

Pulsed Ytterbium Laser

User Instruction

20W

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 20W. 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



Be careful
Avoid direct laser irradiation

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

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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

Items	Quantity	Remark
Fiber Laser module	1	
User instruction CD	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 an 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 50 kHz, because laser with high power may cause damage to the device.
- 9) Maximum absence of the pulse is 2.5×10^{-6} s.
- 10) Power source interrupt will do great harm to the laser device. Please make sure the power supply works in succession.

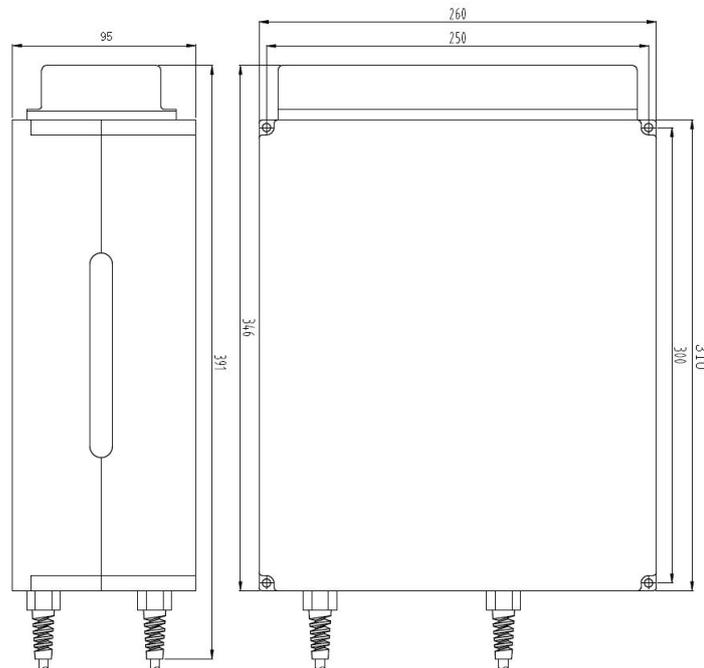
1.4. Specifications

NO	Characteristic	Min	Typ.	Max	Uni	Conditions
1	Central Emission Wavelength	1060	1064	1085	nm	/
2	Polarization Sate	Random				/
3	Nominal Average Output Power	20	21	22	W	/
4	Pulse Repetition Rate	50	400	1000	kHz	/
5	Single pulse energy		0.2@100kHz		mJ	may vary with pulse repetition rate
6	Pulse Duration		4		ns	4,8,14,20,30,50,100,200
7	Output Power Tunability	10		100	%	/
8	Beam Quality		1.4			M ²
9	Beam Diameter	6	7.4	8	mm	1/e ²
10	Guide Laser Power	Optional				$\lambda = 633\text{nm}$
11	Output Fiber Cable Length		2		m	/
12	Anti Strong Back Reflection	Yes				optical isolator
13	Working Voltage	23	24	25	VDC	/
14	Cooling	Forced Air Cooled				/
15	Operating Temperature	0		40	°C	/
16	Store Temperature	-10		60	°C	/
17	Humidity	30		85	%	/
18	Power Consumption		200		W	@20°C
19	Dimension	260×391×95			mm	W×D×H

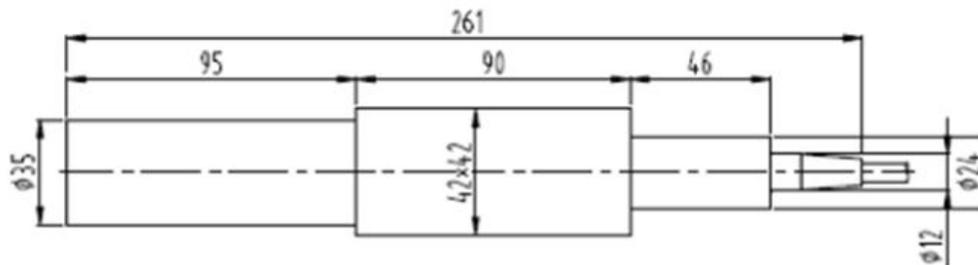
2. Mounting

2.1 Mounting dimensions

1) Fiber Laser module dimensions

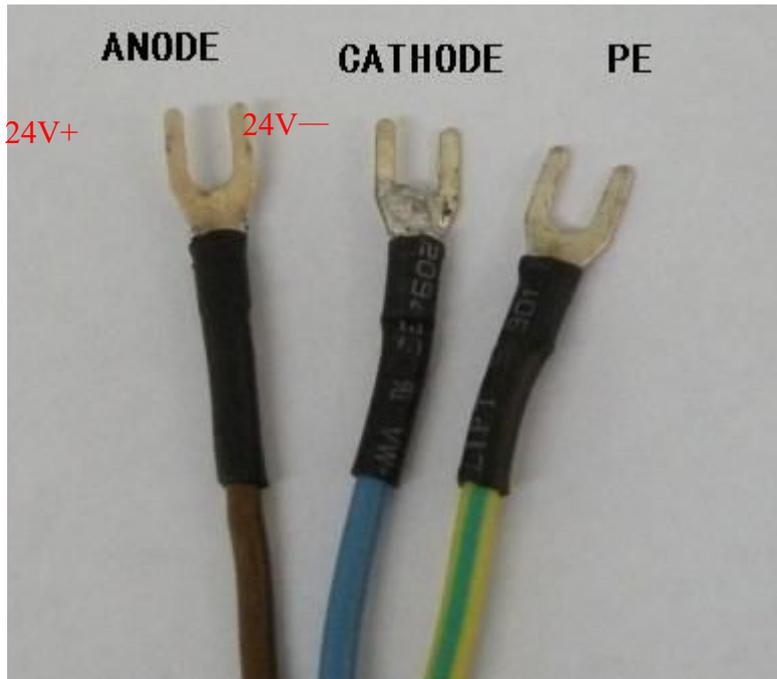


2) Isolated output head dimensions



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.

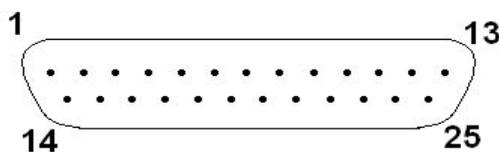


- 3) Make sure that the interface of the external controller matches the laser and the control cable is connected to the laser's interface well.
- 4) The bending radius of the delivery fiber should not exceed 15cm.

3. Control Interface

3.1 Definition of DB25

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.



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
18	MO signal on/off
19	Laser on/off
20	Pulse repeating rate (5V level)
22	Lead light (5V level) optional
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 setting PIN1-PIN8 0~255, the corresponding laser power is of 0~100% (the actual laser power may not be linear with these setting). For example:

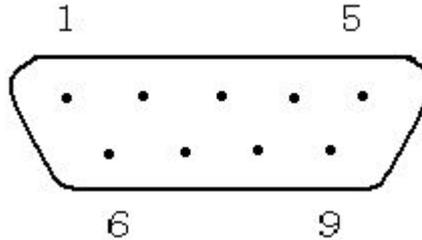
	Setting 1	Setting 2	Setting 3	Setting 4
PIN 1	0	0	0	0
PIN 2	0	0	0	0
PIN 3	0	0	0	0
PIN 4	0	0	0	0
PIN 5	0	0	0	1
PIN 6	0	0	1	1
PIN 7	0	1	1	1
PIN 8	1	1	1	1
current	~50 %	~75 %	~87.5 %	~93.75 %

- 2) PIN 10 to PIN 15、PIN 24 are all digital GND.
- 3) PIN 18 is the MO on/off signal. PIN 19 is the laser on/off signal. High level switch on the laser while low level switch off the laser. The two signals 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).
- 4) PIN 20 is the pulse repeating rate signal (PRR, TTL level). The frequency range should be 50 kHz~1000 kHz. If the PRR need to be changed during the work, it must be changed 5ms earlier than the laser on/off signal turning into high.
- 5) PIN 22 is the lead light on/off signal. High level switch on the lead light while low level switch off the lead light.
- 6) Alarm setting

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

High	High	MO alarm
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3.2. Instruction of DB9-M(RS232C)



DB9-M(RS232C) at the rear of the power module close to DB25 is used for changing optical pulse duration. Only PIN2,3,5 are valid while PIN1,4,6-9 are vacant..When you use a crossed RS-232C cable to link the laser and a PC, the right connection is 2→2,3→3,5→5. Cross connection is forbidden. Make sure that it could communicate reliably with the corresponding PC COM port before operation.

Description of command for adjusting pulse duration mode is developed as follows:

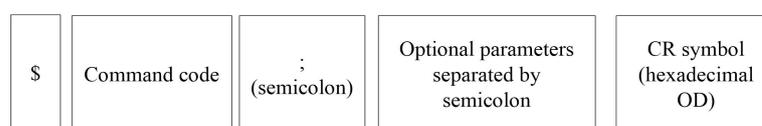
Type	Command code (decimal ASCII)	Parameters or return values	Description/Parameters
Set	49	16 bit integer	Set optical pulse duration in [ns].

4, 8, 14, 20, 30ns are alternatives for pulse duration. The corresponding codes are listed in the table below.

Pulse duration(ns)	Code (hexadecimal)
4	0x24 0x34 0x39 0x3b 0x34 0x3b 0x0d
8	0x24 0x34 0x39 0x3b 0x38 0x3b 0x0d
14	0x24 0x34 0x39 0x3b 0x31 0x34 0x3b 0x0d
20	0x24 0x34 0x39 0x3b 0x32 0x30 0x3b 0x0d
30	0x24 0x34 0x39 0x3b 0x33 0x30 0x3b 0x0d
50	0x24 0x34 0x39 0x3b 0x35 0x30 0x3b 0x0d
100	0x24 0x34 0x39 0x3b 0x31 0x30 0x30 0x3b 0x0d
200	0x24 0x34 0x39 0x3b 0x32 0x30 0x30 0x3b 0x0d

You could set or read back optical pulse duration by send commands whose structures are is shown in the table below:

Firmware command structure (ASCII codes for symbols):



Laser reply structure:

Command code	; (semicolon)	Return values separated by semicolon	CR symbol (hexadecimal OD)
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For all “set” commands device returns as the parameter “Y” if the command was successfully executed and “N” if the command was not executed.

Command parameter is a text string. If the parameter is a numerical value, it should be converted into a decimal ASCII string. For all strings sent to the laser, which were not recognized as valid commands, the laser sends “E” as parameter.

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. Rest procedures can be proceeded when the power have worked for at least 1 minute.

- 2) Laser marking checking

When the device is going to be tested, please turn the power down to zero without turning the marking system on for the first time after the device is started successfully . Then draw a quadrate, marking continuously with increasing 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 50kHz~10000 kHz.
- 2) It is better not to modulate the frequency while marking.
- 3) Stop marking firstly before shutting the device off, then turn 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 31 days 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.

Wuhan Raycus Fiber Laser Technologies Co. Ltd

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