脉冲光纤激光器

Pulsed Fiber Laser

产品手册

User Manual

Version：**v5.1**
Published Date：**2019/9/3**

Please read this manual carefully before using the product.

- Although this user manual has been carefully reviewed, mistakes are inevitable. If there is unclear point, please contact our Customer Service Center or salesman.
- We are devoting ourselves to improving our products. The contents of this manual are subject to change without notice.

Declaration:

- We ensure that all products are well-tested and inspected before shipping, and all the tested items are required to content the written quality qualification. If there is any damage in internal or external package been found when you receive this item, please contact our company or the designated agents immediately.
- All details in this manual are strongly forbidden to be copied, plagiarized and modified without permission.

Security Information:

Before using this product, please read this manual and get familiar and understand all the information we provide for you. This manual provides important product operation, safety, and other information to you and all future users for reference. To ensure optimal performance and operation safety of the product, please follow these cautions, warnings and other information in this manual strictly.

● The security level of this series pulsed fiber lasers are Class IV. The laser power is no less than 10W in 1060 ~ 1085nm wavelength range. Avoid eyes and skin direct contact to radiated lasers;

● Do not look the laser output head directly, laser safety glasses must be wore during long-term operation;

● The laser light is invisible, do not put the laser output head toward anyone, please wear laser safety glasses when operating the laser;

● Do not open the laser module, because there is no product or accessories for users. All maintenance or repair should be done in production company.

Laser Classification:

The laser is a Class IV laser series: Irreparable damage will be caused to the eyes when expose directly to the laser. And the laser can also cause skin and item burn, even it is only the reflected or scattered laser light.

Safety Signs and Location:

The two signs above indicate laser irradiation, we paste this identification on the laser module upper cover close to laser output fiber cable.

CONTENT

1. Product Description

The Q-Switch Pulsed fiber laser series are designed for high-speed and high resolution marking system, providing laser energy source with ideal beam quality for industrial laser marking machine and other laser applications.

Fiber laser is a new solid-state laser, which has a large heat dissipation area, good beam quality, compact size etc., which generally consists of pumping sources, couplers, rare earth element doped fibers, resonators and other parts. The performance of high-power fiber lasers is much better than solid-state lasers. Therefore, fiber lasers are thought to be the new generation alternative products of solid-state laser, also has been gradually developed to be an important candidate in the field of high-precision laser processing, laser radar systems, space technology and laser medicine.

This series laser consist a Q-switch module which performed as a master oscillator in laser pulse energy conversion and a high power fiber amplifier. This series of products provide high output power, low power consumption, high stability, are suitable for laboratory and industrial applications; with advantages of pleasant appearance, compact size, stand-alone, easy to operate. It also can be embedded directly into the user's equipment.

This series laser's wavelength range is 1055nm-1070nm, output periodic pulse train with peak power up to 10KW. The laser can be controlled by the laser industry standard interface, and an external 24VDC power supply is required.

2. Laser Parameters

NO.1	Item	Test Conditions	Min.	Typical Values	Max.	Unit
1	Maximum average output power（Pnom） - 10H(W) - 20H(W) - 30H(W) - 50H(W)		 10 20 30 48	 11 21 31 50	 12 22 32 52	W
2	Output center wavelength	$P_{out}=P_{nom}$	1055	1064	1070	nm

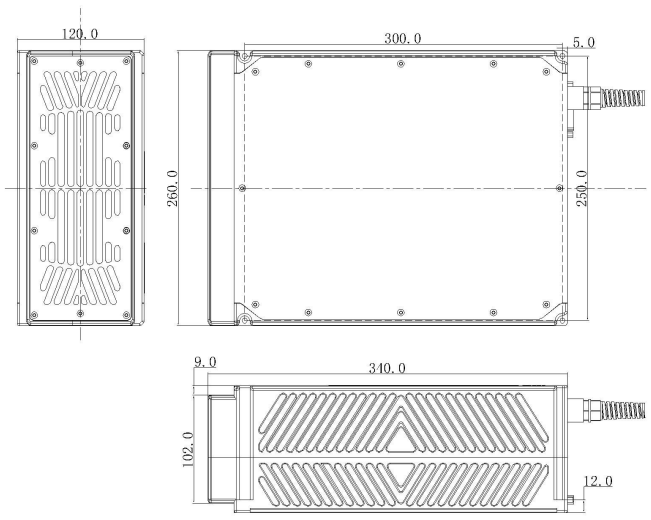
3	Output bandwidth (3dB)	FWHM $P_{out}=P_{nom}$		5	10	nm
4	Max single pulse energy - 10H(W) - 20H(W) - 30H(W) - 50H(W)	RR=20kHz RR=30kHz RR=30kHz RR=50kHz		0.5 0.67 1 1		mj
5	Repetition frequency adjustable range（RR） - 10H(W) - 20H(W) - 30H(W) - 50H(W)		20-60 adjustable 30-60 adjustable 20-60 adjustable 20-80 adjustable			kHz
6	Pulse width - 10H(W) - 20H(W) - 30H(W) - 50H(W)	FWHM RR=20kHz RR=30kHz RR=30kHz RR=50kHz	80 90 90 90	100 110 110 120	120 130 130 140	ns
7	Beam quality（M2）	$P_{out}=P_{nom}$	1.3	1.4	1.7	
8	Polarization		random			
9	Anti-high reflection or not (optical isolator)		Yes			
10	Power adjustable range		10		100	%
11	Power stability	$P_{out}=P_{nom}$			5	%

12	Output beam diameter	$P_{out}=P_{nom}$ $1/e^2$	6	7	8	mm
13	Output fiber length		5			m
14	Operating voltage（DC）		23	24	25	V
15	Output beam shift				1.5	mrad
16	Power consumption（W） - 10H(W) - 20H(W) - 30H(W) - 50H(W)	$P_{out}=P_{nom}$ T=20℃	150 200 300 400			W
17	Warm-up time - can start to work - Be completely stable	$P_{out}=P_{nom}$	1 10			min
18	Weight - 10H(W) - 20H(W) - 30H(W) - 50H(W)	Net weight	<10 <11 <12 <13			Kg
19	Cooling method		Air cooled			

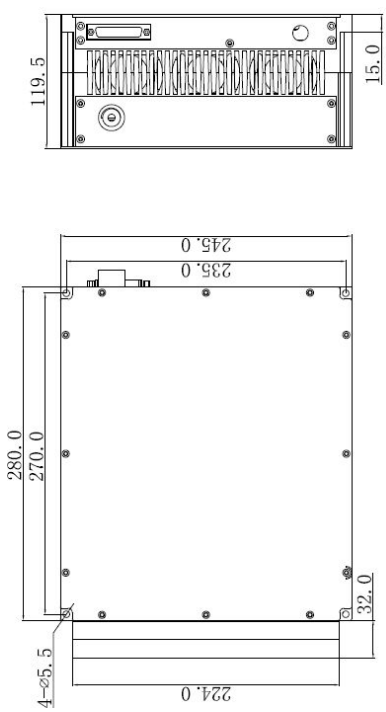
3. Laser Dimensions and Mounting Holes

Laser module dimension and mounting holes

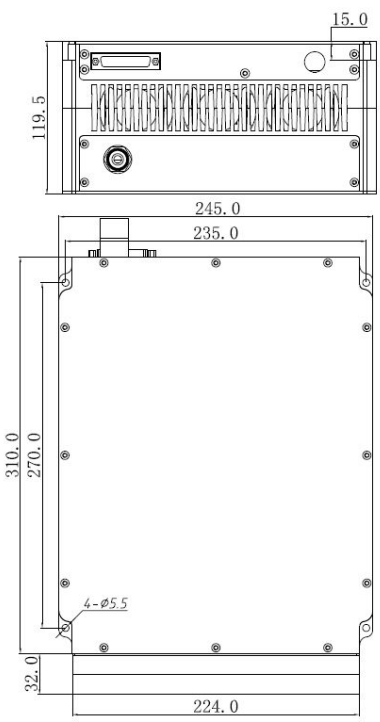
H-Serial



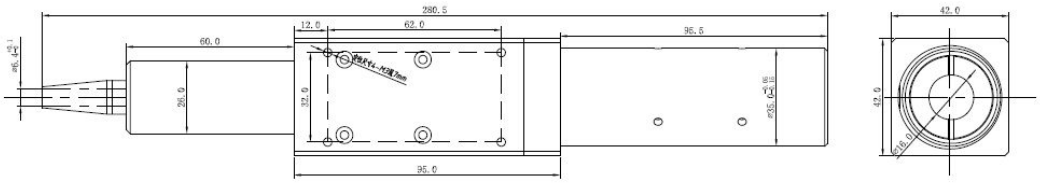
10W & 20W



30W & 50W



Isolator output size:



4. Installation

4.1 Product Transportation and Installation

4.1.1 The laser output fiber is a sensitive and key component, please make sure that the fiber bend radius is no less than 15cm lasers during the installation, transport, packaging and working conditions, so as to the laser output fiber tail and roots, otherwise, the laser might be damaged. If the laser needs to be returned to us, we recommend using the original packaging materials. If there is no original packaging materials, laser body and output optical isolator need to be packaged with suitable flexible materials to avoid damage caused by transport vibration.

4.1.2. The laser module must be reliably fixed to the bracket, also please ensure that there is enough space for good ventilation for laser body.

4.1.3 Connect the power supply wire to the 24V DC power supply and make sure that power supply can provide enough output power. Please note that the polarity of the power supply wire. The brown one is positive, blue is negative, yellow green is ground protection.

4.1.4 Make sure that the interface of external controller matches with the laser, connect the control cable to laser, and be reliably fixed.

4.2 Electrical Connection Caution

4.2.1 The main power supply (24VDC) must be able to provide continuous operating current (refer to the maximum current consumption value in laser parameters) and with peak current no less than 50% during 250us short period. Laser current consumption of most models is less than 10A, so the loss of peak current is less than 15A, the power supply voltage should remain stable and to ensure within the specified range. If the fluctuations of power supply voltage exceed the specifications will cause the laser in unstable working condition, transient load change rate of power supply should be noted, and an appropriate power supply should be chosen.

4.2.2 Connect the main power source of laser, the voltage drop of power supply wire built-in laser can be ignored (especially the peak current consumption).

4.2.3 24VDC main power supply must have suspended output, the return wire can only be connected to the laser power supply wire (blue). Wrong connection may result in unclosed current loop.

4.2.4 Connect laser ground interface(DB25 Pin10-15,24) and laser 24VDC power supply return line (blue) to the laser inside, disconnection between the external interface of the laser is allowed.

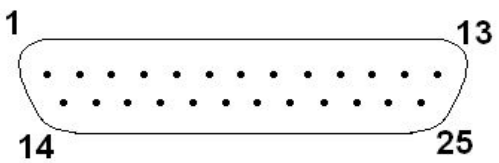
4.2.5 The common ground inside laser goes through a 470 ohm resistor and a parallel connected 47nf capacitor, then connected to the laser shell, This network is used for balancing the voltage difference between ground and laser shell.

4.2.6 Ground connection of control card is based on the design, it may have been connected to the earth; if not, the ground connection of control circuit is suspended, that means the blue and yellow-green wire of laser 24VDC power supply is not connected.

5. Control Interface

DB-25 interface at laser rear board is for the connection between the control system (such as marking machine) and laser systems. it must be connected reliably before starting to work. Each pin is defined as follows:

DB-25 interface
EKOU25



PIN #	Content
1-8	Laser power setting：LSB(D0) corresponds to Pin1，MSB(D7) corresponds to Pin8 - 00H: Minimum output power - 01H …… - FFH: Maximum output power - No connection or not used，Equals to 00H

10-15	Ground
16，21	Laser warning signal indicator
18	Main Oscillator（MO）on/off signal - H level: MO on - L level or disconnected: MO off
19	Laser on / off input pin（Booster on / off input） - H level: Booster on - L level or disconnected: Booster off
20	Pulse Repetition rate input (TTL level), square wave, refer to the specification for operation PRR range.
22	Indication light（ red light）---There is indication light (red light), available for the machine
23	Emergency stop input - H level: ON (normal operation) - L level or disconnected: STOP (laser off)

5.1 Set TTL signals of pin 1-8. Input current of pump laser diode can be controlled by different combination of TTL signal, which means the laser output power can be controlled by 1 to 8 pin with coding range from 0 to 255, corresponding to 0 to 100% output power (the actual output optical power may not be entirely linearity to these settings). e.g.:

	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
Pin 1	**0**	**0**	**0**	**0**	**1**
Pin 2	**0**	**0**	**0**	**0**	**1**
Pin 3	**0**	**0**	**0**	**0**	**1**
Pin 4	**0**	**0**	**0**	**0**	**1**
Pin 5	**0**	**0**	**0**	**1**	**1**
Pin 6	**0**	**0**	**1**	**1**	**1**

Pin 7	**0**	**1**	**1**	**1**	**1**
Pin 8	**1**	**1**	**1**	**1**	**1**
Current	**50%**	**75%**	**87.5%**	**93.75%**	**100%**

5.2 The pin 18 is the switching signal of laser master oscillator MO. Pin 19 is the optical signal input pin of laser amplifier Booster (BS) of with TTL level adopted, signal "1" represents laser on, signal "0" represents laser off. MO signal must be started first and then turn on the laser pin 19, otherwise the laser may be damaged. MO signal (18-pin) must be turned on at least 5ms earlier than 19-pin signal.

5.3 Pin 16 and Pin 21 are alarm output, representing the laser alarm items:

Pin 16	Pin 21	Alarm Item
L	L	Laser temperature alarm
L	H	Normal
H	H	The main oscillator alarm

5.4 The pin 20 is a frequency modulated signal with TTL level. Frequency modulating range is 20KHz ~ 60KHz. (There is slight difference for different laser output power level) Note: The frequency signal must be given at least 7ms earlier than laser optical signal, otherwise, laser will be easily damaged.

Note:

If the input frequency exceeds the specified range, the laser protection circuit will automatically define frequency to the upper or lower limit.

6. Safety Use and Precautions

6.1 When operating the laser, the ground wire must be grounded well and the nominal voltage power supply (24V ± 1V DC) must be used.

6.2 When installing the laser, make sure the laser is off. When testing and operating the laser, do not point the laser output head towards anybody.

6.3 The output laser head is connected to the fiber cable, please be careful when using the output head, do not touch the output lens to prevent dust and other

contamination, when clean the lens, specified lens paper must be used. When the laser equipment is not installed into operating system and there is no light emission, please put the protection cover onto isolator to avoid dust pollution.

6.4 No other accessories provided, all maintenance should be carried out by our qualified technicians. In order to prevent electric shock, do not damage the label and remove the lid, otherwise, any damage to this product will not be warrantied.

6.5 Do not expose the laser in a high humidity environment.

6.6 There are three cooling fans at the tail end of each laser, space with at least 10cm should be kept at laser front and rear parts for good ventilation; Cabinet used for installing laser must have good ventilation condition, if the cabinet comes with a cooling fan, please make sure that the airflow directions of cabinet and laser are same.

6.7 Look directly to the laser output head is strictly forbidden. During long-term operation, make sure to wear laser goggle for eyes protection.

6.8 The pulse repetition frequency should be no less than 20KHz, because high peak power output will do harm to the laser.

6.9 The maximum operating time without pulse is 50×10-6 seconds.

6.10 The power supply interruption does great harm to laser machine during work, please provide continuous power.

7. Usage and Operation Steps

7.1 Preliminary Inspection

1) Check the appearance of the laser is normal or not. For example, if there is any bend or strip off along fiber cable.

2) Check the signal line between laser marking machine and laser is connected normally or not.

3) Check the 24V power supply is connected correctly or not (anode connects brown wire, cathode connects the blue wire, ground connects the yellow-green wire).

7.2 Laser Operation Steps

1. Remove the protective cover from the laser output head.
2. Connect the laser module to the control system via DB-25 interface, please

refer to the pin definitions. In un-marking condition, and the pin is initialized as:

a) Pin18, 19 at L level;

b) The repetition frequency of Pin20 is within the scope of a predetermined range.

3. Laser can start work 120 seconds (warm-up time) later after 24VDC power supply is turned on.

4. Set the laser power and frequency by marking software.

5. Set the marking control card Pin18 at H level, turn on main oscillator (MO).

6. Wait 7ms.

7. Control the on/off switch of amplifier BS by H/L level of Pin19, control amplifier power by setting Pin1-8.

8. After the operation is completed, all work is finished, turn off MO and BS (Pin18, Pin19 are set at low level).

9. Turn off 24VDC power supply.

8. Operating and Storage Environment

- Operating environment: 0 ℃ ~ + 40 ℃, 10% ~ 80% relative humidity;
- Storage environment: -10 ℃ ~ 60 ℃, 10% ~ 95% relative humidity

9. Quality Assurance

9.1 Warranty

All products delivered out according to purchase order or manufacturing standard, We keep the products with problems both of material and technique in warranty to make sure that all products in good working condition.

All rights of repairing or substituting accessories of products with problems are reserved to us during warranty period. Only some special problems diagnosed by us are warranted to be free, and we have rights to charge for repair accordingly.

9.2 Limitations of Product Warranty

Components or equipment in following cases are not warranted:

- ❖ Customers open, detach or mis-install(maintain) the laser by themselves, misuse, neglect, incidents, or operate the module beyond standard range etc.
- ❖ Customers have responsibility to operate the equipment according to operation standards, and accessories and fiber are not in warranty range.

Within the warranty, purchaser must put forward corresponding requests within 31 days after the problems appear, no third party related, including purchasers, final users or customers. Accessories, equipment or other products produced not by us are not warranted.

9.3 Service and Repair

Note:

There are no accessories provided for user, all maintenance must be carried by us. All requests for repair, products return or exchange within warranty, once problems found, please inform us as soon as possible. All products permitted to turn, must be put in a suitable case. If there is any damage to the products once customers received it, please put forward to shipper in time.

We have not granted any third party (including the user or customer) to repair components, equipment or other products.

10. Common Failures and Processing Method

10.1 The main reasons and solutions for no laser output:

A Check emergency stop switch of the whole machine equipment is normal or not.

B Check lasers 24V power supply wire is connected correctly or not.

C Check if the DB-25 serial interface is connected correctly in accordance with the interface definition. Check whether the marking card has a high level signal to trigger laser light.

D. Check the software setting is correct or not.

10.2 The main reason for low laser output power and solutions：

A Check the power supply stable or not, whether the current have reached rated operating current.

B Check the mirror of collimating output head is contaminated or not, if contaminated, please use cotton swab dipped in ethanol and gently wipe, do not

scratch the mirror surface.

C. Check all other optical lens of machine equipment are contaminated or not, such as lens of red light combiner, galvanometer lens, field lens etc.

D. After laser have worked for 20,000 hours, attenuation in power is normal

11. Product Maintenance Record Sheet

Laser Source S.N.		PO. number	
Name		Tel.	
Add.			
Failure Description			
Repair method			
Failure Date		Responsible Person	
Repair Date		Customer Confirmation	