User Guide for
Single-Module Continuous-Wave Fiber Laser

Beijing Reci Laser Technology Co., Ltd.

2021.10

CONTENT

Chapter 1 Safety Information

Thank you for choosing the single module fiber laser from Reci laser.

In order to guarantee the fiber laser is operated safely (including personnel safety, equipment safety, production safety), ensure the product remain its best condition for a long time. 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

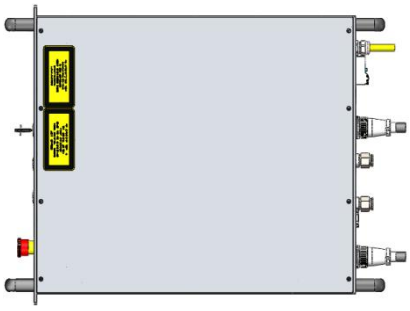
This series of lasers emit invisible laser radiation around a wavelength of 1080 ± 3nm. The average power of the products is ranged from 10% to 100% at a maximum

power about 1000W, 1500W, 2000W or 3000W, 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

All safety warning symbols posted on the series Fiber Laser is shown below in Figure1.1, the symbol positions of all the series products are the same:



1: Top view of 1500W (Same as 1000W &2000W)

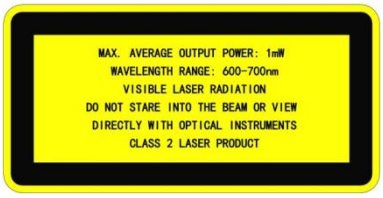
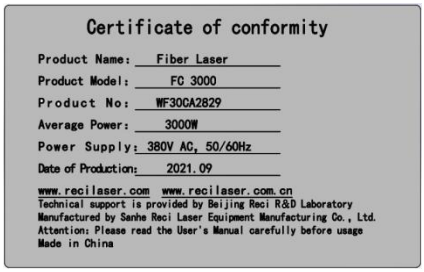
2: Rear view of 1500W (Same as 1000W)

3: Top view of 3000W

4: Rear view of 3000W (Same as 2000W)

Figure 1.1 Positions of the symbols on the series of lasers

Table 1.1 the details of the symbols

	
1: Class 2M Laser Product Label for Guide Laser	2: Class 4 Laser Product(take 3000W as example)
	
3: Laser Radiation Hazard Label	4: Electrical Hazard
	
5: Identification Plate of the device	6: Frost Hazard
	
7: Mark of CE Certification	

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 **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) Make sure that the black cap of the QBH is taken off when you are prepared to use the laser.

(5) Make sure the end surface of the quartz head and the protective window lens of the optical output is clean, if not, please clean it with dust-free lens paper soaked by high purity (≥99.8%) anhydrous ethanol under a microscope.

(6) Make sure that the processing devices can support a maximum laser power above 3000W. If you find that the processing equipment is being heated to a higher temperature, please stop processing immediately. ***An appropriate and approved processing system is needed.***

	**CAUTION :** ***A damage of the end surface of the QBH or Processing lens may lead more serious hazard on product.***

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 or 380V AC), 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) The equipment does not have any part which can be maintained by operators, and all the maintenance operations must be finished by the professionals of Reci Co., Ltd.***

1.6 Other Safety Instructions

(1) There are often numerous secondary laser beams produced at various angles in the output port of the laser. These divergent beams are produced when the primary beam of laser reflects off a smooth surface, and they are

called specular reflections. Although these secondary beams may be less powerful than the total power emitted from the primary beam, the intensity may be great enough to cause damage to the eyes and skin as well as surface of materials.

	**WARNING :** ***You must exercise caution to avoid/minimize specular reflections as these laser radiations are invisible!***

(2) Optical accessories relevant to the laser, such as light-sensitive elements that may be damaged from exposure to the laser light, video cameras, photomultipliers and photodiodes, need related protections.

	**CAUTION :** ***The Reci Single Module Fiber laser is strong enough to cut or weld metal, burn skin, clothing and paint. In addition, this laser can ignite volatile substances such as alcohol, gasoline, ether and other solvents. During the operating process, the flammable materials around the laser must be isolated.***

(3) Please do not operate laser in darkened environments.

(4) Do not turn on the laser without an optical coupling fiber or the optical output connector.

(5) Carry out commissioning, calibration and focusing at low output power and then increase the output power gradually when the calibrating and focusing work is done.

(6) If the equipment is operated in a manner not specified in this document, the protection devices and performance of the equipment may be impaired and the warranty will be voided.

Chapter 2 Product Description

2.1 Property Introductions

As high power fiber lasers developed for industrial application, the Series fiber lasers are compact and efficient. The lasers are mainly applied to the fields of welding, cutting, brazing, etc.

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 FC3000 as an example. Similarly, the FC1000 means its maximum average power can reach 1000W; the FC2000 means its maximum average power can reach 2000W:

:

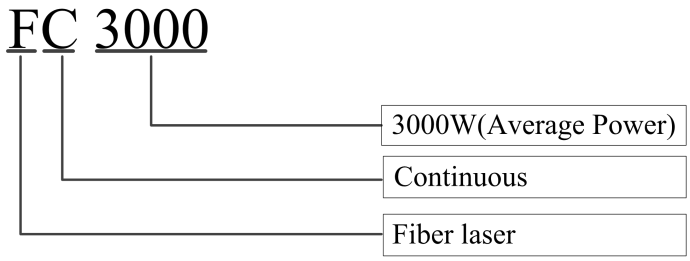


Figure 2.1 the meaning of the model names

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 single module series lasers

Item	Value	
	FC1000、FC1500	FC2000、FC3000
Supply Voltage(V)	220±10% V AC 50/60Hz	380±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	QBH and even the whole machine need deionized water to prevent scaling. At the absence of deionized water, pure water for drinking can be used. When the ambient temperature is lower than 0℃, antifreeze (30% volume ratio for alcohol) needs to be added to the cooling water.	

Note:

(1) Never use the tap water or other cooling water with high ion concentration.

(2) The cooling water shall be replaced timely to prevent microorganism and ions growth.

(3) It is very easy to be damaged when the QBH getting scaling, and there is no warranty in this case.

(4) The output of the laser is connected with the cable. Please check the end surface of the quartz head carefully to prevent dust or other pollution. Lens-cleansing paper must be used when cleaning is necessary.

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

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

	**CAUTION:** ***(1) Never make this product work in high humidity（＞95%）,though the products have an excellent adaptability to the high humidity environment.*** ***(2) Never let this product work below the ambient dew point temperature(like the table 2.2)***

Table 2.2 the Constant Dew Point Table

Maximum Relative humidity (%)	20	30	40	50	60	70	80	90	95
Room Temperature(℃)	Ambient Dew Point (Td-℃)								
10	-11.9	-7	-0.3	0	2.5	4.8	6.7	8.4	9.2
15	-7.9	-2.3	1.5	4.6	7.3	9.6	11.6	13.4	14.2
20	-3.5	2	6	9	12	14.5	16.5	18	19
25	0.5	6	10.5	14	16.5	19	21	23	24
30	4.6	10.5	15	18.5	21.5	24	26	28	29
35	8.5	15	19.5	23	26	28.5	31	33	34
40	13	20	24	27.5	31	33.5	36	38	39
			Temperature range for laser operating						

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 2.3 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 single module series fiber laser which the power is ranged from 1000W to 3000W are demonstrated in the table.

Table 2.3 Parameters of the single module series laser

MODEL		FC1000	FC1500	FC2000	FC3000
Optical Specification	Output Power (W)	≥1000	≥1500	≥2000	≥3000
	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)	20 or 50	30 or 50		50
	Delivery Fiber Length (m)	10 or 15			20
Electric Specification	Operating Voltage (VAC)	AC 220V 50/60Hz		AC380V 50/60Hz	
	Power Consumption (W)	<3860	<5300	<7280	<10600
	Control Mode	Ext. AD/Loc. AD			
Other Specification	Dimensions W×H×D (mm^3)	483×148×532			483×148×740
	Weight (kg)	<60	<65	<70	<75
	Ambient Temperature (℃)	5~40			
	Ambient Humidity (%)	<70			
	Cooling Method	Water cooling			
	QBH Cooling Water Temperature (℃)	Room temperature (No condensation)			
	Cooling Water Temperature (℃)	25 (28 in summer)			
	Cooling Water Flow with load (L/min)	>15	>20	>25	>35
	Storage temperature (℃)	-10~60			

Chapter 3 Installation of the laser

The appearance of all the products is consistent. So no mark will be made in the following is specifically. We will use ”1000W” to represent a fiber laser whose average power can reach 1000W, and so as the other models.

3.1 Dimension of the machine

The dimension of the laser device is just below; figure 3.1 is for front panel and rear panel of the series fiber laser.

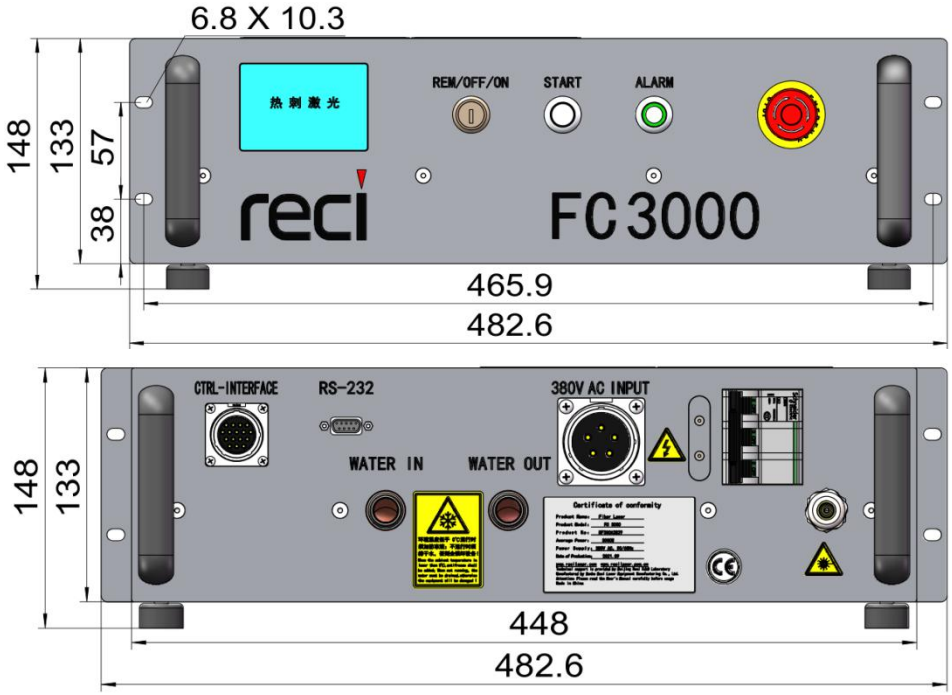


Figure 3.1 Front view and Rear view（unit: mm）

The figure 3.2 describes the side view and bottom view dimensions of 1000W, 1500W&2000W fiber laser; they are the same at appearance size; and then the figure3.3 is for 3000W fiber laser.

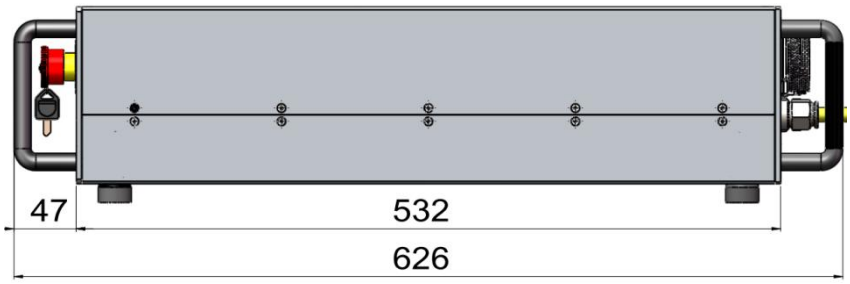


Figure 3.2(a) Side view (for 1000W, 1500W&2000W)) (unit: mm)

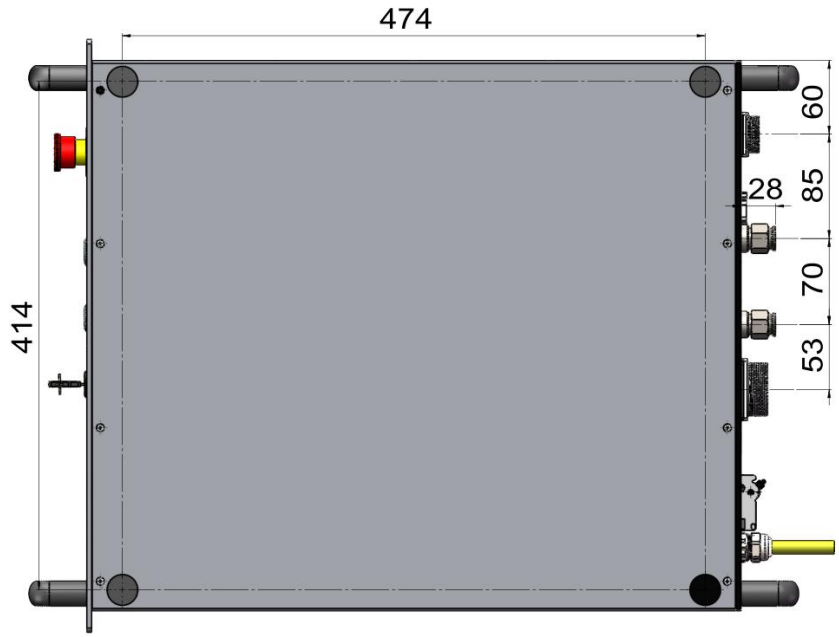


Figure 3.2(b) Bottom view (for 1000W, 1500W&2000W) (unit: mm)

Figure 3.3(a) Side view of 3000W fiber laser (unit: mm)

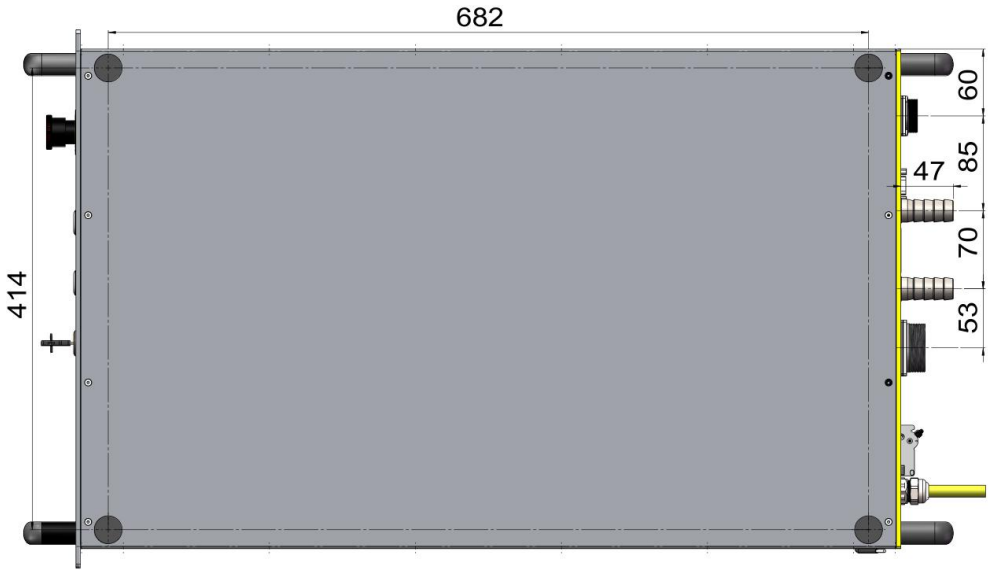


Figure 3.3(b) Bottom view of 3000W fiber laser (unit: mm)

3.2 The optical output head

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

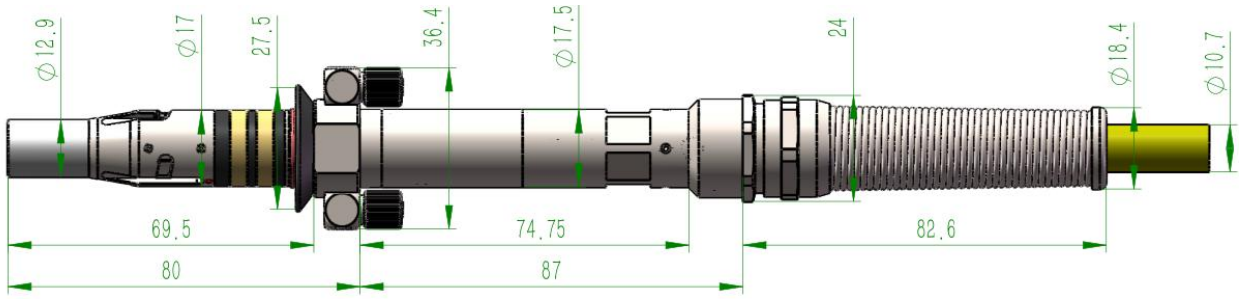


Figure 3.4 the top view of the QBH (unit: mm)

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 Connection and Requirements of the Cooling system

3.3.1 Connection of the cooling system

A water cooler with dual temperature output is required.

For 1000W or 1500W, Polyurethane pipe with outer diameter of 12mm which is used for quick insertion is needed. For 2000W or 3000W, pipe with inner diameter of 20mm is needed for connecting the laser and the water cooler.

Two segments of quick plug water pipes with outer diameter of 6mm are for connection between QBH and the water cooler. The method is shown in Figure 3.5: the outlet of the water cooler is connected with the "WATER IN" of the laser, and the inlet of the water cooler is connected with the "WATER OUT" of the laser, and so is the QBH, ***the new QBH without marked 'inlet and outlet' can use any connection as inlet, another connection as outlet.***

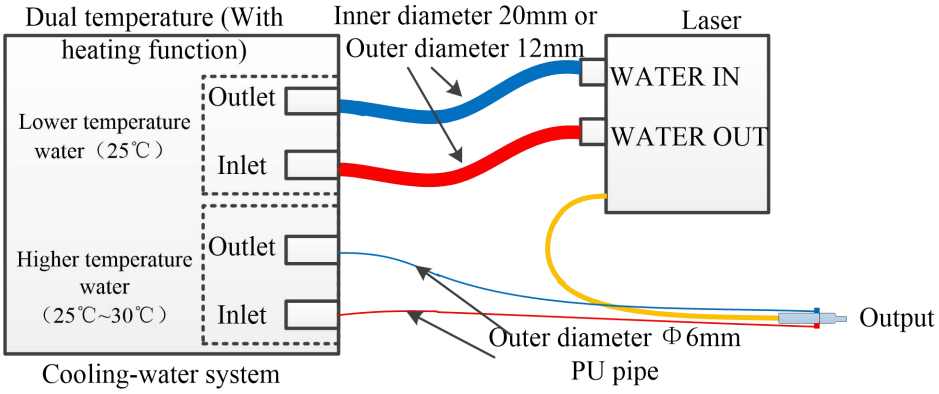


Figure 3.5 Sketch Map for the connection of the cooling system

If a water cooler with dual temperature output isn't ready there, an extra water cooler for QBH specialized will be needed. And you'd better follow the notes below:

(1) Water with poor quality cannot be used, and the water temperature should not make QBH dewy.

(2) Just as the figure 3.6, the QBH must be connected in the water way first, and then the processing head. Do not reverse or divide water in order to avoid cooling capacity lacked.

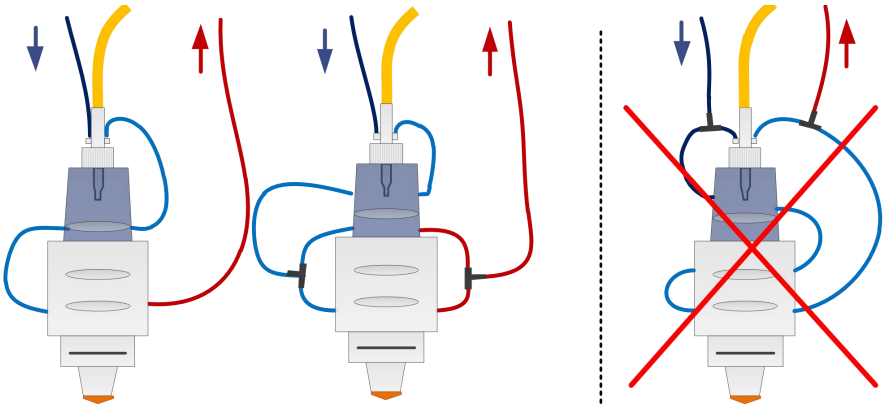


Figure 3.6 the connection of water way between QBH and processing head

3.3.2 Requirement of the cooling system

The requirement of the cooling system is on display in the table below:

Table 3.1 the requirement of the cooling system for the series fiber laser

Item		Unit	1000W	1500W	2000W	3000W
Refrigerating capacity	For the laser machine	kW	>2.5	>4	>5.5	>8
	For QBH		>0.5			
Water flow With load	For the laser machine	L/min	>15	>20	>25	>35
	For QBH		1.5~2.5(with load)			
Pump lift of the cooler	For the laser machine	m	≥35		≥45	
	For QBH		≥20			
Max. water pressure	For the laser machine	Bar	8			
	For QBH		6			
Water temperature	For the laser machine	℃	25 (28 when it is summer)			
	For QBH		Room temperature (No condensation)			
Diameter of the pipe	For the laser machine	mm	Φ12 (outer diameter)		Φ20(Inner diameter)	
	For QBH		Φ6(Outer diameter)-Φ4(Inner diameter)			

(1) Requirement for cooling fluid

(a) Make sure the water is pure enough-- the de-ionized water is the best choice, or you can also use purified water which is for drinking.

(b) Please pour some ethanol into the water in order to avoid the waterway stopped by the putrefaction, which is suggested about 10% of all.

(c) When the surrounding temperature is between -10℃~ 0℃, gain the ethanol proportion to 30%, and replace once two months. ***No warranty for frostbite caused by customers.***

(d) When the surrounding temperature is below -10℃, ***the water cooler with a heating system should never lay off all the time.***

(2) The other requirement of the cooling system

(a) When the cooling machine works the first time, please make sure the waterway is unclogged and watertight, at the same time the water supply (outlet) is connected to the "WATER IN"， and return water (Inlet) is connected to the "WATER OUT".

(b) If the laser is away from work for a long time, please empty the water in it.

	**CAUTION*:*** ***Set temperature for the cooling machine according to the surrounding temperature. Unsuitable temperature will lead bad results—too high temperature can lead the laser exceptional, even damaged, and the low temperature may cause badly condensation trouble both on the laser device and the QBH.***

	**CAUTION:** ***Make sure the cooling system works before the laser device does, and the temperature is required being 25 ℃, when you decide to turn on the laser device.***

3.4 Installation precautions

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

(2) Ensure the power supply wire and the control wire with 16 pin connected without the electrical power is disconnected.

(3) When the laser is connected to the water cooler, recognize the water inlet and outlet signs and step after it.

(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 or AC380V, 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 or AC 380V 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*:*** ***(1)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, 1000W, 1500W, 2000W and 3000W are the same style. Take FC3000 as an example.

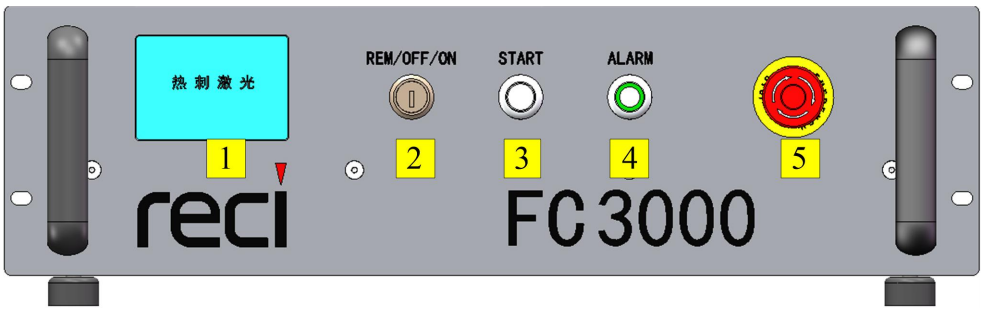


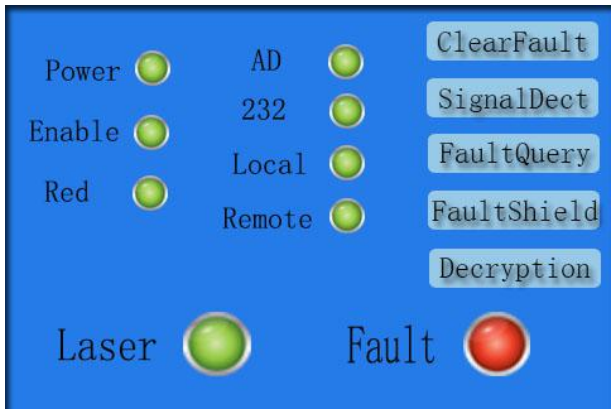
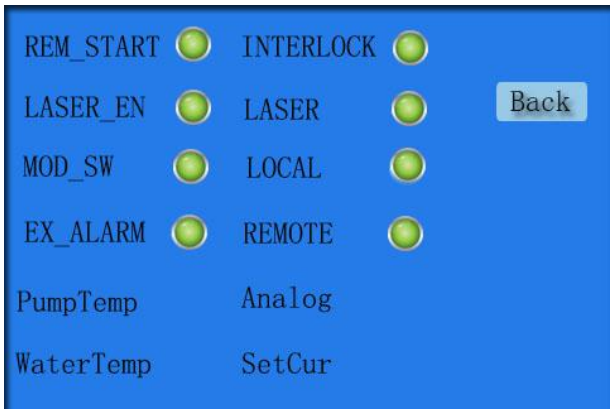
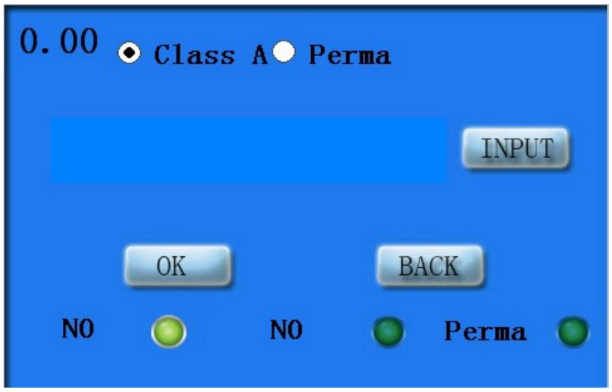
Figure 4.1 the font panel of FC3000 (the same as other single module Fiber Lasers)

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

Table 4.1(a) Function of the button/switch on the Front Panel

NO	ITEMS	FUNCTION DESCRIPTION
1	Touch screen	Check the laser status. Clear the fault, detect the signal, query the fault, query the fault shielding and clear the fault. See 4.1 (b) for details.
2	Key Switch	Power switch of laser. Insert the key, rotating to REM, means the laser is operating in the far end mode; rotating to ON, means the laser is operating in local mode; rotating to OFF, means the laser power is off.
3	Start	Start laser. Local mode power-on button, after the laser source power supply air switch opened, need press the button again, then the laser source power supply can power-on.
4	ALARM	Abnormal situation light of laser. Indicator light, green means that the laser power supply is normally powered on; red means that the laser is faulty.
5	Emergency Stop	Emergency stop. Press to turn the laser off and lock immediately, and turn it clockwise to release the button.

Table 4.1(b) Details of the touch screen

	
1: Touch screen - default interface	2: 2: Touch screen - Signal monitoring interface
	
3: Touch screen-- Fault query interface (Page 1 of 2)	4: Touch screen --Fault shielding interface(Page 1 of 2)
	
5: Touch screen—Language switching interface	6: Touch screen--Decryption settings interface

4.2 Rear Panel

As shown in Figure 4.2 (a) and Figure 4.2 (b), the rear panel styles of 1500W fiber laser (the same as 1000W fiber laser) and 3000W fiber laser (the same as 2000W fiber laser) are respectively shown.

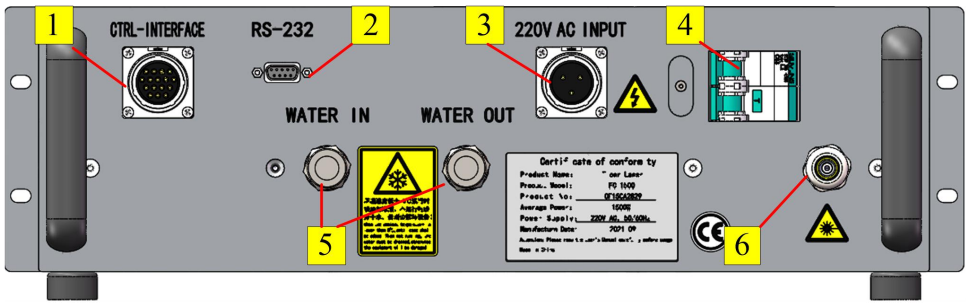


Figure 4.2(a) the Rear Panel of the 1000W &1500W fiber laser

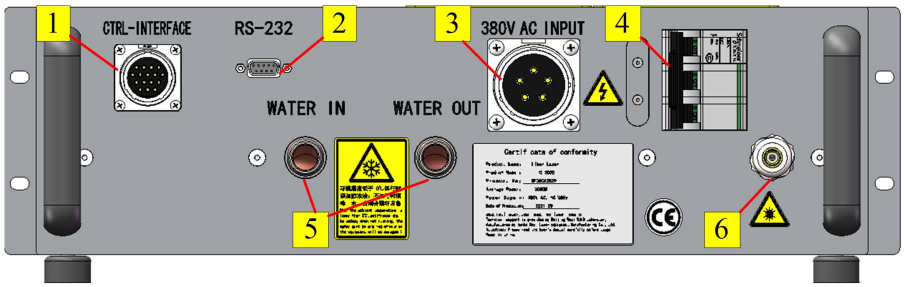


Figure 4.2(b) the Rear Panel of the 2000W &3000W fiber laser

The button functions of the rear panel from 3000W are as the table 4.2

Table 4.2 Function of the button/switch on the rear Panel

NO	ITEMS	FUNCTION DESCRIPTION	
		1000W&1500W	2000W&3000W
1	CTRL-INTERFACE	External control connector	
2	RS232	RS232 connector Can be used for device program modification, providing a matching RS-232 communication line when delivery	
3	AC INPUT	220VAC power input	380VAC power input
4	Air Switch	Power switch of AC power Push on, open AC power； push down, close the AC power	
5	WATER (IN/OUT)	The input and output port of cooling water	
6	Fixed holder of the QBH	For fixing QBH armor	

4.3 Electric Power Connect

The power cord with 3pin (for 1000W& 1500W) or 5-pin (for 2000W& 3000W) aviation plug is inserted into the rear panel with the "AC INPUT" socket and the other end connected to the AC power supply.

a) for1000W& 1500W

b) for 2000W& 3000W

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
	1000W & 1500	2000W & 3000W	
1	1L-live wire	1PE- Earth Wire	
2	2N-Neutral wire	2L- live wire A	
3	3PE-Earth Wire	3L- live wire B	
4	----	4L- live wire C	
5	----	Reserved	

4.4 Interface Definition

4.4.1 RS 232 Connecting Wire

This wire is used to convert the RS232 to a USB.

Figure 4.4 the wire for the RS232 connecting

Table 4.4 definition of the RS232 wire

PIN	DESCRIPTION	REMARK
2	RX	Receive
3	TX	Send
5	GND	GND

4.4.2 CTRL_INTERFACE Connecting Wire

Figure 4.5 the wire for the control connecting

Table4.5 definition of the control wire

PIN	DESCRIPTION	REMARK
1	RS485-A	485 for the parameter setting
2	RS485-B	
3	REM_START-	24V High Level Effective，Used for remote power on（same function as the button in the surface）
4	REM_START+	
5	LASER_EN+	24V High Level Effective，Laser Enable for AD Mode

PIN	DESCRIPTION	REMARK
6	LASER_EN-	
7	Reserved	Reserved
8	Reserved	
9	EX_ALARM_OUT+	fault signal output normal open+
10	EX_ALARM_OUT-	fault signal output normal open -
11	Reserved	Reserved
12	MOD_SW_IN-	External modulation signal input, 24V High Level Effective.
13	MOD_SW_IN+	
14	ANG_GND-	Analog(0~10V) negative
15	ANG 0~10V+	Analog(0~10V) positive
16	Reserved	Reserved

4.4.3 485 connecting wire

This wire is used to convert the a 485Interface to a USB.

Figure 4.6 the wire for the 485 connecting

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

Table4.6 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 powered by local and remote methods. The local mode is controlled by the front panel START button, and the remote mode is controlled by the REM_START signal line in the rear panel CTRL_INTERFACE.

The laser power setting and the light-emission enable control: the laser power setting is controlled by the 0~10V analog signal on the rear panel, the light-emission enable control is controlled by the LASER_EN signal line of CTRL_INTERFACE in the rear panel. In addition, the output is controlled by the MOD_SW signal of CTRL_INTERFACE in the rear panel.

4.6 Local AD Mode

4.6.1 Settings and Connections

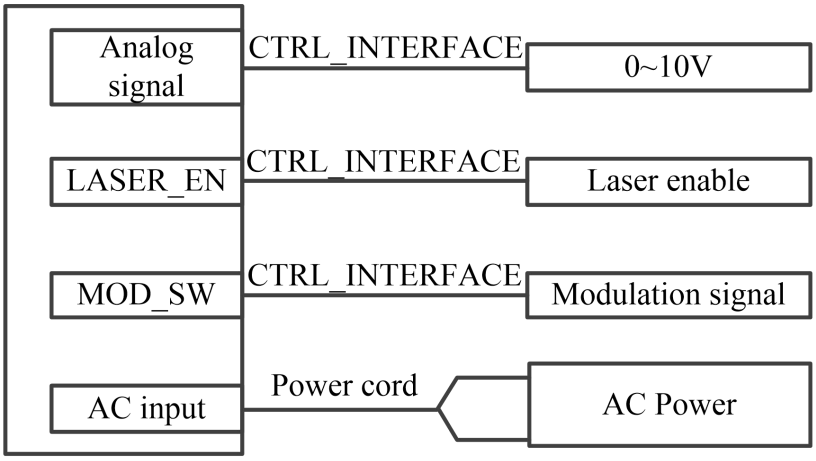


Figure 4.7 the connection for local AD model

(1) Set the AD mode with the control software.

(2) The 24V Laser enable signal is connected to pins 5 and 6 of the rear panel 16PIN CTRL_INTERFACE.

(3) The 24V modulated signal is connected to pins 12 and 13 in the rear panel 16 PIN CTRL_INTERFACE.

(4) Connect 0~10V analog signal to pins 14 and 15 in the rear panel 16 PIN CTRL_INTERFACE.

4.6.2 Sequence of operations

(1) Turn the front panel key switch to the ON side.

(2) Turn on the power switch at Rear panel of device. Wait for 10s to initialize the device. (It can also be closed and opened, controlled by an external switch.)

(3) Press the START button on the front panel, the laser power module is powered up and the red indicator light is turned on.

(4) Set the laser power through the 0~10V analog signal.

(5) Turn on the 24V laser enable signal. (the light output power can also be changed after the light is enabled.)

(6) Fast switching optical modulation output by modulation signal. (The red light indicator automatically turns off when laser is emitted, and turns on when laser is off.)

4.7 Remote AD Model

4.7.1 Settings and Connections

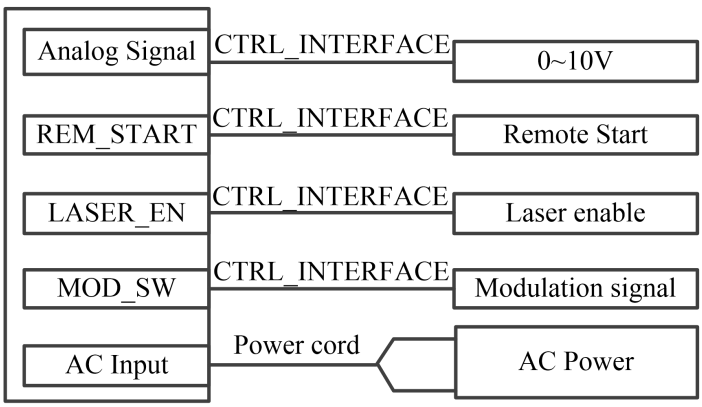


Figure 4.8 the connecting for remote AD model

(1) Set the AD mode with the control software.

(2) The 24V remote start signal is connected to pins 3 and 4 in the rear panel 16 PIN CTRL_INTERFACE.

(3) The 24V laser enable signal is connected to pins 5 and 6 of the rear panel 16 PIN CTRL_INTERFACE.

(4) The 24V modulated signal is connected to pins 12 and 13 in the rear panel 16 PIN CTRL_INTERFACE.

(5) Connect 0~10V analog signal to pins 14 and 15 in the rear panel 16 PIN CTRL_INTERFACE.

4.7.2 Sequence of operations

(1) Turn the front panel key switch to the REM side.

(2) Turn on the power switch at Rear panel of device. Wait for 10s to initialize the device. (It can also be closed and opened, controlled by an external switch.)

(3) Turn on the 24V remote start signal, power on the laser power module, and the red light indicator turns on.

(4) Set the optical power through the 0~10V analog signal.

(5) Turn on the 24V laser enable signal. (After 3 seconds, the remote start signal can be set to enable the laser output power to be changed after the laser is enabled.)

(7) Fast switching optical modulation output by modulation signal. (The red light

indicator automatically turns off when laser is emitted, and turns on when laser is off.)

Chapter 5 Use of monitoring software

The Monitor software for the single module series Fiber Laser, even the followed products of the same series is the same, take monitor for FC3000 as an example.

5.1 Connect

Connect 485 connecting wire to the 1st & the 2nd pin of Rear panel's CTRL_INTERFACE (which has 16 pins). The 1st pin connects to the T/R+ port of the wire, the 2nd pin connects to the T/R- port of the wire.

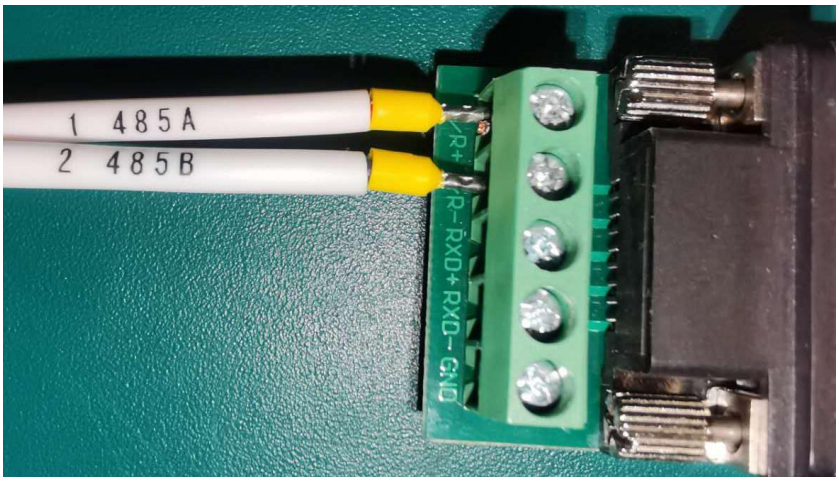


Figure 5.1 the connection of 485 interfaces

Then connect the other side of 485 wire to a computer 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.

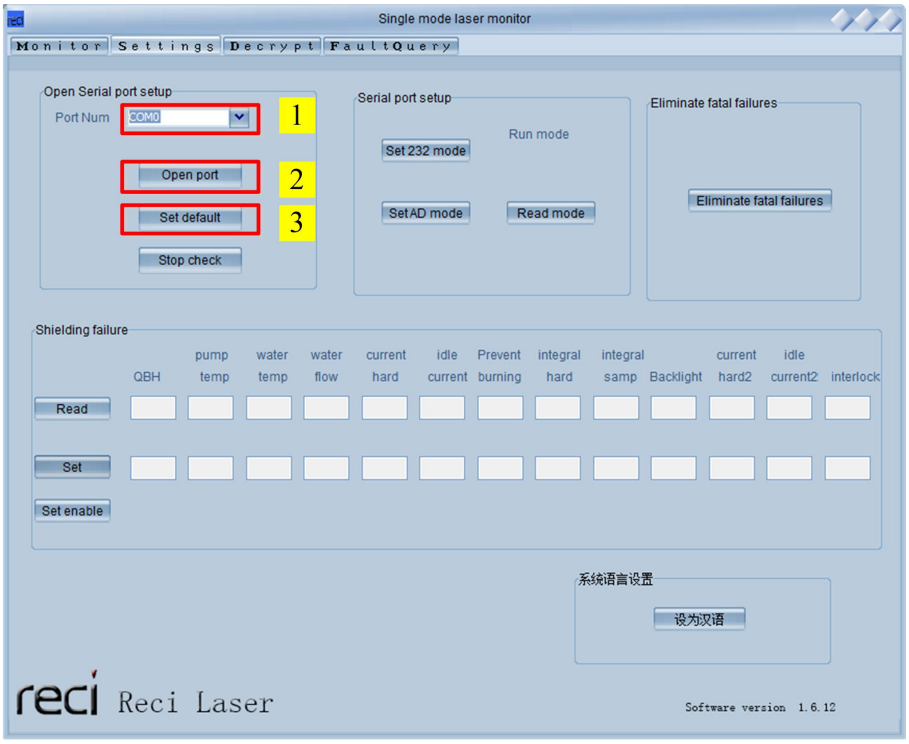


Figure 5.2 Setting of serial port

5.2 Monitor Page

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

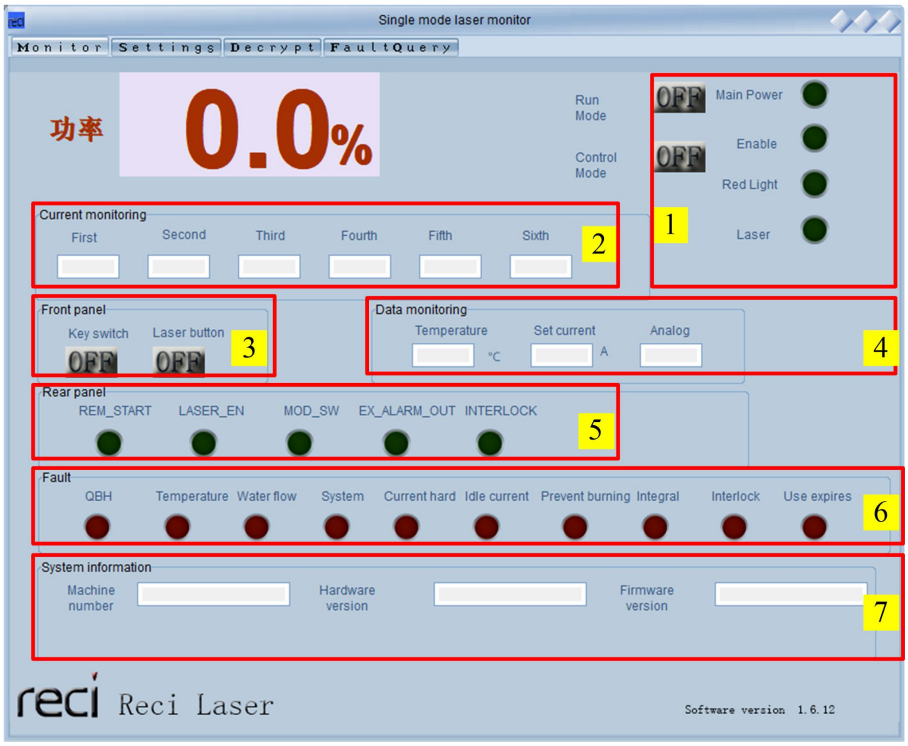


Figure5.3 Monitor Page

Table 5.1 the function of the buttons on Monitor Page

NO	MODULE	DESCRIPTION	FUNCTION
1	Operation instructions	Run mode	1) AD mode is the normal run mode; 2) 232 mode only use in Production debugging
		Control mode	1) REM represents remote mode 2) ON represents local mode
		Main power	Green lamp on means the main power turn on
		Enable	Green lamp on means the laser is enabled
		Red light	Green lamp on means the red light turn on
		Laser	Green lamp on means laser is being emitted
2	Current monitoring	Current monitoring	Display the sampled data values
3	Front panel	Key switch	Position of key switch
		Laser button	Position of laser button
4	Data monitoring	Temperature	Temperature of Pump Source and Water IN
		Set current	Current value set to device
		Analog	Sampling value of power supply added to back-end analog data line

NO	MODULE	DESCRIPTION	FUNCTION
5	Rear panel	As the figure 5.3	Green lamp on means the corresponding signal is valid
6	Fault	As the figure 5.3	Red lamp on means the corresponding fault is valid
7	System information	Machine number	The number of the laser device
		Hardware version	Hardware version of the device
		Firmware version	Firmware version 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.

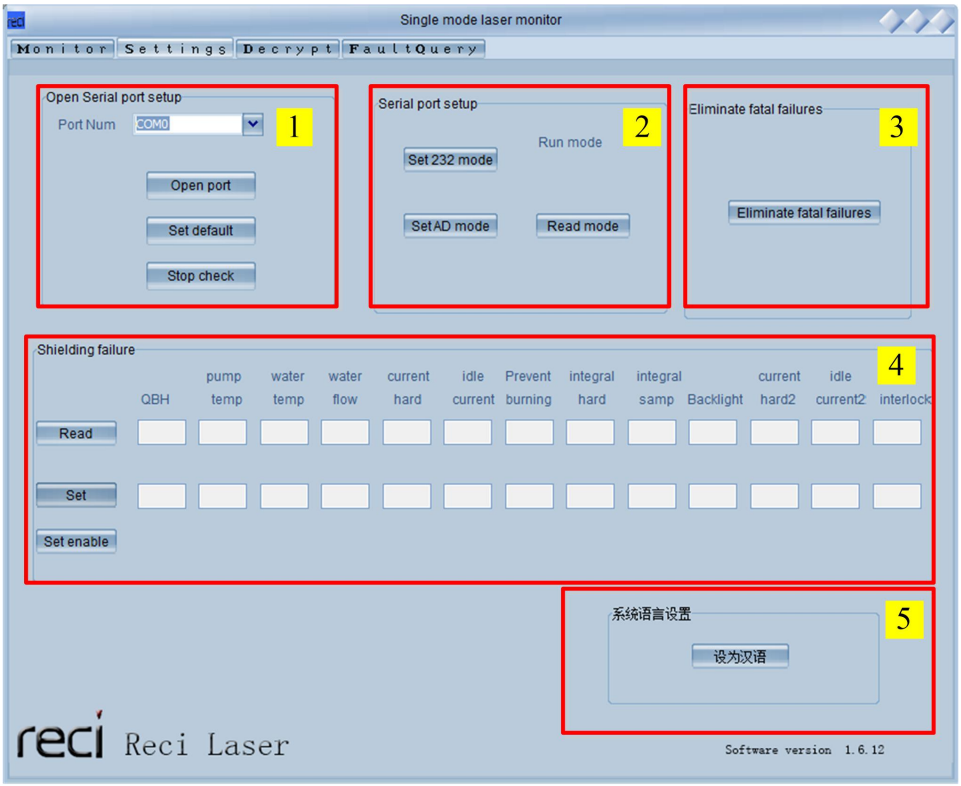


Figure 5.2 Setting Page

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 Num	Drop-down box to select the corresponding serial port

NO	MODULE	DESCRIPTION	FUNTION
		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 port
2	Set run mode	Set 232 mode button	Set the device to 232 mode operation，needs to be restarted to be effective.
		Set AD mode button	Set the device to 232 mode operation，needs to be restarted to be effective
		Read mode button	Read operation mode of the device is now set up
3	Eliminate fatal failures	Eliminate fatal	Eliminate fatal failures of the current device
4	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
5	System language settings	“设为汉语”	With this button, you can translate the system language to Chinese.

5.4 Decrypt Page

Decrypt Page is just like figure5.3.

There are two kinds of settings: “Proxy 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.

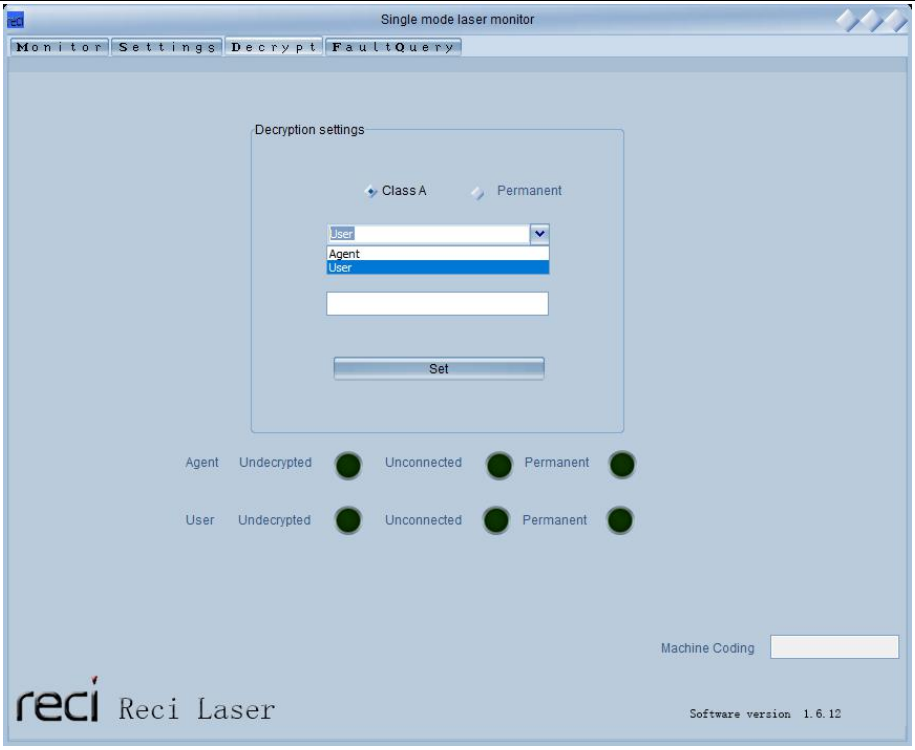


Figure 5.3 Decrypt Page

5.5 Fault Query Page

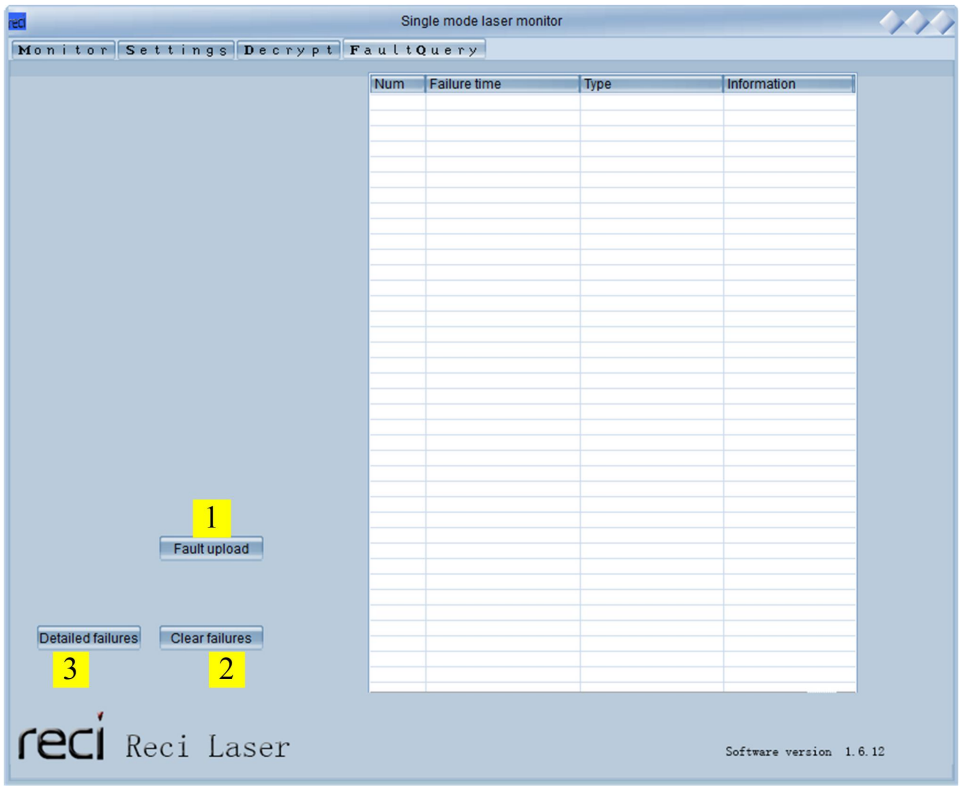


Figure 6.4 Fault Query Page

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 fault data saved in device
3	Detailed failures button	Data required for the production of after-sales service personnel

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 signal of fault will output a conduction signal with the 9th pin (EX_ALARM_OUT+) and the 10th pin (EX_ALARM_OUT-) in the 16 pin Ctrl_Interface on the rear panel. And then the front panel display will display the fault information at this time.

The customers can make detailed query on the software fault query page when they need to know more detailed fault information.

6.2 Common faults solution

The failure instructions and possible solutions are as follows:：

Table 6.1 the failure instructions and possible solutions

NO	MESSAGE	DESCRIPTION	SOLUTION
1	Emergency Stop fault	The Emergency Stop is pressed.	Turn the emergency stop clockwise, and restart the laser to see if the fault still occurs. If there is still a fault after all of above treatments, please contact our after-sales service personnel.
2	QBH fault	Contact between the QBH and the cutting head is not in place.	Reconnect the QBH and cutting 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 source. If there is still a fault after all of above treatments, please contact our after-sales service personnel.

NO	MESSAGE	DESCRIPTION	SOLUTION
3	IntergSamp	Laser internal optical path detection failure	Contact our after-sales service personnel to see if you can continue to use lasers.
4	PumpTemp fault	The temperature of the laser diode used as pump source exceeds the set value.	Check whether the water cooler is working properly; check whether the water temperature is set correctly or not. When the water cooler works normally and the water temperature drops to the set temperature, restart the laser source. If there is any trouble, please contact our after-sales service staff.
5	IntergHard fault	Laser internal optical path detection failure	Contact our after-sales service personnel to see if you can continue to use lasers.(**This function is generally idle**)
6	WaterTemp fault	The water temperature is too high, or the water flow is below the set value.	Check whether the water pipes are installed correctly. Ensure the cooler is working properly and the water flow meets the requirements. If a fault is still happening with everything qualified, please contact us.
7	PrevBurn fault	Laser internal optical path detection failure	Contact our after-sales service personnel to see if you can continue to use lasers.
8	CurHard fault	The laser module supply current exceeds the hardware threshold.(Located on the main drive circuit board)	Check if the 380V 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.
9	IdleCur 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.
10	Cooling fault	Laser internal optical path detection failure. Most of time, caused by Lack of cooling.	Contact our after-sales service personnel to see if you can continue to use lasers.
11	TrialExpi fault	Trial time limit exceeded	Contact our after-sales service personnel to see if you can continue to use lasers.

NO	MESSAGE	DESCRIPTION	SOLUTION
12	TemChip fault	The chip of temperature measurement faults.	Please contact our after-sales service personnel.
13	TimChip fault	The timekeeping chip 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.