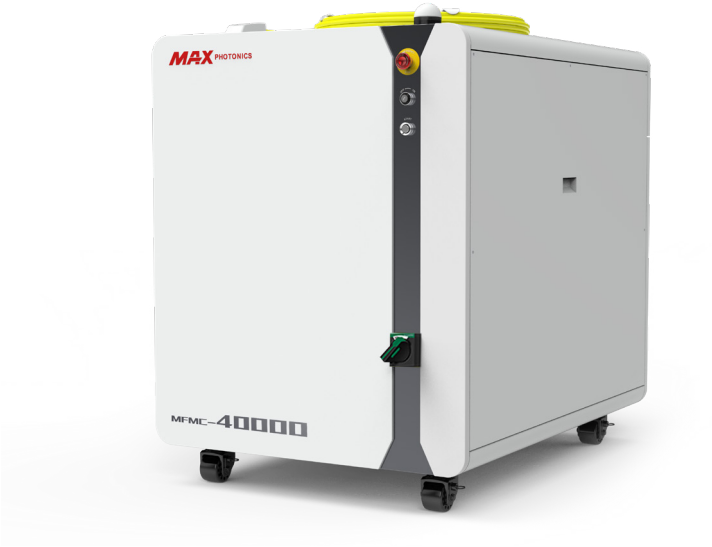

MFMC 40000（G6.1）CW Fiber Laser

USER GUIDE

Maxphotonics Co.,Ltd.

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Preface

Thank you for using the MFMC Series CW fiber laser from Maxphotonics.We compile this document for you in order that the laser is used and maintained properly. Due to the limited level of the writers, coupled with time constraints, there are some careless mistakes in this document, your understanding and suggestion to help us make an improvement will be much appreciated . Thank you again for using Maxphotonics' products.

Please take time to read and understand this User's Guide and familiarize yourself with the operating and maintenance instructions before you use the product. We strongly recommend that the operator read the Section 2 titled "Safety Information" prior to op erating the product.

This User's Guide should stay with the product to provide you and all future users and owners of the product with important operating, safety and other information.

We identify the parts to which you need to pay special attention in the document with underscore. Please notice those information to prevent the unnecessary damages.

Company Profile

Found in 2004, Maxphotonics is one of the first fiber laser manufacturers in China. It is also the first in China to realize independent intellectual property rights and vertical integration in the core technologies of fiber lasers and optical devices. One of the national high-tech enterprises. Maxphotonics has developed into an internationally renowned laser manufacturer that develops, manufactures and sells fiber lasers and core optical components. It is the second largest domestic fiber laser manufacturer in the domestic market.

Maxphotonics specializes in the research, development, production and sales of fiber lasers, including pulsed fiber lasers, continuous fiber lasers and direct diode lasers. It also implements pump sources, combiners, fiber gratings, isolators, laser output heads, and stripping. Optical devices such as molds, acousto-optic modulators, and pattern matchers are produced autonomously. Products are widely used in marking, engraving, cutting, drilling, cladding, welding, surface treatment, rapid prototyping and additive manufacturing processes.

More informations，please visit our website：

http://en.maxphotonics.com

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Chapter 1
Characteristic Description

MFMC Series CW Fiber Laser products provide a wide range of wavelength from 1060nm to 1100nm.The lasers are water-cooled and maintenance-free and with a wall plug efficiency of more than 33% and deliver high efficiency, high reliability and high performance.

Maxphotonics' MFMC Series CW Fiber Laser Series are Class 4 laser products and are designed and tested with safety. By following this User Guide and applying sound laser safety practices, it will be a safe and reliable device.

Laser light exhibits unique characteristics that may pose safety hazards. Therefore, the laser light can’t be normally associated with other light sources, and all operators and people near the laser must be aware of these spec ial hazards.

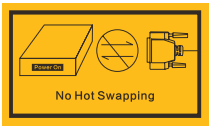
In order to ensure the safe operation and optimal performance of the product, please follow all warnings and safety instructions in this guide during process of operation, maintenance and service and do not disassemble the device.

There are no serviceable parts, equipment or assemblies associated with this product for user. Lasers of unauthorized disassembly shall not be subject to warranty.

Chapter 2
General Safety Information

1-Safety Conventions

All safety warning symbols during operating process of the laser include:

SYMBOLS	DESCRIPTION
	WARNING: There is a potential hazard to the human body; (laser radiation) (shock) needs to follow certain procedures, otherwise it may cause certain harm to you or others' body. Do not violate the requirements of the warning label during operation to ensure the personal safety of the operator.
	Refers to a potential hazard on product. It requires a procedure that, if not correctly followed, may result in damage to the product or components. In order to ensure normal use of equipment, do not violate the requirement of the CAUTION sign.
	When connecting or disconnecting external cables, internal cables, boards or other electronic components, the laser must be operated by professional maintenance personnel after turning off the power of the whole machine for 5 seconds; otherwise, it may cause electric shocks or damages to the electronic components of the laser.

NO SYMBOL	IMPORTANT:Refers to any information regarding the operation of the product. Please do not overlook this information.

NOTE :

◎ This device is classified as a high power Class IV laser instrument. It may emit up to 40KW average power from 1060nm to 1100nm. This level of light may cause damage to the eye and skin. Laser safety eyewear is not provided with this instrument, but must be worn at all times while the laser is operational. Use appropriate laser safety eyewear when operating this device.

CAUTION: The user is cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the

user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

2-Laser Protection

1.Laser Protection Requirements

You must wear the safety protective glasses while operating the laser, and rationally select the safety protective glasses according to the lasing wavelength of the laser. If the device is a tunable laser or Raman product, it emits light over a range of wavelengths and the end user should confirm the laser safety eyewear used protects against light emitted by the device over its entire range of wavelength.

2.Laser Protective Equipment Suppliers

Maxphotonics recommends material or equipments provided by following laser protective equipment suppliers for you, including LaserVision USA, Kentek Corporation, Rochwell Laser Industries, etc. All the supplier information is

provided by Maxphotonics only for the convenience to use, so Maxphotonics assumes no responsibility for any problem caused by using the products of abovementioned suppliers.

3-Reference Standard

Electromagnetic Compatibility Emission:

EN IEC 61000-6-4:2019

CISPR 16-2-1

CISPR 16-2-3

Anti-interference Performance on Electromagnetic Compatibility:

EN IEC 61000-6-2:2019

EN 61000-4-2:2009

EN 61000-4-3:2020

EN 61000-4-4:2012

EN 61000-4-5:2014+A1:2017

EN 61000-4-6:2014

EN 61000-4-11:2020

Laser Security:

EN 60825-1:2014+A11:2021

CDRH 21 CFR 1040.10

Electrical System Safety:

EN 60204-1:2018

NOTE:

◎ Performances of Maxphotonics MFMC laser meet the CE EMC certification requirements, the EMC requirements specified in "EMC Directive" of European market. Comply with the "EMC" standard EN 61000-6-4 emission and EN 61000-6-2 anti-interference requirements.

◎ In accordance with relevant national standards and requirements, the laser must be classified according to its output power and laser wavelength. All MFMC-Series laser products with high power belongs to Class 4 products (according to section J,1040.10 (d) of Part Ⅱ , 21 CFR).

◎ According to the standards of EU, the equipment belongs to Class 4 instrument (according to article 9, EN 60825-1).

4-General Safety Instructions

1.Specular Reflection

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.Safety Instructions of Accessories

The photosensitive elements integrated in laser-related optical accessories may be damaged by laser exposure, such as: video cameras, photomultipliers, and photodiodes. Attention should be paid to related device protection.

WARNING :

◎ The Maxphotonics MFMC laser light is strong enough to cut or weld metal, burn skin, clothing and paint. In addition, this light 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.Optical Operating Instructions

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

1.Never look directly into the laser output port when the power is turned on.

2.Avoid positioning the laser and all optical output components at eye level.

3.Equip with laser beam casing.

4. Make sure to remove the tail cover of the laser output head before the laser is turned on, otherwise it will cause irreversible damage to the laser fiber output head.

5.Ensure that all personal protective equipment is suitable for the output power and wavelength range of the laser.

6.Use the laser in a room with access controlled by door interlocks. Post warning signs. Limit the safety areas to operate the laser.

7.Please do not operate the laser in darkened environments.

8.Do not turn on the laser without an optical coupling fiber or an optical output connector.

9.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.

10.Do not install or detach cutting heads or collimators when the laser is active.

11.Make sure that the laser is shut down and the power is off before you install

or detach cutting heads or collimators.

12.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.

CAUTION:

◎ The output of the laser is delivered through a lens with an anti-reflection coating. If the backward-stage light path of your laser has the optical lens, please strictly inspect the lens of the output head and the backward- stage lens of the laser, and ensure that there is no dust and any other impurity on the lens. Please note that any macroscopic attachment may cause extreme damage to lens or burn the laser or any backward-stage light path equipment.

◎ For cleaning instructions of the lens, please refer to the "Optical Fiber Connector Inspection and Cleaning Guide".

◎ Hot or molten pieces of metal may be produced when the laser is under operation. Exercise caution if debris is produced in operation.

◎ When you carry out commissioning and calibration of the laser output, you must set the laser output at low power level and then gradually increase the output power during checking the quality of the light spot emitted from the laser via an infrared viewer.

WARNING:

◎ Make sure that the individual protective equipment meets the output power and wavelength range of the laser.

◎ Never look directly into the optical fiber or the collimator, and make sure you wear the safety protective glasses in each operation.

4.Electrical Operating Instructions

We strongly recommend that you read the following procedures before operating

the laser:

1.The power supply voltage of the laser equipment is three-phase alternating current 360-440VAC, 3P+PE. The laser equipment needs to be properly grounded during installation and installation. The external cables of the cabinet must be placed in metal trunking or metal pipes during installation. Pay attention to the safety of electricity during use to prevent electric shock injury .

2.When disassembling the laser, turned off the power first . If electrical injury occurs, corrective measures should be taken to prevent secondary injury. The correct treatment process: turn off the power, release the personnel safely, call help, and accompany the injured.

3.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 Maxphotonics.

4.To prevent electrical shock, do not remove enclosure, detach the laser without permission and damage the relevant signs. Any product with unauthorized dismounting shall not be subject to warranty.

WARNING:

◎ The input voltage of the laser is triple-phase AC current (360-440VAC, 3P+3E), which may cause risk of electric shock. All the relevant cables and connection wires have potential hazards.

5.Environment Conditions and Precautions

For ensuring the safety of the laser working area, suitable enclosures shall be applied, including but not limited the laser safety signs and the interlocking devices. Corresponding operators must be trained and examined and know the normal safety specifications for operating the laser.Meanwhile, it is important that the output components shall not be installed at eye level.

Because of interaction of the laser and the metal material, the radiation of high-level ultraviolet light or visible light may be produced. Make sure that the laser

is provided with the protective cover to prevent the eyes or other parts of human bodies from damage by radiation.

We recommend that you comply with the following operating measures to prolong the service life of the laser:

1.In order to ensure a good operating environment of the laser, reduce the risk of condensation, reduce the probability of failure, and prolong the service life. It is strongly recommended to configure the air-conditioned room of the laser in advance. The air-conditioned room should be spacious enough to facilitate internal maintenance. It can guarantee the minimum free space around the laser is 1.0m. If space is limited, the air-conditioned room needs to be designed to be easy to remove and install.

2.It is necessary to provide sufficient installation space for the air-cooled water cooler, and to ensure sufficient water cooler exhaust. The minimum free space of the top of the air-cooled water-cooled fan is 1.5m, and the side plate of the air filter is 1m away from the wall.

3.It is forbidden to place the air-cooled water-cooled machine in the laser air-conditioned room. Because the air-cooled water-cooling machine discharges a lot of hot air, the room temperature will rise rapidly, and finally the heat dissipation will be poor, causing the water-cooling machine high-pressure alarm and laser condensation alarm.

4.Do not expose the laser to a high moisture environment.

5.The device is equipped with cooling fans. Make sure that there is sufficient airflow to cool the laser, any objects or debris that cover the ventilation holes must be removed at all times.

6.Operation at higher temperature will accelerate aging, increase threshold current and lower slop efficiency. If the device is overheated, stop operations and contact Maxphotonics.

7.Ensure that the work surface is properly vented. There may be gases, sparks and debris generated from the interaction between the laser and the work surface, and they could pose additional safety hazard.

CAUTION :

◎ The device may be damaged with incautious operation.

5-Additional Safety Information

For additional information regarding Laser Safety, please refer to the list below:

Laser Institute of America(LIA)

13501 Ingenuity Drive, Suite 128

Orlando,Florida 32826

Phone:407 380 1553,Fax: 407 380 5588

Toll Free:1 800 34 LASER

American National Standards Institute

ANSI Z136.1, American National Standard for the Safe Use of Lasers

(Available through LIA)

International Electro-technical Commission

IEC 60825-1,Edition 1.2

Center for Devices and Radiological Health

21 CFR 1040.10 - Performance Standards for Light-Emitting Products

US Department of Labor - OSHA

Publication 8-1.7 - Guidelines for Laser Safety and Hazard Assessment.

Laser Safety Equipment

Laurin Publishing

Laser safety equipment and Buyer’s Guides

Chapter 3
Product Description

1-Features

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

Main Features:

1.High-quality laser output

2.High power, high efficiency

3.High reliability, long service life

4.Compact, rugged package

5.Extending programming interface

Applications:

1.Industrial applications

2.Scientific research

2-Module Configuration

Maxphotonics offers many configurable Modules. This manual will give complete instructions for all Modules, Please refer to chapter 5 "Operation Guide".

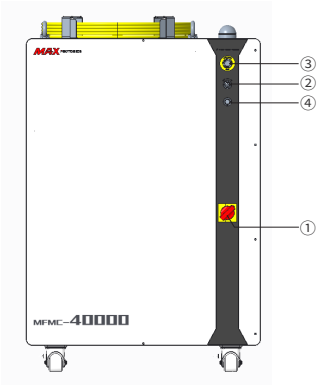
3-Laser Modulel Designation Codes

M - F - M - C - XXX - XXXX 1 - 2 - 3 - 4 - 5 - 6		
1	Manufacturer’s code	M means Maxphotonics
2	Gain media of the laser	F means Fiber Laser
3	Laser Module	M means Multi Module
4	Laser state	C means Continously Wave
5	Maximum output power	XXXX W means the maximum output power of the laser
6	Additional message	Can be null

4 - Certification

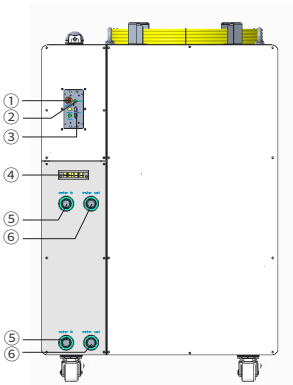
Maxphotonics certifies that this equipment has been thoroughly tested and inspected and meets published specifications prior to shipping. Upon receiving your equipment, check whether the packaging and accessories have been damaged in transit. If damage is apparent, please contact Maxphotonics immediately.

5- Front Panel Description



NO.	Items	Function Description
①	MAIN SWITCH	400VAC main power switch of laser
②	KEY SWITCH	Power switch of laser
③	EMERGENCY STOP	Emergency stop
④	START	Start laser (on-off signal of hardware)

6-Back Panel Description



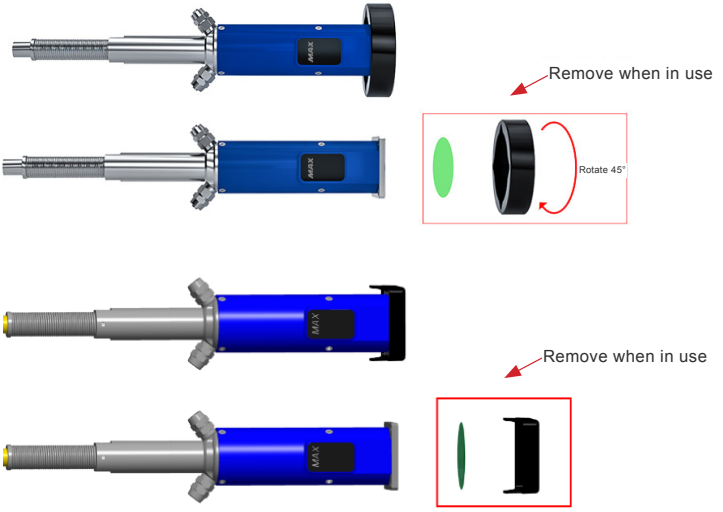
NO.	Items	Function Description
①	BLUETOOTH	Bluetooth communication
②	ETHERNET	Network communication interface
③	CTRL	External control connector
④	AC 380V	AC 360-440VAC input
⑤	WATER IN	1.5"Water Pipe,Inlet
⑥	WATER OUT	1.5"Water Pipe,Outlet

7-Optical Output Terminal

1.Optical Output Head

The optical fiber head is used corresponding to the protective window, and can be replaced after damage. Make sure to remove the black end cap on the LOE head before use, which is usually placed with the laser. Refer to Chapter 6 "Guidelines for Inspection and Cleaning of Optical Fiber Connectors" for protective window cleaning supplies and methods.

Optical Output Head (LOE-P,LOE3.2) MFMC-40000



Chapter 4
Specification

1-Optical Characteristic Parameters

Characteristics	Test conditions	Min.	Nom.	Max.	Unit
Operation Module	CW/Modulated				
Polarization	Random				
MFMC-40000	100% CW Output Power		40000		W
Tuning range of output power		10		100	%
Emission wavelength	100% CW	1070	1080	1090	nm
Spectrum width(3dB)	100% CW		5	8	nm
Short-term power instability	100% CW >1h		±1	±2	%
Long-term power instability	100% CW >24h		±2	±3	%
Beam quality （BPP）	Output fiber core diameter 100um	4		5.5	mm x mrad
	Output fiber core diameter 150um	5.5		6.5	
Laser switching ON time			150	200	μs
Laser switching OFF time			150	200	μs
Modulation rate	100% Output			5	KHz
Red guide laser power		400			uW
Feeding fiber cable length			25	30/35/40 can be customized	m

Feeding fiber core size	100 (150 can be customized)				μm
Feeding fiber cable bending radius		200			mm
Output form	LOE				

2-General Characteristic Parameters

Characteristics	Test conditions	Min.	Nom.	Max.	Unit
Operating voltage		360	400	440	VAC
Input Power	100% output			120	KW
Operating ambient temperature		10	25	40	°C
Operating ambient relative humidity		10		80	%
Cooling method	Water-cooling				
Cooling Medium	Pure water (above 0°C) / glycol antifreeze (below 0°C)				
Storage temperature		-10	25	60	°C
Dimensions	950*1250*1101(W*D*H)				mm
Weight	700(±10)				kg

3-Water Cooling Condition

No.	Characteristics	Min.		Unit
1	Cooling Method	Water Cooling		
2	Water Temperature	winter 20	summer 24	°C
3	Hydraulic pressure	≥ 4.5		bar
4	Water Flow Rate for laser cooling	≥420		L/min
5	Chiller Rated refrigeration capacity	≥100		KW

CAUTION :

◎ The Chiller needs to meet the requirements of the above table under the conditions of a circulating temperature of 40 ° C and an outlet temperature of 22 ° C.

◎ The above recommended water pressure requires the pressure drop of the main line Δp ≤ 0.5bar. If this value is exceeded, the main circuit water pressure should be increased accordingly.

◎ Cooling water and filter element, need to be replaced once a month; Winter (refers to the low temperature environment of 0 ° C and below) before the coming of the cooling water should be replaced with a volume ratio of 20% glycol solution (recommended brand Klein), and every two months, it is strictly prohibited to add excessive, low thermal conductivity of antifreeze, excessive addition is easy to cause poor heat dissipation. After the end of winter, it is necessary to replace the antifreeze back to distilled water and replace the filter element, and restore the maintenance frequency of once a month.

◎ When the ambient temperature of the equipment is lower than -15C, the water cooler with double system function must be used, and the cooling system must run uninterrupted.

4-LOE&QBH Water Cooling Condition

Cooling Method	Water pipe size requirement	Water Flow Rate (L/min)	Hydraulic pressure (bar)	Cooling Temperature (°C)
Water cooling	Φ12	≥4	≥4	28-30

CAUTION :

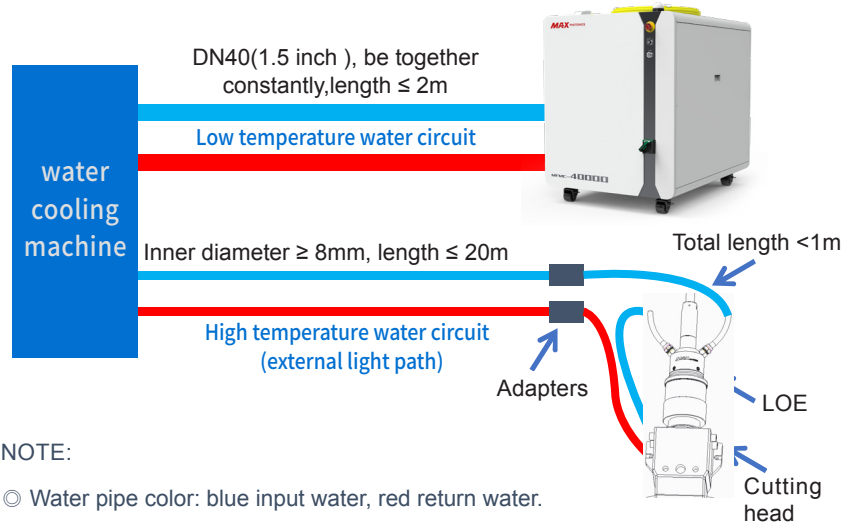
◎ The inner diameter of the external light path pipeline is greater than or equal to 8mm and the length is ≤20m;

◎ The total length of the Φ6 pipeline connecting QBH or the Φ8 pipeline connecting LOE from the external light path is ≤1m;

◎ QBH / LOE and cutting head connected in series

◎ For the QBH scheme, the above recommended external light path water pressure requires the pressure drop of the cutting head Δp ≤ 1.5 bar. If this value is exceeded, the external light path water pressure should be increased accordingly.

◎ For the LOE scheme, the above recommended external light path water pressure requires the pressure drop of the cutting head Δp ≤ 3 bar. If this value is exceeded, the water pressure of the external light path needs to be increased accordingly.



NOTE:

◎ Water pipe color: blue input water, red return water.

5-Installation Environment Requirements

1.The ambient air cleanliness grade requirement for optical fiber output head installation: 1000 or more stringent grade. Suggestions for Configuration of Standard Purification Workbench;

2.laser working environment temperature:10°C–40°C;

3.laser working environment humidity:10%-85%;

4.Avoid the condensation environment,the specific control standards are as follows:

环境温度、相对湿度，露点对照表														
相对湿度%	30	35	40	45	50	55	60	65	70	75	80	85	90	95
环温(℃)	露点 Td (℃)													
10	-7.0	-5.0	-3.0	-1.3	0.0	1.5	2.5	3.6	4.8	5.8	6.7	7.6	8.4	9.2
11	-6.5	-4.0	-2.0	-0.5	1.0	2.5	3.5	4.8	5.8	6.7	7.7	8.6	9.4	10.2
12	-5.0	-3.0	-1.0	0.5	2.0	3.3	4.4	5.5	6.7	7.7	8.7	9.5	10.9	11.2
13	-4.5	-2.0	-0.2	1.4	2.8	4.1	5.3	6.6	7.7	8.7	9.6	10.5	11.4	12.2
14	-3.2	-1.0	0.7	2.2	3.5	5.1	6.4	7.5	8.6	9.6	10.6	11.5	12.4	13.2
15	-2.3	-0.3	1.5	3.1	4.6	6.0	7.3	8.4	9.6	10.6	11.6	12.5	13.4	14.2
16	-1.3	0.5	2.4	4.0	5.6	7.0	8.3	9.5	10.6	11.6	12.6	13.4	14.3	15.2
17	-0.5	1.5	3.2	5.0	6.5	8.0	9.2	10.2	11.5	12.5	13.5	14.5	15.3	16.2
18	0.2	2.3	4.0	5.8	7.4	9.0	10.2	11.3	12.5	13.5	14.5	15.4	16.4	17.2
19	1.0	3.2	5.0	7.2	8.4	9.8	11.0	12.2	13.4	14.5	15.4	16.5	17.3	18.2
20	2.0	4.0	6.0	7.8	9.4	10.7	12.0	13.2	14.4	15.4	16.5	17.4	18.3	19.2
21	2.8	5.0	7.0	8.6	10.2	11.0	12.9	14.2	15.3	16.4	17.4	18.4	19.3	20.2
22	3.5	5.8	7.8	9.5	11.0	12.5	13.8	15.2	16.3	17.3	18.4	19.4	20.3	21.2
23	4.4	6.8	8.7	10.4	12.0	13.5	14.8	16.2	17.3	18.4	19.4	20.4	21.3	22.2
24	5.3	7.7	9.7	11.4	13.0	14.5	15.8	17.0	18.2	19.3	20.4	21.4	22.3	23.1
25	6.2	8.6	10.5	12.3	14.0	15.4	16.8	18.0	19.1	20.3	21.3	22.3	23.2	23.9
26	7.0	9.4	11.4	13.2	14.8	16.3	17.7	19.0	20.1	21.2	22.3	23.3	24.2	25.1
27	8.0	10.3	12.2	14.0	15.8	17.3	18.7	19.9	21.1	22.2	23.2	24.3	25.2	26.1
28	8.8	11.2	13.2	15.0	16.7	18.0	19.6	20.9	22.0	23.0	24.2	25.2	26.2	27.1
29	9.7	12.0	14.0	15.9	17.6	19.2	20.5	21.3	23.0	24.1	25.2	26.2	27.2	28.1
30	10.5	12.9	14.9	16.8	18.5	20.0	21.4	22.8	23.9	25.1	26.2	27.2	28.2	29.1
31	11.4	13.8	15.9	17.8	19.4	20.9	22.4	23.0	24.8	26.0	26.9	28.2	29.2	30.1
32	12.2	14.7	16.8	18.6	20.3	21.9	23.3	24.6	25.8	27.0	28.1	29.2	30.1	31.1
33	13.0	15.6	17.6	19.6	21.3	22.9	24.2	25.6	26.8	28.0	29.0	30.1	32.1	32.1
34	13.9	16.5	18.6	20.5	22.2	23.8	25.2	26.5	27.7	29.0	29.5	31.1	32.1	33.1
35	14.9	17.4	19.5	21.4	23.0	24.6	26.2	27.5	28.7	29.9	31.0	32.1	33.1	34.1
36	15.7	18.1	20.3	22.2	24.0	25.0	27.0	28.4	29.0	30.9	32.0	33.1	34.1	35.2
37	16.6	19.2	21.2	23.2	24.9	26.5	27.9	29.5	30.7	31.8	33.0	34.1	35.2	36.2
38	17.5	19.9	22.0	23.9	25.8	27.4	28.9	30.3	31.5	32.0	33.9	35.1	36.0	37.0
39	18.1	20.8	23.0	24.9	26.6	28.3	29.8	31.2	32.5	33.8	34.9	36.2	36.8	38.1
40	19.2	21.6	23.8	25.8	27.6	29.2	30.7	32.1	33.5	34.7	35.8	36.8	38.1	39.1

NOTE :

◎ In order to ensure a good operating environment of the laser, to reduce the probability of failure due to condensation. We recommende to prepare an air-conditioned room for the laser, so that the temperature in the air-conditioned room is ≤ 28 ° C, and the relative humidity is ≤ 50%. The water cooler should be placed in a different space from the laser. It is forbidden to place the water cooler in the air-conditioned room;

◎ The laser head works at circulating temperature. In order to avoid condensation on the laser head, it is necessary to adjust the temperature of the cooling water of the external light path to room temperature. It is forbidden to cool the laser head with low-temperature cooling water.

6- Installation position and space requirements

To ensure the normal maintenance and service of the laser, the space requirement of the maintenance channel must be considered when installing the laser Please. The laser is provided with a maintenance door, and its opening is a necessary condition for maintenance work. Therefore, in planning the installation of the product When locating, follow these guidelines:

(1) Reserved space size:

The size of the space required for the laser maintenance door to be fully open is critical. Make sure you reserve enough space next to the laser Space so that the maintenance door can be fully opened (the specific size is measured and installed according to the actual model size).

(2) Avoid obstructions:

Ensure that there are no fixed obstacles in the path of the maintenance door opening.

(3) Ground conditions:

When the maintenance door is opened, the ground should be kept flat to avoid accidents during the opening of the operator.

(4) Environmental considerations:

Avoid installing the product in direct exposure to harsh environmental conditions, such as extreme temperature, humidity, chemical corrosion Or wet areas, these conditions may affect the function of the maintenance door.

ATTENTION:

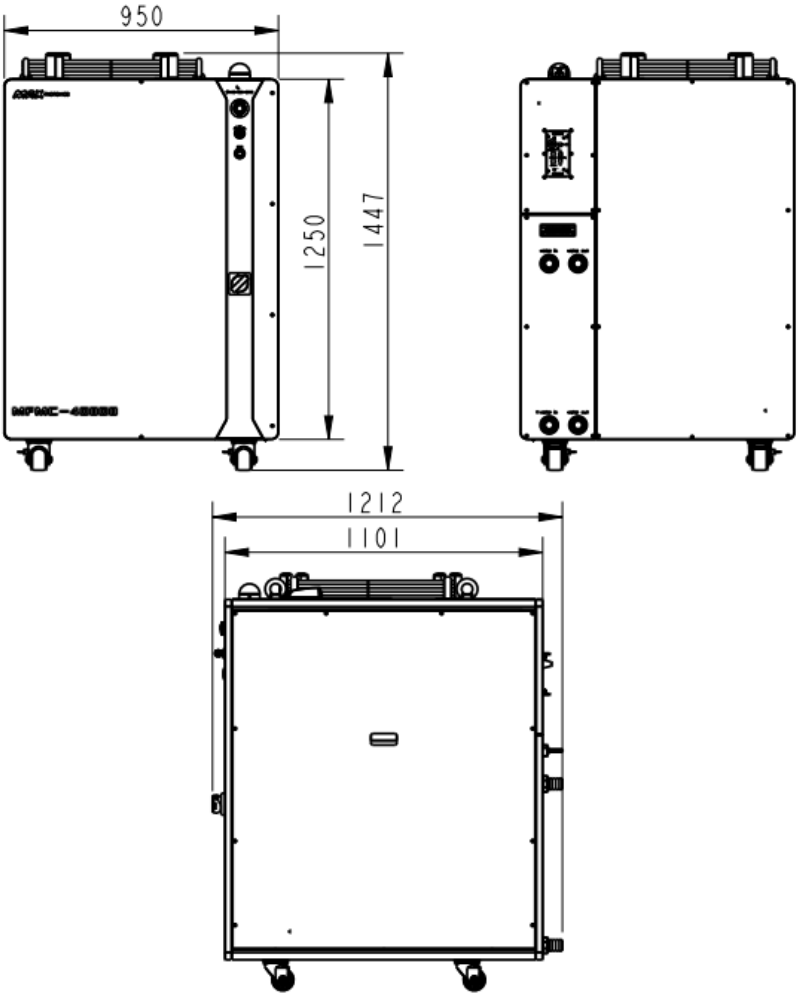
◎ Please strictly follow the above requirements during installation to ensure the normal operation of the laser and the safety of the maintenance personnel.

Failure to comply with these requirements can result in product maintenance difficulties, increased maintenance costs, and possible safety risks.

◎ If you have any questions or need further technical support, please contact Chuangxin laser after-sales engineer.

6-Structural Layout

Laser Views.（Unit：mm）



Chapter 5
Operation Guide

1-Notice

CAUTION:

◎ Please refer to Chapter 4 "Specification" for proper electrical power.

◎ Please refer to Chapter 2 "General Safety Information" for inspecting whether the configuration environment of peripheral work of the laser meets the requirements.

2-Electrical Power Connection

The power supply voltage of the optical device is 360-440VAC for three-phase AC. Make sure that the live and ground wires are correctly connected according to the line mark. Poor contact of the ground wire may cause potential damage to the laser.

For ensuring the safety feature, Maxphotonics recommends you connect circuit breaker (air switch) and Stabilizer in series between the power supply unit and the laser. This electric power shall be in close proximity to the power supply unit of the equipment and can be easily disconnected.

If you have questions about wiring, please check the table below to determine your electrical specifications.

Machine Type/W	Voltage /VAC	Rated current /A	Circuit breaker /A	Stabilizer / kW
MFMC-40000	400V±10%,3P+PE	180	400	≥ 80

3-Extension Interface

WARNING:

◎ The output of laser control interface is not insulation from hazardous live part, it may result electric shock. Please make sure the equipment is power off when perform connection. Please make sure addition insulation shall be provided to prevent against electric shock after installation.

The laser's CTRL interface is a high-quality HDB44 plug interface that provides a variety of signals for the laser's function control. The corresponding jacks and cables are described as follows:

CTRL INTERFACE PIN	WIRE COLOR	FUNCTION DESCRIPTION	CHINESE LOGO	SIGNAL DESCRIPTION
33	Orange-black	EX_LOCK_-	互锁 -	Dry contact input ON/OFF (ON-normal, off-fault)
34	Orange	EX_LOCK_+	互锁 +	
8	Yellowish black	CONTROL-	外部出光 -	Dry contact input ON/OFF (ON- light out,OFF- no light out)
23	Yellow	CONTROL+	外部出光 +	
39	Brownish white	ERROR2	故障输出 2	Dry contact output (ON- fault, OFF- normal)
40	Brown	ERROR1	故障输出 1	
29	Green	EX_DA+	0-10V 输 +	Control laser output power (Analog signal 1V-10%, 10V-100%)
14	Greenish white	EX_DA-	0-10V 输入 -	
2	Black and white	EX_M-	调制输入 -	HIGH:20VDC≤V≤24VDC LOW:0VDC≤V≤5VDC 5mA≤I≤15mA
17	Black	EX_M+	调制输入 +	
4	Red and white	EX_EN-	使能输入 -	HIGH:20VDC≤ V ≤24VDC LOW:0VDC≤ V ≤5VDC 5mA≤ I ≤15mA (Enable :HIGH Disable :LOW)
19	Red	EX_EN+	使能输入 +	
37	Light blue black	EMGERNCY1_INPUT-	急停输入 1-	HIGH:20VDC≤ V ≤24VDC LOW:0VDC≤ V ≤5VDC 5mA≤ I ≤15mA (Scram :HIGH Normal :LOW)
38	Light blue	EMGERNCY1_INPUT+	急停输入 1+	

4-Start Step

WARNING:

◎ Make sure that all the electrical connections (including cooling water connections) are connected prior to use. All the connectors must be held steady with screws if possible.

◎ NEVER look directly into the output fiber and make sure that you wear the laser safety goggles when operating the product.

◎ Make sure all power is removed from the laser when wiring.

The startup process is as follows:

1. Start the chiller;
2. Remove the end cap of the collimator;
3. Check that the end face of the collimator is clean and free of debris;
4. Ensure that the emergency stop switch is turned on;
5. Set the MAIN SWITCH to the ON position;
6. Set the key switch on the front panel to the "ON" position;
7. Press the START button on the front panel.

5-Module Description

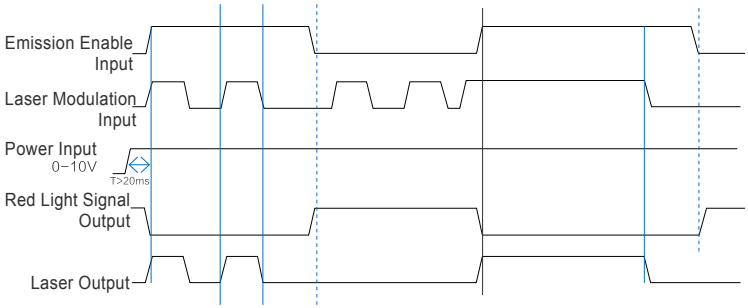
The working Modules of the laser are as follows:

1.Continuous Module: the emitted light is continuous and can be used for cutting;

2.Pulse Module: The emitted light is pulsed. When the pulse frequency is greater than a certain value, the actual application is used to control the average output power of the laser (pulse width adjustment, when the external control, the modulation signal corresponds to the Module);

3.External control: specific parameter settings through the board software interface.

External Control Signal Timing:

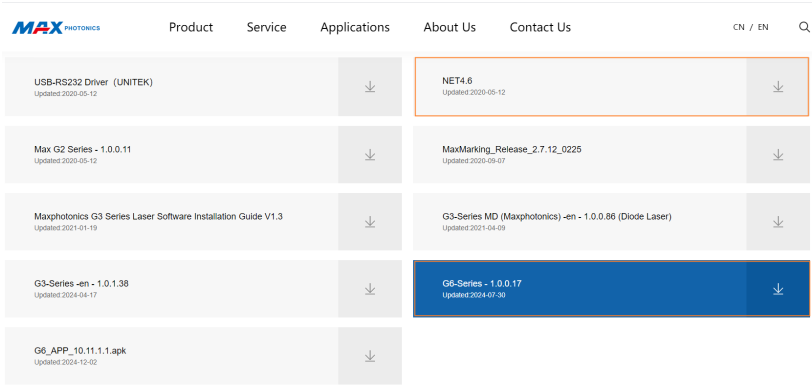


Timing specific description: Power analog quantity 0-10V signal is provided to the laser at least 20mS ahead of time, modulation and enable high level signal input, red light off, laser output. Enable high level signal reduction, red light output, laser off.

6-Software Description

(1) Enter “Chuangxin Laser official website” - “Download Center” - ‘Software’, download “NET4.6”, “G6-Series-n.n.n.n”. NET4.6“ and ”G6-Series-n.n.n.n". (Versions may be upgraded from time to time, subject to the announcement on the official website without prior notice.)

Website:http://en.maxphotonics.com/En/Software.html



(2) Install the runtime environment (NET4.6). (You do not need to install NET4.6 on Win10 systems or systems that already have .NET 4.6 installed).

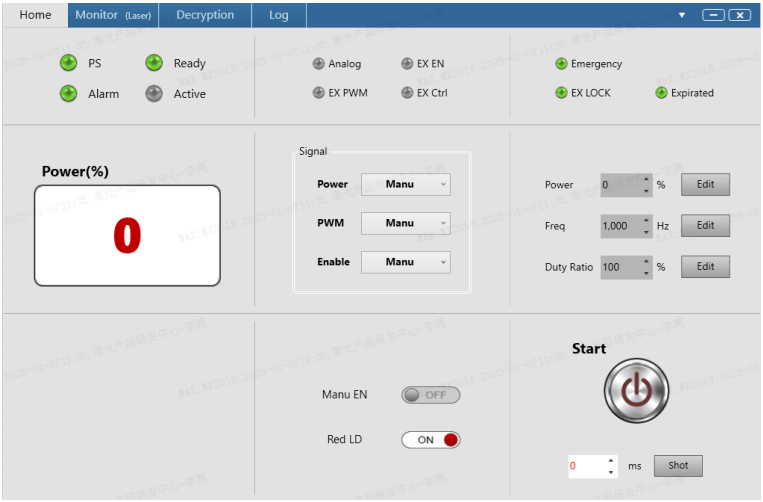
(3) Install the monitoring software (G6-Series-n.n.n.n) and a shortcut to “G6-Series” will appear on your desktop.

(4) Locate the EtherNet communication interface on the laser backplane and connect it to the computer using a network cable, and power up the laser.

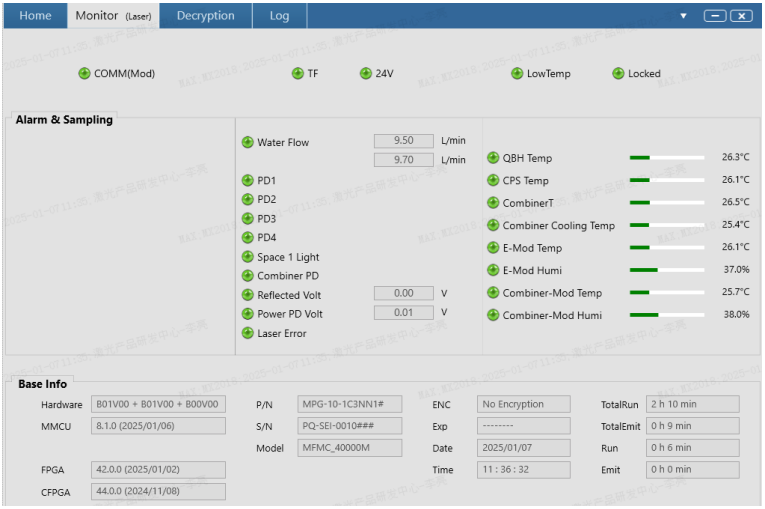
(5) Set the IP of the computer to the same network segment as the IP of the laser, but not the same as the IP of the laser (the default IP of the laser is 192.168.0.178).

(6) Double-click the desktop “G6-Series” shortcut to open the monitoring software and enter the following connection interface. Input the IP address of the laser (default is 192.168.0.178), click “Login” button and try to connect with the laser.

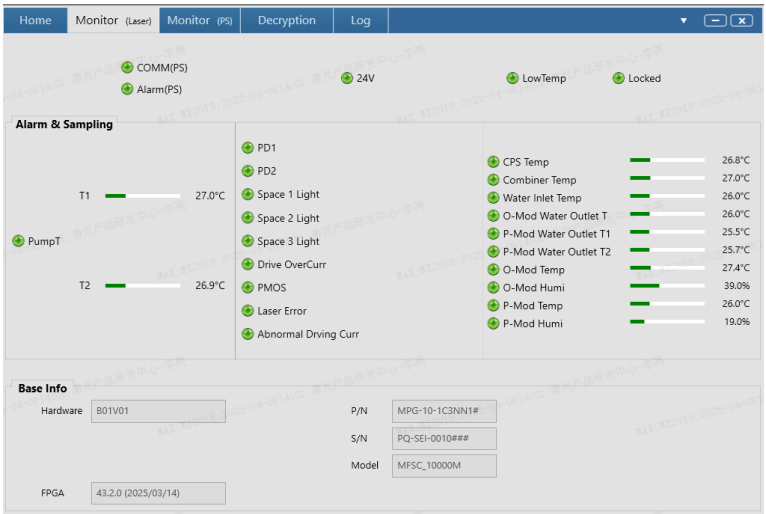
(7) If the laser has been powered up and the model can be matched with the monitoring software, it will enter the following main interface.



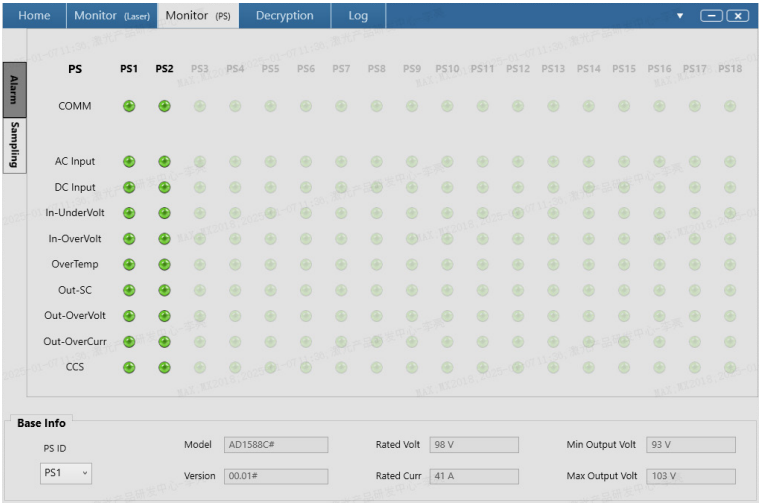
(8) Monitor page (master).



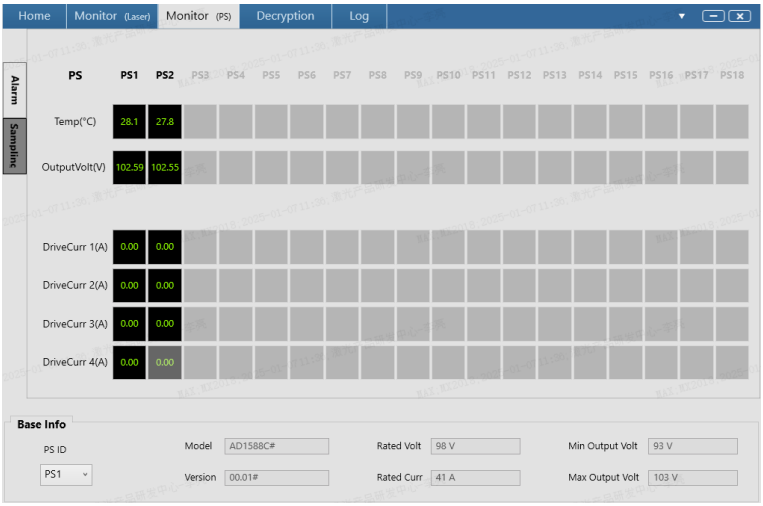
(9) Monitor page (Module-Laser).



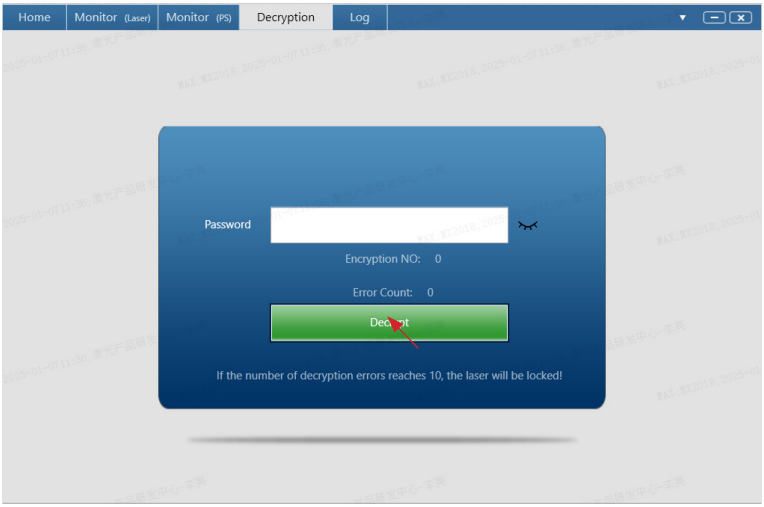
(10) Monitor page (Module-Power Alarm).



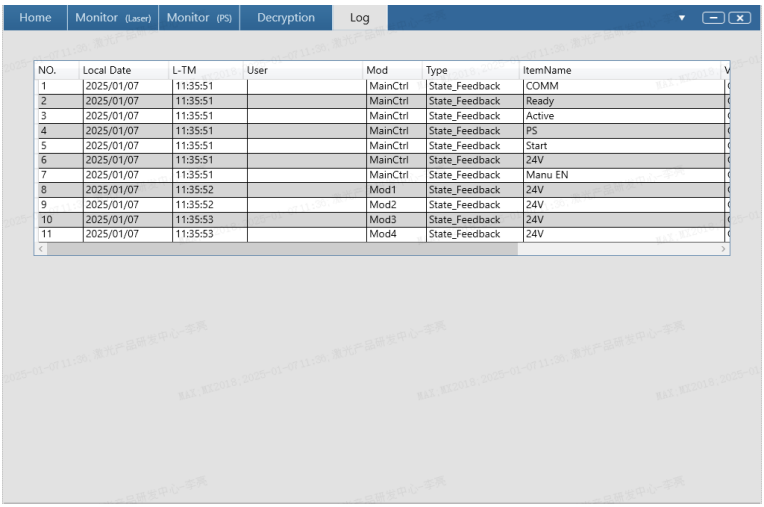
(11) Monitor page (Module-Power Sampling).



(12) Decryption page.



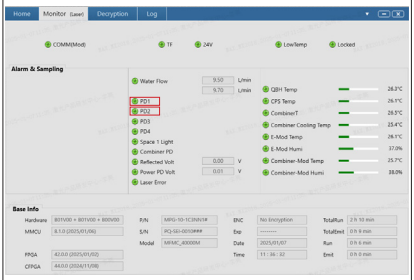
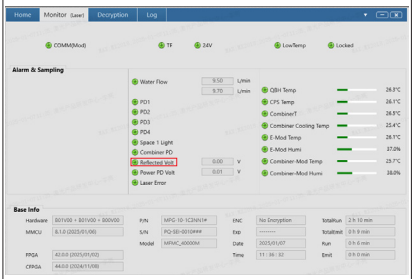
(13) Log page.

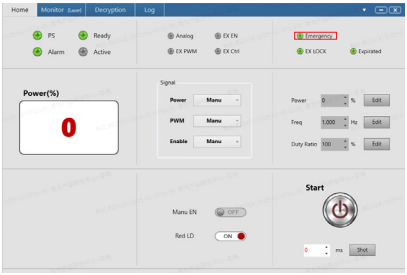


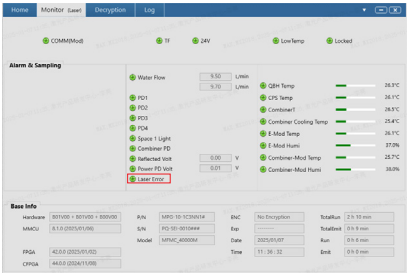
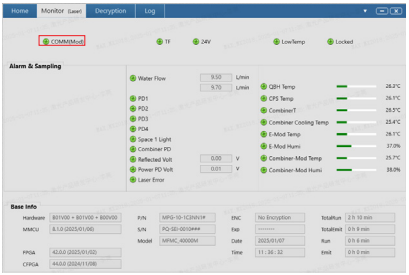
NO.	Local Date	L-TM	User	Mod	Type	ItemName
1	2025/01/07	11:35:51		MainCtrl	State_Feedback	COMM
2	2025/01/07	11:35:51		MainCtrl	State_Feedback	Ready
3	2025/01/07	11:35:51		MainCtrl	State_Feedback	Active
4	2025/01/07	11:35:51		MainCtrl	State_Feedback	PS
5	2025/01/07	11:35:51		MainCtrl	State_Feedback	Start
6	2025/01/07	11:35:51		MainCtrl	State_Feedback	24V
7	2025/01/07	11:35:51		MainCtrl	State_Feedback	Manu EN
8	2025/01/07	11:35:52		Mod1	State_Feedback	24V
9	2025/01/07	11:35:52		Mod2	State_Feedback	24V
10	2025/01/07	11:35:53		Mod3	State_Feedback	24V
11	2025/01/07	11:35:53		Mod4	State_Feedback	24V

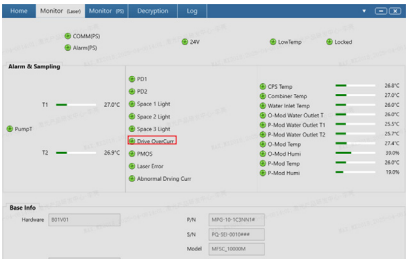
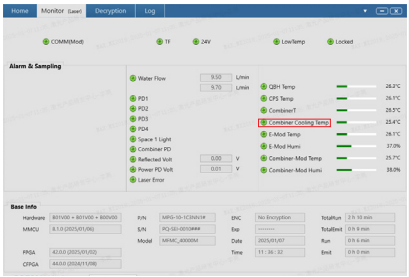
7-Error Listing

The fault alarm points set by the laser include:

NO	Fault picture	Fault name	Protective measures / possible causes / solutions
1		Forward light PD alarm	**Protective measures:** Stop supplying power to the main power and turned off the laser. **Possible causes:** The laser inside does not detect the laser . **Solutions:** 1.Restart the laser without laser ,check for red light. If there is no red light, please Contact Maxphotonics customer service; 2.If there is red light, please check if the relevant module can turn on the laser. Check whether the module DC power supply and voltage output is normal.
2		Super-strong backlight alarm	**Protective measures:** Stop supplying power to the main power and turned off the laser. **Possible causes:** The beam combining module detects that the return light is too strong. **Solutions:** 1.Check the laser focus position; 2.Check if the material is placed horizontally; 3.Check if the material is ultra high-reflective material; 4.Check if the material thickness exceeds the standard and cannot cut through the alarm; 5.Turn off the laser, pause for 3-5 minutes, restart the laser, and turn on the laser .

3		Pump temperature alarm	**Protective measures:** Stop supplying power to the main power and turned off the laser. **Possible causes:** The laser module pump temperature is too high ,the temperature alarms. **Solutions:** Turn off the laser, check if the water cooler flow rate and water temperature are normal, and if the water pipe is blocked.After complete the inspection, restart the laser and the laser returns to normal. If it can't return to normal. Contact Maxphotonics customer service.
4		Emergency stop alarm	**Protective measures:** Stop supplying power to the main power and turned off the laser. **Possible causes:** The emergency stop switch is pressed. **Solutions:** Turn the emergency stop to normal and restart the laser.

5		Water flow alarm	**Protective measures:** Stop supplying power to the main power and turned off the laser. **Possible causes:** The water-cooling machine is abnormal,results in the decrease of water flow. **Solutions:** Turn off the laser, check if the water cooler flow rate and water temperature are normal, if the water pipe is blocked. After the inspection is completed, restart the laser and the laser returns to normal.
6		Commun-ication abnormal alarm	**Protective measures:** Stop supplying power to the main power and turned off the laser. **Possible causes:** There is no signal transmission between the single module communication line and the main module. **Solutions:** 1.Check if the signal line connecting the single module and the main module is loose. 2.Check whether the single module can be powered on normally, whether there is red light, and whether the auxiliary power supply voltage output works normally.

7		Drive OverCurr	**Protective measures:** Stop supplying power to the main power and turned off the laser. **Possible causes:** The single module pump source operating current exceeds the maximum limit. **Solutions:** 1.Restart after the laser is turned off, check whether it is normal; if it is normal, use it normally; 2.If the maximum current alarm continues to occur, the drive MOS tube may break down in a single module. You need to turn off the laser immediately and contact Maxphotonics customer service.
8		Combiner water cooling plate temperature alarm	**Protective measures:** Stop supplying power to the main power and turned off the laser. **Possible causes:** The temperature of the water module is too high, and the temperature alarms. **Solutions:** Turn off the laser, check if the water cooler flow rate and water temperature are normal, and if the water pipe is blocked.After the inspection is completed, restart the laser and the laser returns to normal. If it can't return to normal, contact Maxphotonics customer service.

NOTE:

◎ All laser alarm information, there will be corresponding display reminder on the monitoring software: please pay attention! If you have any questions, please contact our customer service staff.

Chapter 6
Service and Maintenance

1-Maintenance Instructions

Before connect the laser fiber connector, it is necessary to check the dust, dirt adhesion and damage of the end face. Using dirty or unclean fibre optic connectors can cause serious damage to the laser. Maxphotonics does not take any responsibility for laser damage caused by using unclean optical fiber connectors. If the optical fiber connector is tampered with privately, the equipment will no longer in guarantee.

For cleaning a fiber connector you need the following materials:

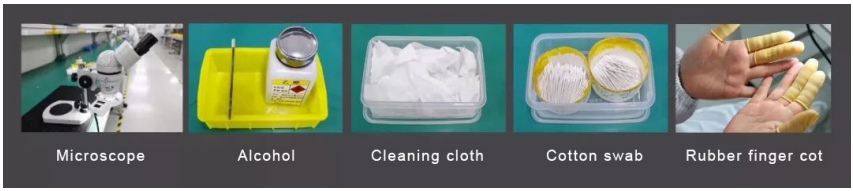
1.Powder-free rubber gloves or fingerstall;

2.Lint free optical cleaning wipes and/or swabs;

3.Ahydrous ethanol (Optical level, purity >99.5%);

4.Compressed air (no oil, no water), or a wooden rod rolled with a double-layer adhesive tape;

5.Scale microscope (can be enlarged by 20 times and above).



IMPORTANT:

◎ It is imperative that you wear powder-free rubber gloves during this cleaning procedure! It is hereby stated that damage to the fiber connector can occur due to mishandling, the use of incorrect cleaning procedures, or chemicals for cleaning. This is not covered by the Maxphotonics' warranty.

2-Appearance Inspection

1.Environmental requirements

LOE cleaning and installing cutting head shall be carried out in the clean room purification workbench,the dust-free grade requires 1000 grades, and the reference cleansing workbench as follow:

2.Operating Procedures

1.Switch off the laser power, and place the key switch on position of "OFF";

2.Rotate the black protective sleeve of the connector clockwise, place it under

a 20x microscope and make the surface to be inspected clear, and check whether the appearance of the quartz rod meets the appearance standard. (referrence2.2.5);

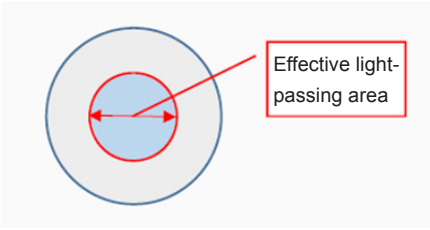
3.If there is no dust particles, or the dust particles meet the appearance standards, put the black protective sleeve to return the connector;

4.If it is found that the dust particles exceed the appearance standard requirements, then clean them according to the requirements of step 3;

5.Appearance standards are shown in the table below:

Power	Quartz rod	
	Effective light-passing area (within φ16mm)	Non-effective light-passing area (outside φ16mm)
20KW-40KW	Pitting diameter：≤ 0.02 Scratch width：≤ 0.005	Pitting diameter：≤ 0.05 Scratch width：≤ 0.01

Unit：mm



Schematic diagram of effective light passing area

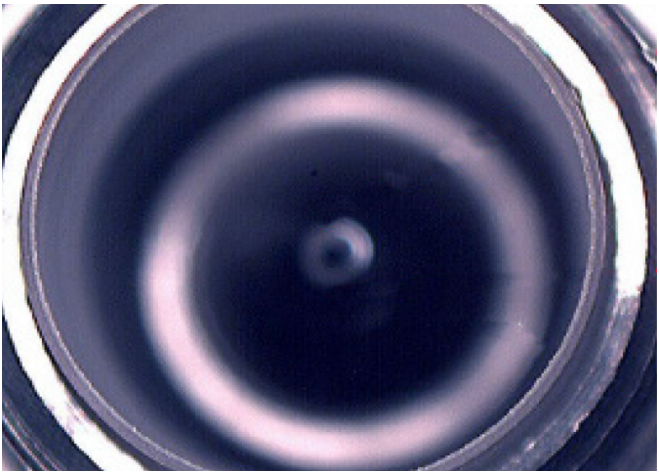
3-Cleaning Procedures

1.Switch off the laser power, and place the key switch on position of "OFF"

2.Cleaning protective lens with swabs

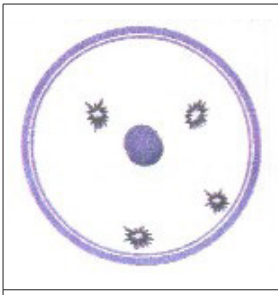
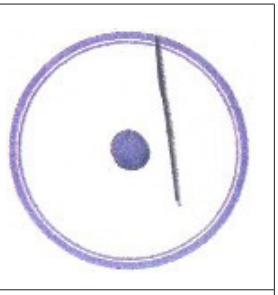
1.Rotate the black protective sleeve of the connector clockwise, place the inner or outer surface under a microscope of 20 times and make it clear. After careful observation, determine the specific position of the dust particles, open the alcohol bottle cap and gently press the alcohol bottle mouth makes a small amount of alcohol ooze out, completely immerse the round cotton swab in alcohol, and then lightly swab the cotton swab to remove excess alcohol. Use a cotton swab to wipe the dust particles straight in the direction of the operator's body. The force should be light. After each wiping, the cotton swab can be rotated 180° and then wiped with the other side. After wiping for 2 times, the cotton swab is scrapped. Note that it is not allowed to circle. Or wipe back and forth to prevent dust particles from contaminating other areas or cotton swabs directly scratching the surface.After all cleaning, it is necessary to observe under the microscope again whether the surface is clean.

Actual image of the fiber



Quartz rod

Endface may be damaged

		
Surface damaged	Coating damage	Scratch

2.Check the inner wall of the protective guide tube if there is obvious foreign matter with the microscope. If the foreign matter can be cleaned with a double-sided glue stick, then use a cotton swab to wash the alcohol for further cleaning. After the protective guide tube is dried, directly put on the connector.

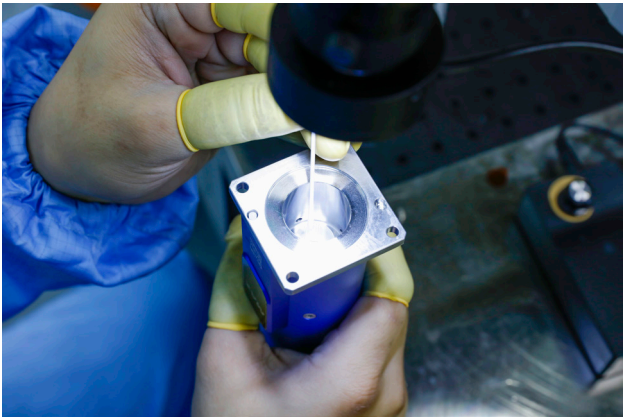
3.Cleaning method for quartz rods

If find that the internal quartz rod is dusty or dirty, you can open the lens to clean it. The specific steps are as follows:

1.Rotate the black protective sleeve, dust cap and protective lens at clockwise, first wipe the circumference and thread surface of the entire connector lens piece with an optical cleaning cloth and alcohol;

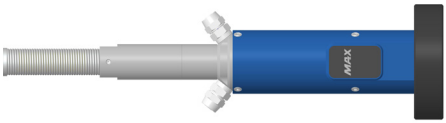
Remove the fiber protection sleeve and inner protective cover

2.Put the quartz rod under a 20x microscope and make it clear. After careful observation, determine the specific location of the dust particles and clean according to the method of 3.2.1. For dust particles on the side of the fused quartz rod, use a pointed cotton swab to clean along the circumferential surface. After all cleaning, confirm under the microscope whether it is clean, including the chamfered area. Finally, wrap it on the table with a non-woven fabric, and then continue other work to prevent the dust from contaminating the end face and side of the fused silica rod again;



Cotton swab to wipe quartz rod

3.Along the grain of the surface of the metal part, gently rotate the lens piece back to the metal part and confirm that it is in place. Place the black protective sleeve on the connector.



IMPROTANT：

◎ Do not reuse a lint-free optical wipe or swab;

◎ Do not touch the protective lens of the fiber connector;

◎ Do not blow directly, or else new dirty will be brought;

◎ Do not touch the tip of the cleaning swab with your fingers;

◎ Cleaning is necessary before place the protective cover and s leeve;

◎ Never blow air directly at the surface, because you could imbed contaminants into the surface. Always blow across the surface;

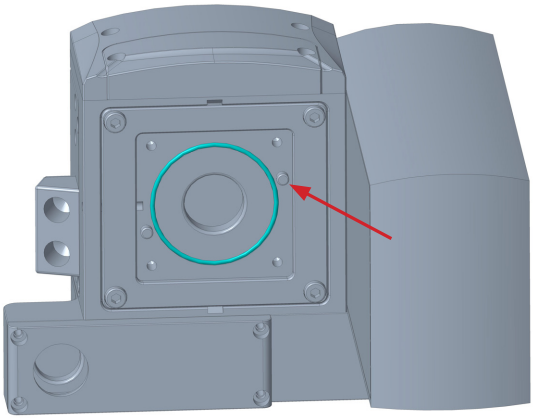
◎ If the fiber connector could not be installed in optical system immediately, please cover it with the protective cap cleaned with compressed air;

◎ Be sure to operate in a Class 1000 clean environment.

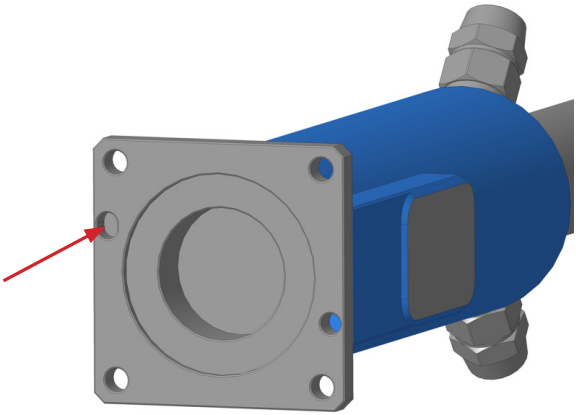
4-LOE Cutting Head Installationand Precautions

1.Installation steps

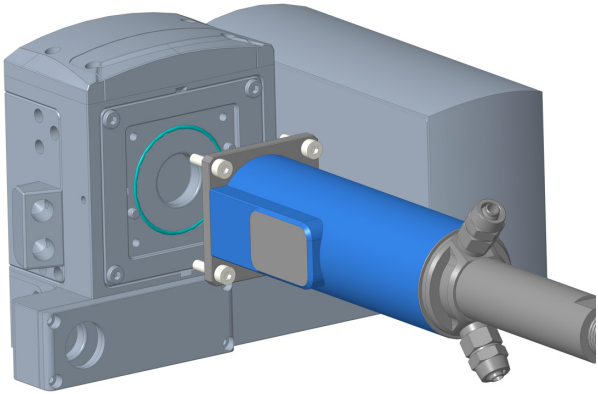
1. Take the laser cutting head, use a clean cloth dipped in alcohol to clean the end face, pay attention to the rubber ring to keep fit, and pay attention to the position of the positioning pin;

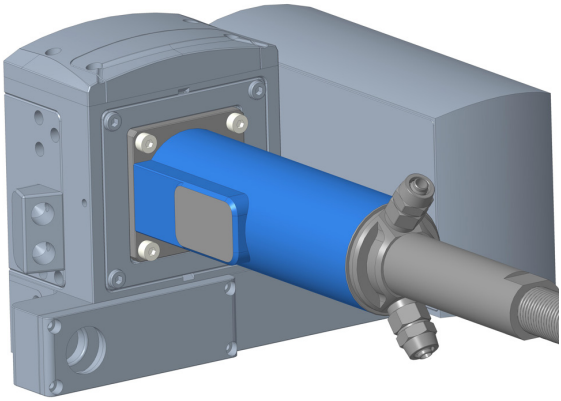


2. Take the LOE output head of the cleaned laser, and pay attention to the position of the positioning pin;



3. Based on the positioning pin, connect the LOE to the cutting head and fix it with the matching screws.





2.IMPORTANT

◎ The entire operation process needs to be performed in a 100-level dust-free purification environment;

◎ Be careful when handling the cutting head and LOE;

◎ During the installation process, pay attention that the rubber ring does not bounce, pay attention to the positioning pin;

◎ The device version is different, the installation method is subject to the actual product.

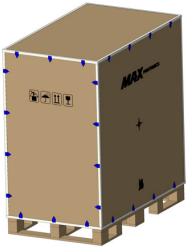
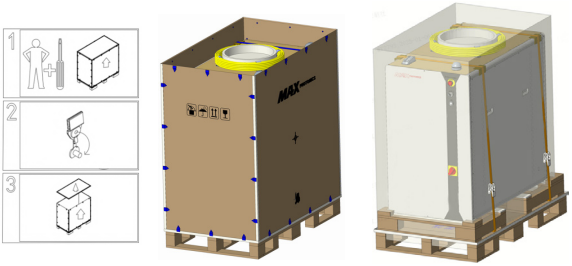
Chapter 7
Disassembly Guide

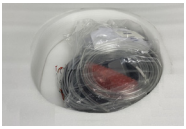
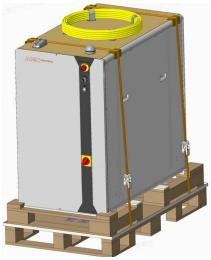
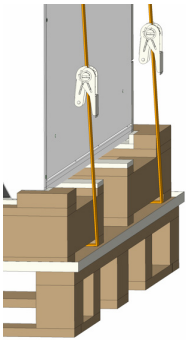
1-Unpacking Steps

The laser belongs to the precise valuables, so Maxphotonics recommends the following steps to unpack the packing box. Packing list is attached to the box. After unpacking, please check the accessories according to the Packing List. Please also save all the items after unpacking to prevent future transportation or storage.

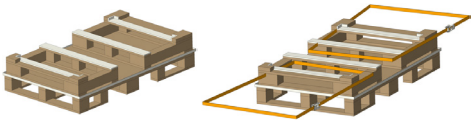
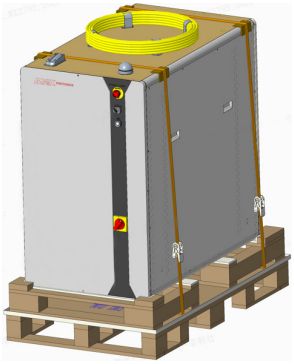
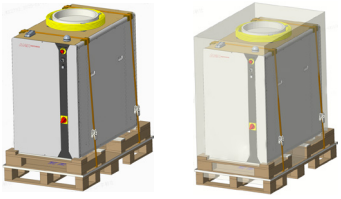
The following picture shows the steps to remove the box:

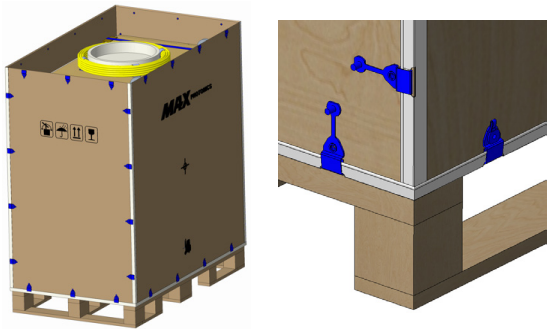
Packing box disassembly and assembly

Place the packaging box containing the laser equipment in a stable place, such as a flat ground or a large platform.	
Chuangxin Laser recommends that you use a flat-blade screwdriver to pry out the plastic buckle, remove the plastic buckle, and remove the top cover. Then remove the four sides in order: long side -> short side -> another short side -> another long side.	

Remove the PE bag, take off the top foam, and take out the supporting items.	 
Remove the tension belt, pay attention to the operating direction of the tension belt ratchet and the method of opening the tension belt: 1. Press and hold the stop circlip 2. Rotate and tighten the gallows 180° 3. Pull out the straps forcefully	
Please use a motorized forklift to pick up the laser and place it at the designated location.	

When customers need to repack, please refer to the following steps.

Place the pallet and clean it up, then place the tension straps, and pass the tension straps through the bottom grooves on both sides of the pallet, a total of two.	
Use a forklift to lift the product to a certain height, move the pallet to the bottom, adjust the direction of the casters at the bottom of the product, and position it properly, and slowly put the product down. When placing the product, pay attention to the orientation of the product as shown in the figure.	
Tighten the tension belt, and separate the product and the tension belt with a paper corner, a total of 4 paper corners. Pay attention to how to use the tension belt: 1. Find the position of the groove shaft and pass the strap under the groove shaft; 2. Pull through the strap tightly and go back into the groove shaft position; 3. Pull out the straps and tighten the straps; 4. Shake the handle back and forth to tighten the strap; 5. The ratchet wheel position of the tension belt is lowered to avoid hitting the product.	
Assemble the top foam and put in matching items. Put on a PE bag.	

Assemble the side panel, insert the plastic buckle into the card slot and fasten it, the assembly sequence is: long side -> short side -> another short side -> another long side.	
Assemble the top cover and fasten all the plastic buckles.	

NOTE:

◎ If you find any damage to the outer packaging or internal components after received the product, please contact Maxphotonics or your local representative immediately.

◎ The laser is equipped with a dehumidifier. When the ambient temperature and humidity are too high, the laser will have a process to prevent dew condensation and dehumidification (about 30 minutes). The condensed water will flow out from the bottom outlet of the cabinet.

◎ When turned off the laser, the water cooler should also be turned off to prevent condensation from occurring due to excessive temperature difference.

RECOMMENDATION:

Change the operating temperature or humidity of the laser to keep the laser away from the dew point. (such as installing the laser in an air-conditioned room)

2-Packing List

No.	Names of fittings	Description	Unit	Quantity
1	Fiber Laser	MFMC-XXX	Pc	1
2	External signal wire		Pc	1
3	Cable		Pc	1
4	Power Keys		Pc	2
5	Cleaning accessories		Bag	1
6	Sample of QBH water pipe		Pc	1
7	Hose clamp	stainless steel hose clamp, 48-51mm	Pc	4
8	LOE water pipe sample tube	∅ 12*2mm	Pc	1
9	Operation Electronic Manual	MFMC Series User Manual	Pc	1
10	Pointed cotton swab		Bag	1
11	Round head cotton swab		Bag	1

Chapter 8
Service and Maintenance

1-Maintenance Notes

CAUTION :

◎ No operator serviceable parts inside. Refer all servicing to qualified Maxphotonics personnel.

◎ For ensuring that the repairs or replacement within the warranty scope can be carried out, and perfectly maintaining your interests, please submit application to the Maxphotonics or the local representative after finding the faults. Upon receiving our authorization, you need to pack the product in a suitable package and return it.

◎ You should keep the proof when finding any damage after receiving the product, so as to claim the rights to shippers.

IMPORTANT :

◎ Do not send any product to Maxphotonics without RMA,otherwise it will be returned according to rejection. The resulting losses are borne by the customer; in order to ensure the timely processing of the returning machine, the customer must ship the faulty machine to the designated address of Maxphotonics.

Adress: Maxphotonics Industrial Park, 3rd Furong Road,

Furong Industrial Area, Shajing, Bao’an,

Shenzhen, China.518125

Contact: Customer Service

Receiving phone: 18682447838

◎ If the product is beyond the warranty period or the warranty scope, customers shall be responsible for the repairing cost.The specific charges include spare parts costs, labor service fees, and travel, accommodation and other expenses incurred by on-site services.

CHANGE :

◎ We have the rights to change any design or structure of our product, and the information is subject to change without notice.

2-Service Statements

More problems regarding the safety, set-up, operation or maintenance please reading this "User Guide" carefully and flowing the operation steps stictly. Please call the Customer Service Department for other questions.

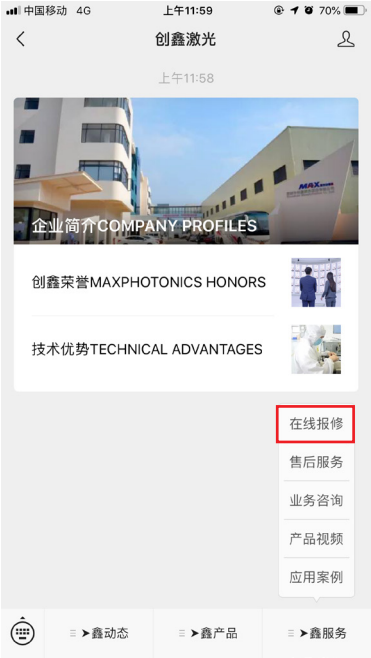
1.Fault repair and consultation methods

(1) 7X24 hour service hotline: 400-900-9588; 1 business consultation; -> 2 after-sales service; -> 3 pre-sales support; -> 4 complaints suggestions; -> 5 front desk consultation;

Another set: South China technical consultation line :18682446878

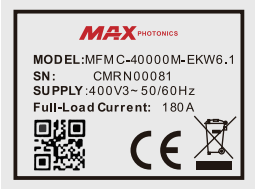
East China, North China Technical Advisory Line: 18682447838

(2) Online registration of Wechat public account: pay attention to Maxphotonics Wechat public account, choose online repair;



(3) Log in to Maxphotonics official website: www.maxphotonics.com, click on the service -- select online repair.

2.Customer repair and consultation need to prepare information in advance



(1) Laser Modulel PN: as shown on the right;

(2) Laser SN code: as shown on the right;

(3) Description of fault;

(4) Customer company name, address, contact person and contact number.

The questions you have feedback will be followed up by the technical support team after confirmation by Maxphotonics Customer Service. If your problem is still not resolved after communicating with the technical support team, you may need to send the product back to Maxphotonics for further investigation.

Chapter 9
Warranty Statements

1-General Clauses

Maxphotonics Co.,Ltd. carries out warranty for any defect of the product caused by its material and production technology within the warranty period agreed in contract, and ensures that its product meet the relevant quality and specification requirements specified in the document under normal use condition.

Maxphotonics Co.,Ltd. rationally determines to repair or replace the products with faults caused by its material or production technology within the warranty period, and repairs or replacement of all the products within the warranty scope are carried out according to the rest of the warranty period of primary products.

2-Warranty Limitations

Under the following circumstances, the products, parts (including the fiber connectors) or equipment are not within the warranty scope:

（1）Tampered, opened, detached or reconstructed by personnel outside Maxphotonics;

（2）Damaged from misuse, neglect or accident;

（3）Used beyond the specification and technical requirements of the product;

（4）Indirectly damaged from users' software or interfaces;

（5）Improper installation or maintenance, or operating under conditions not included in this manual;

（6）The fittings and the fiber connectors are not included in the warranty scope.

Customers are obligated to understand the information above and operate according to the User Guide and specification, or the faults arising therefrom are not included in the warranty scope.

IMPORTANT:

◎ Within the warranty scope, purchasers must feed back within 31 days after finding the product defect.

◎ Maxphotonics does not grant any Third Party rights to repair or replace the parts, the equipment or other Maxphotonics products.