Pulsed Ytterbium Laser

User Instruction

WuHan Raycus Fiber Laser Technologies CO., LTD

Safety Information

Please read this instruction carefully and familiarize yourself with the information we have provided before you use the product. In this brochure, important operation procedures, safety and other information is provided for you and all future users. In order to ensure operating safely and optimal performance of the product, please do according to following warnings, cautions and other information.

- Raycus pulsed fiber laser is classified as a high power Class IV laser device. Before supplying the power to the device, please make sure that the correct voltage of 24VDC power source is connected and the anode and cathode are right. Failure to connect power source correctly will cause damage to the device.
- The device emits invisible 1060~1085nm wavelength light with average power 5W, 10W, 15W, 20W, 25W and 30W. Do not expose your eyes or skin to the radiation of the laser.
- Do not take apart the device, because there are no replaceable accessories available for users to use. Any maintenance can only be proceeded in Raycus.
- Do not look into the light output end directly. Use appropriate laser safety eyewear when operating the device.

Safety labels and locations

The two labels above is located on the top of the cover of the device, representing laser irra

Contents

1. Description

1.1. Product description

Raycus pulsed laser is specially designed for laser making system with high speed and high efficiency. It is an ideal high power laser source for industrial laser making system and other applications.

Compared with conventional lasers, pulsed laser has some unique advantages in accelerating the conversion efficiency of the pump light over 10 times higher, its automated design in low power consumption and being proper for operating both in and outside the lab. Besides, it is exquisite and convenient for its independence in placement, free time in using and facility in connecting to equipment directly.

The device can emit 1060~1085nm wavelength pulsed light under the control of industrial laser's standard interface driven by 24VDC power source.

1.2. Actual configuration list

Table 1 configuration list

Items	Quantity	Remark
Fiber Laser module	1	
User instruction	1	

1.3. Environmental requirements and cautions

Pulsed laser should be driven by 24VDC ±1V power source.

1) Attention: Make sure the wire of the device is properly grounded.
2) All the maintenance of the device should be done by Raycus, for there is no accessory available provided inside. Please do not damage the labels or open up the cover in order to prevent against electric shock, or any damage to the device will not be warranted.
3) The output head of the product is connected with a optical cable. Please be careful dealing with the output head. Avoid dirt and any other contaminations. Please do use exclusive lens paper when cleaning the lens. Please lid the laser with protective cover of the light isolator to be against dirt when the laser is not installed in the device or not in working.
4) If the operating way to use the device fails to follow this instruction, the function of protection produced by the device will be weakened. Therefore, it should be used under normal conditions.
5) Do not install the collimating device into the output head when the laser device is in working.

6) The device has three fans at the rear panel to give off heat. In order to guarantee enough airflow to help giving heat off, there is a space in width of 10cm for airflow in both the front side and the rear of the device. Because the laser's fans are working at blow condition, so if laser is mounted in a cabinet with fans, the direction should be same as laser's fans.
7) Do not look into the output head of the device directly. Please do wear appropriate laser safety eyewear during the time when operating the device.
8) Make sure the pulse repetition rate is no lower than 20 kHz, because laser with high power may cause damage to the device.
9) Maximum absence of the pulse is 50 x 10^{-6} s.
10) Power source interrupt will do great harm to the laser device. Please make sure the power supply works in succession.

1.4. Specifications

Table 2 pulsed fiber laser specifications

Pulsed fiber laser	5W	10W	15W	20W	25W	30W
Wavelength（nm）	1060~1085	1060~1085	1060~1085	1060~1085	1060~1085	1060~1085
Polarization	Random	Random	Random	Random	Random	Random
Optical isolator	Yes	Yes	Yes	Yes	Yes	Yes
Nominal average output power (W)	≥5	≥10	≥15	≥20	≥25	≥30
Single pulse energy (mJ) @20kHz	0.25	0.5	0.6@25kHz	1	1@25kHz	1@30kHz
Beam quality（M^2）	<1.5	<1.5	<1.5	<1.8	<1.8	<1.8
Beam Diameter（mm）	6～8	6～8	6～8	6～8	6～8	6～8
Pulse duration（ns）@20kHz	<100	<100	<110@25kHz	<120	<120@25kHz	<120@30kHz
Pulse repetition rate（kHz）	20 - 60	20 - 60	25 - 60	20 - 60	25 - 60	30 - 60
Output Power Tunability（%）	10-100	10-100	10-100	10-100	10-100	10-100
Output Fiber Cable length（m）	2.0	2.0	2.0	2.0	2.0	2.0
Working voltage（VDC）	24±1	24±1	24±1	24±1	24±1	24±1
Power consumption（20℃）（W）	80	120	150	200	250	300
Cooling	Forced Air Cooled	Forced Air Cooled	Forced Air Cooled	Forced Air Cooled	Forced Air Cooled	Forced Air Cooled
Dimension W×D×H（mm）	260×391×120	260×391×120	260×391×120	260×391×120	260×391×120	260×391×120
Operating temperature	0℃～40℃					
Store temperature	-10℃～60℃					
humidity	30%～85%					

2. Mounting

2.1 Mounting dimensions

1) Fiber Laser module dimensions

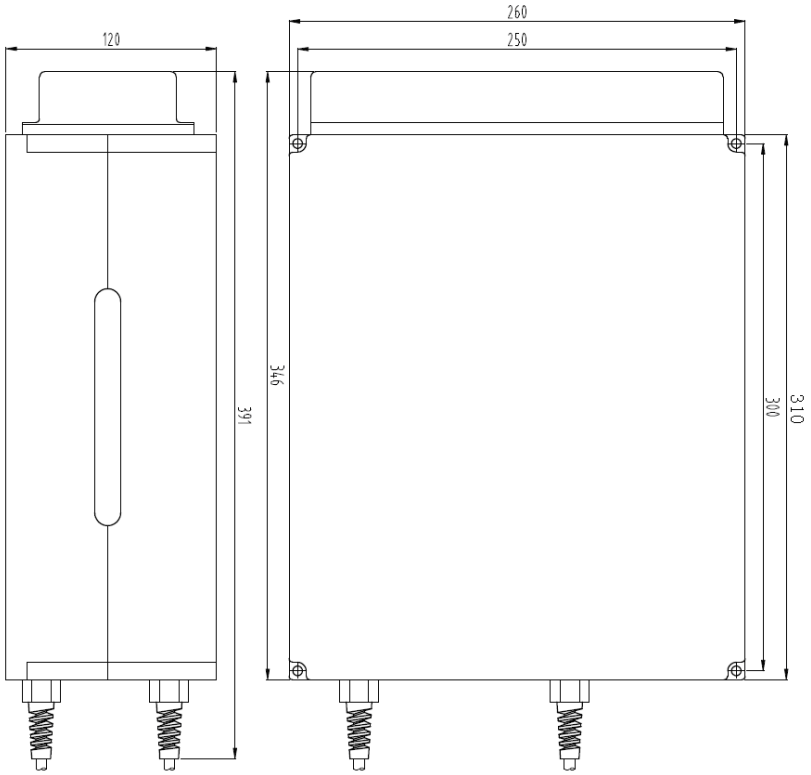

Figure 1 laser dimension (mm)

2) Isolated output head dimensions

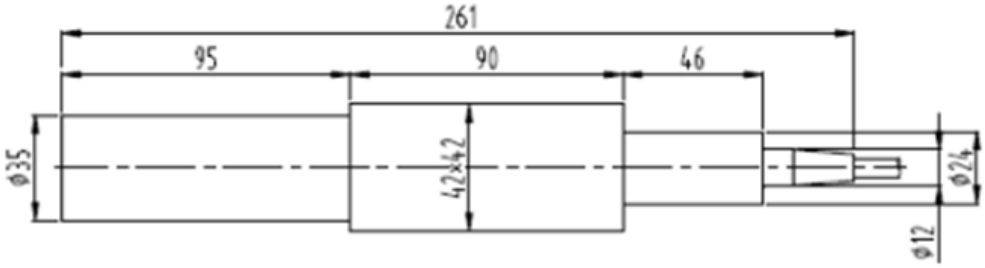

Figure 2 output isolator dimensions (mm)

2.2 Method of installation

1) Fix hard the module to the bracket, keep the laser in adequate ventilation.
2) Connect the power line to 24VDC power and make sure enough DC output power is guaranteed. Pay attention to the polarity of the electric current: anode-brown; cathode-blue; yellow and green: PE.

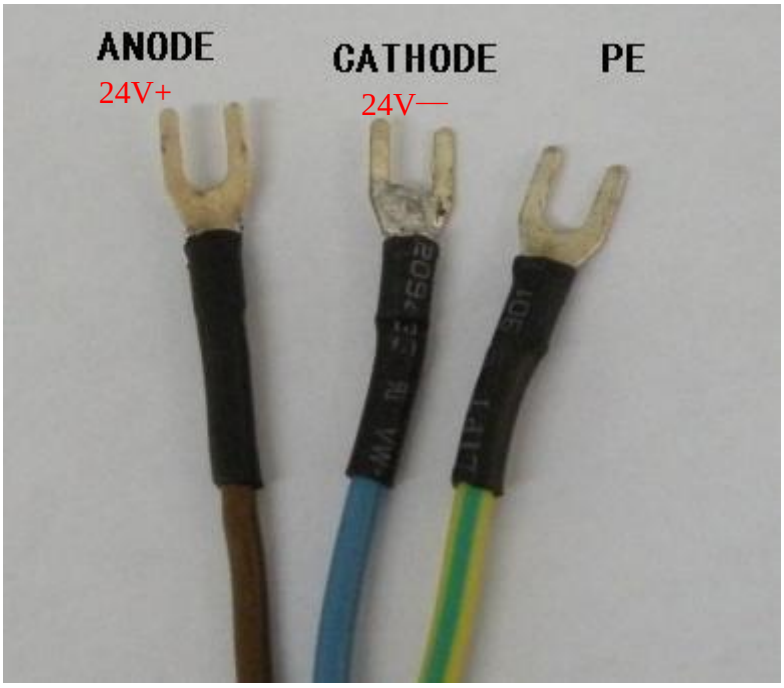

Figure 3 power line definitions

3) Make sure that the interface of the external controller matches the laser and the control cable is connected to the laser's interface well.

4) The bending radius of the delivery fiber should not exceed 15cm.

3. Control Interface

DB25 at the rear of the power module is the joint interface connecting control system with laser system. Please make sure the connection is reliable before operation. Feet of the connector are defined as follows.

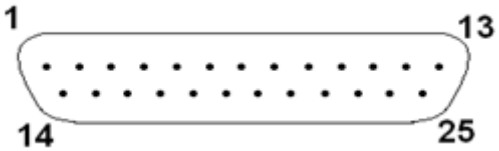

Figure 4 control interface

Table 3 control interface PIN definitions

PIN #	Definition
1-8	Current settings of pump: 00H: zero power 01H ..... FFH: Full power

	MSB: PIN8 LSB: PIN1
10-15	Digital GND
16，21	Alarm signal
17	Outside input 5V
18	MO signal on/off
19	Laser on/off
20	Pulse repeating rate (TTL level)
24	Analog GND

1) By combination of PIN1—PIN8 (TTL level), pump current of diode laser, i.e. the output of laser power can be setting. By PIN1-PIN8 of 0～255，corresponding the laser power of 0～100％ (the actual laser power may not be linear with these setting). For example:

Table 4 example of power setting

	Setting 1	Setting 2	Setting 3	Setting 4
PIN 1	0	0	0	0
PIN 2	0	0	0	0
PIN 3	0	0	0	0
PIN 4	0	0	0	0
PIN 5	0	0	0	1
PIN 6	0	0	1	1
PIN 7	0	1	1	1
PIN 8	1	1	1	1
current	~50 %	~75 %	~87.5 %	~93.75 %

2) PIN 10 to PIN 15、PIN 24 are digital GND and analog GND respectively.
3) PIN 17 is 5V and should be supplied by outside to give the power of alarm signal.
4) PIN 18 is the MO on/off signal. PIN 19 is the laser on/off signal. High level switch on the laser, low level switch off the laser. The two signal are all TTL level. Before switch on the laser on/off signal (PIN 19), the MO signal must be switch on first, or the equipment can be damaged. The MO signal (PIN 18) must be 5ms earlier than laser on/off signal (PIN 19).
5) PIN 20 is the pulse repeating rate (PRR, TTL level). The frequency range should be 20 kHz~60 kHz. If the PRR change during the work, it must be changed 5ms before the laser on/off signal turn into high.

6) Alarm setting

Table 5 alarm setting

PIN 16	PIN 21	Alarm item
Low	Low	Temperature alarm
Low	High	Normal
High	Low	High reflection alarm
High	High	MO alarm

7) Input and output ports

Input port:

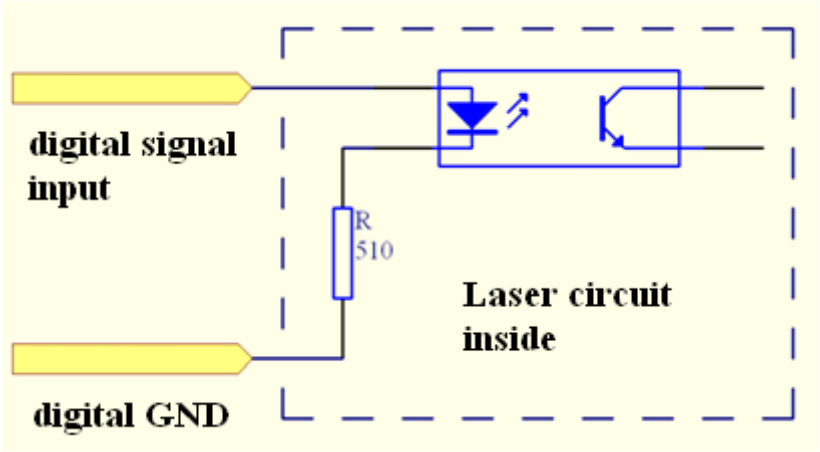

Figure 5 input signal circuit

Note: the input signal should be able to provide 7mA current.

Output port:

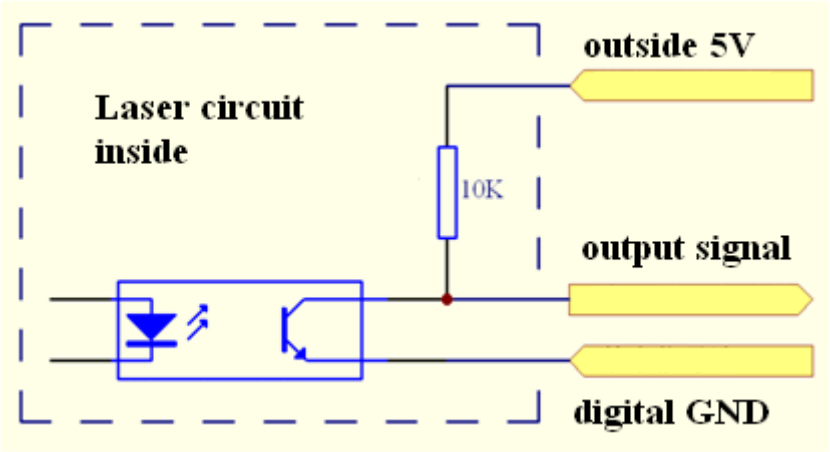

Figure 5 output signal circuit

4. Operation Regulations

4.1 Pre-inspection

1) Make sure whether the device appears to be in good condition, the output fiber is bended or broken off.
2) Make sure signal line of laser and marking system are properly connected.

4.2 Operation procedures

1) starting procedures

Please make sure the control system is on when you turn on the fiber laser. Only after at least 1 minutes since the power worked on the system can the rest procedures be proceeded.

2) Laser marking checking

When the device is started successfully, please play the power down to zero without turning the marking system on for the first time when the device is going to be tested. Then draw a quadrate, marking continuously with playing the power slowly from zero up to 100% at the same time. Meanwhile, use a ceramic material to observe the laser and the laser should be stronger and stronger, otherwise shut down the device and check it. You can operate the marking system in common order afterwards.

4.3 Cautions

1) Marking frequency should be in the range of 20kHz～80 kHz.
2) It is better not to modulate the frequency while marking.
3) Stop marking first before shutting the device off, then play the power down to zero and cut the power off.

5. Instructions for warranty, return and maintenance

5.1 General warranty

All products are warranted by Raycus against defects and problems in materials and workmanship during the warranty period according to the purchase order or specifications and we guarantee the product will accord with the specification under normal use.

Raycus has the right to choose to repair or replace any product that proves to be defective in materials and workmanship selectively during the warranty period. Only products with particular defects are under warranty. Raycus reserves the right to issue a credit note for any defective products produced in normal conditions.

5.2 Limitations of warranty

The warranty does not cover the maintenance or reimbursement of our product of which the problem results from tampering, disassembling, misuse, accident, modification, unsuitable physical or operating environment, improper maintenance, damages due to excessive use or not following the instructions caused by those who are not from Raycus. Customer has the responsibility to understand and follow this instruction to use the device. Any damage caused by fault operating is not warranted. Accessories and fiber connectors are excluded in this warranty. According to the warranty, client should write to us within 31days since the defect is discovered. This warranty does not involve any other party, including specified buyer, end-user or customer and any parts, equipment or other products produced by other companies.

5.3 Service and repairs

Raycus is responsible for all the maintenance, for there is no accessory available inside for users to use. Please contact Raycus as soon as possible when problems under warranty about maintenance happen to the product. The product returned with permission should be placed in a suitable container. If any damage happen to the product, please notify the carrier in document immediately.

All the items about warranty and service above provided by Raycus are for uses' reference, formal contents about warranty and service are subject to the contract.