User Guide for
FCA series Handheld Laser Welding System

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CONTENT

Chapter 1 Safety Information

Thank you for choosing the FCA series Hand Laser Welding System from Reci laser.

In order to ensure operation safety (personnel safety, equipment safety, production safety.) and product operation in the best state. We compile this document with important safety, operating, maintaining and other information. Please take time to read and understand this User's Guide and familiarize yourself with the operating and maintenance instructions before using the product.

1.1 Safety Conventions used in the User Guide

SYMBOLS	DESCRIPTION
	**WARNING :** **Refers to a potential hazard that may leads to a personal injury or death.**
	**CAUTION :** ***Refers to a potential hazard on product, or a potential physical injury on personnel.***
NO SYMBOL	**IMPORTANT :** ***Refers to any information regarding the operation of the product. Please do not overlook this information.***

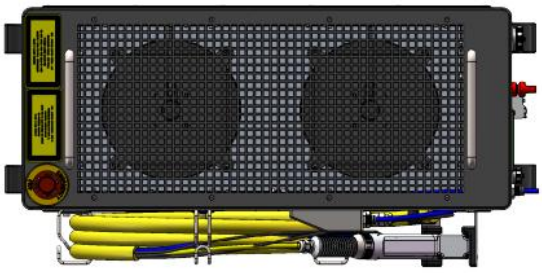
1.2 Laser Classification

The FCA series Hand Laser Welding System adopts a single-mode fiber laser, which can emit laser radiation with a wavelength in the range of 1080 ± 3nm, which is invisible light. The average power of the products is ranged from 10% to 100% at a maximum power about 1000W, 1500W or 2000W, which classifies the series of lasers Class 4 laser instrument. Direct or indirect exposure of this level of light intensity may cause very serious damage to the eyes or skin. In view of this, appropriate and approved laser safety protective glasses must be worn all the time while the laser is operating. At the same time, no directly or reflectively emit on your skin.

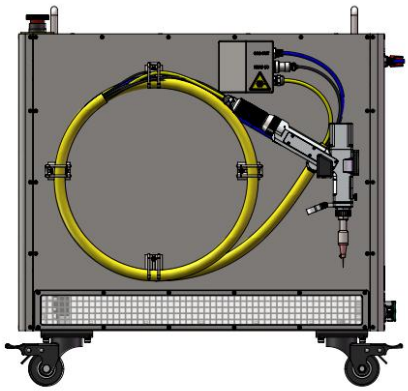
	**WARNING :** ***The laser safety protective glasses are selected according to the wavelengths of the output laser. The users must ensure that the laser safety protective glasses covered the entire range of wavelengths of the laser emission.***

1.3 Labels on the Product

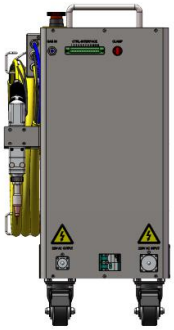
The security identity of each type of product location layout approximation, mainly located above the laser housing, on the rear panel, and on the welding gun, as shown in figure 1.1:



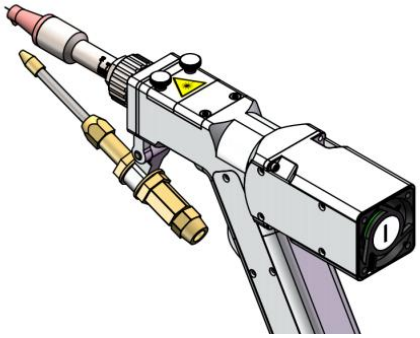
1 Top view of FCA1500



2 Side view of FCA1500



3 Rear view of FCA1500



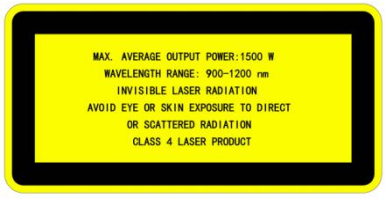
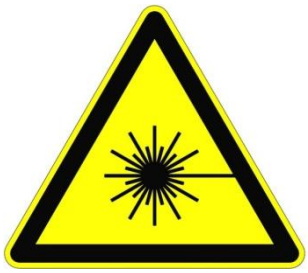
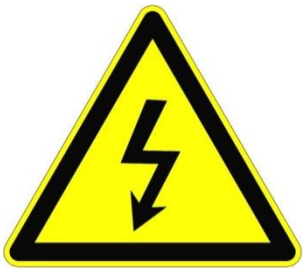
4 welding gun

Figure 1.1 Positions of the symbols on the series of lasers

These safety signs mainly include: laser product category warning, laser radiation hazard warning, strong current hazard warning, product nameplate, etc. The details of identification are

shown in the table below

Table 1.1 the details of the symbols

	
1: Class 2M Laser Product Label for Guide Laser	2: Class 4 Laser Product(take 1500W as example)
	
3: Laser Radiation Hazard Label	4: Electrical Hazard
	
5: Identification Plate of the device	

1.4 Safety Instructions for Optical Operation

We strongly recommend that you read the following procedures before operating the fiber laser:

(1) Never look directly into the optical output when the **Electrical switch** is on.

(2) Make sure that a pair of appropriate and approved laser safety protective glasses is worn all the time while the laser is operating.

(3) No eyes are on the path of the laser beam (direct or reflected light, scatter light from high reflective material, etc.), at the same time, the direction of laser output must be **Shelter by reliable objects**.

	**WARNING :** ***Even though the protective glasses are worn, staring into the optical output is forbidden absolutely while the electrical switch of the laser is on.***

(4) If you are ready to emit light, be sure to confirm whether the red light position is correct. The laser cannot be obtained under the following conditions:

A: No red light.

B: When no swing is set, the red light is not in the center.

C: After setting the swing, the red light is blocked.

(5) Please ensure that the protective lens of the welding gun is clean and free of dust, otherwise the laser will be irreparably damaged. Before use, carefully observe whether the protective window mirror of the welding gun is clean. If there is any pollution, the window mirror needs to be replaced. The damage caused by non-standard operation will not be guaranteed.

(6) If the welding gun is heated during use, please stop using it immediately and check the problem.

	**CAUTION :** ***The dust on the window mirror of the welding gun will cause the lens to burn when the light comes out, and the continued use after burning will even cause the internal damage of the laser.***

1.5 Safety Instructions for Electrical Operation

We strongly recommend that you read the following procedures before operating the fiber laser:

(1) Make sure the power source connected to the equipment is properly grounded with PE wire. At the same time the shell of this equipment must be properly grounded. Any interruption of the ground loop may result in personal injury.

	**WARNING :** ***The input voltage of the fiber laser is AC current (220VAC), which may cause risk of electric shock. All the relevant cables and connection wires have potential hazards.***

(2) Make sure that the input AC voltage and capacity meet the requirements of the very series of lasers.

(3) If the air switch shut down frequently, please contact Reci as soon as possible to ensure the safety use of the equipment.

	**CAUTION :** ***(1) Any incorrect wiring method or AC voltage may cause damage to people or instrument.*** ***(2) There are no devices in the product that need to be used by the operator. Do not try to open the product cover, otherwise electric shock may be caused, and the laser warranty will be invalid accordingly.***

1.6 Other Safety Instructions

(1) Do not use the fiber laser in a dark or dark environments.

(2) Please cut off the power supply when unattended.

(3) It is strictly prohibited to shield the protection. The workpiece clamp and welding gun nozzle must be closed before outputting the laser, otherwise there will be potential safety hazards.

(4) Never aim the laser at the body.

(5) Do not operate by non professionals. Keep out of the reach of children.

(6) Please operate the laser in strict accordance with the product manual, otherwise any damage to the laser will not be guaranteed.

(7) To prevent electric shock, please do not damage the label and remove the cover, otherwise any damage to the laser will not be guaranteed.

(8) Be sure to check whether the position of the red light is correct before use.

Chapter 2 Product Description

2.1 Property Introductions

Compared with the traditional gas and solid-state lasers, the fiber laser used in this system has high electro-optic conversion efficiency and superior beam quality, and the cost of fiber laser is relatively low due to the low cost of glass fiber.

Main Features:

- High wall-plug efficiency
- High power with Excellent beam quality
- High reliability, long service life, maintenance free
- All fiber structure, compact, rugged package
- Multiple anti-high-reflection

Applications:

- Industrial applications: Material cutting（major in metal processing）, metal welding, metal cladding
- Scientific research, Military application

2.2 Model description

As a series of lasers, its model name description is illustrated as the following figure 2.1, take FCA1500 as an example. Similarly, the FCA1000 means its maximum average power can reach 1000W; the FCA2000 means its maximum average power can reach 2000W:

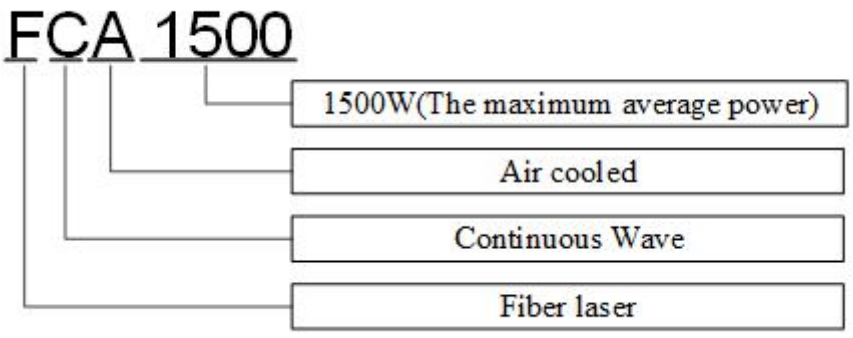


Figure 2.1 the meaning of the model names

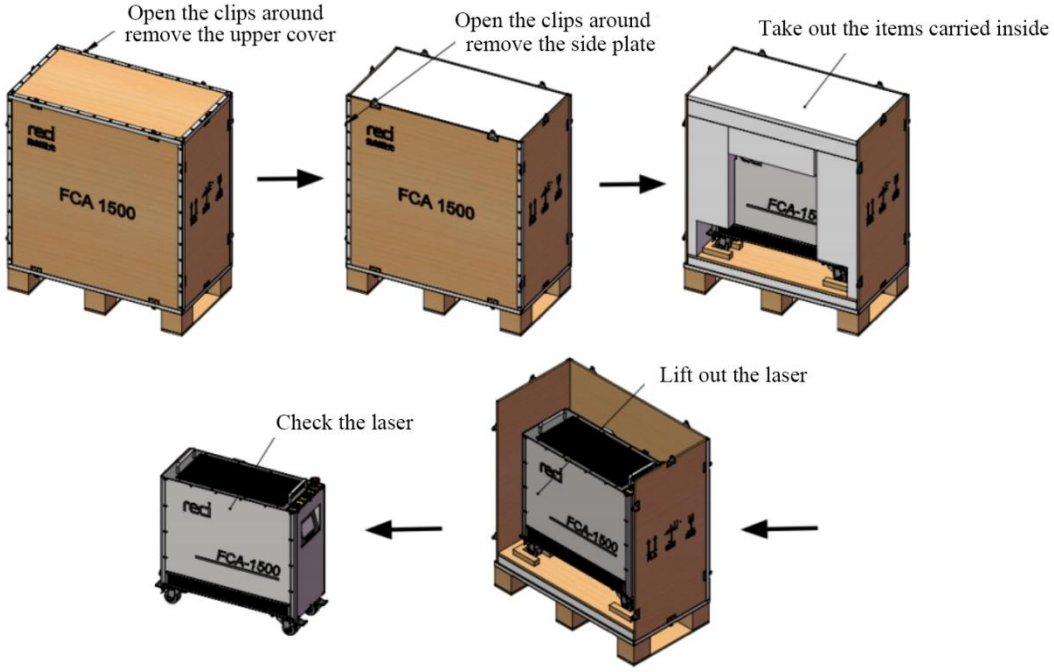
2.3 Unpacking and inspection

Reci certifies that this equipment has been thoroughly tested and inspected and meets published specifications prior to shipping. We advise that the receiver should check the packaging, for there should be potential damage during the transport. Please do as follow:

(1) Check whether the packaging is placed correctly (Flat, upright) and no collision, crack, rain or water immersion outside the box.

(2) Please check actual items refer to the packing list.

If damage is apparent on the laser or part of its accessories in transit, please contact Reci and the carrier immediately.



	**CAUTION :** ***The fiber cable and output head are very precise optical devices, will cause irrecoverable damage to the laser while is be twisting, over bending. At the same time, strong vibration and impact on the output head are forbidden.***

2.4 Operation Conditions

The basic operation conditions are listed in the table followed:

Table 2.1 the operation conditions for the FCA series lasers

Item	Value
	FCA1000&FCA1500&FCA2000
Supply Voltage(V)	220±10% V AC 50/60Hz
Placement	Flat, upright, no vibration and impact
Environment Temperature	5~40℃
Relative Humidity	30%RH~70%RH
Electromagnetic Environment	Avoid too strong electromagnetic interference, which may lead to false alarm of laser

Cooling water quality	The laser adopts air-cooled heat dissipation. Please operate the equipment in a place with good air circulation, and ensure that the distance between the left and right sides and the top of the equipment and the wall is > 10cm, and no objects blocking the exhaust can be placed on the top. The inlet air pressure of the gas pipe shall not be greater than 0.7MPa.

Note:

(1) The output head of the laser is connected with the armor. Please check the output head carefully to prevent dust or other pollution. Please use special lens paper when cleaning the lens at the output end..

(2) Never installing the laser output with the processing system when the equipment is power on.

(3) The protective glasses should be worn all the time.

	**CAUTION*:*** ***Never make this product work in high humidity (>85%),though the products have an excellent adaptability to the high humidity environment.***

NO SYMBOL	***IMPORTANT :*** ***The lifetime of the laser will be shortened and the output power will degrade while the cooling system working at a higher temperature for too long time. Please ensure the cooling system is enough and the temperature is suitable.***

2.5 Instructions for use

(1) Before supplying the power to the device, make sure the power supply and the connection of all wires are correct (See table 2.2 and subsection 4.3).

(2) Keep the outer black cap covered while the device is not in use, dust-proof should not be absent any time.

(3) There is no warranty in case of no following this instruction.

2.6 Characteristic Parameters

The characteristic parameters of the FCA series fiber laser which the power is ranged from 1000W to 3000W is demonstrated in the table.

Table 2.2 Parameters of the FCA series laser

MODEL		FCA1000	FCA1500	FCA2000
Optical Specification	Output Power (W)	≥1000	≥1500	≥2000
	Operating Mode	CW/Modulate		
	Polarization	Random		
	Power Range (%)	10~100		
	Central Wavelength (nm)	1080±3		
	Power Instability (%)	<3		
	Max. Modulation Frequency (kHz)	20		
	Red Laser power (mW)	>0.5		
	Beam Delivery Optics	QBH		
	Output Fiber Diameter (μm)	30		
	Delivery Fiber Length (m)	Standard 5m / customizable 10m		
Electric Specification	Operating Voltage (VAC)	AC 220V 50/60Hz		
	Power Consumption (W)	<3500	<5000	<7000
	Control Mode	Ext. AD/Loc. AD		
Other Specification	Dimensions W×H×D (mm^3)*	279.5×712×566	279.5×712×666	289.5×824×662
	Weight (kg)*	<47	<55	<65
	Ambient Temperature (℃)	5~40		
	Ambient Humidity (%)	<70		
	Cooling Method	Air cooling		
	Storage temperature (℃)	-10~60		
	Input gas pressure （MPa）	⩽0.7MPa		

* The size and weight of each version are different. If you need accurate values, please contact our salesman.

Chapter 3 Installation of the laser

3.1 Dimension of the machine

The dimension of the laser device is just below： （Take FCA1500 as an example）

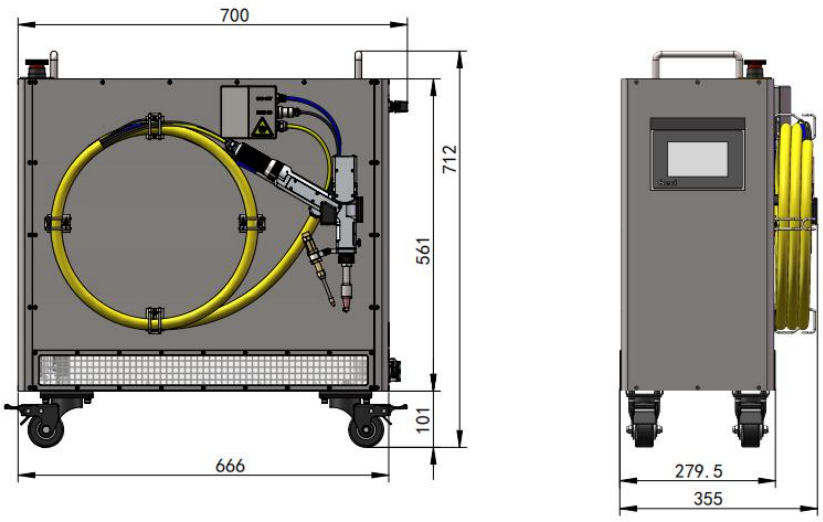


Figure 3.1 Overall dimension（unit: mm）

3.2 The optical output head

A passive device named QBH was used as the optical output in the FCA series laser, its dimensions are just as figures below.

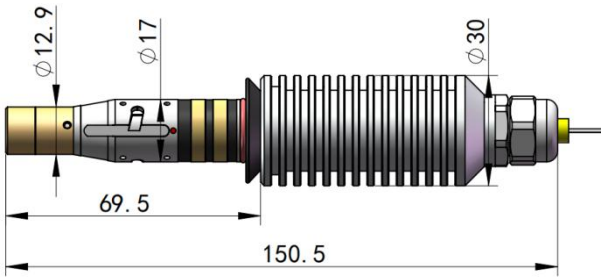


Figure 3.2 the top view of the QBH (unit: mm)

The slot size of QBH is standard, matched well with most of processing heads from the market. During installation, you need to ensure the QBH installed in place, and then establish a reliable connection between the ring contactor with the processing head’s contactor; otherwise the laser will give an alarm.

Before the QBH is installed, the end face of the QBH must be checked. Of course, it must be cleaned when the end face is polluted (check under a microscope).

3.3 Dimensions of welding Gun

The following figure shows the external dimensions of the welding gun.

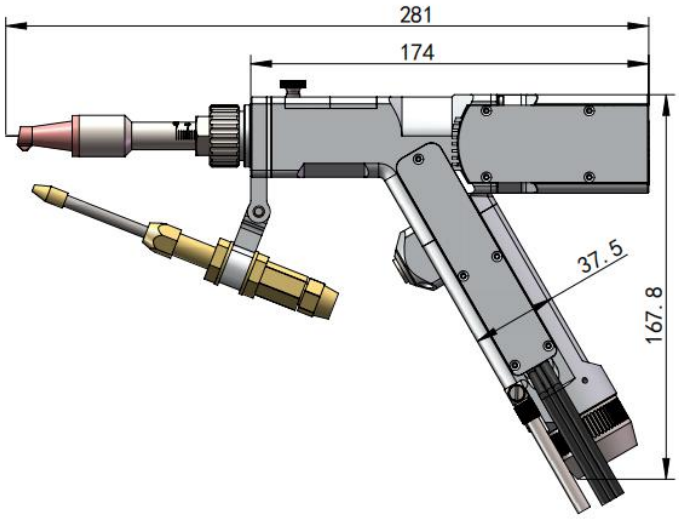


Figure 3.3 appearance dimension of welding gun

3.4 Connection and Requirements

3.4.1 Connection of external circuit and air circuit

Refer to the relevant power requirements in table 2.2. Before connecting the power supply, ensure that the input voltage conforms to the standards indicated in the technical specifications. The equipment must be connected with auxiliary gas with sufficient air volume before operation, so as to dissipate the heat load generated during operation and protect the damage to the welded joint caused by spatter during operation.

Note: the air pressure of the input gas shall not be greater than 0.7MPa.

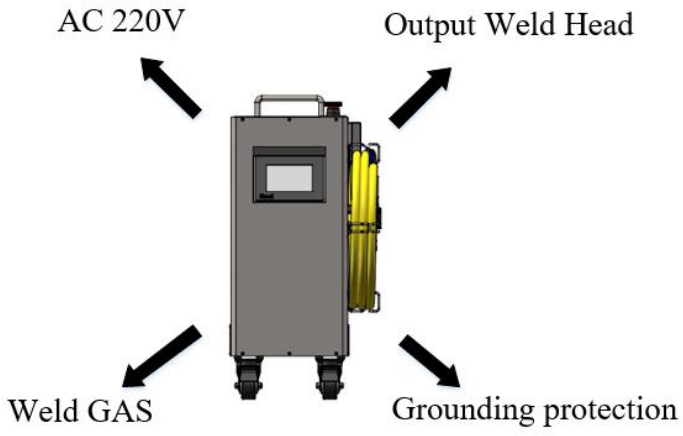


Figure 3.3.1 schematic diagram of external circuit and gas circuit connection of laser

3.4.2 Requirement of the cooling system

The laser adopts air-cooled heat dissipation. When selecting the placement position, please operate in a non closed and narrow space with good air circulation conditions. Do not place any objects that may block the exhaust on the top of the machine. The air flow direction is shown in the following figure:

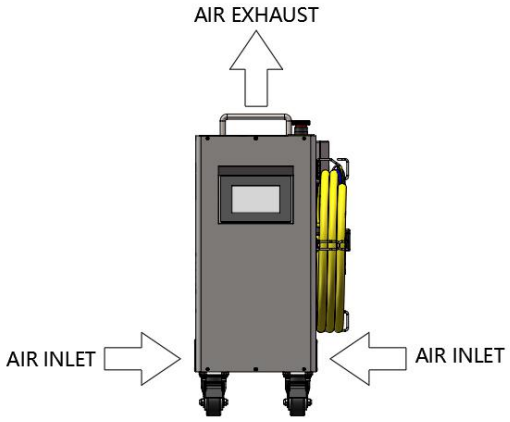


Fig. 3.3.2a schematic diagram of air inlet and exhaust

The requirements for laser placement space are shown in the figure below：

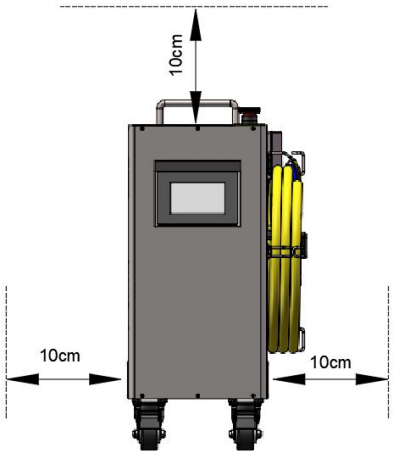


Figure 3.3.2b laser placement space requirements

Note: the filter screens of the two air inlets must be cleaned regularly. The equipment damage caused by improper use / maintenance will not be guaranteed.

3.5 Installation precautions

(1) The laser need to be placed horizontally and fixed, without inversion, side setting, vibration and impact.

(2) When connecting the power line and control line, make sure that the power supply is disconnected for non live operation.

(3) When the laser is connected to the gas circuit, it is necessary to recognize the gas inlet and outlet signs and connect them according to the signs. See Fig. 4.2 for the air inlet.

(4) During the installation of QBH, the surrounding environment must be cleaned, in order to protect the QBH from polluted.

(5) Check the output head and clean it if necessary. If any dust on the QBH end face cannot be cleaned, please contact Reci, and at the same time the cleaning procedure must be performed by personnel of Reci or authorized by Reci.

(6) Prevent the delivery cable from treading, excessive bending, smashing with heavy objects during installation. There would be no warranty if the cable is damaged due to external force.

	**CAUTION*:*** ***(1)Please make sure the laser optical output and the processing head are all dust-free before connecting them together.*** ***(2)Please take good care of the black protective cap of QBH from being polluted; otherwise, it will cause indirect pollution to QBH output head when the protective cap is put on.***

(7) After the installation or connection of the cooling system, optical system, electrical wires, remember to do a recheck: make sure the connection of the electrical system is correct (see section 4.3-4.5 for details), the capacity of the electrical supply power is the one (AC220V , 50Hz/60Hz), and the ground connection is available.

	**CAUTION*:*** ***Never do the recheck with any electrical switch on, especially the air switch for the AC 220V on the wall.***

(8) Handle gently with the QBH while installing or removing it.

(9) Keep the deliver cable a minimum bending diameter of 400mm for storage, or 600mm for laser on.

	**CAUTION*:*** ***please make sure the laser optical output and the processing head cable should be kept as natural as possible and not be distorted*** ***(2) Too small bending diameter for the deliver cable will damage the device.***

Chapter 4 Using of the product

4.1 Front Panel

The layout of the front panel is shown in Figure 4.1.

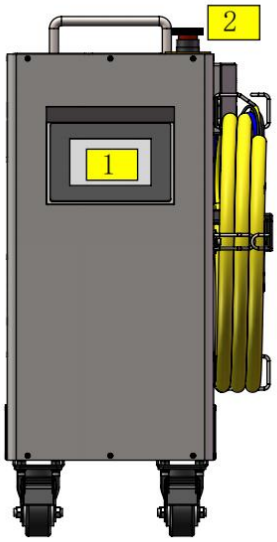


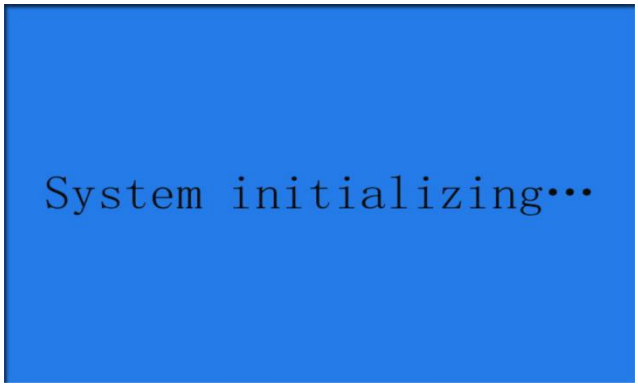
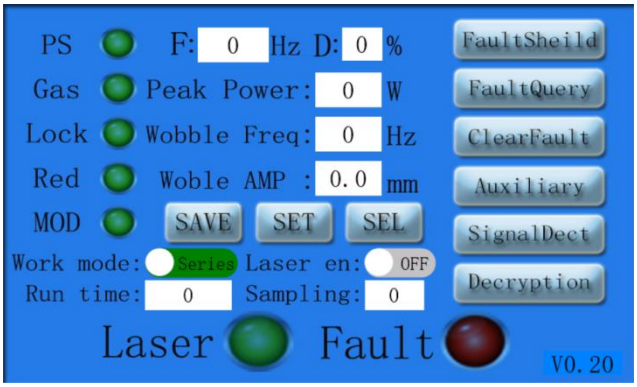
Figure 4.1 The front panel of the FCA series fiber laser

The button functions of the front panel are as the table 4.1.

Table 4.1(a) Function of the buttons on the Front Panel

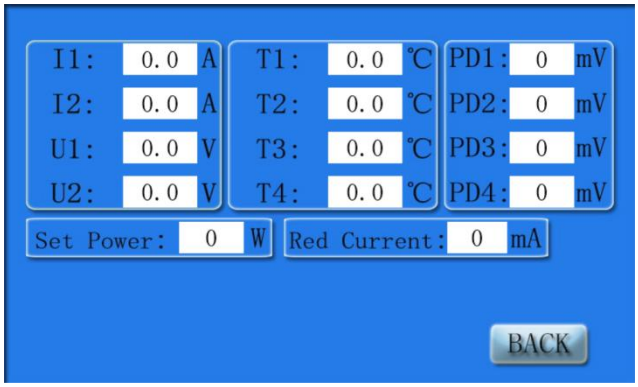
NO	ITEMS	FUNCTION DESCRIPTION
1	Touch screen	Set the parameters, save the parameters and select the parameters. Query and set the fault shielding. Query the fault and view detailed fault. Clear the fatal fault. Set auxiliary parameters. Detect the signal and decryption setting. See 4.1 (b) for details.
2	Emergency Stop	Temporarily suspends power to the laser. When pressed, the power supply will be disabled. Once pressed, the E-Stop can be reset by turning the red knob clockwise. Important tip: This button should be used in the emergency, and there is no need to press it for the normal shutdown.

Table 4.1(b) Details of the touch screen

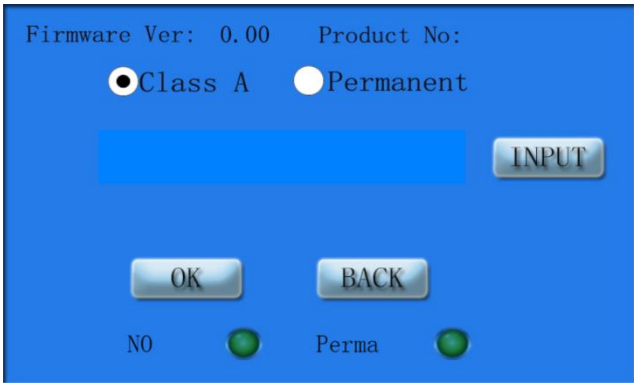
<table>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>1: Touch screen - System initializing interface</td><td>2: Touch screen - Main interface</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>3: Touch screen - Fault shielding query and setting interface</td><td>4: Touch screen - Language switching interface</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>5: Touch screen - Fault query interface</td><td>6: Touch screen - Detailed fault query interface</td></tr>
</table>

7: Touch screen - Detailed fault view interface

8: Touch screen - Auxiliary parameters setting interface



9: Touch screen - Signal detection interface



10: Touch screen - Decryption settings interface

4.2 Rear Panel

The layout of the rear panel is shown in Figure 4.2.

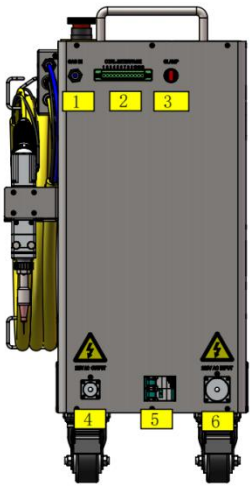


Figure 4.2 The Rear Panel of the FCA series fiber laser

The specific interface functions of the rear panel are shown in the table 4.2.

Table 4.2 Functions of the specific interface on the rear Panel

NO	ITEMS	FUNCTION DESCRIPTION
1.	GAS IN	Connect tubing with the outer diameter of 6mm and inner diameter of 4mm from gas supply tank to rear panel input port.
2.	CTRL-INTERFACE	12-pin interface connection, and see section 4.41 for details.
3.	CLAMP	Workpiece clamp cable attaches to this CLAMP. This closes the safety interlock loop between the welder nozzle tip and this CLAMP. It ensures the weld head is connected to the work piece before emission can safely be turned on.
4.	220V AC OUTPUT	AC output socket:220V AC, 50/60Hz, Imax 5A.
5.	Air Switch	Power switch of AC power. Push on, open the AC power. Push down, close the AC power.
6.	220V AC INPUT	AC input socket:220V AC, 50/60Hz.

4.3 Electric Power Connect

The power cord with 3-pin aviation plug is inserted into the rear panel with the “220V AC INPUT” socket and the other end connected to the AC power supply. The specific definition will be shown in Table 4.3.

The 3-pin aviation socket marked “220V AC OUTPUT” on the rear panel is the output of 220V AC and is equipped with corresponding aviation plugs(no power cord), which can be used to connect wire feeder and other equipment. The current is less than 5A.

a) 220V AC INPUT

b) 220V AC OUTPUT

Figure 4.3 The wire for the AC source

The wiring definition is shown in the table 4.3

Table 4.3 Definition of the AC wire

PIN	DESCRIPTION		REMARKS
	220V AC INPUT	220V AC OUTPUT	
1.	1L-Live wire	1L-Live wire	
2.	2N-Neutral wire	2N-Neutral wire	
3.	3PE-Earth Wire	3PE-Earth Wire	

4.4 Interface Definition

4.4.1 CTRL-INTERFACE

The CTRL-INTERFACE adopts 12-pin welding-free terminal blocks with flanges with the pitch of 5.08mm, which is convenient and reliable to connect. The terminal pins are 1~12 from left to right, as shown in Figure 4.4.

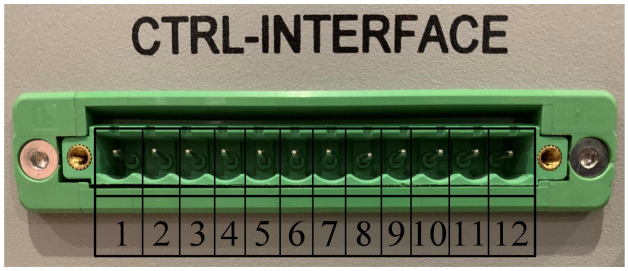


Figure 4.4 CTRL-INTERFACE

Table 4.4 12-pin definition of the CTRL-INTERFACE

PIN	DESCRIPTION	REMARK
1.	RS485A	RS485 for the parameter setting.
2.	RS485B	
3.	INTERLOCK+	External Safety Interlock. Laser cannot be started without the required safety interlocks being in place and satisfied.
4.	INTERLOCK-	
5.	ALARM_OUT+	Alarm signal normally open output, used for external indicator lights, etc. Closed if the output is active. Imax≤0.5A@24V DC.
6.	ALARM_OUT-	
7.	EMISSION_OUT+	Emission signal normally open output, used for the wire feeder, etc. Closed if the output is active. Imax≤0.5A@24V DC.
8.	EMISSION_OUT-	
9.	RESERVED	RESERVED
10.	RESERVED	RESERVED
11.	RESERVED	RESERVED
12.	RESERVED	RESERVED

4.4.2 RS485 wire

This wire is a serial cable used for RS485 to USB.

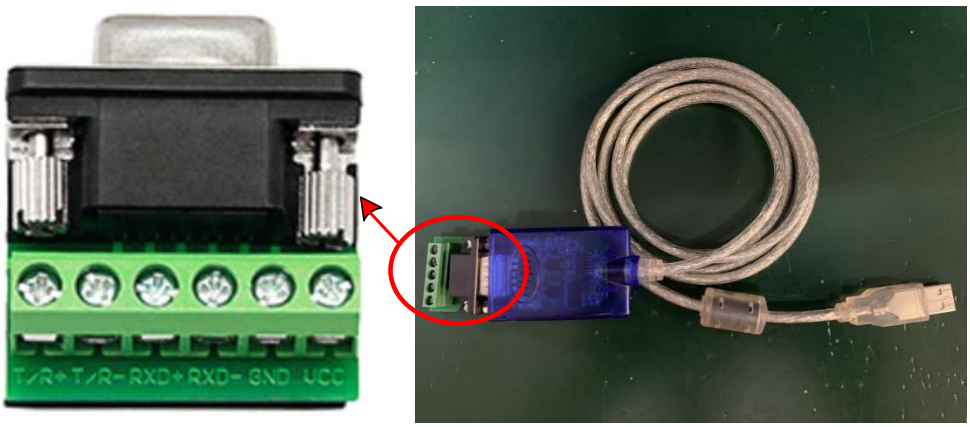


Figure 4.5 The wire for the 485 connecting

Details for the 485 connection are shown in the table below:

Table 4.5 Definition of the 485 interface

PIN	DESCRIPTION	REMARK
1.	R/T+	Connect to 485A of CTRL_INTERFACE
2.	R/T-	Connect to 485B of CTRL_INTERFACE

4.5 Laser Control

The power supply of the fiber laser is controlled by the air switch on the rear panel and the emergency stop on the top panel. The emergency stop is the switch used in the emergency situation and does not need to be pressed during normal shutdown. After connecting the 220V AC INPUT, you need to turn on the air switch, the control circuit is powered on to start the self-check, and the 220V AC OUTPUT aviation plug has 220VAC output. After the self-check is completed, the power circuit starts to work when there is no alarm.

The laser has two control methods: touch screen and PC:

① In the mode of touch screen, the laser enable, work mode, peak power, frequency and duty ratio, as well as the wobble frequency and amplitude of the galvanometer can be touch-input on the main interface of the screen, and the parameters can also be saved and selected. All auxiliary parameter (E.g. the Pre-Flow, Post-Flow, start power, rise time, stop power, drop time, laser delay, wire ahead, spot welding duration and spot welding interval time, etc.) can be set.

② In the mode of PC, all the parameters set by the touch screen can be set on the monitoring interface and parameter setting interface of the PC, but it is necessary to connect the RS485 communication line to the PC through the CTRL-INTERFACE interface on the rear panel.

After the laser is powered on and initialized and there is no alarm, you can turn

on the laser through the "Laser en" on the main interface of the screen. Then, set the working parameters of the laser through the main interface of the screen and the auxiliary parameter interface. Then, through the main interface of the display "Work mode" to select the laser working mode: series or spot welding; finally, the laser and red indicator light switch are controlled by the button of the weld head. After the button is pressed and closed, the laser outputs and the red indicator light is turned off. When the button is turned off, the laser is turned off and the red indicator light outputs.

- Notice:

For safe, the weld head and the work clamp must be short-circuited before the laser output.

4.6 Touch screen Mode

4.6.1 Settings and Connections

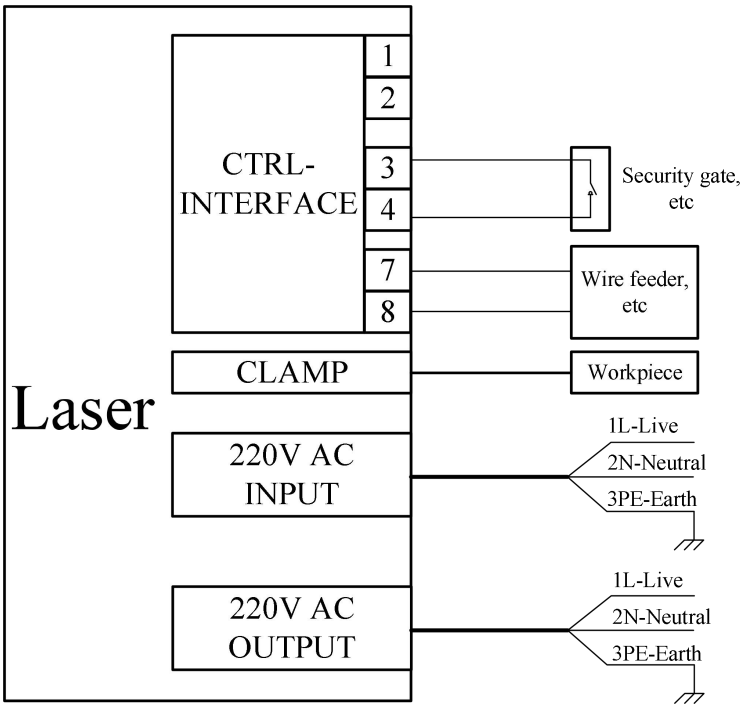


Figure 4.6 The connection of touch screen model

4.6.2 Sequence of operations

(1) If you need to connect a wire feeder, please connect the wire feeder that meets the requirements to the corresponding port on the rear panel of the laser before powering on.

(2) Turn on the power supply of the device, turn on the air switch on the rear panel of the device, and wait for the initialization of the device for 10 seconds.

(3) Turn on the laser output function through the "Laser en" in the main interface of the touch screen.

(4) Touch and input the required process parameters through the main interface of the touch screen and the auxiliary parameter setting interface. After the interface returns to the "Setup successful" prompt, click "Confirm".

(5) Touch to set the laser "Work mode" to series or spot welding through the main interface of the touch screen.

(6) Clamp the workpiece clamp on the workpiece or plate to be processed.

(7) Short the weld head and the workpiece clamp, and simulate the processing process through the red indicator light.

(8) Press the button of the weld head, and turn on the laser according to the set parameters.

(9) After the processing is completed, release the button of the weld head, and turn off the laser according to the set parameters.

(10) If the current parameter is suitable for the current workpiece, the parameter can be saved on the touch screen, and it can be selected directly next time.

(11) If you need to adjust the process parameters, repeat steps (3) ~ (7).

➢ Notice:

The parameter storage and selection can only be 2 digits, and the previously saved parameters will be overwritten when the storage name is repeated.

4.7 PC Model

4.7.1 Settings and Connections

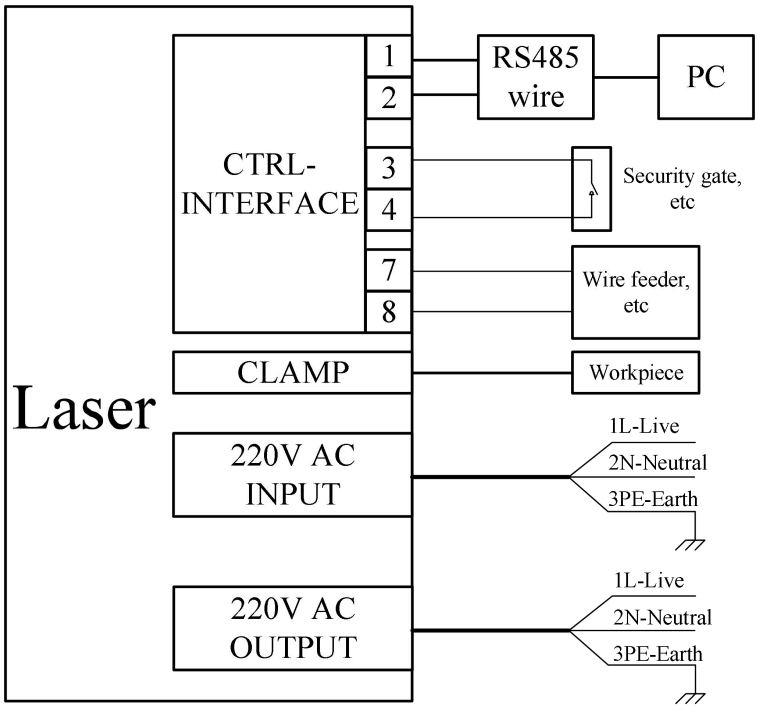


Figure 4.7 The connection of PC model

4.7.2 Sequence of operations

(1) If you need to connect a wire feeder, please connect the wire feeder that meets the requirements to the corresponding port on the rear panel of the laser before powering on.

(2) Turn on the power supply of the device, turn on the air switch on the rear panel of the device, and wait for the initialization of the device for 10 seconds.

(3) Turn on the laser output function through the "Laser en" in the monitoring interface of the PC.

(4) Input the required process parameters through the setting interface of the PC.

(5) Touch to set the laser "Work mode" to series or spot welding through the monitoring interface of the PC.

(6) Clamp the workpiece clamp on the workpiece or plate to be processed.

(7) Short the weld head and the workpiece clamp, and simulate the processing process through the red indicator light.

(8) Press the button of the weld head, and turn on the laser according to the set parameters.

(9) After the processing is completed, release the button of the weld head, and turn off the laser according to the set parameters.

(10) If the current parameter is suitable for the current workpiece, the parameter can be saved on the settings interface of the PC, and it can be selected directly next time.

(11) If you need to adjust the process parameters, repeat steps (3) ~ (7).

- Notice:

The parameter storage and selection can only be 2 digits, and the previously saved parameters will be overwritten when the storage name is repeated.

Chapter 5 Use of monitoring software

The monitoring software for FCA series Fiber Laser, even the followed products of the same series is the same.

5.1 Connect

Use the RS485 cable of the device to connect the 1st & the 2nd pin of Rear panel's CTRL-INTERFACE. The 1st pin connects to the T/R+ port of the wire, the 2nd pin connects to the T/R- port of the wire.

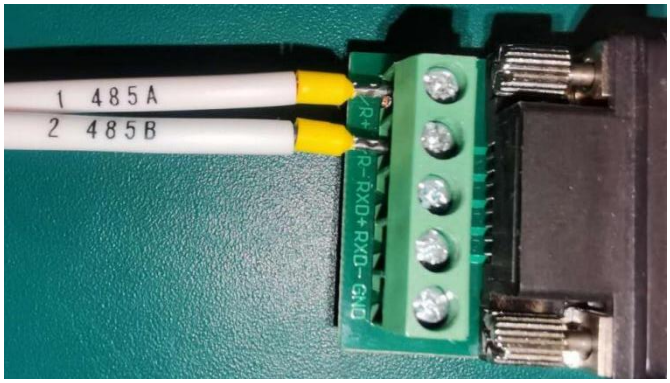


Figure 5.1 The connection of RS485 interface

Then connect the other side of 485 wire to the PC which is installed the software.

Open the software. Click to Setting page（as the figure 5.2）， Select the corresponding serial Num，Click “open port” button. After choosing the right one，Click “set default ”button，The next time the software starts, it will automatically open the serial port.

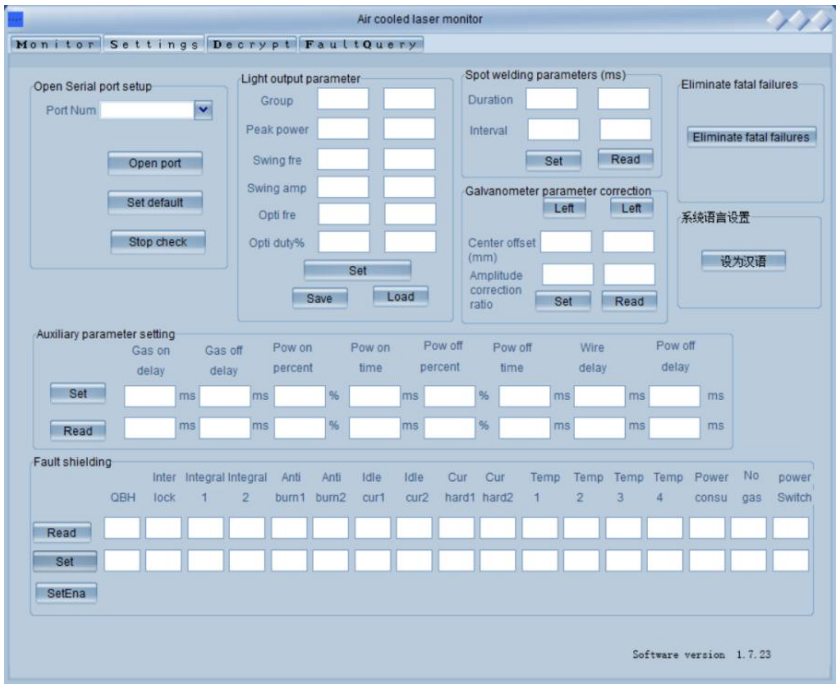
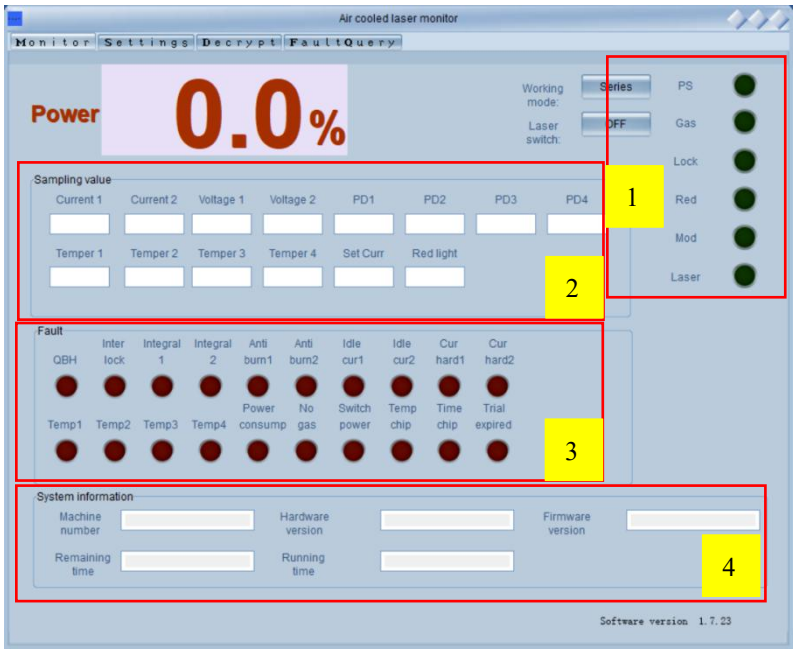


Figure 5.2 Setting of serial port

5.2 Monitor Page

Click “Monitor” to cut over the interface to “Monitor Page”, just as the following figure 5.3:



11Figure5.3 Monitor Page

Table 5.1 The function of the buttons on Monitor Page

NO	MODULE	DESCRIPTION	FUNCTION
1.	Operation instructions	Work mode	The laser has two work modes: series and spot welding.
		Laser en	This function is used to turn on and turn off the laser. In the off state, there is only red indicator light and no laser outputs, which is often used for galvanometer debugging. In the on state, the red indicator light and laser are automatically switched according to the input conditions
		PS	When the light is on, the power supply of the device is ready.
		Gas	When the light is on, the air pressure at GAS IN meets the requirements.
		Lock	When the light is on, it means that the workpiece clamp and the weld head are closed.
		Red	When the light is on, it means that the red indicator light is being emitted.
		MOD	When the light is on, it means that the button on the weld head is closed.
		Laser	When the light is on, it means that the laser is being emitted, please pay attention to protection.
2.	Sampled value	Current	Display current sampling value.
		Voltage	Display voltage sampling value.
		PD	Display laser sampling value.

NO	MODULE	DESCRIPTION	FUNCTION
		Temperature	Display temperature sampling value.
		Set current	Display the set current value corresponding to the current power.
		Red light	Display red indicator light current value.
3.	Fault	As shown	The light is on to indicate that the corresponding fault has occurred.
4.	System information	Machine number	The number of the laser device.
		Hardware version	The hardware version of the device.
		Firmware version	The firmware version of the device.
		Remaining time	The remaining time of the device.
		Running time	The running time of the device.

5.3 Setting Page

The Page is just as the figure 5.4. The function of the different button is as the following table 5.2.

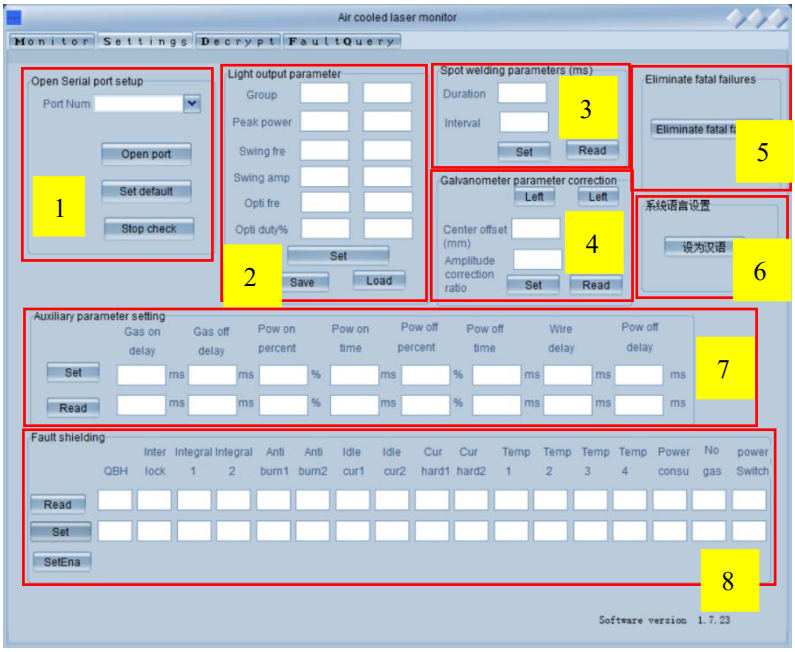


Figure 5.4 Setting Page

The function of the setting page is shown in the table below:

Table 5.2 The function of the buttons on Setting Page

NO	MODULE	DESCRIPTION	FUNTION
1.	Serial port setup	Port Number	Drop-down box to select the corresponding serial port.
		Open port button	Open the corresponding serial port.
		Set default	Set the corresponding serial port to the default serial port. The next software restart will automatically open the serial

NO	MODULE	DESCRIPTION	FUNTION
			port.
2.	Laser output parameter	Group	Save and select the process parameters, only two digits can be input.
		Peak power	Set the peak power of the laser.
		Wobble Freq	Wobble frequency of the galvanometer, the input range is 0~300Hz.
		Wobble Amp	Wobble amplitude of the galvanometer, the input range is 0~5.0mm.
		F	The modulation frequency of the laser, the input range is 20~20000Hz. Default 100Hz.
		D	The duty cycle of the laser, the input range is 0~100%. Default 100%.
3.	Spot welding parameters	Duration time	The duration time of the laser, the input range is 1~60000ms. Default 200ms.
		Interval time	The interval time of the laser, the input range is 1~60000ms. Default 200ms.
4.	Galvanometer parameter correction	Left/ Right	Used to realize the setting of the center movement direction of the galvanometer.
		Center offset	Used to realize the setting of the movement value of the center of the galvanometer, the input range is 0~2.50mm.
		Amplitude correction ratio	Used to realize the correction of the amplitude of the galvanometer, the input range is 0~4.00.
5.	Eliminate fatal failures	Eliminate fatal	Eliminate fatal failures of the current device
6.	System language settings	“设为汉语”	With this button, you can translate the system language to Chinese.
7.	Auxiliary parameter setting	Gas on delay	Ventilation time before turning on the laser, the input range is 0~3000ms. Default 200ms.
		Gas off delay	Ventilation time after turning off the laser, the input range is 0~3000ms. Default 200ms.
		Power on percent	The power percentage when the laser is turned on, the input range is 0~100%. Default3 0%.
		Power on time	The rise time from the percentage of turn-on power to the setting peak power, the input range is 0~2000ms. Default 500ms.
		Power off percent	The power percentage when the laser is turned off, the input range is 0~100%. Default 80%.
		Power off time	The fall time from the setting peak power to the percentage of the laser power off, the input range is 0~2000ms. Default 500ms.
		Wire delay	Compensation time for wire feeding, the input range is 0~2000ms. Default 0ms.

NO	MODULE	DESCRIPTION	FUNTION
		Power off delay	The compensation time of turning off the laser, the input range is 0~1000ms. Default 0ms.
8.	Shielding failure	Read button	Read the current fault shielding of the device.
		Set button	It is necessary to put the fault shielding file provided by the manufacturer under the installation folder of the software, and then click the set enable button to enable it.
		Enable button	Enable the shielding file provided by the manufacturer

5.4 Decrypt Page

Decrypt Page is just like figure5.5.

There are two kinds of settings: “Agent settings” and “user settings”. Among them, the agent is the password set by the manufacturer to the distributor to limit the use time. User is the password set by the distributor to limit the use time of the end user. Level A decryption is a set time for each password input. Permanent decryption denotes unlimited lifetime. The following indicator lights and text display the decryption status of the device after the connection between the software and the device.

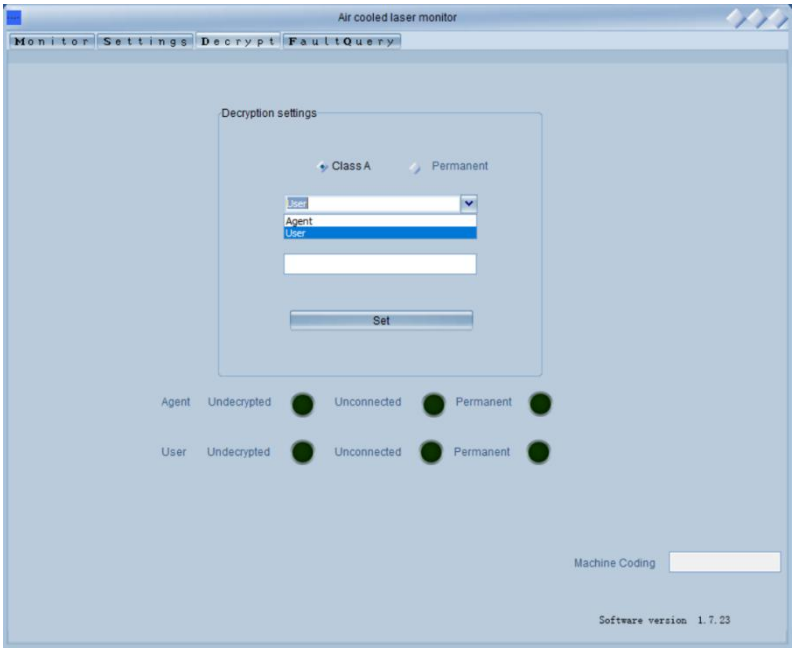


Figure 5.5 Decrypt Page

5.5 Fault Query Page

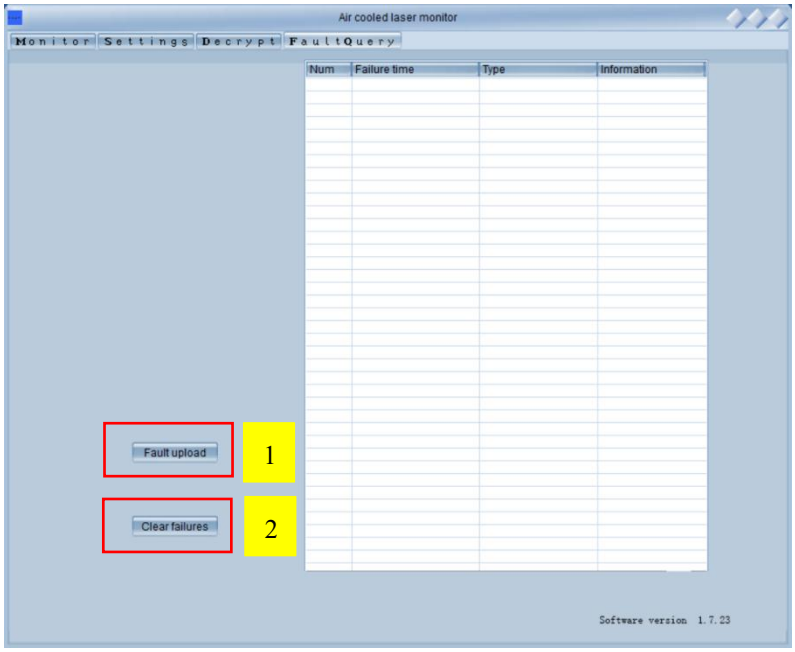


Figure 5.6 Fault Query Page

Detail for the function is shown in the table below:

Table 5.3 The Function of the Button on the Page

NO	DESCRIPTION	FUNCTION
1.	Fault upload button	Upload the Storage failure in device.
2.	Clear failures button	Clear the fault information in the display window.

Chapter 6 Common faults treatment

6.1 Fault alarm and query

In case of fault alarm, the laser will automatically turn off by turning off the internal power supply. At the same time, the fault signal in the 12-PIN CTRL-INTERFACE (ALARM_OUT+—pin 5， ALARM_OUT—pin 6)on the rear panel will be turned on, and the fault light will light up in the touch screen. If the customer needs to know the fault type, they can click “FaultQuery” to view. If the customer needs to know more details, they can click on the "Details" on the second page of the FaultQuery on the touch screen. You can also view the information of fault on PC, but you need to connect the RS485 communication line to the PC.

6.2 Troubleshooting solution

The failure instructions and possible solutions are as follows:：

Table 6.1 The failure instructions and possible solutions

NO	MESSAGE	DESCRIPTION	SOLUTION
1.	QBH Fault	Contact between the QBH and the cutting head is not in place.	Reconnect the QBH and weld head, restart the laser to see if the fault still occurs. If it does, pull out QBH with the ring contactor short circuit connected, and then restart the laser. If there is still a fault after all of above treatments, please contact our after-sales service personnel.
2.	INTERLOCK Fault	Pin 3 and Pin 4 of CTRL-INTERFACE are not shorted.	Connect pin 3 and pin 4 to the safety door or short circuit directly. Then restart the laser. If there is still a fault after all of above treatments, please contact our after-sales service personnel.
3.	INTEG1 Fault	RESEVED	RESEVED
4.	INTEG2 Fault	Laser internal optical path detection failure	Contact our after-sales service personnel to see if you can continue to use the laser.
5.	PrevBurn1 Fault	RESEVED	RESEVED
6.	PrevBurn2 Fault	Laser internal optical path detection failure	Contact our after-sales service personnel to see if you can continue to use the laser.
7.	IdleCur1 Fault	The current value when the laser is turned off exceeds the upper limit.	Restart the laser. If it happens frequently, please contact our after-sales service personnel.

NO	MESSAGE	DESCRIPTION	SOLUTION
8.	IdleCur2 Fault	The current value when the laser is turned off exceeds the upper limit.	Restart the laser. If it happens frequently, please contact our after-sales service personnel.
9.	CurHard1 Fault	The current value exceeds the hardware threshold.	Check if the 220V AC power supply of the laser is stable. If it is stable, reduce the peak output power of the laser. If the fault still occurs, please contact our after-sales service personnel.
10.	CurHard2 Fault	The current value exceeds the hardware threshold.	Check if the 220V AC power supply of the laser is stable. If it is stable, reduce the peak output power of the laser. If the fault still occurs, please contact our after-sales service personnel.
11.	Trial Expires Fault	Trial time limit exceeded.	Contact our after-sales service personnel to see if you can continue to use the laser.
12.	Timing Chip Fault	The timekeeping chip faults.	Please contact our after-sales service personnel.
13.	Over Power Fault	The power consumption of the driver board exceeds the maximum value.	Check if the 220V AC power supply of the laser is stable. If it is stable, but the fault still occurs, please contact our after-sales service personnel.
14.	T1 Fault	The temperature at the pump source exceeds the upper temperature limit.	When confirming that the working environment of the laser is lower than the usage requirements, restart the laser. If the fault still occurs, please contact our after-sales service personnel.
15.	T2 Fault	The temperature at the fiber exceeds the upper temperature limit	When confirming that the working environment of the laser is lower than the usage requirements, restart the laser. If the fault still occurs, please contact our after-sales service personnel.
16.	T3 Fault	RESEVED	RESEVED
17.	T4 Fault	RESEVED	RESEVED
18.	No Gas Fault	The air pressure at the GAS IN is lower than the set value.	Ensure that the air pressure at the GAS IN is greater than 5L/min, restart the laser, If the fault still occurs, please contact our after-sales service personnel.
19.	Power Supply Fault	The power supply is abnormal.	Check if the 220V AC power supply of the laser is stable. If it is stable, but the fault still occurs, please contact our after-sales service personnel.

NO	MESSAGE	DESCRIPTION	SOLUTION
20.	Temp Chip 1~4 Fault	The chip of temperature measurement faults.	Please contact our after-sales service personnel.

Chapter 7 Warranty and Return

7.1 General warranty

While all products manufactured according to the orders or specifications are delivered, the products with problems issued from materials and technologies shall be guaranteed by Reci, as long as the laser is used in accordance with specifications.

When a problem is found, the customers should do as below:

- Contact with the after-sales service personnel of Reci at the first time, then put forward the requirements in writing within a month (30 days) from finding the problems.
- In case of returning to the factory for maintenance, packaging and transportation shall be carried out in accordance with the requirements of this Guide.
- A third party will never covered by the warranty.

7.2 Limit of warranty

The following damages (including the overall damage of the machine, the damage of parts, optical fiber, etc.) are not covered by the warranty:

- Damages caused by tampering, opening, MIS installation, improvement intention, etc. without Reci personnel.
- Damage caused by inappropriate operations and negligence.
- Damage caused by using beyond the limit of the product.
- Damage caused by a violation the information and warning in the user guide.

CAUTION:

The customer has the responsibility to understand and operate according to the operation instructions in the user's guide. The damage caused by the wrong operation is not covered by the warranty.

7.3 Transportation

- Before transportation, all machines to be repaired or replaced must be reliably packed with the original packaging boxes provided by Reci, otherwise any damage caused thereby will not be repaired free of charge.
- Please carry out inspection and acceptation according to the list when prepare to repairing or returning. If the machine to be repaired or replaced does not return accompanied with all its wires, Reci will not send the wires again.

- When the products will be transported in winter, please use high-pressure air (which must be dry and clean) to drain the cooling water inside the products (inside the machine and QBH). If the products are frozen crack to water leakage, additional maintenance fees will be charged.