



MFS Series -M⁵ BOX

USER GUIDE

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Preface

Thank you for using the MFS Series pulsed fiber laser products. 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, and your understanding 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 recommend that the operator read the Section titled "Safety Information" prior to operating 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 semiconductor 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:

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Chapter 1

Characteristic Description

MFS Series is one of the Maxphotonics outstanding products. Its appearance has revolutionary significance for the integration of high-speed and high- resolution laser marking system.

Compact, stand-alone, easy-to-use design that can be integrated directly into the user's device. Low power consumption, practical and durable design for laboratory and market applications.

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 special 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.




For ensuring the safety of operators, operators are urged not to open the equipment privately at all times. There are no user serviceable parts, equipment or assemblies associated with this product. 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
	<p>WARNING: Refers to a potential Electrical Hazard to human body. It requires a procedure that, if not correctly followed, may result in bodily harm to you and/or others. Do not proceed beyond the WARNING sign until you completely understand and meet the required conditions.</p>
	<p>CAUTION: 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.</p>
	<p>WARNING: Refers to a potential Laser Hazard. The symbol represents laser radiation. The symbol is pasted on laser output end.</p>
<p>NO SYMBOL</p>	<p>IMPORTANT: Refers to any information regarding the operation of the product. Please do not overlook this information.</p>

NOTE :

© This device is classified as a high power Class IV laser instrument. It may emit up to 20W average power near 1060nm wavelength. This level of light may cause damage to the eye and skin. Despite the radiation being invisible, the beam may cause irreversible damage to the retina. 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. The manufacturer of the laser system is responsible for the safety compliance according to the applicable standards and regulations.

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.

General Safety Instructions

In order to ensure the safe operation and optimal performance of the product, please follow these warning and cautions in addition to the other contained elsewhere in this document.

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

WARNING :

© This device has an output optical head connected to the laser with a fiber cable. Please, be careful dealing with the output head.

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. Ensure that all personal protective equipment is suitable for the output power

and wavelength range of the laser.

4. Do not install collimators when the laser is active.
5. It is forbidden to turn on the laser during the mounting of fiber or cutting head.
6. For collimated outputs, maintaining a clean output lens is essential. Always close (re-cap) the collimator after use. Do not touch the output lens and do not clean it with any solvents. Cleaning with the special solvent and cleaning buds is allowed as described later on in this manual.

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 Use appropriate laser safety eyewear when operating this device.
- ⊙ Optical damage may result from failure to comply with the above instructions. Such damage is not covered by the warranty.

CAUTION:

- ⊙ Use of controls or adjustments or performance of procedures other than those set forth in this User's Guide and related documents may result in hazardous radiation exposure.

4.Operation Environment Requirements

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

1. Do not expose the device to a high moisture/high temperature environment . Install the laser in the cabinet with the function of temperature-humidity control

and dust-free.

2 Before switching on the device make sure that environmental temperature and humidity are within a specified range.



WARNING:

© Optical damage may result from failure to comply with the above instructions. Such damage is not covered by the warranty.

1. Avoid the impaction on the shipper rod of worktable when the laser is working.
2. The laser and optical lens are fragile, please handle with care.
3. Stop running once device failure, and provide professional treatment.
4. Please follow a set sequence of on-off.
5. The limitation on surface of marking machine is within the working area.
6. Keep the device clean and indoor.

6. Safety Labels and Labeling Locations

The following shows the pictures of tags and their positions on the product:

Pictures of label	Label name	Label location
	Light Emission	at top of galvanometer
	Caution	at top of galvanometer

4-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

MFS Series is one of the Maxphotonics outstanding products. Its appearance has revolutionary significance for the integration of high-speed and high- resolution laser marking system. Compact, stand-alone, easy-to-use design that can be integrated directly into the user's device. Low power consumption, practical and durable design for laboratory and market applications.

Main Features:

- 1.Narrow Pulse width, High peak power, Wide frequency
- 2.High reliability, Super long life time
- 3.Shadow and virtual breakage will not occur in special material processing

Applications:

1. Industrial applications
2. Scientific research

2-Laser Model Designation Codes

Model Coding Rules:

Model	Model Coding Rules
MFS-10T	Maxphotonics Q-switched laser-10W
MFS-20T	Maxphotonics Q-switched laser-20W

3 - 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.

Chapter 4

Specification

1-Characteristic Parameters

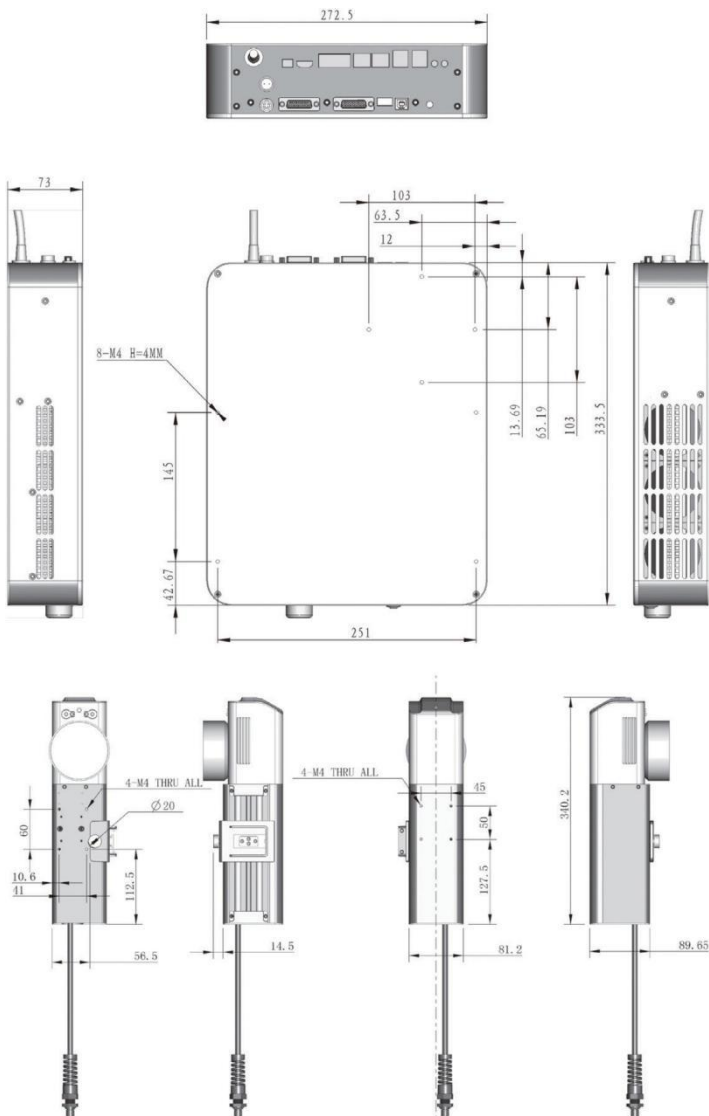
No.	Type	MFS-10T	MFS-20T
1	Laser power	$9 \pm 1W$	$19.5 \pm 0.5W$
2	Central wavelength	1064nm	
3	Beam quality Frequency tunable	$M2 < 1.4$	
4	Marking Area	20-50khz	30-60khz
5	(Standar)	110 (F=160MM)	
6	Engraving Line Speed	0-15000mm/s	
7	Mode for focusing	Manual	
8	Marking Speed	600-1000 characters/min	
9	Min. Line Width	0.02mm	
10	Min. Character	0.15mm	
11	Repetition Accuracy	$\pm 0.002mm$	
12	Cooling	Air Cooling	
13	Working Environment	Clean Room or Less dust room	
14	Working Temperature	10-35°C	
15	Power Consumption	$\leq 120W$	$\leq 160W$
16	Operation voltage	AC220V $\pm 10\%$, 50HZ	

2-Computer Configuration

No.	TYPE	Configuration
1	CPU	Intel J1800 Processors
2	Memory	ADATA 4G DDR3L 1600
3	Ethernet	2x LAN Intel I211 (post IO interface)
4	Graphic Control	Intel® HD Graphics
5	Display Port	1x HDMI HDMI supported Max. resolution is 1920×1200@60Hz
6	Hard disk	64G
7	USB Interface	2x USB2.0; 2x USB3.0
8	Serial Port	1x RS232(contact pin) and COM1 support mode RS422, RS485
9	Operate System	Windows 7 32 bit Chinese Professional System (strandard) Also support Windows 7/ Windows 8/ Windows 10/ Linux
10	Temperature	Working Temperature: 0℃ ~ 60℃
11		Storage Temperature: -40℃ ~ 85℃
12	Humidity	5% ~ 95% relative humidity,no condensation

3-Structural Layout

Laser Views. (Unit: mm)



Chapter 5

Using Instruction

Please confirm the attachments contained in this product according to the table below:

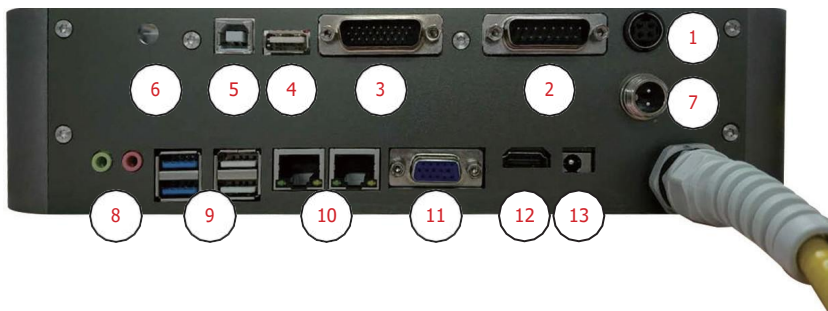
ITEM	QTY
User Manual and Test	1
Power supply (optional)	1

NOTE:

© If you find any damage to the outer packaging or internal components after receiving the products, please contact Maxphotonics or local representative immediately.

1-Interface function description

Laser power supply as follows:



Definition of each interface:

1. Power Supply: 220V to 24V power adapter socket;
2. DB 15 Pins Interface: Scan head/Galvometer interface;
3. DB 26 Pins Interface: External Control IO interface of control card (more definition about IO);
4. USB Interface: For USB upgrade the control card program interface and WiFi interface;
5. External USB port: used for external computer and laser control system connection port by USB cable (reserved);
6. DIP switch: used for internal USB interface and external USB interface selection switching;;
7. Foot Switch Interface: use for foot switch/padel; turn ON, the laser emit, turn OFF, no laser emit;
8. Microphone, audio interface;
9. Computer USB interface;
10. Computer network port, when the industrial computer is connected to the network cable;
11. VGA interface, computer monitor interface;
12. HDMI interface, computer monitor interface;
13. Industrial computer power supply interface, the internal power of the laser machine has been supplied, so this interface does not need to be used under normal circumstances.

2-

DB 26 Pins Interface Definition**1. Functions of each interface**

No.	Item	Direction	COM Port	Description
1	EN_A_N	input	Differential Input	Optical encoder input A-
2	EN_B_N	input	Differential Input	Optical encoder input B-
3	MARKING_END	output	OUTIO_COM	Marking end pulse output, high level available (around 4ms)
4	IO_OUT1	output	OUTIO_COM	IO port output 1
5				
6	OUTIO_COM	input		IO output COM port
7	EMSTOP	input	GND	Emergency input
8	PULSE_N	output	Differential output	Rotary motor pulse output -
9	DIRECTION_N	output	Differential output	Rotary motor direction output-
10	EN_A_P	input	Differential Input	Optical encoder input A+
11	EN_B_P	input	Differential Input	Optical encoder input B+
12	MARKING_BUSY	output	OUTIO_COM	Marking busy Output, high level available
13	MARKING_ERR	output	OUTIO_COM	Marking Error Output, high level available
14	IO_OUT2	output	OUTIO_COM	IO Port Output 2
15				/
16	GND	output		Control System Ground
17	PULSE_P	output	Differential output	Rotary motor pulse output+
18	DIRECTION_P	output	Differential output	Rotary motor direction output +
19	START	input	GND	Foot pedal start
20	STOP	input	GND	Foot pedal Stop
21	PHOTO_SWITCH+	input	Differential Input	Photoelectric switch Input+
22	PHOTO_SWITCH-	input	Differential Input	Photoelectric switch Input-
23	INPUTIO_COM	input		IO Input COM Port
24	IO_INPUT1	input	INPUTIO_COM	IO Port Input 1
25	IO_INPUT2	input	INPUTIO_COM	IO Port Input 2
26	IO_INPUT3	input	INPUTIO_COM	IO Port Input 3

2. Rotary Port

No.	Item	Direction	COM Port	Description
17	PULSE_P	output	output Differential	Rotary motor pulse output +
8	PULSE_N	output	output Differential	Rotary motor pulse output -
18	DIRECTION_P	output	output Differential	Rotary motor direction output +
9	DIRECTION_N	output	output	Rotary motor direction output -

3. Foot Switch Output

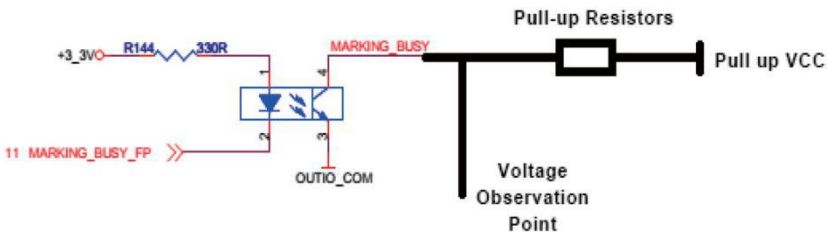
No.	Item	Direction	COM Port	Description
19	START	input	GND	Foot pedal start
20	STOP	input	GND	Foot pedal Stop
16	GND	output		Control System Ground

NOTE:

- ◎ START and GND in short circuit, it is foot pedal start.
- ◎ STOP and GND in short circuit, it is Foot pedal Stop.

4. Foot Switch Output

No.	Item	Direction	COM Port	Description
3	MARKING_END	output	OUTIO_COM	Marking end pulse output
12	MARKING_BUSY	output	OUTIO_COM	Marking busy Output
13	MARKING_ERR	output	OUTIO_COM	Marking Err Output
6	OUTIO_COM	input		IO Output COM Port



NOTE:

© Pull MARKING END, MARKING BUSY, MARKING ERR on three output ports to ensure pull-up current is higher than 40ma; If only for monitor the electrical level, then 10ma pull-up current will be ok; , if need to connect an electric relay, ensure the pull-up current is less than 40ma.

© In MARKING_END, MARKING_BUSY, MARKING_ERR three outputs for level monitoring, monitoring points are active when at high level.

5. Emergency Port

No.	Item	Direction	COM Port	Description
7	EMSTOP	input	GND	Emergency input
16	GND	output		Control System Ground

NOTE:

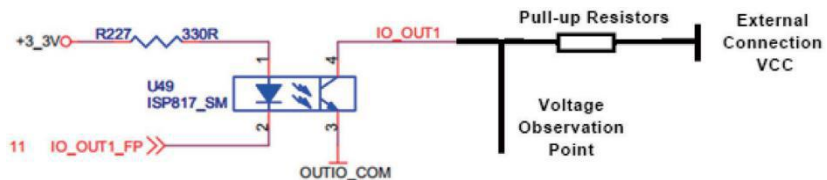
© Put the EMSTOP and GND in short circuit, then emergency stop active.

6. Digital IO Port

Model coding rules:

(1) Output IO

No.	Item	Direction	COM Port	Description
4	IO_OUT1	output	OUTIO_COM	IO Port Output1
14	IO_OUT2	output	OUTIO_COM	IO Port Output2
6	OUTIO_COM	input		IOOutput COMPort

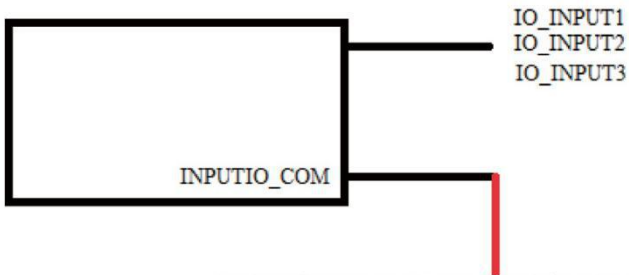


NOTE:

- ◎ Pull up IO_OUT1, IO_OUT2 there output ports and make sure pull-up current below 40ma. Level Observation Point below than 10ma. If connect relay, please make sure current below 40ma.
- ◎ Do Level Observation at IO_OUT1, IO_OUT2 there ports, all observation point valid at high level.
- ◎ OUTIO_COM connect external input GND.

(2) Input IO

No.	Item	Direction	COM Port	Description
23	INPUTIO_COM	input	INPUTIO COM	IO Input COM Port
24	IO_INPUT1	input	INPUTIO_ COM	IO Port Input 1
25	IO_INPUT2	input	COM INPUTIO_	IO Port Input2
26	IO_INPUT3	input	COM	IO Port Input3



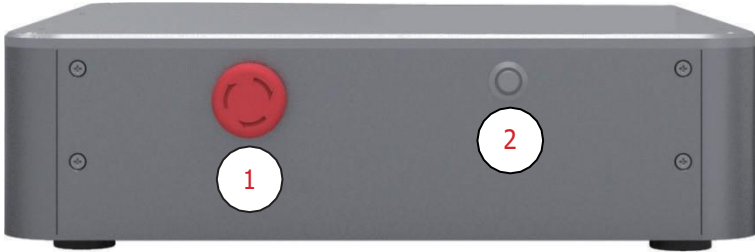
Connect ground of counter party's input signal

NOTE:

- ◎ Pin 23 INPUTIO_COM connect your input GND.
- ◎ IO_INPUT1,O_INPUT2,IO_INPUT3 default without connection, or when input low level, software detection input "0".
- ◎ When IO_INPUT1,IO_INPUT2,IO_INPUT3 input high level,software detection input "1".

3-

Button Function Description



Definition of each interface function:

1. Emergency Stop button, press it, no laser emit;
2. Computer key switch.

4-

Software operating manual

Check the software operating instructions for details.

Chapter 6

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.
- ⦿ If the product is beyond the warranty period or the warranty scope, customers shall be responsible for the repairing cost.

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 following the operation steps strictly. Please call the Customer Service Department for other questions.

Please call the Customer Service Department for other questions: 400-900- 9588.

Customer repair and consultation need to prepare information in advance.

- (1) Laser model 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.



Your problems will be follow-up by our technical support group after verified. If the problems cannot be solved , you may need to return the product to Maxphotonics for further troubleshooting.

Chapter 7

Warranty Statements

1-General Items

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 feedback 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.