MA1 Series Handheld Laser Welding Machine

USER GUIDE

Revision: V1.0

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Preliminary Note

Before using the product, ensure that you have read and understood all contents of this manual and are familiar with the instructions for operation and maintenance. Maxphotonics strongly recommends that all operators of the Product read and take special care to confirm all safety information contained in this document before operating the product. This User Guide provides important operational, safety, and other information to be reviewed regularly for operators, users, and product owners. For product technical assistance, please contact Maxphotonics Customer Service.

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This guide applies to all owners and operators of Maxphotonics equipment and to all persons working in the vicinity of the Product at the time of use. Usage of this product should be limited to fully trained professional and non-professional welding operators.

MAX PHOTONICS

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Preface

Thank you for choosing Maxphotonics' handheld laser welding products. This User's Guide has been compiled to help you use and maintain the laser properly. While we have made every effort to provide accurate information in this document, there may be occasional oversights due to the writer's limitations and time constraints. We appreciate your understanding and welcome any suggestions for improvements.

Before using the product, please take the time to read and understand this User's Guide and familiarize yourself with the operating and maintenance instructions. We highly recommend that the operator review Section 2, "Safety Information," before operating the product.

Keep this User's Guide with the product, as it provides crucial operating, safety, and other information for you and any future users or owners.

Throughout the document, we have underscored sections that require special attention. Please take note of these sections to prevent unnecessary damage. Thank you once again for choosing Maxphotonics' products.

MAX PHOTONICS

Company Profile

Introduction:

Founded in 2004, MaxPhotonics is a leading global provider of high-performance fiber lasers, laser solutions, and optical components for various industries, including manufacturing, healthcare, research, and telecommunications. Over the years, MaxPhotonics has consistently focused on developing state-of-the-art products, driving innovation, and delivering cutting-edge solutions to customers worldwide. With a strong commitment to quality, excellence, and customer satisfaction, MaxPhotonics has earned a reputation for precision, reliability, and innovation in the field of photonics.

Headquarters and Locations:

MaxPhotonics maintains its headquarters in Shenzhen, China, and holds a strong presence in many countries across the globe. This extensive network enables the company to rapidly respond to customer needs and effectively collaborate with industrial partners.

Products and Services:

MaxPhotonics specializes in offering a wide range of high-quality products and services, such as:

Fiber Lasers: MaxPhotonics provides a comprehensive portfolio of fiber lasers, including continuous wave (CW) fiber lasers, pulsed fiber lasers, ultrafast fiber lasers, and high-power fiber lasers. These lasers cater to a vast range of applications, including material processing, healthcare, optical transmission, sensing, and research.

Optical Components: The company also designs, manufactures, and markets high-performance optical components that include fiber Bragg gratings, optical isolators, optical circulators, couplers, and other passive components required in various photonic systems.

Laser Solutions: MaxPhotonics delivers turnkey laser solutions and customized systems for a myriad of industries like automotive, aerospace, electronics, and semiconductors. These solutions enable customers to achieve improved efficiency, productivity, and cost-effectiveness.

Engineering Services: With a highly skilled and knowledgeable team of engineers, MaxPhotonics offers technical consulting, system integration, and customer training services, ensuring that customers receive the best value and optimal performance from their laser systems.

Quality and Certifications:

MaxPhotonics is dedicated to providing world-class quality products and services to its customers. The company adheres to stringent quality control procedures and has achieved significant certifications such as ISO 9001, CE, and RoHS, demonstrating its commitment to international quality standards.

Research and Development (R&D):

MaxPhotonics continually invests in R&D, driving technological advancements and product innovation. The company's in-house R&D team collaborates with leading research institutions and universities, exploring new technologies and materials to create breakthroughs in the field of photonics.

Customers and Partners:

MaxPhotonics serves an extensive global customer base, ranging from small businesses to Fortune 500 companies, across various industries such as automotive, aerospace, electronic, telecommunications, and semiconductor industries. The company has established strategic partnerships with numerous industry-leading businesses and organizations, leveraging their combined expertise to innovate and provide premium solutions for its customers.

Core Values and Vision:

MaxPhotonics's core values revolve around innovation, customer-focus, and excellence. The company is dedicated to pushing the boundaries of photonic technology and delivering cutting-edge, reliable, and customized solutions that exceed customer expectations.

The company's vision is to become a global industry leader in advanced fiber lasers, expand its product portfolio, and provide advanced photonic solutions that empower businesses to achieve revolutionary improvements in their operations, ultimately contributing to a better world.

Conclusion:

With more than a decade of experience in optics and photonics, MaxPhotonics has become a trusted leader in the global photonics industry. As it continues to drive innovation and deliver world-class products and solutions, MaxPhotonics remains committed to its core values and vision, ensuring sustainable growth and success for its customers and partners alike.

More information，please visit our website： http://en.maxphotonics.com

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Chapter 1
Product Information

Introducing the MA1 Series: High-Efficiency, High-Reliability, Maintenance-Free High-Power Lasers from Maxphotonics.

The MA1 series by Maxphotonics offers a high-performance, efficient, and reliable range of lasers designed for a variety of applications. Utilizing phase transition heat dissipation technology, these lasers feature a wavelength range of 1070 nm to 1090 nm, with an approximate efficiency of 30%.

As Class 4 certified laser products, safety has been a priority in the design and testing of the MA1 series. However, due to the unique properties of lasers, they can pose safety hazards that should not be overlooked. It is crucial that all personnel operating or near the laser are aware of these risks and adhere to the safety guidelines and warnings provided within this manual to ensure both secure operation and optimal performance. Disassembling the device is strongly discouraged to maintain user safety during operation, maintenance, and service.

The MA1 series is designed to be user-friendly, with no parts or components requiring user repair or servicing. Unauthorized disassembly can lead to voiding any warranties provided by Maxphotonics.

Maxphotonics also offers a handheld welding laser system, featuring a compact control unit and lightweight torch with a built-in beam swing function. By adhering to the user guide and implementing proper laser safety measures, this system can be a dependable tool. All operators and nearby personnel must be attentive to the laser's special hazards and use personal protective equipment as needed.

Following all instructions and safety warnings in this guide will ensure a safe operation and maximum performance.

Intended Use: The MA1 series is suitable for welding and brazing applications, handling materials such as stainless steel, carbon steel, galvanized sheet, aluminum, and copper.

Maxphotonics ensures that this laser has undergone rigorous testing and inspection, complying with all published specifications before shipment. Upon receiving the equipment, please inspect the packaging and components for any damage that may have occurred during transit. If any damage is found, contact Shenzhen Maxphotonics Co., LTD for assistance.

Chapter 2
General Safety Information

1 -Safe Usage of Handheld Laser Welding Machines

Handheld laser welding machines fall under the hazardous Class 4 laser product category due to their emission of invisible, infrared laser radiation with a wavelength of 1080nm. With the welding head radiating over 100W on average, this high-intensity light can cause direct or indirect damage to eyes and skin. In particular, exposure to this laser beam may result in irreversible damage to the retina or cornea. It is imperative to wear appropriately certified 1080nm near-infrared laser safety glasses before operating a handheld laser welding machine to ensure safety.

IMPORTANT:

- Always avoid looking directly at the fiber output connector and ensure that you are wearing appropriate protective eyewear while using the laser to prevent potential eye injuries.
- Refrain from opening the laser device as there are no parts or accessories intended for user access inside. All maintenance and repair work must be performed by authorized service personnel only.
- Ensure proper grounding power supply and normal voltage when operating this product.

- Before starting the laser, verify that the surrounding temperature and humidity are within the recommended range.
- Avoid subjecting the product to excessive moisture.
- This laser relies on air cooling; ensure that the surrounding air is dry and clean.
- Any operation or adjustments made outside of the guidelines specified in this manual may result in damage or malfunction.

2-Safety Conventions

As shown in the following table, all safety warning signs (not limited to those affixed to the laser body) during the operation of the handheld laser welding machine include:

SYMBOLS	NAME	DESCRIPTION
	Electrical hazard	Warning: Text marked with electrical warning symbol indicates potential personal danger. If you do not follow certain procedures, certain or fatal harm may be caused to you or others.
	Laser radiation hazard	Note: Text with a laser radiation warning symbol indicates a potential personal danger. We have affixed this mark to the laser output end of the product.
	Warning	Note: Text with a warning symbol indicates a potential product hazard. It requires an operating procedure that, if not followed correctly, can result in damage or destruction of the product or component.

	Laser safety housing	Note: Welding device operation should only be done in the laser safe or in the enclosure (or room) with interlocking safety devices. If someone enters unexpectedly, the interlock automatically shuts down the welding system.
	Direct and reflected beams are dangerous	Note: The symbol represents a potential hazard, indirectly or directly causing damage to the eyes or skin from the laser beam reflected by welding. Personnel must wear protective equipment and clothing.
	Direct beam to danger	Note: Never look directly at the output welding head "gun" or point the gun at another person. This is very dangerous.
	Wear laser safety glasses	Symbol indicates that personnel must wear laser safety glasses (personal protective equipment) to prevent laser radiation hazards.
	Wear protective gloves	The symbol indicates that personnel must wear laser - and heat-resistant protective gloves.
	Wear protective clothing	The symbol indicates that personnel must wear protective aprons against laser and heat.

3-Laser protection Measures

1.Requirements for Laser Safety Goggles

When using a hand-held laser welding machine, it is crucial to wear laser safety goggles that provide protection against the entire wavelength range emitted by the device. To select the appropriate goggles, end-users must accurately identify the product's wavelength range. If the device is a tunable laser or Raman product, it emits light in a range of wavelengths, and users should confirm that the chosen laser safety goggles effectively block light across this entire range. Additionally, it is essential to verify that all personal protective equipment (e.g., safety shields, viewing windows, goggles) is sufficient for the device's output power and wavelength range. Consideration should also be given to any secondary radiation hazards posed by the welding process (refer to Chapter II, Section 4-1).

2.Suppliers of Laser Protective Equipment

Whether incorporating a laser into a new facility or retrofitting an existing system, the end-user bears sole responsibility for determining the appropriateness of all personal protective equipment.

Numerous laser safety equipment suppliers offer materials and equipment, including LaserVision USA, Kentek Corporation, and Rockwell Laser Industries. While there are other laser personal protective equipment suppliers, Maxphotonics provides these names for convenience only, without endorsing or recommending any specific supplier, product, or service. Furthermore, Maxphotonics assumes no responsibility for the advice, products, or services provided by these suppliers.

4-Welding Feature Safety

1.Eye and Ultraviolet Radiation Hazards

Welding generates visible and invisible radiation, which can pose risks to welders. The high-power laser beam's interaction with the material being welded can create plasma, emitting ultraviolet radiation and "blue light." These emissions can lead to conjunctivitis, photochemical damage to the retina, and skin reactions similar to sunburn. Welders exposed to UV light without adequate protection may experience permanent eye damage.

2.Skin Hazards

Welders are at risk of skin damage from infrared and ultraviolet radiation during welding. These types of radiation can cause skin burns, increase the likelihood of skin cancer, and promote premature skin aging. Welding sparks can also lead to burns. Laser material processing can cause parts to become extremely hot even after the cutting process has ended. It is essential to use appropriate personal protective equipment to avoid potential burns. To prevent skin damage, wear protective clothing such as heat-resistant gloves, hats, leather aprons, and other flame-resistant garments. Button up sleeves and collars.

3.Fire Hazards

The heat and sparks generated during welding can ignite or explode flammable materials near the welding area. Only perform laser welding in areas clear of combustible materials. Never weld containers that contain, or are assumed to contain, flammable or combustible materials. Ensure fire extinguishers are easily accessible and nearby, and have personnel trained to use them.

4.Smoke and Fume Hazards

Welding "fumes" can consist of fine particles and gases produced by the combination of welding materials, filler materials, shielding gases, paint, coatings, chemical reactions, and air pollutants. Welding fumes can negatively impact the lungs, heart, kidneys, and central nervous system. To mitigate these risks:

(1) Keep the head away from the smoke while welding. Always work in a well-ventilated area to ensure safe breathing conditions.

(2) Implement a fume extraction system to remove vapors, particulates, and hazardous debris from the welding process area.

(3) Use a respirator in confined spaces or other situations where it may be required.

(4) Conduct regular air monitoring to determine the level of noxious fumes in the welding area.

5. Cylinder Safety Measures

A gas cylinder poses a risk of explosion if it is damaged or situated close to the welding zone. To ensure safety, place shielding gas cylinders in a secure location where they are not susceptible to impact or damage, and maintain distance from sources of heat, sparks, or flames. It is essential to store the cylinders in an upright position and fasten them securely to a stationary stand. Utilize a functioning regulator specifically designed for the intended gas and pressure. Additionally, verify that all hoses and fittings are appropriate for their intended application and are in optimal working condition.

6. Important Safety Notice for Outbound Security Indicators:

Important:

It is crucial to be aware that when the power supply (PS) is activated, the laser is in a hazardous state. Every necessary precaution must be taken to prevent accidental exposure to direct and reflected beams. Both diffuse and specular reflections can lead to severe retinal or corneal damage, potentially causing permanent eye damage. Class 4 laser beams may also pose fire and skin damage risks when handling equipment or being in its vicinity. Ensure that all personnel

wear appropriate personal protective equipment (PPE), including safety goggles and helmets with face shields. To maintain laser safety information, adhere to laser control measures and operate the system correctly, otherwise, exposure to detrimental radiation may occur.

1. Safety guidance

To ensure the safe use of the product and optimize its performance, please follow the instructions, warnings, and precautions detailed in this manual.

WARNING:

Use the appropriate ground power supply when operating this product.

WARNING:

Do not open any parts within the product for maintenance. If required, contact Maxphotonics laser technicians for servicing. Unauthorized alterations to this product will void the warranty.

WARNING:

Be cautious when using hand-held welding tips connected to the output connector of this product via optical fiber cable.

WARNING:

Adhere to the provided instructions as improper use may affect the safety mechanisms of the product. This product must only be operated under conventional conditions.

CAUTION:

Ensure the AC power is off when working with laser-welded output joints, such as

installing optical cable joints or using optical instruments to test the end face of the connection.

WARNING:

Avoid looking directly at the fiber output connector and always wear proper eye protection to prevent injury.

CAUTION:

Performing any operation or adjustment outside the scope of this manual may result in radiation-related injuries.

2. Secondary radiation hazard

During the welding process, both visible and invisible light radiation are generated. The interaction between the high-power laser beam and the target material being welded can result in the production of ultraviolet (UV) light and plasmas that emit "blue light." These radiations can lead to various health issues, such as conjunctivitis, photochemical damage to the retina, and sunburn-like reactions on the skin.

Welders who are exposed to these invisible UV rays without appropriate safety measures are at risk of incurring permanent eye damage. Even a short exposure to the UV rays during welding can lead to symptoms like blurred vision, burning, tearing, eye pain, and irritation — often described as a sensation similar to having sand in the eye.

3.Precautionary Measures for Welding Protection and Minimizing Risks in Welding Processes

Warning:

◎ To safeguard your eyes from harmful conditions during welding, it is crucial to wear appropriate personal protective equipment! Employing a combination of a mask, gloves, welding helmet, and laser safety glasses can effectively mitigate the effects of wind speed and equipment noise. During welding operations, ensure that you are wearing anti-noise earplugs to achieve optimal protection throughout the laser welding process. Welding helmets also shield welders from risks such as heat splatter, metal fragments, and sparks. All individuals in the vicinity of laser welding activities must also be equipped with proper personal protective gear.

◎ Hazards during welding ----- Wear personal protective items!

Warning:

◎During welding processes, be mindful of potential hazards and take necessary precautions. Ensure that all combustible and flammable materials are kept at a safe distance from the welding area, as heat and sparks produced during welding may result in fires or explosions. Limit laser welding operations to designated areas free of combustible materials.

Avoid performing welding tasks on containers holding flammable or combustible substances. When the contents of containers are uncertain, treat them as potentially dangerous. Additionally, always keep a fire extinguisher nearby, and ensure that all welding personnel have undergone comprehensive training in fire extinguisher usage.

4. Dangers of Reflected Beam in Welding Process

Warning:

◎Beware that during the welding process, numerous secondary laser beams, known as "specular reflections," can be generated at various angles near the laser's output aperture. Specular reflections occur when the main laser beam reflects off the surface it is directed at, and can be produced due to the interaction between the laser beam and the treated part. Although these secondary beams are not as powerful as the laser's total emitted energy, they are potent enough to cause harm to the eyes, skin, and surrounding materials.

Take extra precautions when working with highly reflective metals, such as aluminum and copper, as they may cause some of the beam energy to reflect away from the target weld site. Moreover, specular reflection can pose a threat to the operator if any part of the beam is reflected from more than one surface. Ensure that you are aware of the anticipated specular cone for each machined part, and avoid looking at or placing any part of your body within the expected specular cone.

Warning:

◎Operators and observers must always remain vigilant about potential reflections. If the laser settings are not configured correctly to ensure the target portion melts, increased reflection may result.

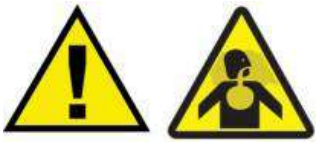
To ensure safe operating conditions, follow these steps:

1. Choose the suitable mode based on the material and thickness;
2. Select the right nozzle according to the joint geometry.

Warning:
◎ To ensure safety, equipment operators are advised to use only the jet nozzle tip. For the part number of Maxphotonics nozzle tip kit, refer to the table in Figure 6-1. Replacement nozzle tips can be purchased as needed.

◎ For the proper angle and position of the welding gun, consult Figure 6-1.

5. Hazard of Welding Smoke



Warning:
◎ Beware of the dangers of inhaling welding smoke!

Welding "smoke" encompasses a mixture of fine particles and gases that are created during the welding process. This smoke originates from the materials being welded, filler materials, shielding gases, coatings, paints, chemical reactions, and air pollutants. Exposure to welding fumes can negatively impact the lungs, heart, kidneys, and central nervous system. The laser interaction with target materials like plastics, metals, and composites may cause them to evaporate, producing toxic and hazardous smoke and fog which are often invisible but pose serious health risks. Performing welding tasks in enclosed spaces with poor ventilation is extremely dangerous, as toxic smoke and gas concentrations can quickly build up, leading to coma or asphyxiation. The ultraviolet light emitted during welding reacts with oxygen and nitrogen in the air, producing ozone and nitrogen oxides, which can be lethal at high concentrations. Shielding gases used in welding can displace air and cause harm or even death.

• To prevent exposure to hazardous fumes during welding, keep your head away from the fume source and always work in a well-ventilated area.

• Implement smoke extraction systems to capture and remove dangerous fumes,

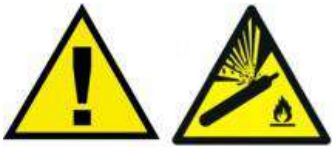
vapors, particles, and debris from the welding workspace.

• Review and adhere to the safety data sheets and warning labels for all welding materials being used.

• In confined spaces and other high-risk situations, the use of respiratory protection may be necessary.

• Regular air monitoring should be conducted to ensure that hazardous smoke levels are kept in check within the welding environment.

6. Cylinder safety



Warning:

◎Be cautious that gas cylinders may explode if damaged or located close to the welding zone. It is crucial to protect and position them in a secure area, away from potential hazards such as impact damages, heat, sparks, or flames. Ensure that cylinders are stored in an upright position and securely fastened to a fixed bracket. Utilize a compatible regulator designed for the necessary gas and pressure requirements. Additionally, confirm that all hoses and fittings are appropriate for the intended purpose and maintained in good working condition.

7. Optical safety

Warning:

◎Please be cautious of the following optical safety measures:

The laser output is transmitted through a window. Ensure that these windows are clean and of high quality. Any dust on the head assembly may cause damage to both the window and the laser. Periodically inspect the quality of the laser output spot, initially at low power levels, and then progressively increase the output power.

Avoid direct observation of the laser hole, such as the output optical fiber or the welding connector, when the device is powered on. It is mandatory to wear safety glasses, a helmet, and a face mask while operating or handling the product. Individuals in close proximity must also wear the same safety gear.

Ensure that all personal protective equipment (PPE) is appropriate for the power output and wavelength range specified on the laser safety label affixed to the product.

Warning:

◎ While operating a laser, refrain from gazing directly into the output port.

◎ Ensure that the laser and all associated optical components are not placed at eye level.

◎ Refrain from utilizing lasers in dimly lit surroundings.

◎ Furnish a protective casing for the laser beam.

Warning:

◎ Refrain from installing or ceasing the laser head while it is active. To perform these actions, always verify that the switch is in the "off" position and that the device is unplugged from AC power.

8. Equipment and solvents

Warning:

◎Please note that the photosensitive components within the equipment, including the camera, photomultiplier tube, and photodiode, may suffer damage from laser exposure. The laser has the capacity to inflict burns on skin, clothing, and paint. It possesses the potential to cut and weld metal. Additionally, the laser can ignite volatile substances like alcohol, gasoline, ether, and other solvents. Ensure to take necessary precautions and avoid exposure to solvents or flammable materials and gases during the installation and operation of the equipment.

9. Electrical safety

Warning:

◎ Ensure that all electrical and welding gas connections are properly connected and secured with screws, if necessary, before powering the unit. The input voltage to the laser can be lethal, and all cables, connectors, and equipment enclosures should be treated as hazardous.

◎ Prioritize electrical safety by properly grounding the equipment through the protective conductor of the AC power cable and protecting the ground terminal. Any interruption could potentially cause personal injury.

◎ Before providing power to the equipment, ensure the correct AC supply voltage is used to avoid damaging the device. Refer to the markings on your specific model for

proper power connections.

◎ The equipment does not contain any user-serviceable parts, and all servicing should be done by qualified personnel. To avoid electric shock and voiding the warranty, do not remove the protective cover or tamper with the product.

◎ External circuit connections, aside from power connections, should comply with IEC 61140's PELV (protected extra-low voltage) definition. The non-power output of other devices connected to this product must also be PELV or SELV (safe extra-low voltage).

10. Environmental safety

Warning:

◎ Electronic devices must be disposed of in accordance with regional regulations on electronic waste disposal.

◎ Ensure that all personal protective equipment (PPE) is compatible with the output power and wavelength range indicated on the laser safety label attached to the laser.

◎ The laser may be damaged if the equipment is not handled carefully. Refer to the product specifications for more information. This device is not intended for use in areas where unprotected individuals or children may be present. Keep away from sources of shock or vibration. Utilize appropriate housing to establish a laser-safe work environment, which may include laser safety signage, interlocking mechanisms, warning devices, and proper training and safety procedures. Do not operate the output welding head at eye level.

◎ Humidity: Avoid exposing the device to high humidity levels (> 90% humidity).

◎ The laser device uses air cooling. Operating at higher temperatures can accelerate aging, increase threshold current, and decrease slope efficiency. If the device overheats, discontinue use and contact Hgri Laser for assistance.

◎ Ensure proper ventilation in the work area. A laser beam interacting with materials can produce steam, smoke, sparks, and particulate debris. Many byproducts of laser processing can be toxic and pose additional safety risks. It is crucial to remove these fumes from the workspace using an extraction system.

◎ For general information about laser products, please visit the Maxphotonics official website.

5 - Reference Standard

Electromagnetic compatibility immunity:

EN IEC 61000-6-4:2019

EN IEC 61000-6-2:2019

Power supply safety:

EN 62368-1:2014+A11:2017

Laser Safety:

ISO 12100:2010

ISO 11553-2017

EN 60204-1:2018

Functional Safety:

EN 60825-1:2014+A11:2021

CDRH 21 CFR 1040.10

Please Note:

◎In compliance with EU and national standards and requirements, lasers must be categorized based on their output power and wavelength. All high-power MFSC series laser products fall under Class 4 classification, as per EN 60825-1, Chapter 8.

6 - General Safety Instructions

1. Mirror Reflection

The output port of the handheld laser welder may generate a secondary laser beam that radiates outwards at various angles. This occurrence, where the main beam of the handheld laser welding machine produces a diverging beam upon reflecting off a flat surface, is referred to as specular reflection. Although the energy of the secondary laser beam is significantly lower than that of the primary laser beam, its intensity can still cause harm to human eyes, skin, or certain material surfaces. Exercise caution while welding highly reflective materials, and ensure there is no one in the line of reflection and no flammable materials present during the welding process.

WARNING :

◎Laser radiation from this device is invisible, so take extreme caution to avoid or minimize any reflections.

2. Safety Instructions for Accessories

Laser exposure can damage the photosensitive elements within the optical accessories of the handheld laser welding machine, so pay close attention to device protection.

WARNING :

◎The output laser intensity of Maxphotonics handheld laser welding machine can weld metal, burn skin, clothing, and paint, and ignite volatile substances like alcohol, gasoline, and ether. During operation and use, make sure to isolate flammable items around the handheld laser welding machine.

3. Optical Handling Precautions

Before operating the handheld laser welding machine, Maxphotonics strongly recommends you follow these guidelines:

(1) Do not look directly into the light-emitting hole of the handheld laser welding machine;

(2) Keep the handheld laser welding machine and related optical output devices below eye level;

(3) Choose appropriate safety protection equipment based on the output power and wavelength requirements of the handheld laser welding machine, to ensure operator safety;

(4) Place a warning sign near the handheld laser welding machine to designate a safe operating area;

(5) Do not use the handheld laser welding machine in a dark environment;

(6) Never turn on the handheld laser welding machine without first installing the optical coupling fiber or optical output connector;

(7) Ensure the protective lens, copper nozzle, and wire-feeding structure are installed and clean when the handheld laser welding machine is powered off and disconnected;

(8) Perform debugging, calibrating, and focusing without the laser, and only turn on the laser after completing these tasks;

(9) Operate the equipment strictly according to the instructions provided in this document; otherwise, the protective devices and performance of the equipment may be compromised, and Maxphotonics will not be held responsible.

NOTICE:

◎ The optical output of the handheld laser welding machine will be transmitted after passing through a lens with an anti-reflection coating. Any dust or debris present on the lens can cause serious damage, potentially resulting in the burning of the handheld laser welding machine or the malfunction of subsequent optical path equipment.

◎ Please consult the "Optical Fiber Connector Inspection and Cleaning Guide" for proper lens cleaning and inspection procedures.

◎ Exercise caution around any heat or molten metal particles that may be generated during the operation of the handheld laser welding machine.

◎ When debugging and calibrating the output of the handheld laser welding machine, ensure that the machine is set to detect the spot quality of the laser output through the red indicator light in the absence of the actual laser light. Turn on the laser only if there are no abnormalities detected.

WARNING:

◎ Select appropriate safety protection equipment based on the laser output power and wavelength requirements.

◎ Do not look directly at the tip of the gun, and always wear safety glasses during each operation.

4. Electrical Operating Guidelines for the Handheld Laser Welding Machine

Maxphotonicsstronglyadvisesyoutocarefullyreadthefollowingoperatinginstructions before using the handheld laser welding machine:

(1) Ensure that the machine's outer casing is well grounded; any interruptions in the grounding loop may result in personal injury.

(2) Before using the device, ensure that the power supply connected to it is also connected to a protective ground.

(3) To minimize fire risk, only replace fuses with the same type and rating when necessary; do not use other fuses or materials for this purpose.

(4) Verify that the handheld laser welding machine's input AC voltage lies within the normal AC mains voltage range (single-phase voltage 200-240VAC) and that the wiring is correct. Improper wiring may lead to personal or equipment injury.

(5) Users should not attempt repairs on parts, components, or assemblies other than the gun head consumables. All maintenance operations should be performed by Maxphotonics professionals.

(6) Unauthorized disassembly and reassembly of the handheld laser welding machine are strictly prohibited, as doing so may result in electric shock or burns, and damage to relevant labels.

(7) Keep flammable materials away from the welding area, as the heat and sparks generated during the process may cause fires or explosions. Perform laser welding only in areas free of combustible materials.

(8) Do not weld on containers holding flammable or combustible substances. If a container's contents are unknown, assume they are flammable or combustible. Keep fire extinguishers nearby, easily accessible, and ensure personnel are trained to use them.

(9) Disassembling any product without permission will void the warranty rights.

WARNING:

◎ The handheld laser welding machine operates at a single-phase alternating current (200-240VAC), posing a risk of electric shock. All associated cables and connections are potentially hazardous.

5. Operating Environment Requirements for Handheld Laser Welding Machines

This equipment is commonly used in:

(1) below 2000 meters above sea level,

(2)overvoltage category II,

(3) environmental pollution degree 2,

(4) dry location. For more information, please refer to the product specifications.

Humidity: Do not expose the device to high humidity (>85% humidity)

Cooling and temperature: The laser unit is cooled by air. Operating at higher temperatures accelerates aging, increases threshold current and reduces slope

efficiency. If the device overheats, do not use it and call Maxphotonics for help. When the temperature of the laser is too high, the device will trigger an alarm and stop emitting light.

To ensure a safe laser work area, the interaction between the laser and the work surface, which can create additional safety hazards due to the high temperatures that generate gases, sparks and debris. The corresponding operators need to go through certain assessment and training, and be familiar with and master the general safety regulations of laser operation.

Maxphotonics advises taking the following steps to extend the lifespan of your handheld laser welding machine

(1) Ensure proper ventilation in the work area and place the machine in a dry, cool, and clean environment. Avoid exposure to high temperatures, humidity, and water hazards.

(2) When operating the machine, make sure no foreign objects block the air intake at the bottom of the laser and keep the area within 1 meter clear of debris for uninterrupted airflow. Ensure the top air outlet is elevated by 1 meter.

(3) Avoid allowing any debris (including liquids) to enter the laser from the top, as this may damage the machine and potentially cause personal injury.

(4) Operating the equipment at high temperatures can accelerate aging, increase the current threshold, and decrease the machine's sensitivity and conversion efficiency. If the device overheats, stop using it and contact Maxphotonics for assistance.

NOTICE :

◎ Handle the equipment with care to prevent accidental damage.

◎ Periodically clean the filter at the bottom of the laser to remove dust and debris from the air inlet.

7 - Additional Safety Information

For more information on laser safety, please refer to the following resources:

Laser Institude 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

8 - Important Safety Information

1. Laser radiation

Laser exposure can lead to severe retinal or corneal damage, resulting in permanent eye damage and potential skin damage. Adhere to safety protocols to avoid accidental exposure to invisible direct or reflected beams. Operate the system within the designated laser control area only.

2. Eye damage

All personnel within the laser control area should wear personal protective equipment, including safety glasses and helmet shields, to protect against reflected or scattered laser beams, welding glare, ultraviolet light, heat, and sparks.

3. Skin hazards

Exposure to infrared and ultraviolet radiation can cause serious skin damage. It is recommended that operators and personnel within the laser control area wear protective clothing, including laser-protective garments, heat-resistant gloves, hats, leather aprons, and other laser- and heat-resistant attire. Keep sleeves and collars buttoned. Sparks from welding may also cause burns, and laser beams penetrating metal parts can reach surfaces or individuals. Never place machined parts in a position where the laser penetrates the workpiece, as this may be hazardous.

4. Reflected beam hazards

Highly reflective metals, such as aluminum and copper, can cause laser energy to be reflected from the target welding site to the laser source or surrounding area, posing a risk to anyone in the laser-controlled area. All individuals within this area must wear personal protective equipment, including safety goggles and welding helmets with face shields. Operators should never attempt to observe the welding process from the opposite side. Professional training in laser welding operations is provided by Hgri Laser; always wear recommended protective equipment when operating laser devices.

All users within the laser control area must read the entire user guide and complete full training before use. Keep your head away from smoke during welding, and always use a fume extraction system to remove vapors, particles, and harmful debris from the welding area. The heat and sparks generated during welding can cause fires or explosions, so only perform laser welding in areas free of combustible or flammable materials. Do not operate in environments containing flammable or combustible substances. Store gas cylinders in a secure place where they cannot be struck by welding. Ensure proper storage and adjustment of gas pressure, and verify that all hoses and fittings are suitable for the type of gas and pressure used in welding applications

Chapter 3
Product Description

1-Features

The hand-held laser welding machine offers a highly integrated and efficient solution for various applications. This compact and user-friendly device combines the laser, welding torch, and control system to deliver outstanding performance compared to traditional hand-held welding equipment.

Key Features:

(1) Highly integrated and compact design

(2) Excellent ergonomics for ease of use

(3) Continuously adjustable power with rapid response

(4) High reliability and exceptional beam quality

(5) Impressive electro-optical conversion efficiency

Applications:

This versatile welding machine is ideal for use in a wide range of industries, including hardware, construction materials, kitchenware, aerospace, and automotive.

2-Module Configuration

Maxphotonics offers multiple configuration options for tailored solutions. Detailed information about each mode can be found in Chapter 6 "Usage Guide" of this manual.

3-Laser Model Overview and Safety Features

Model	Model Coding Rules
MA1-XX	Indicates the penetration capacity of Maxphotonics handheld laser welding: X.Xmm for stainless steel
Product Functional Safety	
Electrical safety	ISO 12100:2010 ISO 11553-2:2015 EN 60204-1:2018
Laser safety	EN 60825 - 1:2014+All:2021 CDRH 21 CFR 1040.10

4-Certificate of Assurance

Maxphotonics assures that this product has undergone rigorous testing and inspection before packaging and transportation, ensuring compliance with published standards and procedures. Upon receiving this product, kindly examine the packaging for any signs of external damage; inspect the equipment for potential damages, and promptly notify both the carrier and Maxphotonics after-sales team. As you unbox this product, please handle it with care to prevent any damage or cracking to the fiber optic cables. Moreover, double-check the enclosed packing list. Once you receive the product, verify all the listed items, and refrain from attempting to install or operate the laser equipment if any component is missing or exhibits apparent or suspected damage.

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5 - Front and Back Panel Description Of Laser Welding Machine

5.1. Front Panel Description: (Left: MA1-35; Right: MA1-45&MA1-65)

Front Panel Name	Description
ACTIVE/ALARM	➢ Normal working status (Green light) ➢ abnormal alarm status indicator (Red light) ➢ Standby, no laser output status(red and green lights flash alternately)
Emergency stop switch	Emergency stop equipment work
Key switch	➢ Turn key clockwise to 1 (ON) position to power the unit. ➢ Turn key counter-clockwise to 0 (OFF) position to shutdown unit.. ➢ Key cannot be removed while in the 1 (ON) position.
LOOP	Safety Loop Line Interface
OUTPUT	Torch interface

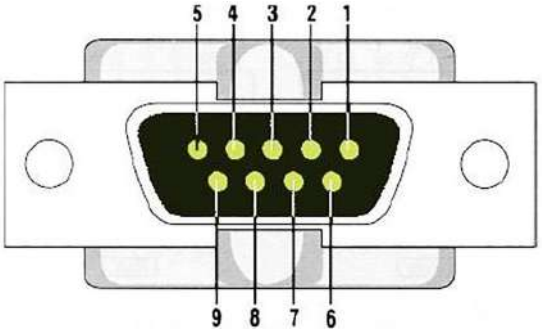
5.2. Rear Panel Description:(Left: MA1-35; Right: MA1-45&MA1-65)

Rear Panel Name	Description
ON/OFF	200-240VAC AC power switch
EX-CTRL	External control interface(For Safety & Cobot)
RS232	Welding platform RS232 interface
POWER	200-240VAC AC power input
FEEDER	Wire feeder interface
GAS_IN	Protective gas inlet port

The laser welding machine's external control port utilizes an RS232 interface (DB9) and an EX-CTRL interface (DB25),with the following interface descriptions:

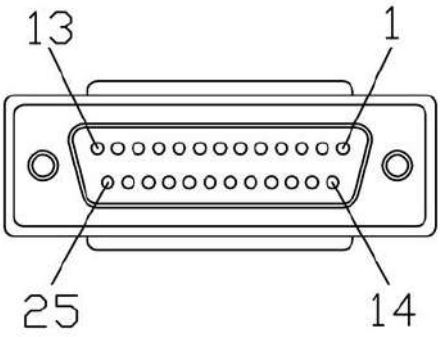
RS232 Interface Description

Pin#	Describtion
1	N/A
2	RxD Serial data input
3	TxD Serial data output
4	N/A
5	GND
6~9	N/A



EX-CTRL Description (Security interface)(DB25)

PIN #	Signal Name	Type	Functionality
16	Enable+	IN	**Laser Enable** Laser Enable ON/OFF; when the voltage is high(24V), Laser Enable is ON; when voltage is low(0V), Laser Laser Enable is OFF.
3	Enable-		
18	EX-CTRL+	IN	**External Start** External control Laser Emission ON/OFF; when the voltage is high(24V), Laser Emission is ON; when voltage is low(0V), Laser Emission is OFF. When Enable and EX-CTRL are ON, Laser is ON.
5	EX-CTRL-		
14	Error 1	OUT	**Alarm Output** Connect to external LED Bar to indicate the Alarm status; the two pins are Relay output pins; When LASER works normally, the two pins open, when LASER has error, the two pins close.
1	Error 2		
7	EXLOCK1-	Contact Closure	**Interlock1 Input** External Safety interlock; Potential free contacts. Laser cannot be started without the two pins connected together. DO NOT connect an external voltage.
20	EXLOCK1+		
9	EXLOCK2-	Contact Closure	**Interlock2 Input**(Only for MA1-35) External Safety interlock; Potential free contacts. Laser cannot be started without the two pins connected together. DO NOT connect an external voltage.
22	EXLOCK2+		
19	EMG1 +	IN	**Emergency Stop Input1** When the voltage is high(24V), the Emergency Stop is triggered (Valid); When the voltage is low(0V), the Emergency Stop is NOT triggered(invalid)
6	EMG1 -		
21	EMG2 +	IN	**Emergency Stop Input2**(Only for MA1-35) When the voltage is high(24V), the Emergency Stop is triggered (Valid); When the voltage is low(0V), the Emergency Stop is NOT triggered(invalid)
8	EMG2 -		



6-Torch Instructions

No.	Describtion
1	Laser Trigger Button
2	Brass Nozzle
3	Extension Tube
4	Protective Len
5	Focus Len
6	Status Indicator
7	Feed Wire Switch

The welding head's indicator light displays various working states. A successful communication between the welding head and the laser, coupled with a normal functioning of the equipment, results in a yellow indicator light. When the safety lock and the copper nozzle simultaneously contact the material to be welded, the safety lock guides the process. By holding the gun head and pressing the laser trigger button, light is emitted, and the indicator light turns green. However, if there is an abnormality in the welding head or the laser, the indicator light turns red.

NOTICE :

◎Please pay attention to the following when using the welding head:

- The welding head serves as the point of contact during welding operations.
- Ensure that the copper nozzle of the welding gun is in direct contact with the workpiece to establish a proper electrical loop before proceeding with any safety detection.
- It is highly recommended to maintain a smooth surface on the welding workpiece to minimize wear and tear.

Welding Torch indicator light description:

Indicator Color	Illustrate
Yellow	Standby Mode
Green	Laser Light
Red	Fault State

Chapter 4
Specification

1 -Optics Characteristic Parameters

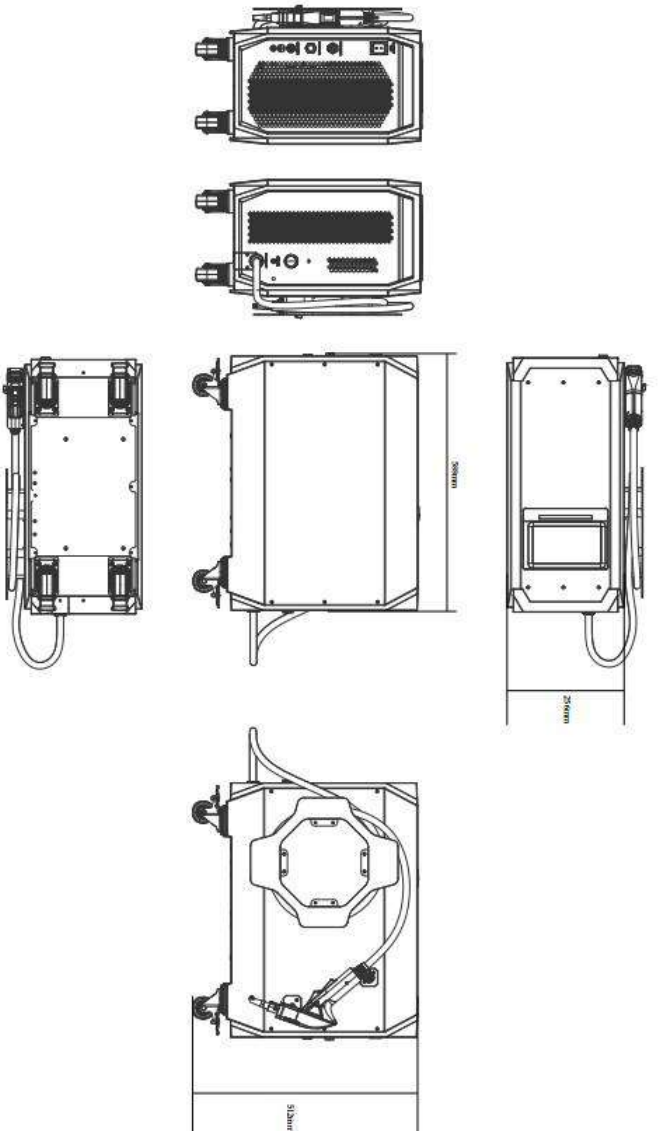
No.	Characteristics	Test conditions		Min.	Nom.	Max.	Unit
1	Operation mode	CW/Modulated					
2	Polarization	Random					
3	Output	100% CW	The ambient temperature is 26℃		800		W
					1200		
					1500		
4	Power regulation range	1% gradient		10		100	%
5	Central wavelength	100% CW			1080		nm
6	Electro-optical efficiency	10-100%Linear fitting			27		%
7	Spectral bandwidth (3dB)	100% CW			3	5	nm
8	Short-time power stability	100% CW>1h			2		%
9	M2	100% CW			1.3		
10	Laser switching ON time	10%→90%Output			50	100	us
11	Laser switching OFF time	90%→10%Output			50	100	us
12	Indicated red light power	100% CW		300		1000	uW
13	Length of optical fiber armored cable	MA1-35		4.35			m
		MA1-45&MA1-65		5.6			
14	Bending radius of optical fiber armored cable			200			mm
15	Output form	QCS integrated with the tip					
16	Continuous light output time (S)	Light 120S, stop 6S					

2 -General Characteristic Parameters

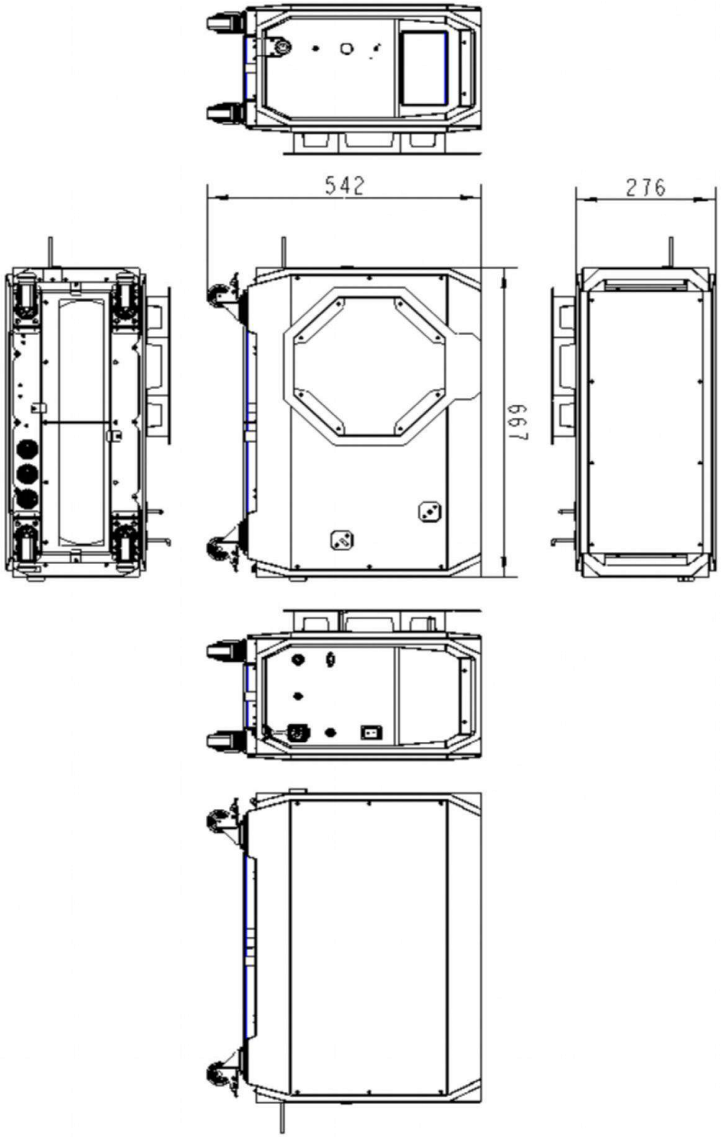
No.	Characteristics	Test conditions	Min.	Nom.	Max.	Unit
1	Operating Voltage		200	220	240	VAC
2	Input Power	100% Output/MA1-35			3	kW
		100% Output/MA1-45			4.8	
		100% Output/MA1-65			6	
3	Operating Ambient Temperature		0		40	℃
4	Operating Ambient Relative Humidity		10		85	%
5	Laser cooling method	Phase change heat dissipation				
6	Cooling method of tip	Nitrogen and argon cooling				
7	Storage Temperature		-10		60	℃
8	Dimensions	MA1-35	588*265*512			mm
		MA1-45	667*276*542			
		MA1-65				
9	Weight	MA1-35	29±3			kg
		MA1-45	38±3			
		MA1-65	39±3			

3-Structural Layout

MA1-35 Laser Three Views.（Unit：mm）



MA1-45 & MA1-65 Laser Three Views.（Unit：mm）



Chapter 5
Disassembly Guide

1- Unpacking Instructions for Shipping Container

Please follow these guidelines when unpacking the equipment from its shipping container:

1. Thoroughly inspect the packaging for any external signs of damage. If any damage is detected, examine the equipment for potential harm, and immediately notify the freight forwarder.
2. Exercise caution when removing the device from its packaging, ensuring the fiber optic cable remains intact and undamaged.
3. The equipment is enclosed in a wooden case with foam insulation, accompanied by foam shock absorbers and shock indicators to secure and promote safe handling during transport.
4. Be particularly careful when unpacking software packages. To minimize the risk of equipment damage, Huangri Laser strongly recommends reviewing these instructions in their entirety.

2-Delivery And Transportation

The carrier's information and details should be prominently displayed on the shipping package, although it should be noted that this information may not always be accurate. It is essential to inspect the crate's exterior for any signs of damage that may have occurred during transit.

• Identification – Packaging labels should be placed on the top panel of the wooden crate, containing the manufacturer's name, address, and phone number. They should also provide general product information, such as model, model code, and serial number, and indicate the shipment date (month/day/year).

• Impact Indicators – To ensure proper handling, labels and indicator panels are affixed to the sides or ends of wooden crates. These provide guidance and help prevent damage during transport.

Lift the box upright

Take out the welding head and accessories

CAUTION:

◎ Do not use cable accessories to lift or locate equipment.

3-Packing List

3.1 MA1-35 Packing List

No.	Names of fittings	Description	Unit	Quantity
1	Hand Held Laser	MA1-35	Pc	1
2	The Welding Torch	Torch	Pc	1
3	The Power Cable	5M	Pc	1
4	Ground Cable	5M	Pc	1
5	Goggle	Support the 0D8+	Pc	2
6	Hanging Welding Torch Frame	Hexagon flowered countersunk head screws with socket (4pcs)	Pc	1
7	Armoring Cable Rack	Hexagon flowered countersunk head screws with socket (8pcs)	Pc	1
8	The Gun Nozzle	Brass nozzle 1, 3, A, B and flat nozzle each	Pc	5
9	Protective Lens	φ20 * 3	Pc	5
10	Lock Ring Wrench	/	Pc	1
11	Wire Outlet Assembly	0.8/1.0/1.2/1.6mm wire feeding nozzle and wire feeding frame	Pc	1
12	Cotton Swabs 1	25 pcs	Pc	1
13	Cotton Swabs 2	25 pcs	Pc	1
14	Wire Feeder (individually Packed)	Including wire feeding conduit, wire feeding wheel	Pc	1
15	Acoustic Earplugs	3M brand	Pc	5
16	Dust Mask	Advanced dust	Pc	2
17	The Screwdriver	Hex Wrench	Pc	1
18	Safe return route	3.0M	Pc	1
19	Silicone sleeve	/	Pc	1
20	Reel	/	Pc	1
21	Trachea	φ6, 5M	Pc	1
22	Two vent quick plug connector	φ6 to φ10	Pc	1
23	Live ore desiccant	/	Pc	2

3.2 MA1-45 & MA1-65 Packing List

No.	Names of fittings	Description	Unit	Quantity
1	Hand Held Laser	MA1-45 or MA1-65	Pc	1
2	The Welding Torch	Torch	Pc	1
3	The Power Cord	10 meters	Pc	1
4	Ground Wire	10 meters	Pc	1
5	Goggle	Support the OD7+	Pc	3
6	Hanging Head Frame	Hexagon flowered countersunk head screws with socket (4pcs)	Pc	1
7	Armoring Cable Rack	Hexagon flowered countersunk head screws with socket (8pcs)	Pc	1
8	The Gun Nozzle	Brass tips 1, 3, A, B and flat tips	Pc	5
9	Protective Len	Phi 20 * 3	Pc	5
10	Lock Ring Wrench	/	Pc	1
11	Wire Outlet Assembly	0.8/1.0/1.2/1.6mm wire feed nozzle and wire feed rack	Pc	1
12	Spear Jig	The collimating focusing lens is disassembled and used	Pc	1
13	Cotton Swabs 1	25 pcs	Pc	1
14	Cotton Swabs 2	25 pcs	Pc	1
15	Wire Feeder (individually Packed)	Including wire feeding tube, wire feeding wheel	Pc	1
16	Acoustic Earplugs	3 m brand	Pc	5
17	Dust Mask	Advanced dust	Pc	2
18	The Screwdriver	Allen	Pc	1
19	Ground Wire	3.0M	Pc	1
20	Graphene Wire Feed Tube	3.0 M	Pc	1

Chapter 6
Operation Guide

1 - Notice

Caution:

◎ Please refer to Chapter 4 "Detailed Specifications" to select a suitable power supply. To select an appropriate power supply, kindly refer to Chapter 4 "Detailed Specifications.

◎ To ensure the peripheral working environment of the laser meets safety requirements, consult Chapter 2 "Safety Information.

◎ Prior to laser welding, please wear the provided soundproof earplugs for your protection.

2 -Electrical Power Connection Guidelines

1. The laser's power input line must be connected to a single-phase alternating current (220VAC) using a 25A industrial power source.

2. It is strictly prohibited to connect the power cord directly to a household electrical outlet.

3. Ensure that the power cord is connected to the appropriate voltage and phase: L=220VAC, N=0VAC, and PE=ground. Verify that the wiring is correct before operating the machine, and never neglect the PE connection.

For enhanced safety, Maxphotonics strongly recommends connecting a 32A circuit breaker (air switch) in series between the power supply and the laser. Ideally, position the power supply near the device's power supply unit for easy disconnection.

If you have further questions about the power connection, kindly consult Chapter 4, "Detailed Specifications," to ascertain the product's electrical specifications. To ensure safety, only qualified personnel familiar with electrical safety and wire connections should carry out electrical connections. Additionally, wiring must adhere to all national and local regulations

3-Electrostatic Grounding Process

It is essential to ensure a secure and reliable connection between the laser housing's grounding nut and the ground using a grounding wire, in order to prevent any potential damage to the laser due to static electricity.

As illustrated in the wiring diagram:

Attach one end of the grounding wire to the ground stud,

Connect the other end of the grounding wire securely to the outdoor grounding pole.

4- Securely Lock the Connection

Ensure a Secure Connection Before Activating the Laser

Prior to switching on the laser, it is crucial to attach the safety lock to the loop interface of the laser device. During laser preparation, fasten the other end of the safety lock (alligator clip) onto the workpiece. This ensures that the alligator clip and the welding head form a complete loop, allowing the laser to function properly and output laser energy safely.

5-Safely Secure the Gas Connection

The welding head is cooled by inert gas, which requires maintaining optimum gas purity and air pressure. Typically, nitrogen and argon serve as shielding gases. The shielding gas purity must be 99.99%, and the input gas pressure should range from 80Kpa to 500Kpa. For an effective welding process, it's essential to use a pressure-reducing valve with a flowmeter (nominal flow rate of 25L/min) to accurately control the airflow.

Connect the 6mm outer diameter gas pipe to the Gasin port, and adjust the gas flow rate to 15-20L/min. Choose the normally open gas valve mode (found in the advanced settings interface) to regulate the gas flow..

Device Connection Diagram

6-Wire Feeder Instructions and Installation Guide

Introducing the Maxphotonics Welding Wire Feeding System, launched in 2022. This innovative system features our independently researched and developed control system, as well as a convenient wire filling function. The versatile Huan Ri laser multifunctional wire feeder is fully compatible with Maxphotonics' hand-held laser welding products..

1. Operating environment and parameters

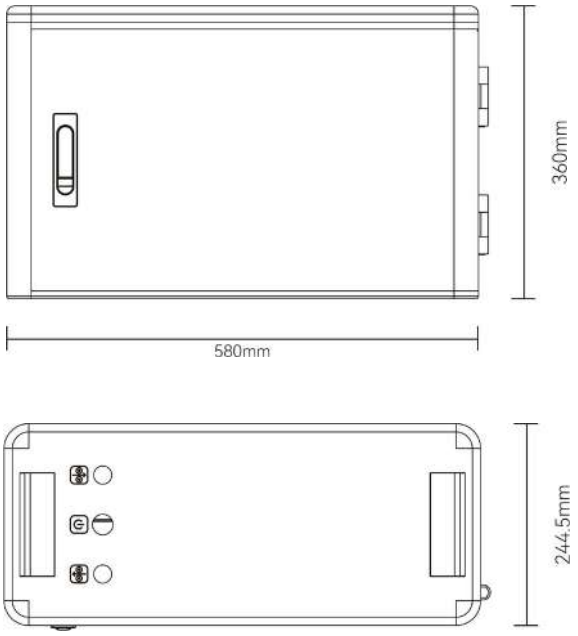
Supply voltage (V)	DC 24V
Setting environment	Smooth, no vibration, no impact
Operating ambient temperature (° C)	5 ~ 50
Ambient humidity (%RH)	< 90
Storage environment temperature (° C)	-15 to 85
Storage environment temperature (%RH)	< 90
Maximum support wire weight	25KG

2.Important Information to Consider:

(1) Ensure that the wire feeding wheel matches the diameter of the wire and is correctly aligned with the wire feeding conduit.

(2) Do not bend the wire feed conduit, as this may cause damage or compromise the functionality of the system.

3.Specifications and Characteristics of the Wire Feeder:"



Size: 580mm×360mm×244.5mm

Features:

(1) The device offers laser coupling, a dual driving force mechanism, a closed circuit board design, and a robust cold rolled plate shell for enhanced efficiency and durability.l.

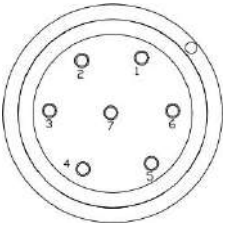
(2) Supports wire feeding/drawing speeds ranging from 2 to 100mm/s, offering both continuous and pulse wire feeding options, allowing for precise fish scale welding.

(3) Equipped with automatic pumping and filling functionalities for added convenience during the welding process.

Primarily designed for scenarios that require wire feeding welding or larger welds, this wire feeding machine is both versatile and effective.

Welding wire diameter compatibility: 0.8/1.0/1.2/1.6mm

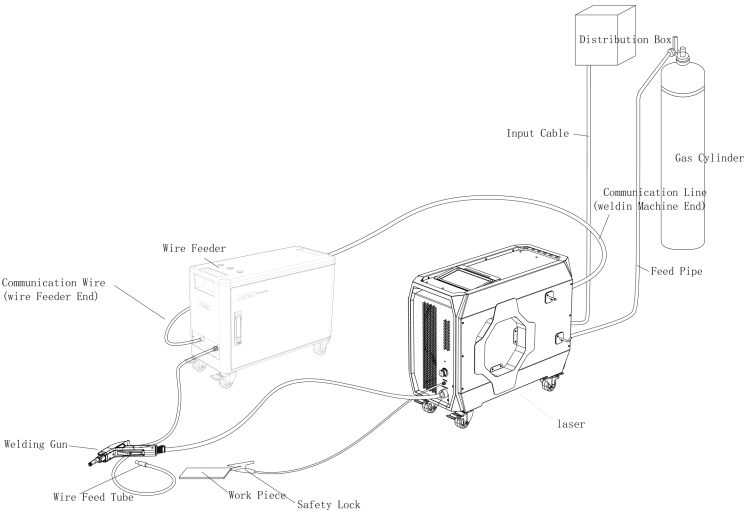
4. General definition of circuit connection



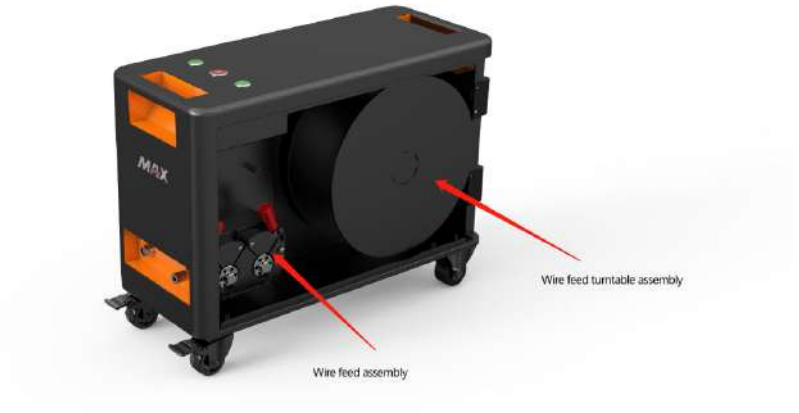
Connection Definition	
1，2 pins	Connect to power +24V
3 pins	Signal input/low level is active
4 pins	Connect to the power GND
5 pins	Shell PE

6 pins	Enter RX for the serial port
7 pins	Serial port output TX

5. External wiring method for wire feeder



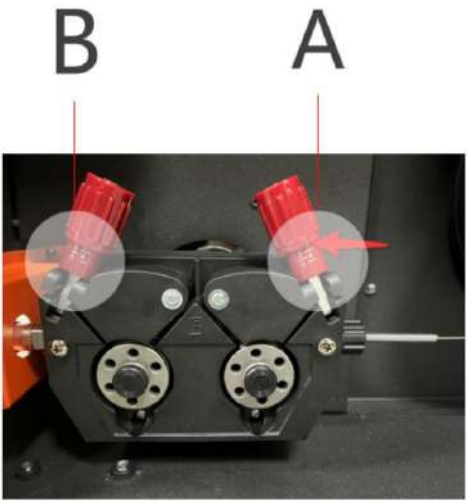
6. Installing Welding Disk and Wire Feed Wheel



1. As illustrated in the figure, remove the fixing nut from the rotary wire feeding platform, place the welding wire spool onto the platform, and securely fasten the fixing nut back onto the platform.

2. Refer to the figure demonstrating the assembly of the wire feeding wheel. Lower the two red handles, remove the fixing screws of the two wire feeding wheels, and take out the wheel to be replaced. Assemble the new wire feeding wheel with the side that matches the size of the welding wire facing outward. Tighten the screws, lower the clamping plate, and lift the handle to secure it in place.

3. Pressing Wheel Selection: Based on the diameter of the welding wire used, choose the appropriate wire feeding gear. For stainless steel welding wire, select a V-shaped gear; for aluminum welding wire, opt for a U-shaped gear..



7-Installation of Wire Feeding Tube

1. Interface of wire feeder

1. Connect the communication wire of the wire feeder (left side) as shown in the above diagram (with the red point of the wire plug aligned to the upward direction of the parent). Connect the other end to the wire feeding interface of the laser;

2. Attach the wire feed pipeline (right side) to the right interface as illustrated in the above diagram, and connect the other end to the gun head;

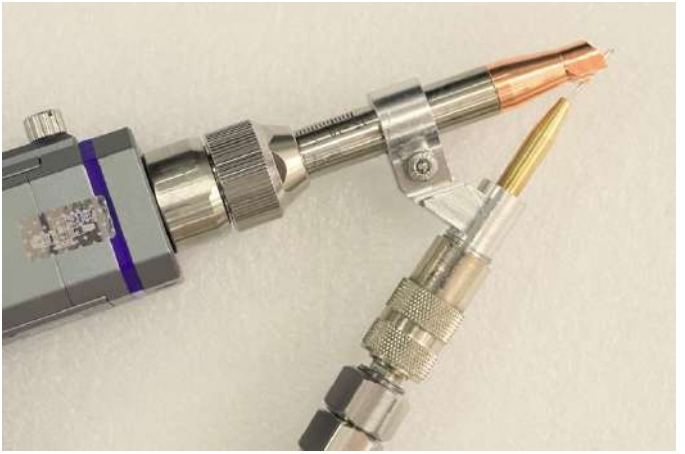
3. The main types of tubes available for use are graphite tubes, stainless steel tubes, and Teflon tubes.

8-Wire Feeder and Torch Connection

Comprehensive Assembly Diagram

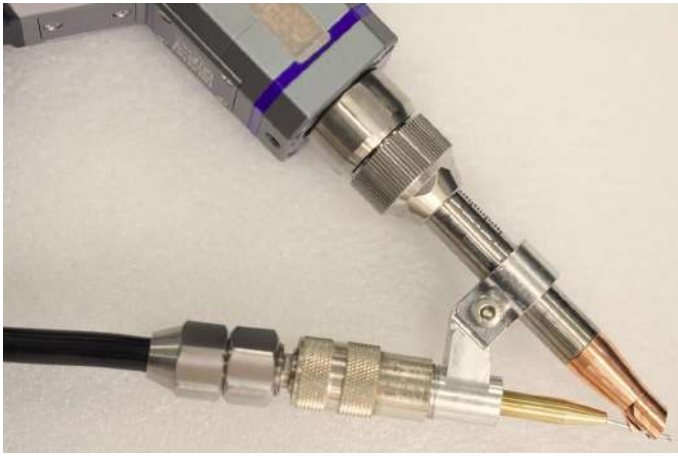
(1) Secure the wire feed tube

Insert the wire guide tube into the push-in connector



Wire Feed Tube Assembly

(2) Attach the wire feeder



Assemble the wire feeder securely to ensure proper functioning.

(3) Adjust the wire feed frame position

First, determine the length of the welding gun barrel to establish the welding focal point. Then, adjust the wire feed nozzle to align with the center of the wire groove in the welding copper nozzle. Lastly, adjust the length of the wire feeding tube so that the wire feed nozzle is close to the welding copper nozzle.

9-Wire Feed Frame and Hand Welding Connection

1. Power Button:  This button signifies the power control for the wire feeder. When activated, a red light will illuminate, indicating that the wire feeder is powered on.

2. Manual Wire Feeding Button:  This button is used for manual wire feeding, typically during daily troubleshooting or maintenance procedures. Pressing the button will result in a green light turning on, indicating that the wire feeding process is ongoing.

3. Manual Pull-Back Button:  This button serves for manual wire retraction and is generally used during daily troubleshooting or maintenance procedures. Upon pressing the button, a green light will be illuminated, signifying that the wire is being retracted.

10-Maintenance and Troubleshooting of Wire Feeders

1. Check regularly:

Regular Inspections: Before using the wire feeder, ensure to examine the following components for any damages:

(1) Control cables and their connectors

(2) Power supply and functionality of the wire feeding button

(3) Switch locking mechanism

11-Routine Maintenance

(1) Inspect the wire feeding wheel and pressing wheel:

Examine the groove section of the wire feeding wheel and the wear condition of the pressing wheel, ensuring there are no impurities in the groove. Replace them if wear is severe.

(2) Inspect the wire feeding pipe:

Verify if the connectors at both ends of the wire feed pipe are loose and if the stainless steel pipe (graphite pipe & teflon pipe) is obstructed. Use compressed air to clear any minor blockages caused by metal chips. Replace the wire feed pipe if the blockage is significant.

(3) Check the motor:Listen for any abnormal sounds coming from the motor..

(4) Clean the equipment:Thoroughly clean and purge the equipment at least once a month.

Selecting the Appropriate Wire Feeder and Welding Tip:

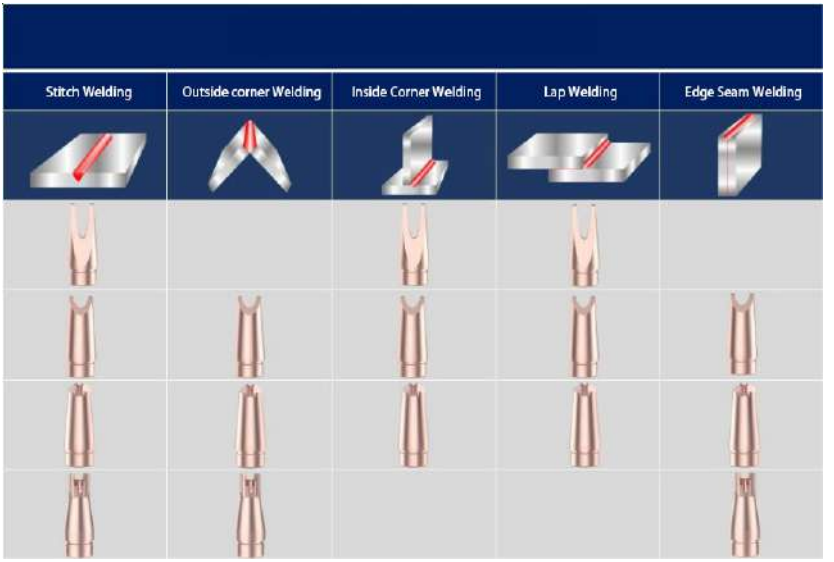


Figure 6-1

When it comes to wire-fed welding of workpieces, it's essential to choose a copper nozzle with a proper wire slot to ensure accurate welding wire direction and smooth wire feeding.

Wire feed nozzle 0.8-1.6mm

To adjust the wire feeding speed, follow these steps:

(1) 1. Activate the wire feeding switch on the touchscreen interface.

(2) 2.Disable the laser function.

(3) 3.Press and hold the handheld welding head switch.

(4) 4.Initially set the wire feeding speed to a low rate (approximately 10mm/s) for adjustments.

(5) 5.Depending on the wire feeding pressure, turn the two adjustable preload pressure rods' sleeves left or right.

(6) 6.Continue adjusting until the wire reel rotates at a consistent speed. Make sure that the wire feeding tube is straight and unbent, ensuring optimal wire delivery..

12-Startup Steps for Laser Operation

WARNING:

◎ Ensure all electrical connections (including protective gas and grounding) have been adequately connected before usage. It is recommended to tighten and secure all connectors with screws whenever possible..

◎ Avoid directly looking at the laser outlet during operation. Always wear appropriate safety gear such as protective eyewear, soundproof earplugs, and masks before operating the laser.

◎ Prior to wiring, make sure all the power switches of the laser are turn off.

Startup Procedure:

(1) Connect the power input to the specified voltage, phase, and frequency.

(2) Securely lock the connection to the loop interface and connect the wire-feeding power cord to the FEEDER interface.

(3) Attach the protective gas pipe (outer diameter 6mm) to the gas inlet port and open the gas valve.

(4) Switch on the power on the laser's rear panel.

(5) Release the emergency stop switch on the laser's front panel.

(6) Tap the touch screen to access the software interface, and adjust the required parameters (laser power, swing amplitude, swing frequency, air blowing and closing air delay, power increasing and decreasing slowly, light output mode, etc.).

(7) Set the air valve mode to normally open, and adjust the protective gas flow to 15-20 L/min

(8) Attach the alligator clip to the workpiece intended for welding.

(9) Activate the laser start button and the laser enables switch.

(10) Press and hold the torch head switch to emit light.

13-Welding Process Parameters

Handheld laser welding process parameter table								
Material type	Welding form	Thickness (mm)	Laser power percentage (%)	Swing range (mm)	Swing frequency (hz)	Defocus amount (mm)	Air flow volume (L/min)	welding Effect
Carbon Steel (Q235B)	Stitch welding	1	45	2-3	60~80	-1~1	15~20	Penetration
	Stitch welding	1.5	100	2-3	60~80	-1~1	15~20	Penetration
	Stitch welding	2.5	100%/D4	1.5-2	50~70	-2~1	15~20	Penetration
Stainless steel (SUS304)	Stitch welding	1	45	2-3	60~80	-1~1	15~20	Penetration
	Stitch welding	2	100	2-3	60~80	-1~1	15~20	Penetration
	Stitch welding	2.5	100%/D4	1.5-2	50~70	-2~1	15~20	Penetration
Brass	Stitch welding	1	85	2-3	50~70	-1~1	15~20	Penetration
	Stitch welding	2	100%/D4	1.5-2	50~70	-1~1	15~20	Penetration
Galvanized sheet	Stitch welding	1	55	2-3	60~80	-1~1	15~20	Penetration
	Stitch welding	2	80	2-3	60~80	-1~1	15~20	Penetration
	Stitch welding	2.5	100%/D4	1.5-2	50~70	-2~1	15~20	Penetration
Aluminum alloy (Al6061)	Stitch welding	1	80	2-3	60~80	-1~1	15~20	Penetration
	Stitch welding	2	100%/D4	1.5-2	60~80	-1~1	15~20	Penetration
Remark	1, the welding form is splicing welding, welding head ratio of 60:120,800 W laser fiber core diameter of 20 microns; 2, welding protective gas: stainless steel - nitrogen (purity 99.99%), other materials - argon (purity 99.99%); 3. The power percentage is 10-100%, the swing amplitude is 0-4mm (2-3mm is recommended), the swing frequency is 0-220hz (40-80hz is recommended for manual welding, and the gas flow rate is 15-20L/min). Under the condition that other parameters remain unchanged, the swing amplitude or welding speed increases, and the laser power also needs to increase accordingly; 4, welding speed = welding length/welding time (welding speed is influenced by human factors, welding speed is roughly 10-20mm/s) Due to different customer welding process (air pressure, manual speed, degree of deflection, welding Angle), this data is for reference only. 5. D mode enabling condition: D mode can be enabled if the power is ≥90% 6. Due to the difference of welding process (air pressure, manual speed, degree of deflection, welding Angle) of different customers, this data is for reference only. 7, welding users must wear protective glasses, handheld laser welding machine welding operation needs to be carried out in an independent space with laser protection; Non-welding personnel and combustible and flammable materials should be kept away from the welding operation table, and fire extinguishers should be placed near the welding area.							

NOTICE:

◎ Please refer to the above process parameters for stack welding, fillet welding, lap welding, etc.

Handheld laser welding process parameter table - wire feeding										
Material	Material thickness	wire feed speed	Laser power percentage	Scanning width	Scanning frequency	Defocus amount	Air flow volume	Welding consumables	Wire diameter	Welding effect
	mm	mm/s	%	mm	HZ	mm	L/min	/	mm	Penetration
Carbon Steel (Q235B)	1	12~15	85%	2	40~80	1~-1	15~20	Stainless steel	0.8-1.0	Penetration
	2	8~10	100%/D4	2	40~80	1~-3	15~20	Stainless steel	0.8-1.0	Penetration
Stainless steel (SUS304)	1	12~18	85%%	2	40~80	1~-1	15~20	Stainless steel	0.8-1.2	Penetration
	2	8~10	100%/D4	2	40~80	1~-3	15~20	Stainless steel	0.8-1.2	Penetration
Galvanized sheet	1	12~18	85%	2	40~80	1~-1	15~20	Stainless steel	0.8-1.0	Penetration
	2	8~10	100%/D4	2	40~80	1~-3	15~20	Stainless steel	0.8-1.0	Penetration
Aluminum alloy (Al6061)	1	12~18	95%	2	40~80	1~-1	15~20	Aluminum alloy	0.8-1.0	Penetration
	2	12~15	100%/D4	2	40~80	1~-3	15~20	Aluminum alloy	1.0	Penetration
Remark	1, the welding form is splicing welding, welding head ratio of 66:120,800 W laser fiber core diameter of 20 microns; 2, welding protective gas: stainless steel - nitrogen (purity 99.99%), other materials - argon (purity 99.99%); 3. The power percentage is 10-100%, the swing amplitude is 0-4mm (2-3mm is recommended), the swing frequency is 0-220hz (40-80hz is recommended for manual welding, and the gas flow rate is 15-20L/min). Under the condition that other parameters remain unchanged, the swing amplitude or welding speed increases, and the laser power also needs to increase accordingly; 4, the wire feed machine needs to adjust the wire feed speed, by adjusting the pressure of the wire feed wheel, in the automatic mode, the wire feed speed is uniform, smooth wire feed, no lag phenomenon; 5. D mode enabling condition: D mode can be enabled if the power is ≥90% Process parameters are adjusted according to the actual wire material and wire diameter 6. Due to the different equipment configuration (wire feeding machine differences) and welding methods (wire feeding speed, air pressure, degree of deflection, welding Angle) adopted by different customers, this data is for reference only.									

NOTICE:

◎ Please refer to the above process parameters for stack welding, fillet welding, lap welding, etc.

14-How To Use The Fish Scale Function

Method 1: Enable the fish scale pattern on the home page

The fish scale pattern has built-in default parameters, so you don't need to set them.

Simply turn on the switch:

1. Firing time: 150ms
2. Interval: 40ms

For optimal fish scale effects, use the wire feeding machine parameters and set the wire feeding speed according to 7-10.

Method 2: Access the Professional mode.

In the Settings, set reasonable firing duration and interval times:

1. 1.Ignition duration: 150ms (this parameter affects the size of the welding striatum)
2. 2.Interval time: 40ms (this parameter affects the interval between two striatum) Fish scale pattern welding (In this mode, only the laser is turned off during the interval, and other settings such as on/off time do not affect or take effect) Simply set the spot welding duration and interval to produce the fish-scale welding effect. Note: It is recommended to use fish-scale pattern welding at 50% power. If it is necessary to use fish-scale pattern under high power, do not use a large welding angle and use appropriate positive defocus (gun barrel scale: +2 to +4 range) to increase gas flow and reduce welding splash. This can prolong the service life of the protective lenses.

Method 3: Use pulse wire feeding mode (recommended).

In the wire feeder parameters, select "pulse":

1. Pulse period: 140ms
2. Pulse wire feed speed: 10mm/s
3. Pulse smoothness: 20%

Note: When using the pulse mode for the wire feeder, set the laser light output to continuous mode.

15-Product Accessory Inspection and Cleaning Guide

1. Inspecting Product Accessories:

To clean the tip protection mirror window, gather the following equipment:

(1) Powder-free rubber gloves or finger cots

(2) Lint-free fiber cleaning cloth and cotton swab

(3) Optical grade alcohol (purity >99.5%)

(4) Light source (flashlight or mobile phone indicator)

(5) Masking tape

(6) Microscope

NOTICE:

◎ Before using this product, please check the cleanliness and integrity of the protective lens. Operating with a dusty or damaged protective lens may cause damage to the welding torch head (focusing lens, extension tube, etc.) and affect welding quality.

◎Unauthorized disassembly of the gun head and laser products will void the Maxphotonics warranty.

◎ Please wear powder-free gloves or finger cots when cleaning the product in a dust-free environment. Maxphotonics is not responsible for tip damage due to improper operation or incorrect cleaning procedures.

◎ When cleaning, the concentration of alcohol should be greater than 99.5%.

2.Cleaning Steps Follow these procedures to clean and maintain the laser welding machine:

(1) Turn off the laser switch and disconnect the power supply;

(2) Rotate the locking screw on the protective mirror housing from the gun head and pull out the mirror holder (sealed with clean masking tape to prevent dust from entering). Use an optical cleaning cloth dipped in alcohol to wipe the entire protective mirror window surface;

(3) Hold the window in the left hand and place it under the microscope (20x magnification);

(4) With the right hand, adjust the focal length of the microscope so that the protective lens surface is clearly visible;

(5) Carefully examine the protective lens surface. If dust or tiny particles are present, use a cotton swab to clean them:

① Dampen a cotton swab with alcohol, shaking off any excess;

② Position the cotton swab on the dust location on the lens under the microscope;

③ Gently wipe the dust with the swab, moving it towards the edge of the lens, and replace the swab after use;

④ After cleaning all debris, verify cleanliness under the microscope.

(6) Insert the cleaned protective lens into the lens holder;

(7) Place the protective lens holder into the gun head's lens cavity seat and fasten the locking screw on the lens holder shell to secure the lens holder in place..

IMPORTANT:

◎ Do not reuse lint-free cotton cloth or cotton swabs..

◎ Do not touch the welding torch head's protective lens with your fingers.

◎ Do not blow directly on the lens surface with your mouth as this may introduce new debris.

◎ Do not touch the cleaning swab's tip with your fingers..

◎ Remember to clean the protective cover and sleeve when replacing them.

◎ When using compressed air, avoid blowing debris directly at the surface, and instead use a side-blowing technique.

◎ If the protective lens holder cannot be immediately reinstalled, seal the lens cavity shell with textured paper

1. Loosen the locking screw of the protective lens holder shell

2. Take out the protective lens holder

3.Masking paper package to protect the lens seat cavity

4. Gently wipe the front of the lens with a clean cotton swab or clean cloth dipped in alcohol

5. Take out the protective mirror holder and wipe the other side of the protective mirror

6. Put the protective mirror into the protective mirror holder, push it into the protective mirror holder cavity, and tighten the screws

Chapter 7
Service and Maintenance

1-Maintenance Notes

Caution:

◎There are no user-serviceable parts inside. For all servicing needs, please consult with qualified Maxphotonics personnel.

◎To ensure that repairs or replacements within the warranty scope can be carried out and to protect your interests, please submit an application to Maxphotonics or your local representative if you encounter any issues. After receiving our authorization, pack the product in a suitable package and return it.

◎ When discovering any damage upon receiving the product, keep the proof in order to claim your rights from the shippers.

IMPORTANT :

◎ Do not send any product to Maxphotonics without an RMA.

◎ If the product is beyond the warranty period or outside the warranty scope, customers will be responsible for any repair costs.

CHANGE :

◎ Maxphotonics reserves the right to modify the design or structure of our products, and the information is subject to change without notice.

2-Service Statements

For any issues regarding safety, setup, operation, or maintenance, please consult this "User Guide" carefully and follow the provided operation steps. For other questions, contact the Customer Service Department.

For further inquiries, please contact the Customer Service Department at 400-900-9588.

Our technical support team will verify and address your concerns. If the problem remains unresolved, you may need to return the product to Maxphotonics for further troubleshooting.

Chapter 8
Warranty Statement

1-General Provisions

Maxphotonics Co., Ltd. provides a warranty for any defects in its products resulting from materials and manufacturing processes during the warranty period agreed upon in the contract. We ensure that our products meet the relevant quality and specification requirements outlined in the documentation under normal usage conditions.

During the warranty period, Maxphotonics Co., Ltd. shall, at its sole discretion, repair or replace products with faults caused by material or manufacturing processes. Repairs or replacements of products within the warranty coverage will be performed according to the remaining warranty period of the original products.

2-Warranty Limitations

The following circumstances will render products, parts (including fiber connectors), or equipment not covered by the warranty::

(1)Tampering, opening, disassembling, or modification by unauthorized personnel

(2) Damage resulting from misuse, neglect, or accidents;

(3) Usage beyond the product specifications and technical requirements;

(4) Indirect damage caused by the user's software or interfaces;

(6) Accessories and fiber connectors are not included in the warranty coverage.

Customers are responsible for understanding and following the User Guide and product specifications; any faults resulting from non-compliance are not covered by the warranty.

IMPORTANT NOTICES:

◎ Purchasers must report any product defects to Maxphotonics within 31 days of discovery to be eligible for warranty coverage.
◎ Maxphotonics does not authorize any third party to repair or replace parts, equipment, or other Maxphotonics products.