200ms, and the range is 200ms-500ms.

④ Scan correction coefficient range 0.01~4, coefficient target line width/measurement line width: generally 1.25.

⑤ The maximum temperature alarm threshold is 70 °C . When the value is set to 0, the temperature alarm will not be detected.

⑥ Laser center offset -75~75mm, reduce it and move it to the left, increase it and move it to

the right.

⑦The alarm level signal is the default, and the shielded alarm can be directly changed to the corresponding level detection.

⑧Trigger setting: set the trigger to emit light by single-click or double-click.

⑨Click the HELP button on the upper right to get more related parameter explanation.

### 7.7.6 Monitoring main interface



This interface shows the status of each detection signal and device information

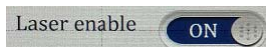
7.7.7 Connect as shown in the figure below, press the gun switch to perform "Laser rust cleaning"



1. There should be no flammable or explosive materials in the workplace,
2. The laser spot should not come into contact with human parts, nor should it be directed towards any part of the human body or other animals, otherwise there is a risk of serious burns

note: single-click: Press the gun switch once to start working

double-click: Press the gun switch twice continuously to start working



The switch can be cleaned when ON, but cannot be cleaned when OFF



The distance between the cleaning nozzle and the workpiece is about 70cm (SUP23T) or 30cm (SUP20T).

## VIII. Shutdown process

1. click the stop button on the touch screen of the controller.
2. Hang the gun on the hanger and turn off the laser.
3. Turn off the key switch.
4. Turn off the air switch at the back of the device.

## IX. Equipment maintenance

● warranty : machine from the date of sale, non-artificial failure, with invoices and warranty cards, the company is responsible for free warranty for one year.

1. The pure water (distilled water) in the chiller needs to be replaced once 3 month and the water tank filter cleaned once a month ;(or according to the site conditions ,can shorten the time for maintenance)

2. the energy is uneven or the energy is small, please check that the protective lens in the handheld welding gun is burned out, and make sure the equipment is closed when checking;

3. Fiber must not be more than 60 bending, not heavy weight binding, welding joints must be light, not in use, please hang on the hanger.

4. laser welding equipment is a precision equipment, other equipment prone to electromagnetic interference and power grid interference must not be placed too close, need to save more than 5 meters distance, and can not share a power line.

Periodic maintenance (for reference only, different models, possibly different maintenance items, some maintenance items are not available )

### Daily maintenance items

No	item	method	objective	remarks
1	Cleaning housing and external equipment	Clean cotton cloth to wipe surface dust	cleaning	
2	Cleaning protective lenses	Remove lens and scrub with long fiber degreasing cotton dipped in 99.5% pure alcohol	No oil, dust	If there are cracks or spots should be replaced, ensure that no coating surface is in the direction of flame spatter

### Weekly maintenance projects

No	item	method	objective	remarks
1	Check the water level of small water tank	A water level should be marked between water levels (MIN~MAX)	Normal water level	
	Check water level of chillers	A water level should be marked between water levels (2/3~4/5)		
2	Check temperature protection	Turn the temperature switch below the current temperature and the power supply should trip	Protection normal	
3	Check flow protection	After boot, the internal circulating water pipe is blocked, so that the water flow is reduced, and the power supply should be tripped.	Protection normal	

### Monthly maintenance projects

No	item	method	objective	remarks
1	Cleaning Screens	Remove lens and scrub with long fiber degreasing cotton dipped in 99.5% pure alcohol	Clean, transparent, oil-free lenses	
2	Clean all back lenses			Need to adjust light path in time
3	Cleaning of semi-reverse lenses			
4	Clean focus lens			
5	Clean 45° full mirror			
6	Replacement of filter elements and cooling water	Replacement of cooling water, replacement of filter and resin every two months	Ensure clean cooling water	
7	Confirm the validity of limit switch	The worktable can return to the mechanical zero point and can move the worktable to the limit	Table without jam, smooth movement	

### Semi-annual maintenance projects

No	item	method	objective	remarks
1	Clean the end face of laser rod	Remove laser rod and scrub with long fiber degreasing cotton dipped in 99.5% pure alcohol	Clean face, transparent	
2	Cleaning ceramic reflector	Scrub with long fiber degreasing cotton dipped in 99.5% pure alcohol	Clean, no dirt	
3	Dust removal	Remove the laser power, blow the dust away with dry compressed air, check that the screws are tight, the connector is loose, and oil the fan rotor.	Dust removal, eliminate the hidden trouble of bad contact	
4	Check pumps	Check whether the pump has more than 80°C of heat during the operation of the whole machine	Determine whether the pump is overloaded	
5	Equipment body dust removal	Remove the shell of the equipment body and blow the dust away with dry compressed air for internal cleaning	dust elimination	
6	Cleaning heat exchanger	Wash scale with 35% dilute hydrochloric acid	clean scale	

### Fault analysis and troubleshooting methods

fault phenomenon	analysis of causes	Exclusion methods	remarks
1. power on no response	1, power supply no power or lack of phase 2, emergency stop switch press 3, contactor failed to suck	1, restore power 2, right spin emergency stop switch to the end 3, check contactor and its control line	
2. no laser output	1, laser power supply unstable 2, in lock mode 3, ground wire clamp not connected workpiece	1, overhaul or replace power supply 2, turn on lock light switch 3, connect try again	
3. laser output power low	1, laser rod aging 2, optical lens aging 3, optical path deviation 4, lens dirty or damaged	1, replace laser rod 2, replace optical lens 3, adjust all, half mirror 4, clean or replace all, half mirror	need professional replacement
4. Water leakage at both ends of lamp and rod	1, O type sealing ring aging 2, lamp or rod not installed	1, replace O type sealing ring 2, adjust the position of lamp and rod fixing card	

## **X. Transport, shipment and storage**

### 10.1 Transport considerations

In the course of transportation equipment, please pay attention to the following matters to avoid accidents :

- hoisting, during transportation, it is forbidden to deflect or invert the machine.
- hoisting, transportation may affect the laser light path, need to be re-commissioned before use.
- the machine is not in use for a long time, all external electrical connections of the machine should be disconnected to keep the optical components clean.
- long-distance transportation shall not be installed in open cabins and vehicles, shall not be stored in open-air warehouses, shall not be allowed to be shipped with flammable, explosive and corrosive items, and shall not be allowed to withstand wet and mechanical damage from rain, snow or other liquids.
- in the course of transportation, it is necessary to use at least 600Kg loadable lifting forklifts, cranes, straps, etc.
- for safety, staff members are required to wear helmets, gloves and safety shoes.
- in the course of transportation, you need to completely pack the goblet(wheels).

### 10.2 Precautions for storage

The following should be noted in storage of equipment

- When the equipment is stored, it should be placed in the original packing box. The ambient temperature of the storage equipment is :0℃~40 ℃, the relative humidity is at 45%~80%;
- storage of equipment with hazardous gases, inflammable, explosive materials and corrosive substances shall not be permitted
- storage sites shall be free from strong mechanical vibration, shock and strong magnetic field effects ;
- packing cases shall be cushioned off the ground for at least 20cm.

The storage period shall not exceed three months in the absence of other provisions.

# XI. For complete packages, please see packing list

## PACKING LIST



No.	Name	Specifications	Quantity	Note
1	Laser Welding Machine	FR-LA- 2000	1	
2	Laser gun+cable	--	1	
3	Wire feeder	--	1	
4	Operation instructions	--	1	
5	Certificate of quality	--	1	
6	Laser gun nozzle	AS-12	1	suitable for wire: 0.8/1.0/1.2mm
		BS-16	1	1.6mm
		CS-12	1	0.8/1.0/1.2mm
		ES-12	1	0.8/1.0/1.2mm
		FS-16	1	1.6mm
		C	1	no wire
		cutting AS-20D	1	thickness:<1.5mm cleaning
7	Upper and lower wire connectors and wires	--	1	
8	tool box	--	1	
9	Protective lens	D18T2	5	
10	Wire feed wheel	0.8/1.0,1.2/1.6V	1set	
11	Protective goggles	--	1	
12	wire for welding	ER304 1.0mm	2kg	optional accessory
13	Laser Diagnostic Data wire	--	1	
14	inner hexagon spanner	--	1set	
15	Laser head protector	--	1	
16	Wire feed nozzle	--	1set	

No. \_\_\_\_\_

### Certificate of quality

Name of product: Fiber Continuous Laser Handheld Welding Machine

Type of product: FR-LA- 2000

Packing No: \_\_\_\_\_

Test results of this welder fulfils \_\_\_\_\_

\_\_\_\_\_technical requirements and its release

from the works is granted.

Inspector \_\_\_\_\_ Date \_\_\_\_\_

<b>WARNING</b>	<ul style="list-style-type: none"> <li>● Do not touch electrically live parts or electrode with skin or wet clothing.</li> <li>● Insulate yourself from work and ground.</li> </ul>	<ul style="list-style-type: none"> <li>● Keep flammable materials away.</li> </ul>	<ul style="list-style-type: none"> <li>● Wear eye, ear and body protection.</li> </ul>
Spanish <b>AVISO DE PRECAUCION</b>	<ul style="list-style-type: none"> <li>● No toque las partes o los electrodos bajo carga con la piel o ropa mojada.</li> <li>● Aíslese del trabajo y de la tierra.</li> </ul>	<ul style="list-style-type: none"> <li>● Mantenga el material combustible fuera del área de trabajo.</li> </ul>	<ul style="list-style-type: none"> <li>● Protéjase los ojos, los oídos y el cuerpo.</li> </ul>
French <b>ATTENTION</b>	<ul style="list-style-type: none"> <li>● Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension.</li> <li>● Isolez-vous du travail et de la terre.</li> </ul>	<ul style="list-style-type: none"> <li>● Gardez à l'écart de tout matériel inflammable.</li> </ul>	<ul style="list-style-type: none"> <li>● Protégez vos yeux, vos oreilles et votre corps.</li> </ul>
German <b>WARNUNG</b>	<ul style="list-style-type: none"> <li>● Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung!</li> <li>● Isolieren Sie sich von den Elektroden und dem Erdboden!</li> </ul>	<ul style="list-style-type: none"> <li>● Entfernen Sie brennbares Material!</li> </ul>	<ul style="list-style-type: none"> <li>● Tragen Sie Augen-, Ohren- und Körperschutz!</li> </ul>
Portuguese <b>ATENÇÃO</b>	<ul style="list-style-type: none"> <li>● Não toque partes elétricas e electrodos com a pele ou roupa molhada.</li> <li>● Isole-se da peça e terra.</li> </ul>	<ul style="list-style-type: none"> <li>● Mantenha inflamáveis bem guardados.</li> </ul>	<ul style="list-style-type: none"> <li>● Use proteção para a vista, ouvido e corpo.</li> </ul>
Japanese <b>注意事項</b>	<ul style="list-style-type: none"> <li>● 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。</li> <li>● 施工物やアースから身体が絶縁されている様にして下さい。</li> </ul>	<ul style="list-style-type: none"> <li>● 燃えやすいものの側での溶接作業は絶対にしてはなりません。</li> </ul>	<ul style="list-style-type: none"> <li>● 目、耳及び身体に保護具をして下さい。</li> </ul>
Chinese <b>警告</b>	<ul style="list-style-type: none"> <li>● 皮肤或湿衣物切勿接触带电部件及焊条。</li> <li>● 使你自已与地面和工件绝缘。</li> </ul>	<ul style="list-style-type: none"> <li>● 把一切易燃物品移离工作场所。</li> </ul>	<ul style="list-style-type: none"> <li>● 佩戴眼、耳及身体劳动保护用具。</li> </ul>
Korean <b>위험</b>	<ul style="list-style-type: none"> <li>● 전도체나 용접봉을 젖은 형갑 또는 피부로 절대 접촉치 마십시오.</li> <li>● 모재와 접지를 접촉치 마십시오.</li> </ul>	<ul style="list-style-type: none"> <li>● 인화성 물질을 접근시키지 마십시오.</li> </ul>	<ul style="list-style-type: none"> <li>● 눈, 귀와 몸에 보호장구를 착용하십시오.</li> </ul>
Arabic <b>تحذير</b>	<ul style="list-style-type: none"> <li>● لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الألكترود بجسد الجسم أو بالملابس المبللة بالماء.</li> <li>● ضع عازلا على جسمك خلال العمل.</li> </ul>	<ul style="list-style-type: none"> <li>● ضع المواد القابلة للاشتعال في مكان بعيد.</li> </ul>	<ul style="list-style-type: none"> <li>● ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.</li> </ul>

**READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.**

**SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.**

**LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.**

**LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.**

			
<ul style="list-style-type: none"> <li>● Keep your head out of fumes.</li> <li>● Use ventilation or exhaust to remove fumes from breathing zone.</li> </ul>	<ul style="list-style-type: none"> <li>● Turn power off before servicing.</li> </ul>	<ul style="list-style-type: none"> <li>● Do not operate with panel open or guards off.</li> </ul>	<b>WARNING</b>
<ul style="list-style-type: none"> <li>● Los humos fuera de la zona de respiración.</li> <li>● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases.</li> </ul>	<ul style="list-style-type: none"> <li>● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.</li> </ul>	<ul style="list-style-type: none"> <li>● No operar con panel abierto o guardas quitadas.</li> </ul>	Spanish <b>AVISO DE PRECAUCION</b>
<ul style="list-style-type: none"> <li>● Gardez la tête à l'écart des fumées.</li> <li>● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.</li> </ul>	<ul style="list-style-type: none"> <li>● Débranchez le courant avant l'entretien.</li> </ul>	<ul style="list-style-type: none"> <li>● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.</li> </ul>	French <b>ATTENTION</b>
<ul style="list-style-type: none"> <li>● Vermeiden Sie das Einatmen von Schweißrauch!</li> <li>● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!</li> </ul>	<ul style="list-style-type: none"> <li>● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)</li> </ul>	<ul style="list-style-type: none"> <li>● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!</li> </ul>	German <b>WARNUNG</b>
<ul style="list-style-type: none"> <li>● Mantenha seu rosto da fumaça.</li> <li>● Use ventilação e exaustão para remover fumo da zona respiratória.</li> </ul>	<ul style="list-style-type: none"> <li>● Não opere com as tampas removidas.</li> <li>● Desligue a corrente antes de fazer serviço.</li> <li>● Não toque as partes elétricas nuas.</li> </ul>	<ul style="list-style-type: none"> <li>● Mantenha-se afastado das partes moventes.</li> <li>● Não opere com os painéis abertos ou guardas removidas.</li> </ul>	Portuguese <b>ATENÇÃO</b>
<ul style="list-style-type: none"> <li>● ヒュームから頭を離すようにして下さい。</li> <li>● 換気や排煙に十分留意して下さい。</li> </ul>	<ul style="list-style-type: none"> <li>● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切ってください。</li> </ul>	<ul style="list-style-type: none"> <li>● パネルやカバーを取り外したまま機械操作をしないで下さい。</li> </ul>	Japanese <b>注意事項</b>
<ul style="list-style-type: none"> <li>● 頭部遠離煙霧。</li> <li>● 在呼吸區使用通風或排風器除煙。</li> </ul>	<ul style="list-style-type: none"> <li>● 維修前切斷電源。</li> </ul>	<ul style="list-style-type: none"> <li>● 儀表板打開或沒有安全罩時不準作業。</li> </ul>	Chinese <b>警告</b>
<ul style="list-style-type: none"> <li>● 얼굴로부터 용접가스를 멀리하십시오.</li> <li>● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시오.</li> </ul>	<ul style="list-style-type: none"> <li>● 보수전에 전원을 차단하십시오.</li> </ul>	<ul style="list-style-type: none"> <li>● 판넬이 열린 상태로 작동치 마십시오.</li> </ul>	Korean <b>위험</b>
<ul style="list-style-type: none"> <li>● ابعء رأسك بعيداً عن الدخان.</li> <li>● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها.</li> </ul>	<ul style="list-style-type: none"> <li>● أقطع التيار الكهربائي قبل القيام بأية صيانة.</li> </ul>	<ul style="list-style-type: none"> <li>● لا تشغيل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه.</li> </ul>	Arabic <b>تحذير</b>

**LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.**

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

請詳細閱讀並理解製造廠提供的說明以及應該使用的銀焊材料，並請遵守貴方的有閣勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

اقرأ بتمعن وافهم تعليمات المصنع المنتج لهذه المعدات والمواد قبل استعمالها واتبع تعليمات الوقاية لصاحب العمل.