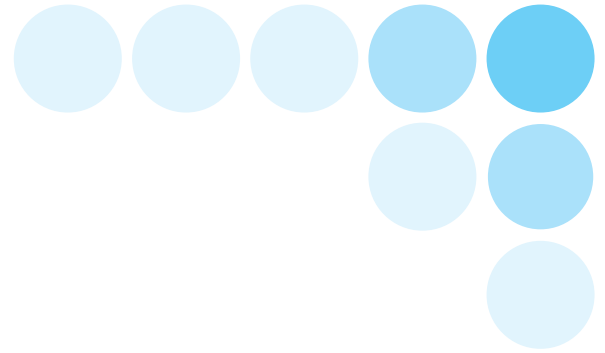


## Fiber Laser Marker

MX-Z2000H-V1 series



## User's manual



# Introduction

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Thank you for purchasing Fiber Laser Marker MX-Z2000H-V1 series.

This manual describes the functions, performance, how to use and other information you need to know to use the MX-Z2000H-V1 series.

Take heed of the following when using the MX-Z2000H-V1 series:

- The MX-Z2000H-V1 series should be handled by experts with knowledge of electrical engineering.
- Read this manual carefully and understand the content fully to ensure the correct use.
- Keep this manual in good care so that it can be referenced at any time.

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- EtherNet/IP is a trademark of ODVA.
- Other company names and product names mentioned herein may be registered trademarks or trademarks of their respective owners and are hereby acknowledged.

## ●Types and purposes of manuals

The main content of the manuals are below. Select and read the manual that meets your specific purpose.

### Instruction sheet

This manual provides basic information you need to know to use safely and correctly this product. And it primarily covers the information contained in the setup manual including the explanation of installation/connection and basic operating procedures.

### Manuals contained in the CD-ROM (PDF files)

Setup manual (Japanese, English)

User's manual (Japanese, English)

Information including how to install software and how to use the Font logo editor is provided.

### Note

Adobe Reader® by Adobe® must be installed to view the Manual (PDF file).  
Download it from Adobe®'s website.

## Terms and Conditions Agreement

### **Warranties.**

- (a) Exclusive Warranty. Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.
- (b) Limitations. OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NONINFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE.

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### **Limitation on Liability; Etc.**

OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY.

Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.

### **Suitability of Use.**

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Omron assumes absolutely no liability for any losses or damages incurred either directly or indirectly along with any associated costs that may be incurred to Omron products, installed software or any computer equipment, computer programs, networks or databases that may be infected as a result of a DDoS (distributed denial of service) attack, a computer virus or some other technically harmful program, or from unauthorized access.

We ask that you take sufficient measures including (1) anti-virus protection, (2) data input/output, (3) restoring any lost data, (4) preventing the spread of computer viruses to Omron products or to the software installed on them, and (5) preventing unwanted access to Omron products.

### **Programmable Products.**

Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.

### **Performance Data.**

Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.

### **Change in Specifications.**

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

### **Errors and Omissions.**

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

## Notes on Safety

### ● Safety Labels and Definitions

In this manual, the precautions are indicated with the following labels and symbols so that MX-Z2000H-V1 series can be used safely. The precautions described here contain information critical to ensuring safety. Be sure to observe them. The labels and symbols are as follows.



**Danger**

Improper handling will lead to a hazardous situation where a death or serious injury may result. It may also result in serious property damage.



**Warning**


Improper handling will lead to a hazardous situation where a minor or moderate injury or, in the worst case, serious injury or death may result. It may also result in critical property damage.



**Caution**

Improper handling will lead to a hazardous situation where a minor or moderate injury, or property damage may result.

### ● Meaning of Graphic Symbols

	<ul style="list-style-type: none"> <li>● Laser beam</li> </ul> <p>Indicates a possibility of injury or damage due to laser beam.</p>
	<ul style="list-style-type: none"> <li>● Caution for electric shock</li> </ul> <p>Indicates a possibility of electric shock in certain conditions.</p>
	<ul style="list-style-type: none"> <li>● Prohibited</li> </ul> <p>Indicates a prohibition in general.</p>
	<ul style="list-style-type: none"> <li>● Caution for explosion</li> </ul> <p>Indicates a possibility of explosion in certain conditions.</p>
	<ul style="list-style-type: none"> <li>● Wear protective glasses</li> </ul> <p>Indicates a situation that requires eye guard to be worn.</p>
	<ul style="list-style-type: none"> <li>● Contact prohibited</li> </ul> <p>Indicates a possibility of injury caused by touching a certain part of the device in certain conditions.</p>
	<ul style="list-style-type: none"> <li>● Execute</li> </ul> <p>Indicates an action of a non-specific, general user.</p>
	<ul style="list-style-type: none"> <li>● Always connect a grounding wire.</li> </ul> <p>Indicates an instruction to the user to always connect a grounding wire when using a device with a safety ground terminal.</p>
	<ul style="list-style-type: none"> <li>● Disassembly prohibited</li> </ul> <p>Indicates that disassembly of the device is prohibited as doing so may cause an electric shock or other injury.</p>
	<ul style="list-style-type: none"> <li>● Caution for high temperature</li> </ul> <p>Indicates a possibility of injury due to high temperature in certain conditions.</p>



● Caution for falling

Indicates a possibility of falling due to strongly pushing and pulling certain parts of the device.

● Warning display

 **Danger**

A serious personal injury may result.

Do not operate the product unless you have received laser safety training or operation training, or have understood the content of this manual.

Set up the laser controlled area and enclose the laser irradiation area with a shield so that the laser emission does not exceed the class 1 (IEC 60825-1, JIS C6802) level.



A serious personal injury may result.

Voltage is applied to some parts inside the product. Do not touch the inside of the product.



A serious personal injury may result.

When you must touch the electrical system of the product for maintenance or cleaning, disconnect the controller power supply cable of the main unit from the outlet and wait for at least 10 minutes, and then make sure, using a tester, that there is no residual voltage.



A serious personal injury may result in some extreme circumstances.

Do not have your hand or any other body part come close to the laser emission port.


Furthermore, never open the head cover because the extremely strong, near-infrared laser beam, which is invisible to the eye, is being emitted inside the marker head.



A serious personal injury may result in some circumstances.

Construct an interlock system with which the laser stops when the laser safety gate is opened.



 **Warning**

A serious personal injury may result in some extreme circumstances.

Do not disassemble the product or modify the inside parts for purposes other than the specified maintenance.



A serious personal injury may result in some extreme circumstances.

Always turn off the power supply before wiring, installing, or performing maintenance on the product.

Be sure to observe the instructions for connections in the manual.



A serious personal injury may result in some extreme circumstances.

Install the product in a location that is as bright as possible. Since the diameter of pupil is larger in a dark place, laser beam may cause an even more serious injury if it were to hit the eye.



A serious personal injury may result in some extreme circumstances.

Do not place a highly reflective object with a smooth surface near the laser beam path.



A serious personal injury may result in some extreme circumstances.

Do not place a flammable or combustible object around the product or near the laser beam path.














Smoke generating or igniting accident may result.













A serious personal injury may result in some extreme circumstances.

Never forcibly continue to operate the product when an error or failure occurs as doing so may result in smoke generating or igniting accident.



<p>A serious personal injury may result in some extreme circumstances. If you feel a sense of danger due to abnormal behavior or noise while operating the product, do not hesitate to press the emergency stop switch ([EMERGENCY] button) and turn off the power supply to the product.</p>	
<p>A serious personal injury may result in some extreme circumstances. Never +/- short-circuit, charge, disassemble, change the shape by pressure, or put in fire a button battery.</p>	
<p>A serious personal injury may result in some extreme circumstances. Never put a metal object through the opening of the case.</p>	
<p>A serious personal injury may result in some extreme circumstances. Never put a finger through the opening of the case.</p>	
<p>A serious personal injury may result in some extreme circumstances. Terminate the laser beam path with a reflecting diffuser or absorber with appropriate reflectance and heat characteristic. Do not install the marker head at the height of the eye. Usage other than specified within this manual is prohibited. There is risk of radiation exposure from the laser beam.</p>	
<p>A serious personal injury may result in some extreme circumstances. Use the dedicated software installed on the main unit.</p>	
<p>A serious personal injury may result in some extreme circumstances. Deposits of dust generated during processing may result in smoke or ignition at a low temperature. Install a suction duct to prevent dust from accumulating. Do not store the product in a dusty area.</p>	
<p>A serious personal injury may result in some extreme circumstances. Never disconnect the marker head, the controller and the fiber cable. Stop the use of the product if any of them is disconnected. The product will need to be collected and repaired by OMRON.</p>	
<p>A serious personal injury may result in some circumstances. Always reset the error manually.</p>	
<p>A serious personal injury may result in some circumstances. Sufficiently purify and discharge the gases generated during processing.</p>	
<p>A serious personal injury may result. Unauthorized operation of the product by a person who has not received laser safety training may, in rare cases, result in an injury or other personal accident. Be sure to have the laser safety manager manage the key switches.</p>	
<p>A serious personal injury may result. Any procedures or adjustments made outside of those specified in this manual may cause exposure to dangerous laser radiation. This product must be controlled and operated using the procedures specified in this manual.</p>	
<p>A serious personal injury may result. Wear protective glasses when emitting laser beam. Laser beam, if it hits the eye, may cause blindness. Do not look into it.</p>	

 **Caution**

<p>In rare cases, property damage may result. When using the product, be sure to observe the installation conditions and provide necessary space for it.</p>	
<p>Do not use the product in any of the following environments as the product may, in rare cases, be damaged.</p> <ul style="list-style-type: none"><li>(a) Dusty area</li><li>(b) Area with oil mist floating in the air</li><li>(c) Area subject to impact or vibration</li><li>(d) Area with high humidity (of 85% RH or higher)</li><li>(e) Wet floor surface</li><li>(f) Installation on a table other than an affixed frame (movable part)</li></ul> <p>Securely tighten the marker head with screws and provide appropriate amount of space.</p>	
<p>In rare cases, the product may be damaged. Be sure to conduct periodic inspections to maintain the level of product performance and to ensure safety.</p>	
<p>In rare cases, property damage may result. Do not bend the optical fiber cable to a radius of 100 mm or less, or apply excessive load or impact to it. Do not move the marker head by holding or pulling the fiber cable.</p>	
<p>Touching it may, in rare cases, cause a burn due to high heat. Do not touch while the power is being supplied or immediately after the power is turned off.</p>	
<p>In rare cases, the product may be damaged. Do not touch the cover glass with bare hands.</p>	
<p>Conducting maintenance in an unnatural posture may, in rare cases, result in an injury or other personal injury. Provide a space for maintenance when installing the product.</p>	
<p>A serious personal injury may result. Be sure that excessive force is not placed on the area above the caution label for falling on the side of the controller.</p>	
<p>When transporting the marker head, be sure to hold the concaved section in front and handle at the back with both hands.</p>	
<p>If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.</p>	



## Safety Points

Be sure to observe the following points that are necessary to ensure safety.

### 1. Usage

This product was developed and manufactured to be integrated with systems, machines, equipment and so on in an industrial environment. When using this product, follow all applicable standards, laws and regulations. Also, the customer is responsible for confirming the compatibility of the product.

### 2. Installation Location

Do not install the product in any of the following environments.

- Area with an ambient temperature that exceeds the rated range
- Area with sudden temperature shift (area where condensation can occur)
- Area with a humidity level that exceeds the 35 to 85% RH range
- Area subject to direct sunlight or near a heating appliance
- Area where a ferromagnetic field or an intense electric field is present
- Area where a carrier machine, etc. moves
- Area where corrosive gas or flammable gas is present
- Area where dust, salt, or iron powder is present
- Area where water, oil or chemical splashes or mist may be present

### 3. Power Supply, Connection and Wiring

- Do not use a voltage that exceeds the rated voltage or AC power source.
- Make the separate wiring for high-voltage line, power wire and power to the product. Using the same wire or duct will result in induction, which then may cause malfunction or damage.
- Use the dedicated cables that are specified in this document.
- Connect the controller power supply cable to a 3P outlet with grounding (D-class grounding). If a D-class grounding is not used, there is a risk of electric shock.
- Use SELV (Safety Extra Low Voltage) circuit for all external circuits connected to this product. SELV is an ungrounded circuit separated from dangerous voltage by double insulation or higher insulation, and it does not exceeds safe voltage (peak 42.4 V or 60 V (DC)) even in single failure condition.



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### 4. Interlock

The product is equipped with the shutter interlock function. Use it for remote interlocks, etc.

Set the terminal of the input terminal block [EMERGENCY A] (emergency stop input A) or [EMERGENCY B] (emergency stop input B) to open (OPEN) to forcibly close the shutter inside the marker head and stop the laser emission.

When constructing an interlock system according to Category 3 indicated in International Standards ISO13849-1 (JIS B 9705-1) (classification of the safety-related parts of a control system in respect to their resistance to faults and their subsequent behavior under the fault condition), use the interlock terminal.



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### 5. Emission Direction

The product assumes laser emission in the downward direction. When setting the emission direction to a direction other than downward, at your own risk, please thoroughly implement safety measures, as well as protective measures to prevent dust from sticking to the cover glass.

### 6. Dust and Gas Generated during Marking

Dust or gas generated during marking can cause damage to the laser oscillator or the optical system. Be sure to protect the laser marker by collecting the dust or gas generated during marking.

When using a suction duct to suck in fine particles, such as metal, oxidized and carbide material, generated during marking, welding, cutting or other processes, use a duct with straight interior walls with which fine particles are hard to accumulate, and install the duct so that fine particles do not accumulate. Furthermore, periodically clean the inside of the duct to prevent fine particles from accumulating and to prevent a dust explosion.

### 7. Other

- Do not disassemble, repair, modify, change the shape by pressure, or incinerate this product.
- When disposing of the product, follow the instructions of the local government and other authorities and dispose of it as industrial waste.
- Connect the dedicated products (marker head, controller and cable). Use of non-dedicated products may lead to malfunction or failure.

- If you feel a sense of error, immediately stop using the product and turn off the power supply, and contact your OMRON representative.
- Do not move the product with the cable still attached.
- Do not cut the fiber cable. If the fiber cable is cut accidentally, please stop using the product and consult your OMRON representative.

## Notes on Operation

Observe the following points to prevent the product from becoming inoperative or malfunctioning, or to avoid adverse effects on its performance or device.

### 1. Power Supply, Connection and Wiring

- Never bundle the marker head control cable and the marker head power supply cable together with 200/100 [VAC] power wires or the power wire or control wire of the AC motor, AC servo motor, or electromagnetic valve, etc. that is being used on your system. Bundling them together will cause noise to enter the galvanometer control cable and the I/O cable for the external control device, which may result in a laser marker malfunction.
- If there is a surge in the power supply line, connect a surge absorber depending on the operating environment.
- Do not step on the cables.

### 2. Operating Environment

- To prevent power supply noise or radiant noise from occurring, be sure to implement measures against noise, such as a spark killer, at the locations where a surge can occur, such as the point of contact with the motor used for surrounding devices.
- Refrain from using a cellular phone as it may cause the laser marker to malfunction.

### 3. Work materials

Follow the instructions below when using this product with gold, silver, copper, or other highly reflective materials. Reflected beams may damage the marker head.

(1) For a work positioned horizontally to the marker, do not mark within  $\phi 6$  mm of the center of the marking area.

(2) If the marking surface of the work is slanted or curved, ensure that the specular reflection beam is not reflected back into the marker head.

Please consult with our sales center when using this product within these conditions.



### 4. Maintenance Inspection

- If the cover glass of the marker head laser irradiation port gets dirty, the laser output may drop or a failure may occur. Do not use this product while the cover glass is dirty.
- Do not use thinner, benzene, acetone or kerosene items to clean the marker head or the controller. Carefully remove dirt or dust on the cover glass without scratching it by moistening with cleaning agent a piece of cleaning paper specifically for use on an optical device.

### 5. Storage

Do not store the product in an environment described below.

- Storage temperature: -10 to 60 °C (Non condensation or freezing)
- Storage humidity: 35 to 85% RH (No condensation)
- Outdoor or area subject to direct sunlight
- Area where corrosive gas, flammable gas, oil or mist may be present
- Area that is constantly vibrating or subject to startling vibration
- Very dusty area

The aforementioned points do not guarantee any unforeseen situations that may arise from storing of the product.

## 6. Packing and Transporting

This product is a precision machine. Please carefully observe the following points to avoid damaging the product if you are packing and transporting the product. When transporting the product, use the packing materials that were used at the factory setting by OMRON.

- Do not stack it on top of anything.
- Do not apply strong pressure on the cables.
- Pack and transport the product in the same direction as it was installed.
- Protect the control panel, display panel, connector and other parts from damage.
- Prevent condensation.
- Prevent the product from rolling over or falling, or do not apply strong impact.
- Refer to the previous item, "Storage," for details of storing the product that is packed and is in transit.

The aforementioned items do not guarantee any unforeseen situations that may arise from packing or transporting of the product.

## Applicable Standards

### 1. CE marking

We have confirmed that this product satisfies the requirements of EU directive on the basis of the following requirements. Keep the following requirements in mind when you use this product in EU countries.

### EMC Standards

#### ■ EMC Directive (2014/30/EU)

Warning: This is a class A product. In a residential areas it may cause radio interference, in which case the user may be required to take adequate measures to reduce interference.

#### ● Electromagnetic interference (EMI)

EN55011: 2009+A1: 2010 Group 1, Class A

EN55032: 2012 Class A "Electromagnetic compatibility of multimedia equipment. Emission requirements"

EN61000-3-2: 2014 Class A, EN61000-3-3: 2013

#### ● Electromagnetic susceptibility (EMS)

EN61000-6-2: 2005

- When RS-232C or RS-422A serial port is used, use a shielded twisted pair cable (AWG24) equivalent to UL2464U-TKVVBS (Tachii Electric Wire). MX-9160-1M, 3M, and 5M (option) cables are available for RS-232C to connect this product with the PLC.
- Use a shielded cable 5m or less for connecting to the Ethernet port.
- Use a shielded cable (AWG12 to 26) for connecting to the removable terminals (for input and output) and I/O connector.
- We do not guarantee that this product works with any monitor, mouse, or keyboard. Check the compatibility before selecting a device.



### Precautions for Safe Use

These requirements do not guarantee that all machinery and equipment with this product incorporated satisfy the requirements of EMC directive. Manufacturers of the machinery and equipment are responsible for verifying the compatibility of the product with all the machinery and equipment.

### Safety Standards

#### ■ Low Voltage Directive (2014/35/EU)

EN61010-1: 2010 "Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements"

EN60825-1: 2014 "Safety of laser products - Part 1: Equipment classification and requirements"

- Install in a place with an altitude of 3000 m or less.
- Install indoors.
- The laser marker is a class 4 product. It is your responsibility to build your own safety system when using the product.



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#### ■ Machinery Directive (2006/42/EC)

When incorporating this product into a device that complies with IEC60204-1:2005 Standard | Safety of machinery - Electrical equipment of machines - Part 1: General requirements, the exterior of the product may need to be changed. Please purchase the "Masking set" (MX-9190) that helps you easily change the exterior of your laser marker.

### 2.UL standards

We have confirmed and received certification that this product satisfies the requirements of the UL standard on the basis of UL 61010-1.

### 3.Regulation of perchlorate in California, United States

This product uses parts that contain perchlorate. When you bring this product or a device with this product incorporated into California in the United States, the following statement must be indicated on the individual packing box and shipping box or on documents such as manuals or MSDS included in the package.

Perchlorate Material - special handling may apply, see  
<http://www.dtsc.ca.gov/hazardouswaste/perchlorate/>

### 4.Korean Radio Waves Act

This equipment is an industrial (Class A) electromagnetic wave generator. Dealers and users should keep this in mind and use this equipment outside the household.

**사 용 자 안 내 문**

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다

### 5.List of Applicable Standards

This product complies with the following standards.

Note that this product is not certified by safety standards in countries and regions not listed.

When exporting the laser marker overseas alone or incorporated into a machine or device, always check the laws and standards in the country or region the product is exported to.

Applicable Standards	Details
JIS (Japanese Industrial Standards)	JIS C 6802: 2014 "Safety Standards for Laser Products"
Radio Act (Japan)	Corresponds to facilities not requiring permission
FDA (U.S. Food and Drug Administration) regulations	21 CFR1040.10 except for deviations pursuant to Laser Notice No. 50 "PART 1040 PERFORMANCE STANDARDS FOR LIGHT-EMITTING PRODUCTS" Evaluated under IEC60825-1:2007
FCC	47 CFR Part15 Subpart B Class A Digital Device
ICES	ICES-001 Class A ISM equipment
Korean Radio Waves Act	Korean Radio Waves Act Electromagnetic interference (EMI) • KN11 (Ver 2011.12) • KN61000-6-4 (Ver 2012.06) Electromagnetic susceptibility (EMS) • KN61000-6-2 (Ver 2012.06)
EN/IEC standards (EU directive)	2014/30/EU "EMC directive" Electromagnetic interference (EMI) • EN55011: 2009+A1: 2010 "Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics" • EN55032: 2012 Class A "Electromagnetic compatibility of multimedia equipment. Emission requirements" • EN61000-3-2: 2014 Class A "Harmonic emission" • EN61000-3-3: 2013 "Voltage fluctuations and flicker" Electromagnetic susceptibility (EMS) • EN61000-6-2: 2005 "Electromagnetic compatibility (EMC)" 2014/35/EU "Low Voltage Directive" • EN61010-1:2010 "Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements" • EN60825-1:2014 "Safety of laser products - Part 1: Equipment classification and requirements"
UL, CSA Standards	UL61010-1, CAN/CSA C22.2 No.61010-1
GB Standards	GB7247.1
RCM	EN 55011:2009 +A1:2010, EN 55032:2012

## For Safe Use of Laser Products

Although JIS C6802-compliant safety measures are incorporated in this product, the safety measures can be effective only when the user of the product understands the functions of these measures. Accordingly, please keep in mind that JIS C6802-compliant products are products in which the safety measures specified by JIS C6802 are incorporated, and that the products, on their own, are not necessarily safe.

This product is categorized as class 4 based on the JIS C6802 classification. The product incorporates the function of the safety measures based on JIS C6802 for the protective casing of the laser oscillator part, cover interlock, remote interlock (external interlock), key control, laser emission display, opening label, classification label, warning label, radiant output information label, and optical path cut-off (internal shutter).

Users of the product must use these functions to apply the safety measures.

### Safety Measures for Class 4 Products

#### (1) Assignment of the laser safety manager

A laser safety manager is "a person who has the sufficient knowledge required to evaluate the danger of laser and to ensure safety and who is responsible for the laser management," and is selected based on the level of knowledge and experience in handling laser devices and prevention of interference due to laser emission. Such a person must conduct tasks equivalent to those of a laser device manager based on the "Measures to prevent interference caused by laser beams" issued by the Ministry of Health, Labour and Welfare (March 25, 2005).

#### (2) Setting and management of the laser controlled area

Separate the area from other areas and place a sign to clearly indicate that the area is a laser controlled area. Ensure that only authorized personnel are allowed to enter the area.

Do not allow any hazardous materials such as explosives and flammables to be brought into the controlled area.

#### (3) Warning displays and signs

- Post signs of danger and hazard of a laser beam and its handling precautions in locations where the signs are easily seen.
- Post the name of the laser safety manager.

#### (4) Use of remote interlock

When using this product, construct an interlock system and surround the laser emission area with protection in order to prevent radiation exposure due to reflections from the object to be marked or the surrounding area. Also, install the controller in a location not being exposed to laser beams.



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#### (5) Management of the keys to operate the laser devices

While a laser device is not in use, be sure to remove the system key and pass it to the safety manager for safekeeping in order to keep the laser from being operated by unauthorized personnel or without permission.

#### (6) Setting and verification of the beam path position

Setting the beam path position lower than the eye level of a seated person or higher than the eye level of a standing person can prevent laser beams from getting in the eye accidentally.

#### (7) Handling of the end terminal

Take into consideration when no work exists and terminate the laser radiation range with a reflecting diffuser or absorber with appropriate reflectance and heat resistance.

#### (8) Prevention of specular reflection

Do not use a specular reflector at the terminal.

#### (9) Cut-off and attenuation of beam

Be sure to install a protective enclosure around the laser radiation range and scattered beams in order to prevent radiation exposure due to unexpected reflection from the printed object and surrounding objects.

Scattered beams may exceed class 1 level. Take measures to prevent laser exceeding class 1 level from leaking through the gaps in the protective casing joints.

#### (10) Inspection and maintenance of protective gear (safety glasses, protective wear, flame-resistant materials)

- Wearing laser safety glasses for eye protection in the laser controlled area must be mandatory.
  - Use laser safety glasses that covers wavelength range of 1062 nm.
  - Do not look at a direct or reflected laser beam even with safety glasses on.
  - Safety glasses are for protecting eyes from scattered beams, not for protecting eyes from direct or reflected beams.
- Laser beam irradiation to the skin may cause burns and irradiation to clothing may cause it to burn.
  - Wear flame-retardant clothing with as little skin exposure as possible.

#### (11) Safety training/practice

#### (12) Occupational health (Medical examinations (anterior part of the eye and ocular fundus))

#### (13) Other measures to prevent any interference due to laser radiation (system protective casing, safety inspections, etc.)

Caution -- use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

## Risk Level and Safety Measure

Summary of safety measures requirements for users (JIS C6802 2014)

Requirements	Classification						
	Class 1	Class 1M	Class 2	Class 2M	Class 3R	Class 3B	Class 4
Laser safety manager	Not required, but recommended to have one in place for an application that involves direct observation of the laser beam.				Not required for visible radiation. Required for non-visible radiation.	Required	
Remote interlock	Not required					Connect to the room or the door circuit.	
Control with a key	Not required					Unlock when not in use.	
Beam attenuator	Not required					Avoid inadvertent emission when in use.	
Emission indicator	Not required				Indicates that laser is being emitted in non-visible wavelengths.	Indicates that laser is being emitted.	
Warning sign	Not required					Follow the safety measure described on the warning sign.	
Beam path	Not required	Same as class 3B	Not required	Same as class 3B	Terminate the beam at an end of an effective length.		
Specular reflection	No required item	Same as class 3B	No required item	Same as class 3R	Avoid unintended reflection.		
Eye protection	No required item					Required when the technical and administrative procedures cannot be executed, and when the laser level exceeds the MPE (*1).	
Protective clothes	No required item					Required in some cases.	Requires specific instructions.
Practice	No required item	Same as class 3R	No required item	Same as class 3B	Required for all operators and maintenance personnel.		


\*1: MPE (Maximum Permissible Exposure)  
Maximum value of the level of laser irradiation to which a person may be exposed without hazardous effects in a normal environment.

Note: The table lists the required elements for your convenience.

## Laser Information

### ■ Class 4 laser (processing laser)

Class 4 lasers are defined to "have a possibility of causing acute vision disturbances and skin damage with direct and scattered beams and causing a fire".

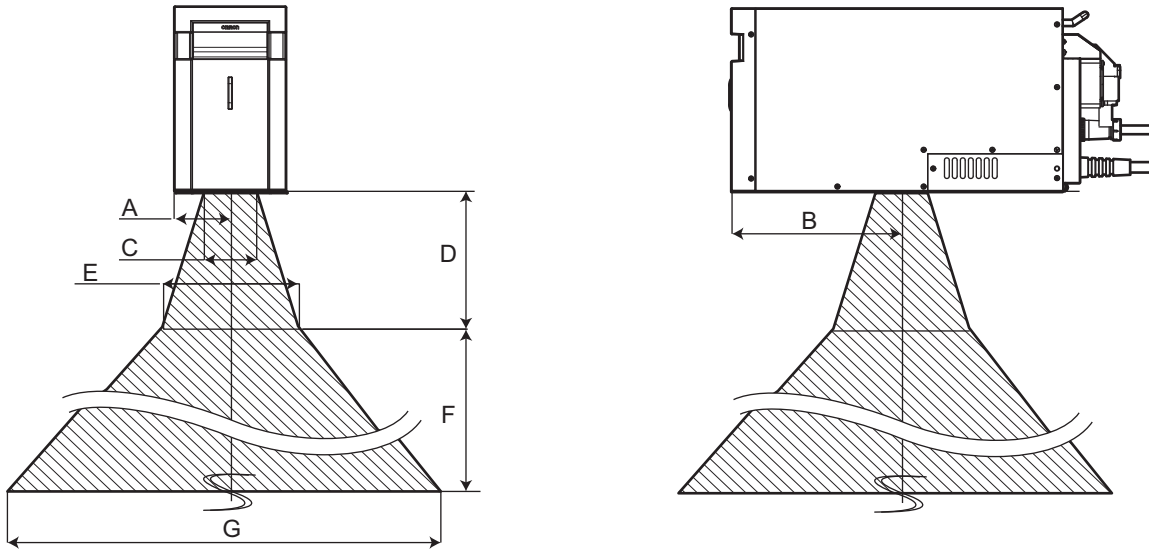
Item	Specification			Remarks
	MX-Z2000H-V1	MX-Z2050H-V1	MX-Z2055H-V1	
Wavelength	1062 nm			Invisible laser
Laser medium	Yb: Fiber			-
Maximum output*1	40 W			-
Average output	20 W (fiber laser oscillator output)			-
Laser oscillation type	Pulse oscillation			-
Pulse cycle	10 kHz to 1000 kHz			-
Pulse width	1 to 500 ns			-
Class	4			-
NOHD*2	 " ■ Radiation range (page 14)"			Nominal Ocular Hazard Distance
MPE*3	MPE for the cornea: 50 W/m <sup>2</sup>			Maximum Permissible Exposure
NOHA	Indicates an area where the laser beam radiation intensity or radiation exposure exceeds the maximum permissible exposure. The maximum hazard distance and range are the same as a sphere that has the radius of NOHD. It changes according to the workpiece reflectance and surface conditions. Calculate the value taking the actual usage conditions into consideration.			Nominal Ocular Hazard Area

\*1: Maximum output refers to the maximum power of the laser beam that the device may output under all operating conditions including during a single point of failure. (The maximum output may exceed the highest output during normal operation.)

\*2: Indicates the distance from the source at which the beam radiation intensity or radiation exposure becomes equal to the maximum permissible exposure for the cornea.

\*3: The value is calculated with the exposure time set to 10 seconds.

## ■ Radiation range



Unit: mm

Position	Specification		
	MX-Z2000H-V1	MX-Z2050H-V1	MX-Z2055H-V1
A: Laser irradiation port center position	70		
B: Laser irradiation port center position	210		
C: Laser irradiation port diameter	65		
D: Working distance	170	220	
E: Laser radiation range in focusing surface	φ342	φ423	
F: NOHD	22 m	29 m	57 m
G: Laser radiation range in NOHD	φ17 m	φ31 m	φ60 m

## ■ Class 2 laser (guide laser, focus pointer)

Class 2 lasers are defined as "laser products that are safe when exposure is momentary and the eye is protected by defensive reactions such as blinking, but are hazardous when the beam is stared into deliberately".

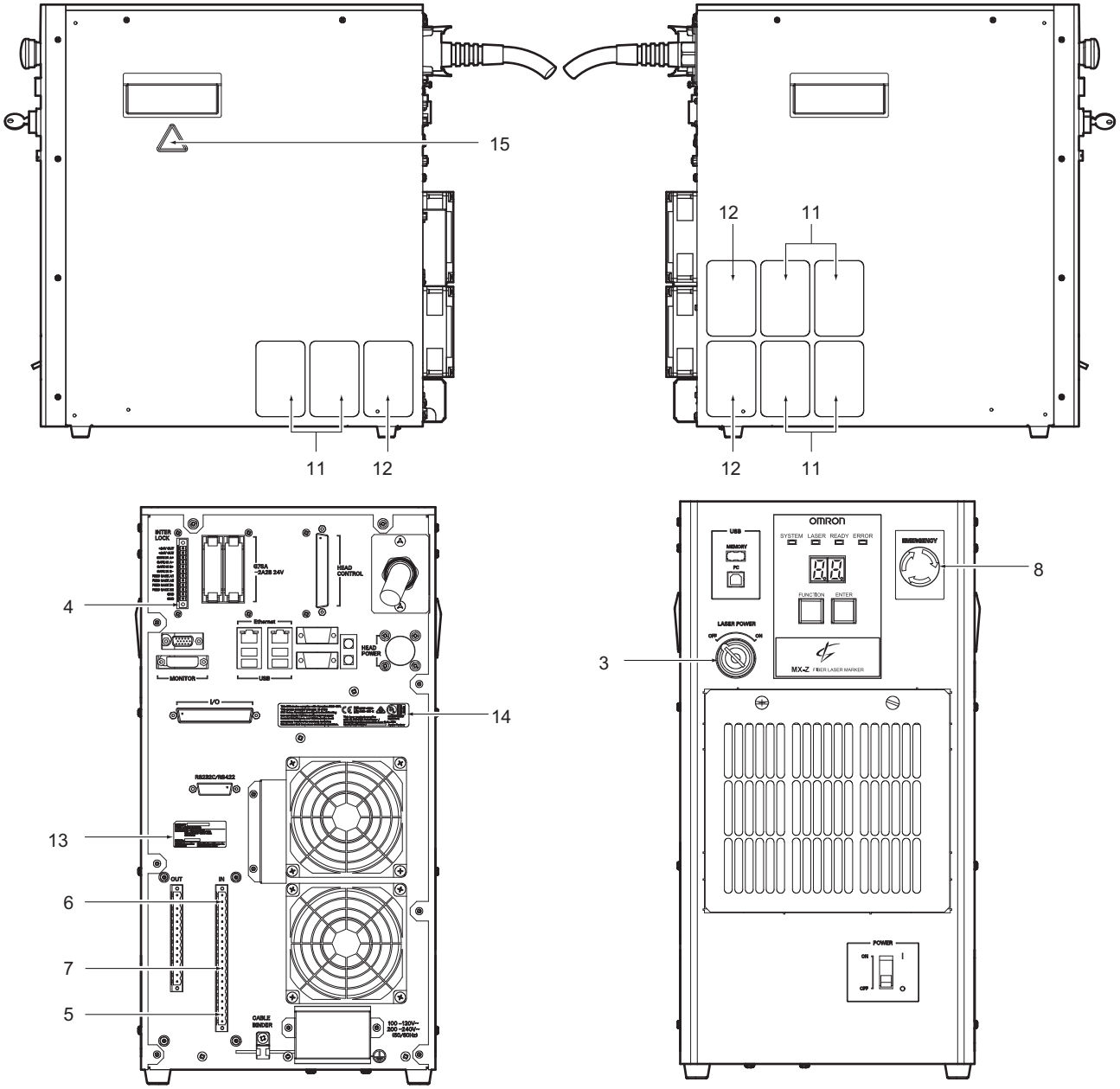
Item	Specification			Remarks
	MX-Z2000H-V1	MX-Z2050H-V1	MX-Z2055H-V1	
Wavelength	655 nm			Visible laser
Laser medium	Semiconductor laser			-
Maximum output	1 mW			-
Laser oscillation type	CW (continuous wave)			-
Class	2			-



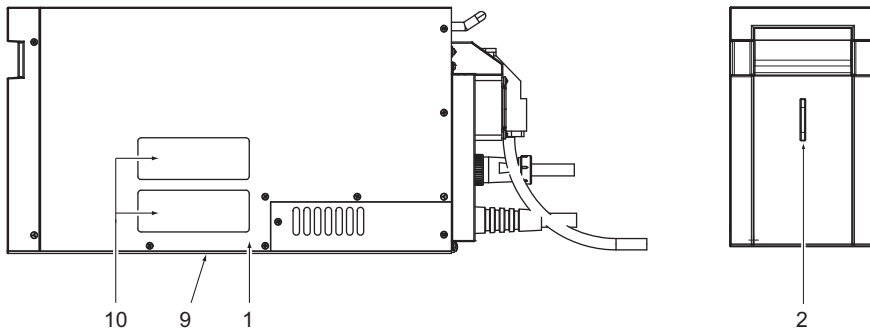
■ Safety Functions of Laser Marker








This product is equipped with the following safety functions.

• Controller



• Marker head



No.	Name	Function															
1	Shutter	This shutter is located inside the head. Closing this shutter can block the emission of the laser beam.															
2	Laser warning indicator	<p>The laser warning indicator light indicates the following statuses.</p> <table border="1"> <thead> <tr> <th>Color</th> <th>Status</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>Unlit</td> <td>Laser power OFF</td> <td>The laser power is OFF.</td> </tr> <tr> <td>Green</td> <td>Laser power ON</td> <td>The laser power is ON and laser can be irradiated (laser standby mode).</td> </tr> <tr> <td>Red</td> <td>Processing laser irradiating</td> <td>Processing laser is being irradiated (marking is in progress).</td> </tr> <tr> <td>Green/red</td> <td>Guide laser irradiating</td> <td>Guide laser is being irradiated.</td> </tr> </tbody> </table>	Color	Status	Meaning	Unlit	Laser power OFF	The laser power is OFF.	Green	Laser power ON	The laser power is ON and laser can be irradiated (laser standby mode).	Red	Processing laser irradiating	Processing laser is being irradiated (marking is in progress).	Green/red	Guide laser irradiating	Guide laser is being irradiated.
Color	Status	Meaning															
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Red	Processing laser irradiating	Processing laser is being irradiated (marking is in progress).															
Green/red	Guide laser irradiating	Guide laser is being irradiated.															
3	Key switch	The laser power ON/OFF can be controlled with the key switch. While a laser system is not in use, the safety manager must keep the system key in order to keep the laser from being operated without permission.															
4	Interlock connector	This connector is used to construct a mechanism that forcibly turns OFF the laser and stops the laser emission. Use this connector to utilize a device into which the laser marker is incorporated as the interlock system to comply with International Standards ISO13849-1 (JIS B 9705-1).															
5	I/O emergency stop input	Set the [EMERGENCY A] (emergency stop input A) or [EMERGENCY B] (emergency stop input B) terminal to open (OPEN) to forcibly close the shutter inside the marker head and stop the laser emission.															
6	Marking stop input	Input a signal to [STOP] to stop the processing laser emission and operate in the guide laser mode.															
7	Shutter control input	Open the [SHUTTER A] (shutter control input A) or [SHUTTER B] (shutter control input B) terminal to close the shutter.															
8	Emergency stop switch	If you want to immediately stop the marking, press this switch to turn OFF the laser power.															
9	Laser beam exit	This is the laser irradiation port.															
10	JIS/EN laser warning label	 JIS/EN laser warning label (Japanese/English) (page 17)															
	EN laser warning label (German/French)	 EN laser warning label (German/French) (page 17)															
11	Electric shock warning label	 Electric shock warning label (page 18)															
12	Igniting or explosion warning label	 Igniting or explosion warning label (page 18)															
13	Name plate	 Name plate (page 19)															
14	Standard label	 Standard label (page 19)															
15	Caution label for fall hazards	 Caution label for fall hazards (page 19)															