



USER GUIDE

THEO MA1 Series | Handheld Laser Welding Machines

REVISION: V1.2
©COPYRIGHT2024 THEO LASER INC



Disclaimer

THEO strives to ensure that the information in this User Guide is accurate and reliable. However, no warranty or representation, expressed or implied, is made regarding the content of this document. This includes, without limitation, any implied warranty of merchantability or fitness for a particular purpose, whether used alone or in combination with other devices, equipment, materials, or processes.

The user assumes full responsibility for the application of any product referenced herein. THEO shall not be held liable for any incidental, indirect, special, or consequential damages, including, but not limited to, lost profits, production losses, or similar costs. Furthermore, the information in this document may potentially infringe on patents or third-party rights. THEO shall not be held liable for any indirect or special damages arising from misinterpretations or omissions in this document or related consequences.



Copyright Notice

© THEO Laser Inc. (hereinafter referred to as THEO). All rights reserved. Unauthorized copying, modification, transmission, or publication of this material, in any form or medium, is strictly prohibited without the prior written consent of THEO, except as permitted by applicable copyright laws. Any authorized copies must include the original copyright and proprietary notices.

While THEO strives to ensure the accuracy and reliability of the information provided, no warranties, representations, or guarantees are made regarding the use of this document as a reference in other contexts. Additionally, THEO assumes no responsibility for any infringement of patents or third-party rights resulting from the use of the information contained herein. THEO is not liable for any errors in this document or for any direct or indirect damages to related equipment.

THEO, Maxphotonics, and the THEO and Maxphotonics logo are registered trademarks of Maxphotonics Co., Ltd. Their use is governed by trademark law. THEO does not grant any rights to patents or other intellectual property mentioned in this document.

All information contained herein is subject to change and revision without prior notice.



Preliminary Note

Before using the product, ensure you have thoroughly read and understood this manual, and are familiar with the operational and maintenance instructions. THEO strongly recommends that all operators review and understand the safety information provided in this document before using the product. This User Guide contains essential operational, safety, and other key information that should be regularly reviewed by operators, users, and owners.

For technical assistance, please contact our Customer Service team:

<http://theo.inc/support>

THEO Laser Inc.

1900 West Park Dr., Suite #150
Westborough, MA 01581, USA
Phone: +1 (508) 299 5639

THEO Laser Europe

c/o MAXPHOTONICS GmbH
Dornierstraße 11
82205 Gilching, Germany

Website: <http://theo.inc>

This guide is intended for all owners and operators of THEO equipment, as well as individuals working near the product during operation. Usage of this product is restricted to fully trained professional and non-professional welding operators.



Preface

Thank you for choosing THEO's handheld laser welding products. This User Guide has been created to assist you in using and maintaining the laser effectively. While we have made every effort to ensure the accuracy of the information in this document, occasional oversights may occur. We appreciate your understanding and welcome any suggestions for improvement.

Before using the product, please take the time to read and understand this User Guide and familiarize yourself with the operating and maintenance instructions. We strongly recommend that operators review Section 2: Safety Information before operating the product.

Keep this User Guide with the product, as it contains important operational, safety, and maintenance information for you and future users or owners.

Throughout this document, we have highlighted sections that require special attention. Please be mindful of these to prevent unnecessary damage. Thank you once again for choosing THEO products.

Invitation to THEO Academy

Online Laser Welding Safety and Training

THEO Academy is an online learning platform designed to provide operators with essential training on the safe use and maintenance of THEO laser welding equipment. It offers a range of video tutorials and instructional materials covering topics such as laser safety, machine setup, and operational best practices.

Key features of THEO Academy include:

- Machine Setup and Operations: Step-by-step video tutorials covering the setup and basic operation of the MA1 series handheld laser welding machines.
- Laser Safety Protocols: Instructional videos and guides on the hazards of Class 4 laser products, emphasizing the importance of risk assessment and safety measures.
- Personal Protective Equipment (PPE): Detailed tutorials on the correct use of 1080 nm near-infrared laser safety glasses and other necessary protective gear.
- Safe Operation Practices: Online courses explaining proper handling, maintenance routines, and safety procedures to ensure compliance with industry safety standards.

Operators can access THEO Academy to complete online training modules at their own pace. The platform is designed to ensure all personnel assigned to THEO laser products are equipped with the knowledge necessary to work safely and efficiently. Video tutorials and written resources are available for both beginners and experienced users, helping to reinforce safe operation and maximize performance. Certification is awarded upon successful completion of courses.

Please register using the serial number of your MA1 Series device to receive access to additional resources and to obtain the machine license code. Registration ensures that you have full access to all available support and product features.

For more detailed training, machine setup guidance, and safety tutorials, visit THEO Academy via the online platform.

Please visit: <http://academy.theo.inc>



Table of Content

DISCLAIMER	2
COPYRIGHT NOTICE	3
PRELIMINARY NOTE	4
PREFACE	5
INVITATION TO THEO ACADEMY	6
<i>Online Laser Welding Safety and Training</i>	6
TABLE OF CONTENT	7
CHAPTER 1 PRODUCT INFORMATION	10
CHAPTER 2 GENERAL SAFETY INFORMATION	11
1 - Safe Usage of Handheld Laser Welding Machines	11
2-Safety Conventions	13
3-Laser protection Measures	15
1. <i>Requirements for Laser Safety Goggles</i>	15
2. <i>Suppliers of Laser Protective Equipment</i>	15
4-Welding Feature Safety	16
1. <i>Eye and Ultraviolet Radiation Hazards</i>	16
2. <i>Skin Hazards</i>	16
3. <i>Fire Hazards</i>	16
4. <i>Smoke and Fume Hazards</i>	16
5. <i>Cylinder Safety Measures</i>	17
6. <i>Important Safety Notice for outbound Security Indicators:</i>	18
7. <i>Safety guidance</i>	18
8. <i>Secondary radiation hazard</i>	20
9. <i>Precautionary Measures for Welding Protection and Minimizing Risks in Welding Processes</i>	21
10. <i>Dangers of Reflected Beam in Welding Process</i>	22
11. <i>Hazard of Welding Smoke</i>	23
12. <i>Cylinder safety</i>	25
13. <i>Optical Safety</i>	26
14. <i>Equipment and solvents</i>	28
15. <i>Electrical safety</i>	29
16. <i>Environmental safety</i>	30
5 - Reference Standard	31
6 - General Safety Instructions	32
1. <i>Mirror Reflection</i>	32
2. <i>Safety Instructions for Accessories</i>	32
3. <i>Optical Handling Precautions</i>	33
4. <i>Electrical operating Guidelines for the Handheld Laser Welding Machine</i>	35
5. <i>Operating Environment Requirements for Handheld Laser Welding Machines</i>	36
7- <i>Additional Safety Information</i>	38
8 - Important Safety Information	39
1. <i>Laser radiation</i>	39
2. <i>Eye damage</i>	39
3. <i>Skin hazards</i>	39
4. <i>Reflected beam hazards</i>	39
CHAPTER 3 PRODUCT DESCRIPTION	41

1. Features	41
Key Features:.....	41
Applications:.....	41
2. Module Configuration	42
3. Laser Model overview and Safety Features	43
4. Certificate of Assurance	44
5. Front and Back Panel Description of Laser Welding Machine	45
5.1. <i>Front Panel Description: (Left: MA1-35; Right: MA1-45&MA1-65)</i>	45
5.1. <i>Back Panel Description: (Left: MA1-35; Right: MA1-45&MA1-65)</i>	46
5.2. <i>RS232 Interface Description</i>	48
5.3. <i>EX-CTRL Description (Security interface) (DB25)</i>	49
6. Torch Instructions	50
Precautions for Welding Gun Angle:.....	52
Welding Torch indicator light description.....	54
CHAPTER 4 SPECIFICATION	55
1. Optics Characteristic Parameters	55
2. General Characteristic Parameters	57
3. Structural Layout	58
MA1-35 Laser Three Views. (UNit: mM).....	58
MA1-45 & MA1-65 Laser Three Views. (UNit: mM).....	59
CHAPTER 5 DISASSEMBLY GUIDE	60
1. Unpacking Instructions for Shipping Container	60
2. Delivery And Transportation	60
CHAPTER 6 OPERATION GUIDE	62
1. Notice	62
2. Electrical Power Connection Guidelines	62
3. Electrostatic Grounding Process	63
4. Securely Lock the Connection	64
5. Safely Secure the Gas Connection	64
<i>Device Connection Diagram</i>	65
6. Wire Feeder Instructions and Installation Guide	66
1. <i>Operating environment and parameters</i>	66
2. <i>Important Information to Consider:</i>	66
3. <i>Specifications and Characteristics of the Wire Feeder:</i>	67
Features:.....	67
4. <i>General definition of circuit connection</i>	68
5. <i>External wiring method for wire feeder</i>	69
7. <i>Installation of Wire Feeding Tube</i>	71
1. <i>Interface of wire feeder</i>	71
8. <i>Wire Feeder and Torch Connection</i>	72
(3) <i>Adjust the wire feed frame position</i>	73
9. <i>Wire Feed Frame and Hand Welding Connection</i>	74
10. <i>Maintenance and Troubleshooting of Wire Feeders</i>	75
1. <i>Check regularly:</i>	75
11. <i>Routine Maintenance</i>	75
<i>Selecting the Appropriate Wire Feeder and Welding Tip:</i>	76
12. <i>Startup Steps for Laser operation</i>	78
Startup Procedure:	78
13. <i>Welding Process Parameters</i>	80
14. <i>How To Use the Fish Scale Function</i>	83
Method 1: <i>Enable the fish scale pattern on the home page</i>	83

Method 2: Access the Professional mode	83
Method 3: Use pulse wire feeding mode (recommended)	83
15. Product Accessory Inspection and Cleaning Guide	85
1. Inspecting Product Accessories:	85
2. Cleaning Steps Follow these procedures to clean and maintain the laser welding machine.	86
Protective Windows	87
PROTECTIVE WINDOW CLEANING INSTRUCTIONS	87
Replace Focus Lens Instruction	89
CHAPTER 7 SERVICE AND MAINTENANCE.....	93
1. Maintenance Notes	93
CHANGE:	93
2. Service Statements.....	94
CHAPTER 8 WARRANTY STATEMENT.....	95
1. General Provisions.....	95
2. Warranty Limitations	95
CHAPTER 9 OPERATION GUI DESCRIPTION.....	97
1. Startup safety instructions.....	97
2. Operation Interface.....	98
(1) Basic mode.....	98
(2) Expert mode.....	100
Home	100
Status.....	102
Warning.....	103
Details:.....	105
Parameters Library:.....	110
Customize:	112
(4) Setting interface	115
HHW Settings:	115
Laser Setting:	118
(5) System Information	121
MACHINE INFORMATION:.....	121
COMPANY PROFILE	123
Introduction	123
About THEO.....	123
About Maxphotonics.....	124

Chapter 1

Product Information

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

The MA1 series by THEO 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 wall plug 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 must not be overlooked. It is crucial that all personnel working with or in the same room as the laser are aware of these risks and adhere to the safety guidelines and warnings provided in this manual to ensure both secure operation and optimal performance. **Disassembling the device will void any and all warranties and is strongly discouraged to maintain user safety during operation, maintenance, and service.**

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

THEO also offers a handheld welding laser system, featuring a compact control unit and lightweight torch with a built-in wobble 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 required. Following all instructions and safety warnings in this guide will ensure 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 steel and aluminum.

THEO 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 THEO for assistance.

Chapter 2

General Safety Information

1 - Safe Usage of Handheld Laser Welding Machines

Handheld laser welding machines are classified as hazardous Class 4 laser products due to the emission of invisible infrared laser radiation at a wavelength of 1080 nm. The welding head typically emits over 100W of high-intensity light, which can cause both direct and indirect harm to the eyes and skin. In particular, exposure to the laser beam may result in irreversible damage to the retina or cornea.

To ensure safety, it is essential to wear appropriately certified 1080 nm near-infrared laser safety glasses with an OD rating of 6 or higher before operating a handheld laser welding machine. Always follow proper safety protocols to minimize the risk of injury.








For more detailed information and training on laser welding safety, please visit **THEO Academy** (<https://academy.theo.inc>), where you can access comprehensive resources on safe laser operation and best practices.




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 void the machine warranty and result in injury, 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:

SAFETY SIGNS	NAME	DESCRIPTION
	Electrical hazard	Warning: Text marked with electrical warning symbol indicates potential personal danger. If you do not follow certain procedures, certain, potentially fatal harm may be caused to you or others.
	Laser radiation hazards	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.
	Warnings	Note: Text with a warning symbol indicates a potential product hazard. It A specific operating procedure must be followed. If the procedure is not followed correctly, damage or destruction of the product or components may occur.
	Laser safety enclosure/room	Note: Welding device operation should only be done in a laser safe enclosure (or a light proof room) with entryway interlock safety switches. 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 wavelength-specific protective eyewear and clothing.
	Direct beam to danger	Note: Never look down the gas tube ("barrel") of the MA1 hand torch or point it at others. The guide beam can cause temporary eye irritation. The process beam can lead to permanent, irreparable blindness
	Wear laser safety glasses	Symbol indicates that personnel must wear laser safety glasses (personal protective equipment) to prevent laser radiation hazards.

	<p>Wear protective gloves</p>	<p>The symbol indicates that personnel must wear laser - and heat-resistant protective gloves.</p>
	<p>Wear protective clothing</p>	<p>The symbol indicates that personnel must wear protective sleeves and outerwear against laser exposure and heat.</p>
	<p>Put on helmets</p>	<p>The symbol indicates that personnel must put on the helmet against laser and heat. Personnel operating the laser tool must wear a laser specific mask in combination with laser specific glasses</p>

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, eyewear) 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 Laser Safety Innovation USA, LaserVision USA, Kentek Corporation, and Rockwell Laser Industries. While there are other laser personal protective equipment suppliers, THEO provides these names for convenience only, without endorsing or recommending any specific supplier, product, or service. Furthermore, THEO 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. For all personnel in the laser-controlled area, THEO recommends wearing personal protective equipment, including IR safety glasses and helmet shield devices, to protect the eyes from any reflected or scattered laser beam as well as welding strong light, ultraviolet light and heat and sparks.

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 welding 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 and flame-resistant gloves, hats and outerwear with long sleeves.

3. Fire Hazards

The heat and sparks generated during welding can ignite 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 airborne 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.*

7. 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

- *. Never attempt to perform service on the laser power supply or torch optics past the protective window. If required, contact THEO technical support for service. 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.*

8. 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." This radiation can lead to various health issues, such as conjunctivitis, photochemical damage to the retina, and sunburn-like reactions on the skin.

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

9. 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 most process and environment related hazards while welding. If welding in a loud/noisy environment, ensure that you are wearing anti-noise earplugs to protect your hearing throughout the laser welding process. Welding helmets also shield welders from risks such as molten metal spatter, airborne metal fragments, and sparks. All individuals stationed near laser welding activities must also don proper personal protective gear.*



Hazards during welding ----- Wear personal protective gear!



WARNING

- *While welding, be mindful of potential hazards and take the appropriate 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. Containers with unknown contents should be regarded as combustible. Additionally, always keep a fire extinguisher nearby, and ensure that all welding personnel have undergone comprehensive training in fire extinguisher usage.*

10. 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.*



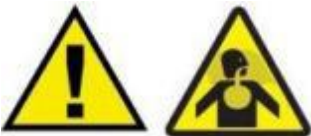
WARNING

- Operators and observers must always remain vigilant about potential reflections. If the laser settings are not configured correctly to produce a stable weld pool, 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.
 3. Ensure gas tube is positioned to the correct defocus value for the welding process selected, as displayed in Table XXXXX, or displayed on the UI depending on the MA1 unit's firmware version.

WARNING

- To ensure safety and proper shielding gas coverage, equipment operators are advised to use only the round-tipped nozzle tips. For the part number of THEO 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.

11. Hazard of Welding Smoke



WARNING: BEWARE OF THE DANGERS OF INHALING WELDING SMOKE!

- *Welding "smoke" contains 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 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 ventilations 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 oxygen 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. If the job conditions allow for it, always don a particulate respirator rated for welding applications and wear based on manufacturer's instructions
- 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.

12. 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.*
- *Gas cylinders in a laser welding area should be protected from potential reflections or beam strikes by separating the cylinders from the work surface with a panel of sheet metal. 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.

13. 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 free of damage. Any dust on the head assembly may cause damage to both the window and the laser. Any variations in laser power (the ability to produce and/or maintain a weld pool) should warrant an inspection of the protective window. Avoid direct observation of the laser aperture, such as the output optical fiber or the welding connector, when the device is powered on. It is mandatory to wear IR specific safety glasses, in combination with a helmet while operating or handling the product. Individuals in proximity must also wear the same safety gear, IR safety glasses at a minimum*
- *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, NEVER look 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.*
- *No matter what, some type of solid light proof enclosure must surround the laser welding area during operations. Ordinary sheet metal panels placed flush together are suitable if laser specific curtains cannot be sourced or utilized.*



WARNING

- *Even outside of factory warranty, NEVER open any optical components of this unit while power is connected. To perform these actions, always verify that the switch is in the "off" position and that the device is unplugged from AC power.*

14. 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. Understanding proper tool positioning and how laser reflections work will allow operators to avoid potentially damaging the unit while performing ordinary welding applications.*
- *The laser has the capacity to inflict burns on skin, clothing, and paint. It possesses the potential to melt 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.*

15. Electrical safety



WARNING

- *Ensure that all electrical and welding gas connections are properly connected and secured the appropriate hardware before powering on 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).*

16. 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. Constantly operating at higher temperatures can shorten the lifespan of the machine, increase threshold current, and decrease slope efficiency. If the device overheats, discontinue use and contact THEO 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 THEO 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 MA1 series laser products fall under Class 4 classification, as per EN 60825-1, Chapter 8.*

6 - General Safety Instructions

1. Mirror Reflection

When firing the process beam, 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. Always have the “barrel” of the welding torch facing towards a solid, light proof surface like a wall (made of non-flammable materials), sheet metal panel, or laser safety enclosure during welding operations.

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 due to back reflection can damage the photosensitive elements within the optical accessories of the handheld laser welding machine, so pay close attention to tool approach angle, machine power parameters and the condition of the protective window and torch consumables.

WARNING

- *The output laser intensity of THEO 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, THEO strongly recommends you follow these guidelines:

- (1) Never look down the barrel 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) When not in use, please ensure that the handheld laser welding machine is turned off and the power supply is disconnected, to protect the lens, contact nozzle tip, wire feeder assembly and power supply from potential power surges. (7) When troubleshooting, recalibrating and adjusting the defocus position, please do it under the condition of no laser. Deactivate with either the laser enable button on the UI, or via the mechanical locking key on the front of the unit.
- (7) 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 any and all warranties will be voided. THEO will not be held responsible for any damages or injuries incurred by unapproved use of this machine.

NOTICE:

- *The optical output of the handheld laser welding machine will be transmitted after passing through a focus lens and a protective window, both treated with an anti-reflective IR rated coating. Any dust or debris present on the lens can cause serious damage, potentially resulting in the burning of the handheld laser welding machine fiber cable 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 fumes that may be generated during the operation of the handheld laser welding machine.*

WARNING

- Select appropriate safety protection equipment based on the laser output power and wavelength requirements.
 - *Never look down into the aperture of the gun, and always wear IR rated safety glasses when the machine is powered on.*

4. Electrical operating Guidelines for the Handheld Laser Welding Machine

THEO strongly advises you to carefully read the following operating instructions before using the handheld laser welding machine:

- (1) Ensure that the machine's electrical ground cable is securely fastened to the machine and work surface; 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) 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.
- (4) Users should not attempt repairs on parts, components, or assemblies other than the gun head consumables. All power supply and optical maintenance and repair operations should be performed by THEO professionals.
- (5) Unauthorized disassembly and reassembly of the handheld laser welding machines is strictly prohibited, as doing so may result in electric shock or burns, and will void any and all warranties and consumer protections described in this manual..
 1. machines is strictly prohibited, as doing so may result in electric shock or burns, and will void any and all warranties and consumer protections described in this manual..
- (6) 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.
- (7) Do not weld on containers holding flammable or combustible substances. If a container's content is unknown, assume they are flammable or combustible. Keep fire extinguishers nearby, easily accessible, and ensure personnel are trained to use them.
- (8) 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 fatal 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, immediately power off the unit and disconnect from power source. Immediately call THEO technical support 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. While not required by law, THEO encourages all end users of our handheld laser tools to attend and complete a Laser Safety Officer (LSO) certification course.

THEO 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 THEO 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 debris from the air inlet.

7-Additional Safety Information

For more information on laser safety and corresponding jurisdictional standards where applicable please refer to the following resources:

Laser Institute of America (LIA)

13501 Ingenuity Drive, Suite 128 Orlando, Florida 32826

Phone: 407 380 1553, Fax: 407 380 5588 Toll Free: 1 800 34 LASER

American National Standards Institute

ANSI Z136.1, American National Standard for the Safe Use of Lasers (Available through LIA)

International Electro-technical Commission IEC 60825-1, Edition 1.2

Center for Devices and Radiological Health

21 CFR 1040.10 - Performance Standards for Light-Emitting Products US Department of Labor -

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

Laurin Publishing Laser safety equipment and Buyer's Guides

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. No matter what position the welding process calls for, make sure there is a light proof surface behind or underneath the workpiece to absorb the process beam in case of overpenetration (burnthrough).

4. REFLECTED BEAM HAZARDS

Highly reflective metals, such as aluminum , 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. ; Always wear recommended protective equipment when operating laser devices.

All users within the laser control area must read the entire user guide and complete basic laser safety and unit operation 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

THEO 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 THEO 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

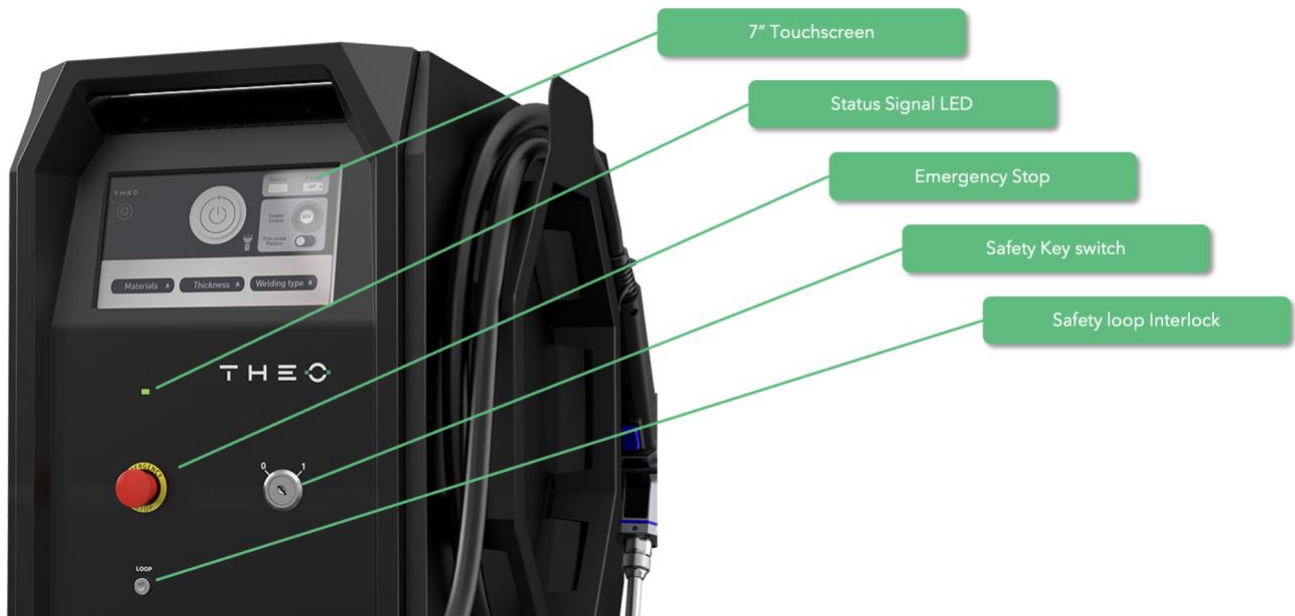
THEO assures that this product has undergone rigorous testing and inspection before packaging and transportation, ensuring compliance with published standards and procedures. Upon receiving this product, kindly examine the packaging for any signs of external damage; inspect the equipment for potential damages, and promptly notify both the carrier and THEO 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.

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 Interface
OUTPUT	Torch interface



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



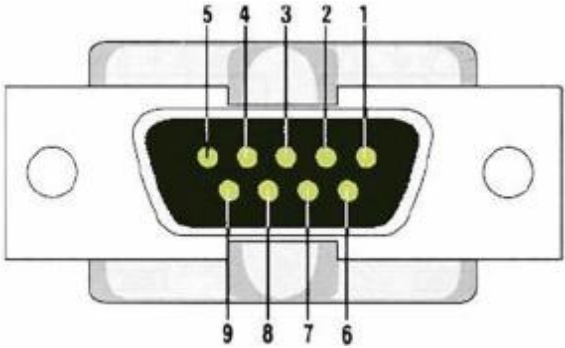
REAR PANEL NAME	DESCRIPTION
ON/OFF	200-240VAC AC power switch
EX-CTRL	External control interface (For Safety & Cobot)
RS232	Welding platform RS232 interface
POWER	200-240VAC AC power input
FEEDER	Wire feeder interface
GAS_IN	Protective gas inlet port



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

5.2. RS232 Interface Description

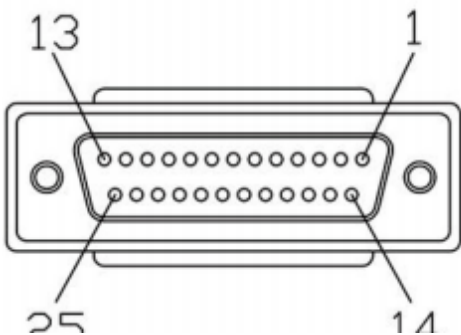
PIN#	DESCRIPTION
1	N/A
2	RxD Serial data input
3	TxD Serial data output
4	N/A
5	GND
6~9	N/A



5.3. EX-CTRL Description (Security interface) (DB25)

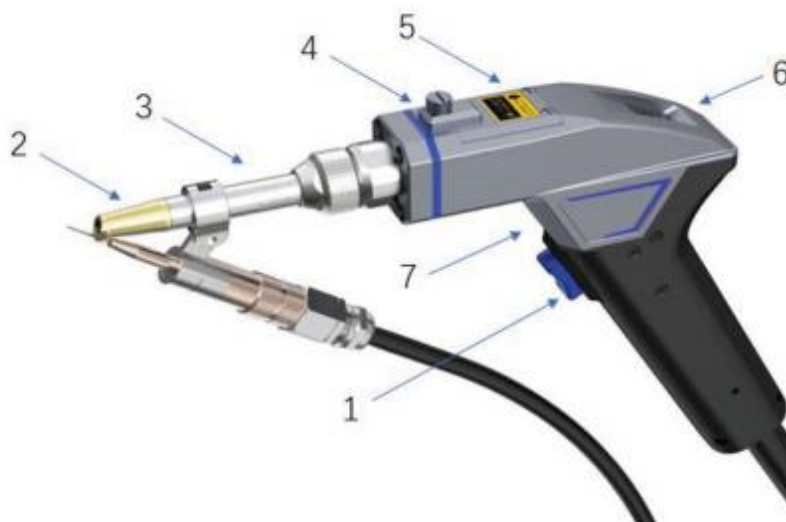
(Note: Bold font is the basic function, the other functions are optional for the Cobot)

PIN #	SIGNAL NAME	TYPE	FUNCTIONALITY
16	EX-CTRL+	IN	External Start (Optional Function) External control Laser Emission ON/OFF; when 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.
3	EX-CTRL-		
18	Enable+	IN	Laser Enable (Optional Function) Laser Enable ON/OFF; when voltage is high (24V), Laser Enable is ON. when voltage is low (0V), Laser Enable is OFF.
5	Enable-		
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 fired without the two pins connected. DO NOT connect an external voltage.
20	EXLOCK1+		
9	EXLOCK2-	Contact Closure	Interlock2 Input External Safety interlock; Potential free contacts. Laser cannot be fired without the two pins connected. DO NOT connect an external voltage.
22	EXLOCK2+		
19	EMG1 +	IN	Emergency Stop Input1 When 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 When 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 -		

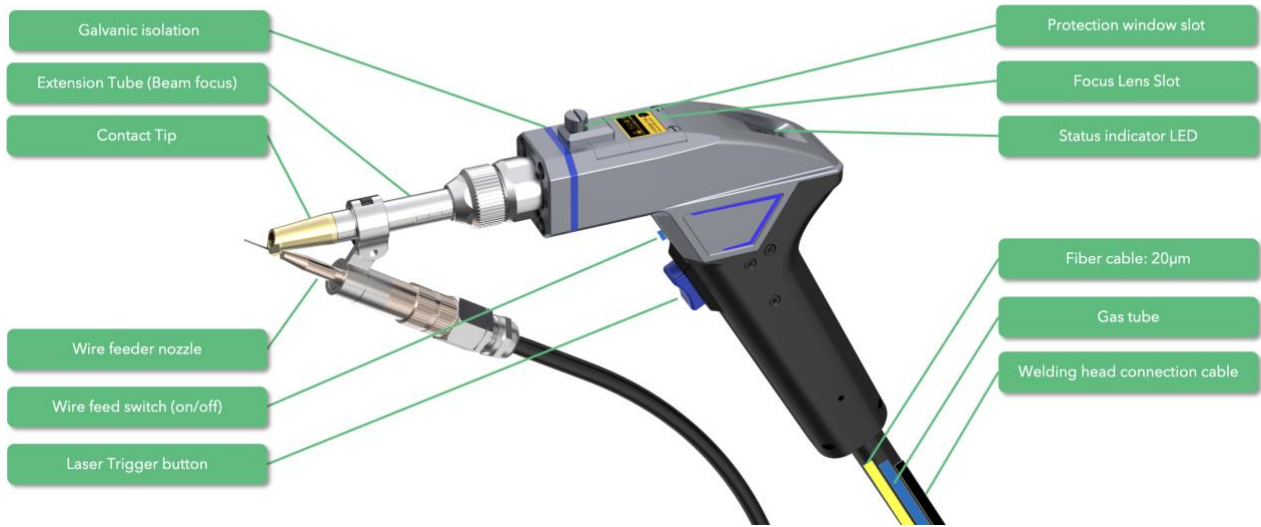


6. Torch Instructions

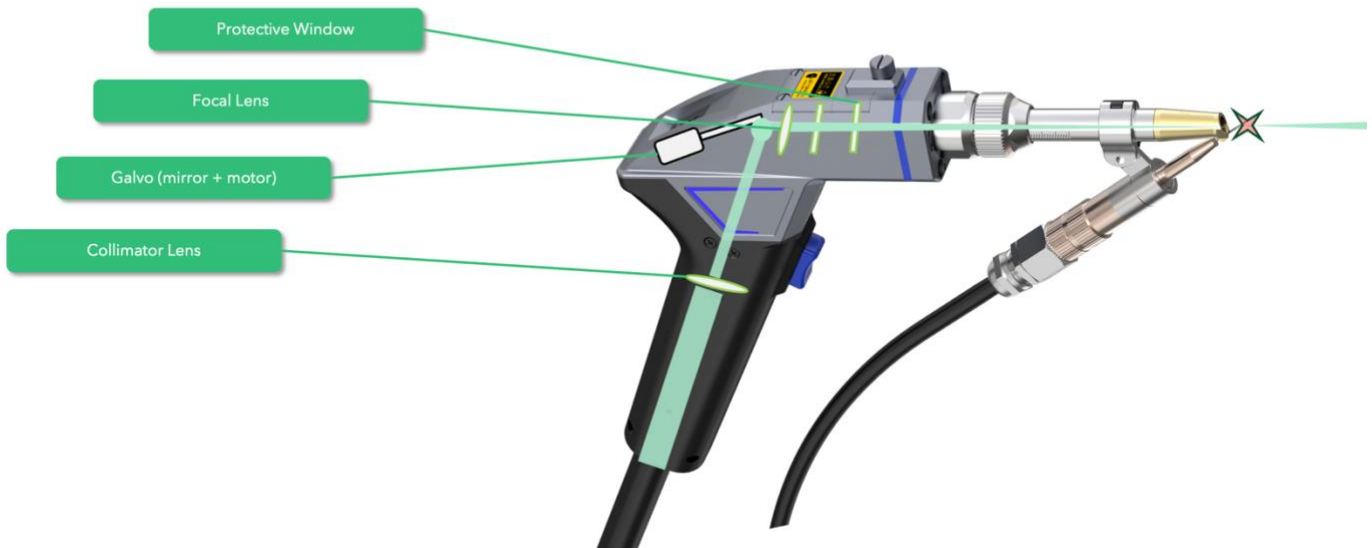
NO.	DESCRIPTION
1	Laser Trigger Button
2	Contact Tip
3	Extension Tube
4	Protective Window Subassembly
5	Focus Lens
6	Status Indicator
7	Feed Wire Switch



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.



MA1 Welding Torch (Optics)

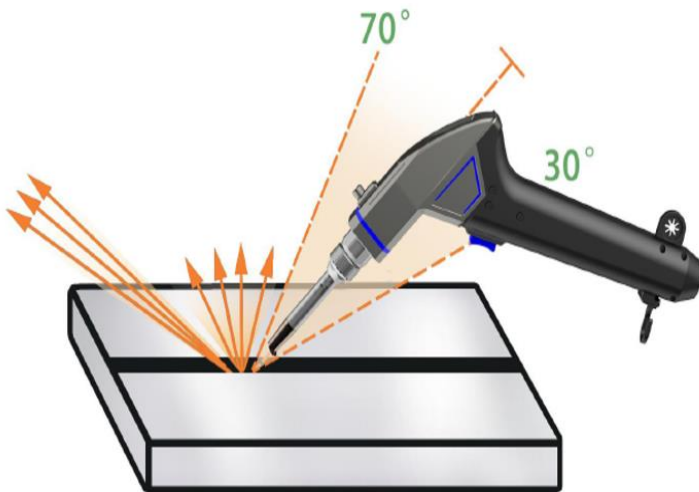


NOTICE:

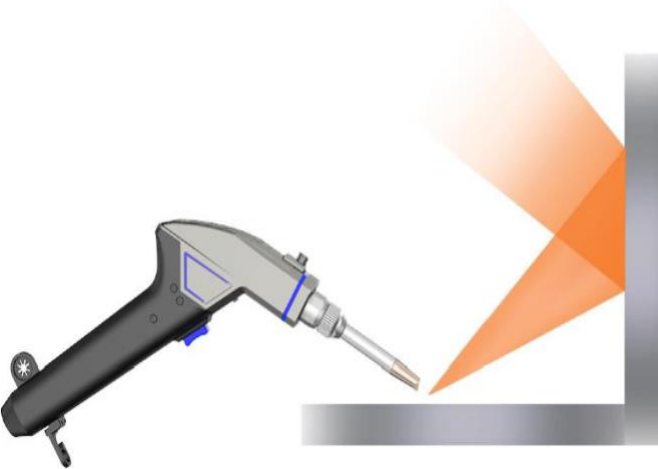
- Please pay attention to the following when using the welding head:
The welding head serves as the point of contact during welding operations. Ensure that the contact tip of the welding gun or, for wire assist processes, the end of the filler fire with guide beam visibly centered on the wire is in direct contact with the workpiece to establish a proper interlock feedback loop before proceeding with any welding operations. It is highly recommended to maintain a smooth surface on the welding workpiece to minimize wear and tear.

PRECAUTIONS FOR WELDING GUN ANGLE:

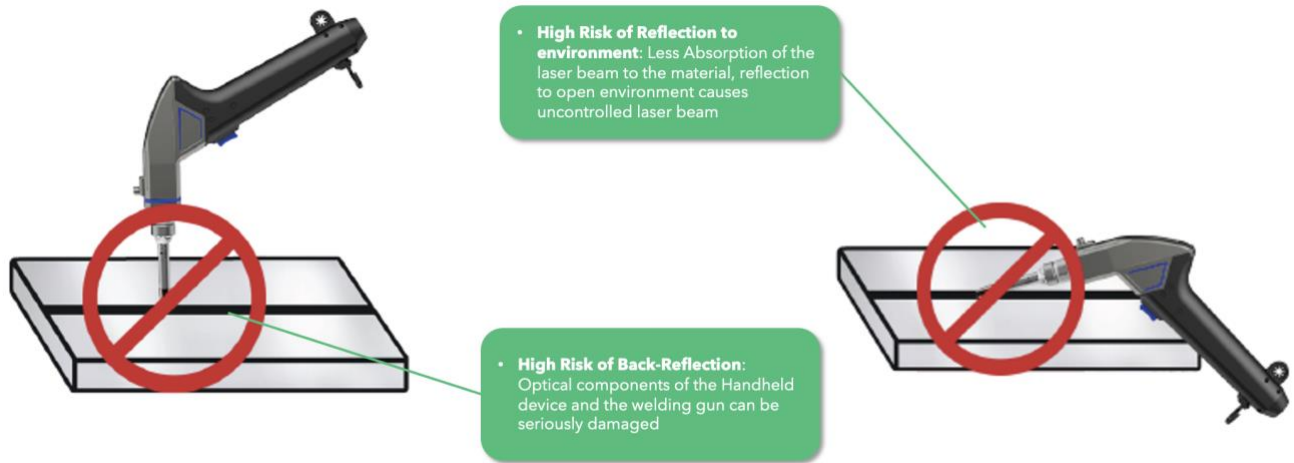
(1) As shown in the diagram, during welding, it is recommended to maintain a gun head angle between 30° and 70°. Personnel involved should stand at the back of the reflection area to avoid standing in the laser reflection zone, as it may pose a danger.



(2) As shown in the diagram, when welding, multiple reflections should be taken into consideration, and proper safety precautions should be taken.



(3) As shown in the diagram, during welding, improper welding gun angles should be avoided to prevent damage to the gun head.



WELDING TORCH INDICATOR LIGHT DESCRIPTION

INDICATOR COLOR	ILLUSTRATE
Yellow blinking	Standby Mode - ready to fire (weld)
Green solid	Process beam firing (unit is welding)
Red	Fault State - unable to fire laser until conditions corrected

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°C/79 deg F	700	800	W
				1000	1200	
				1400	1500	
4	Power Tunability		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	4.3 meters/ 14.1 feet			m

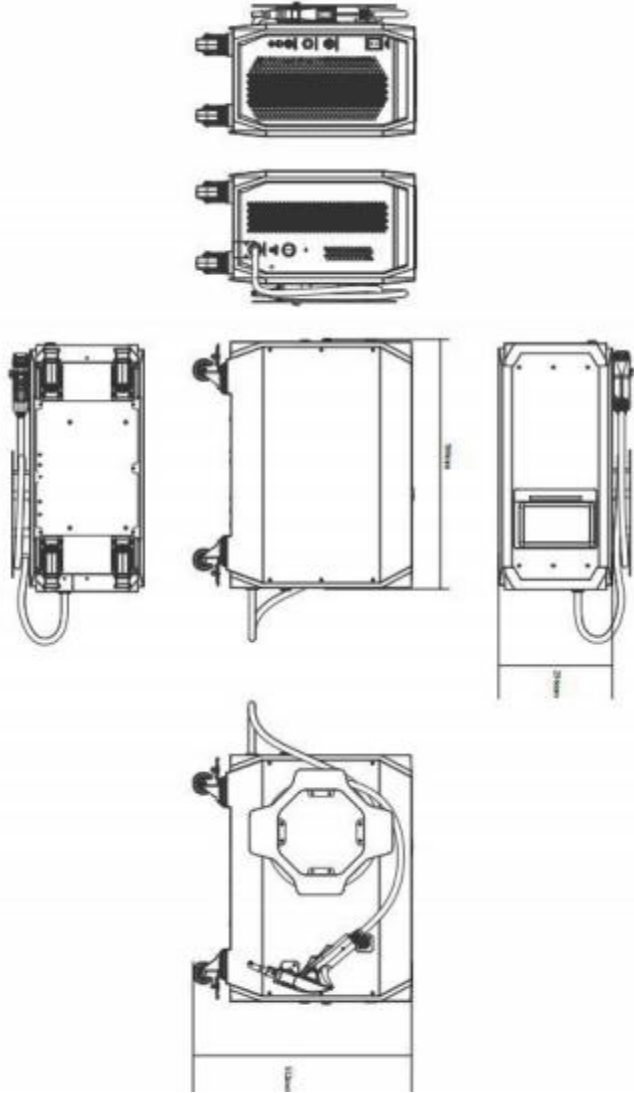
	MA1-45&MA1-65	5.6 meters/18.4 feet
14	Bending radius of optical fiber armored cable	200m m/ 7.9 in
15	Output form	QCS integrated with the torch
16	Continuous light output time (S)	Light 120S, stop 6S

2. General Characteristic Parameters

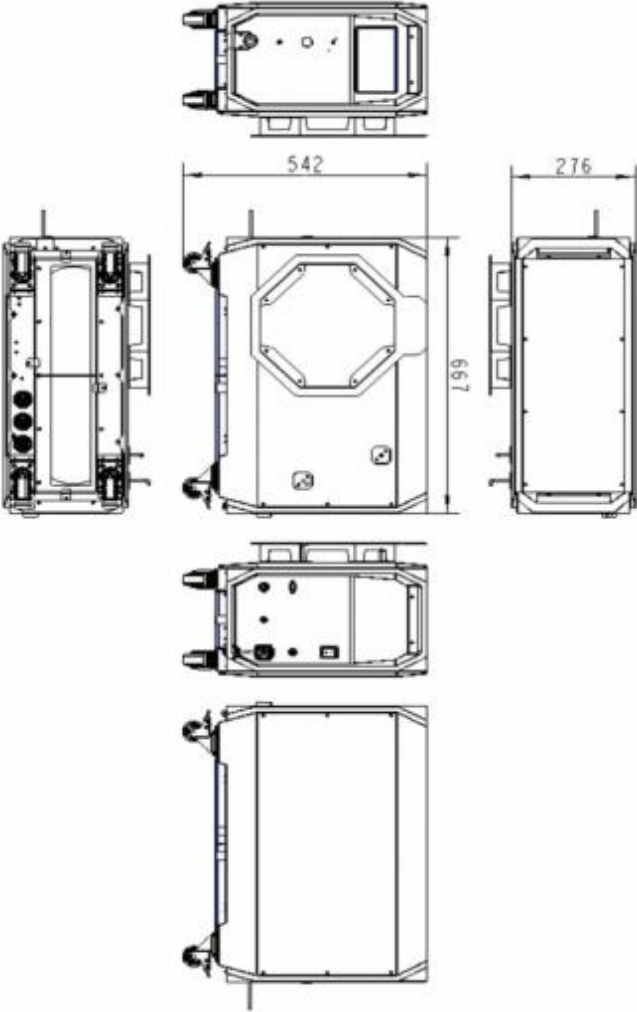
NO.	CHARACTERISTICS	TEST CONDITIONS	MIN.	NOM.	MAX.	UNIT
1	Operating Voltage		200	220	240	VAC
2	Input Power	100% output/MA1-35			3	KW
		100% output/MA1-45			4.8	
		100% output/MA1-65			6	
3	operating Ambient Temperature		0		40	°C
4	Operating Ambient Relative Humidity		10		85	%
5	Laser cooling method	Phase change heat dissipation				
6	Cooling method of tip	Nitrogen and argon cooling				
7	Storage Temperature		-10		60	°C
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, THEO 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.



1) Lift the box



2) Takeout the welding head and accessories



3)



CAUTION:

- Do not use cable accessories to lift or move equipment.

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.

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, THEO 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 work surface or an outdoor grounding pole.

4. Securely Lock the Connection

Ensure a Secure Connection Before Activating the Laser

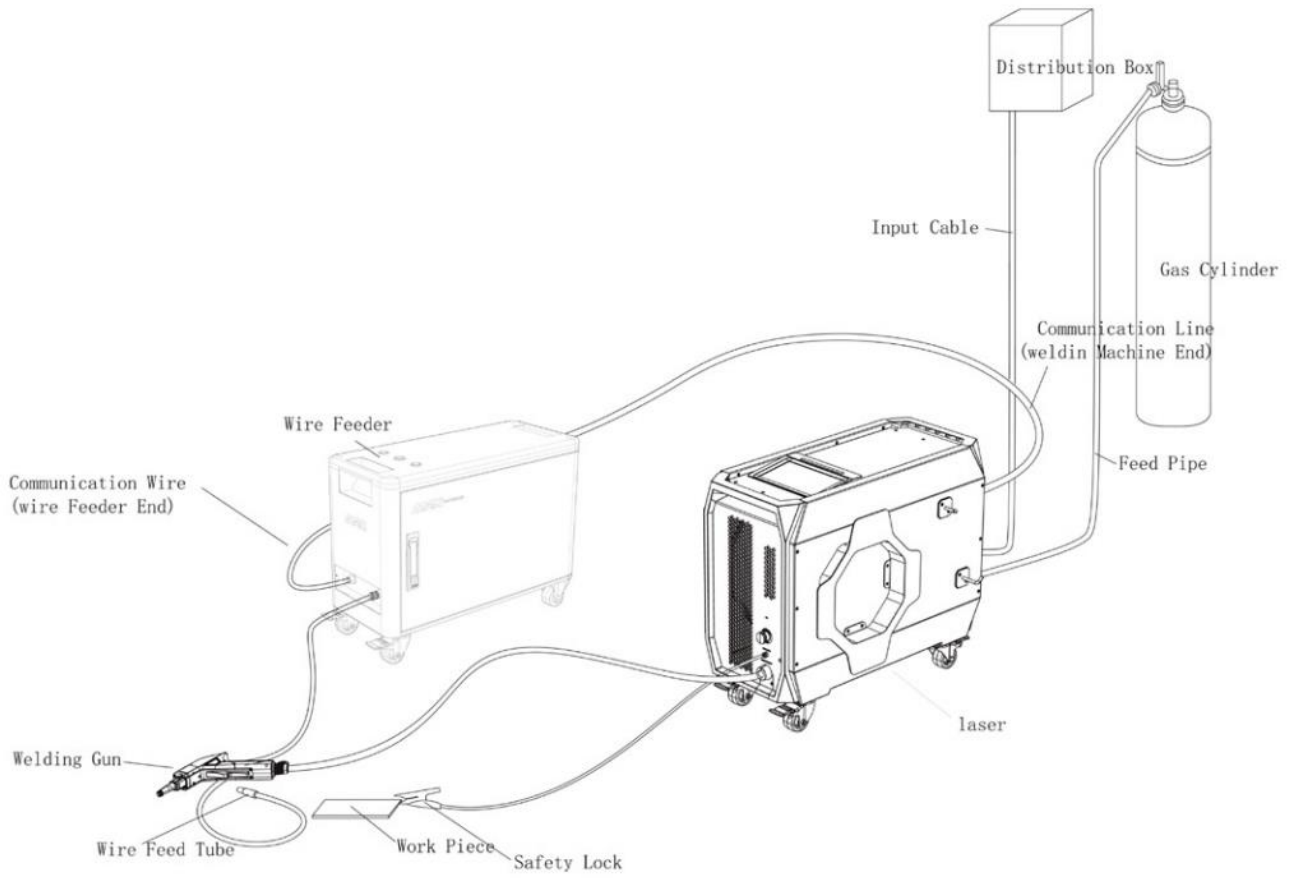
Prior to switching on the laser, it is crucial to attach the safety lock to the loop interface of the laser device. During laser preparation, fasten the other end of the safety lock (alligator clip) onto the workpiece or immediate work surface. This ensures that the alligator clip and the welding head 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. Insufficient gas flow may trigger an alarm on the unit, or produce a heavy, excessive weld plume near the pool which may foul the optics and damage the contact tip and gas nozzle tube.

Device Connection Diagram



6. Wire Feeder Instructions and Installation Guide

Introducing the THEO Welding Wire Feeding System, launched in 2022. This innovative system features our independently researched and developed control system and provides users with convenient filler-assisted welding options across all processes. The versatile multifunctional wire feeder is fully compatible with THEO' hand-held laser welding products.

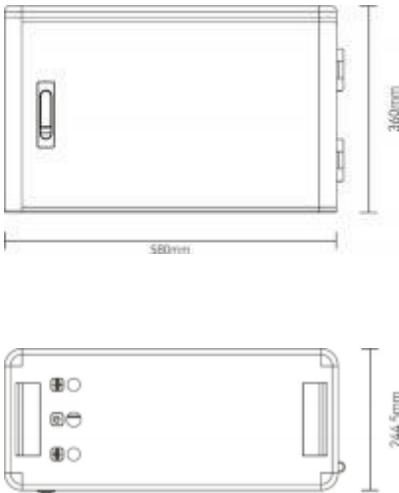
1. Operating environment and parameters

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

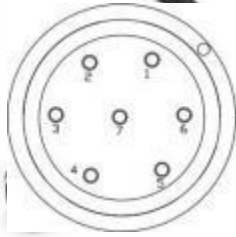
FEATURES:

- (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.
- (2) Supports wire feeding/drawing speeds ranging from 2 to 100mm/s, offering both continuous and pulse wire feeding options, allowing for the aesthetically pleasing, tacked-coin appearance of TIG welding beads. .
- (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 (up to 4mm toe width), this wire feeding machine is both versatile and effective.

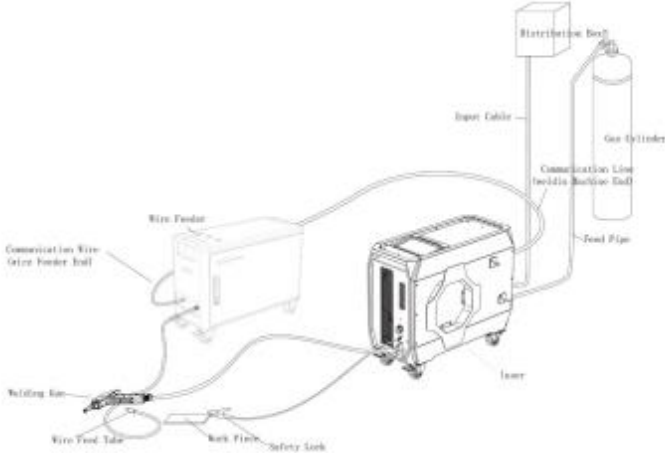
Welding wire diameter compatibility: 0.8/1.0/1.2/1.6mm

4. General definition of circuit connection

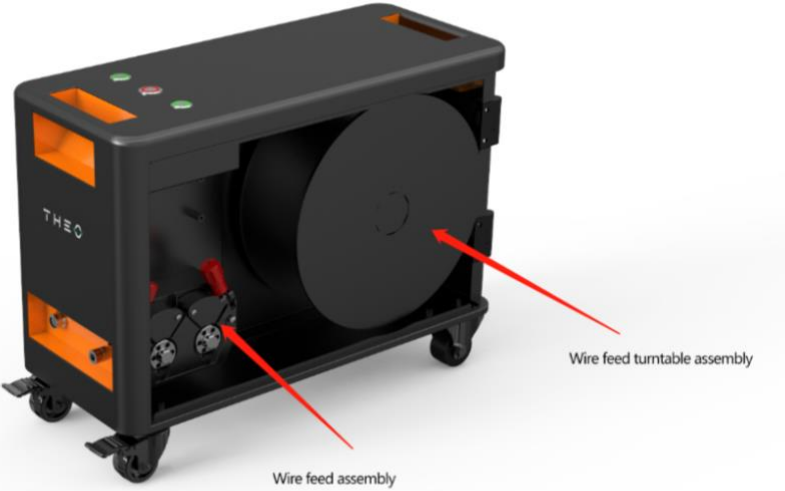


CONNECTION DEFINITION	
1 , 2 pins	Connect to power +24V
3 pins	Signal input/low level is active
4 pins	Connect to the power GND
5 pins	Shell PE
6 pins	Enter RX for the serial port
7 pins	Serial port output TX

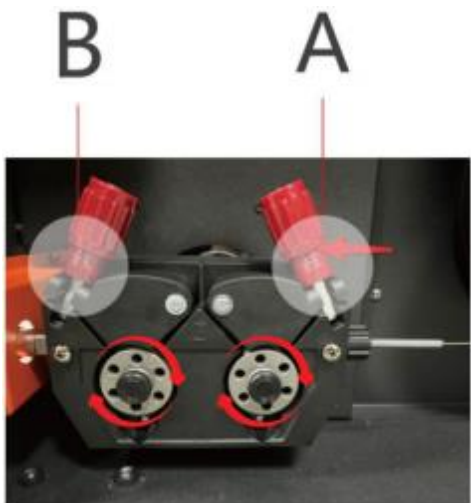
5. External wiring method for wire feeder



6. Installing Wire Spool 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. Note wire roller fixing screws are reverse threaded - left to tighten.
3. Roller Wheel Selection: Based on the diameter of the welding wire used, choose the appropriate wire feeding gear. For steel and other hard welding wires, select a V-shaped gear; for softer aluminum and metal powder cored welding wires, opt for a U-shaped gear. NEVER, UNDER ANY CIRCUMSTANCES, ATTEMPT TO LASER WELD ANY FILLER WIRE CONTAINING FLUX. SEVERE OPTICAL AND TORCH DAMAGE WILL RESULT.



Clockwise

ATTENTION:

- *Loosen the screw in the clockwise way!!*

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 MA1 unit.
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 underside of the torch's gas nozzle.
3. The main types of tubes available for use are graphite tubes, stainless steel tubes, and Teflon tubes.

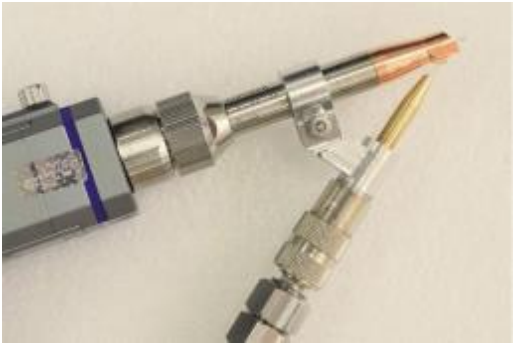
8. Wire Feeder and Torch Connection



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 tip to align with the center of the wire groove in the contact tip. Lastly, adjust the length of the wire feeding tube so that the wire feed nozzle is close to the welding copper nozzle. Proper configuration will see the wire resting securely in the groove of the contact tip, but without pressing up into the tip which will lead to friction and inconsistent wire feed rates.


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 to toggle manual wire feed, typically during daily troubleshooting or maintenance procedures. Jog by tapping the button, or hold down the Button for roughly two seconds to maintain a manual wire feed. Tap the button again to end the feed.

3. Manual Pull-Back Button:  This button is used to toggle 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. Jog by tapping the button, or hold down the Button for roughly two seconds to maintain a manual wire feed. Tap the button again to end the feed.

10. Maintenance and Troubleshooting of Wire Feeders

1. CHECK REGULARLY:

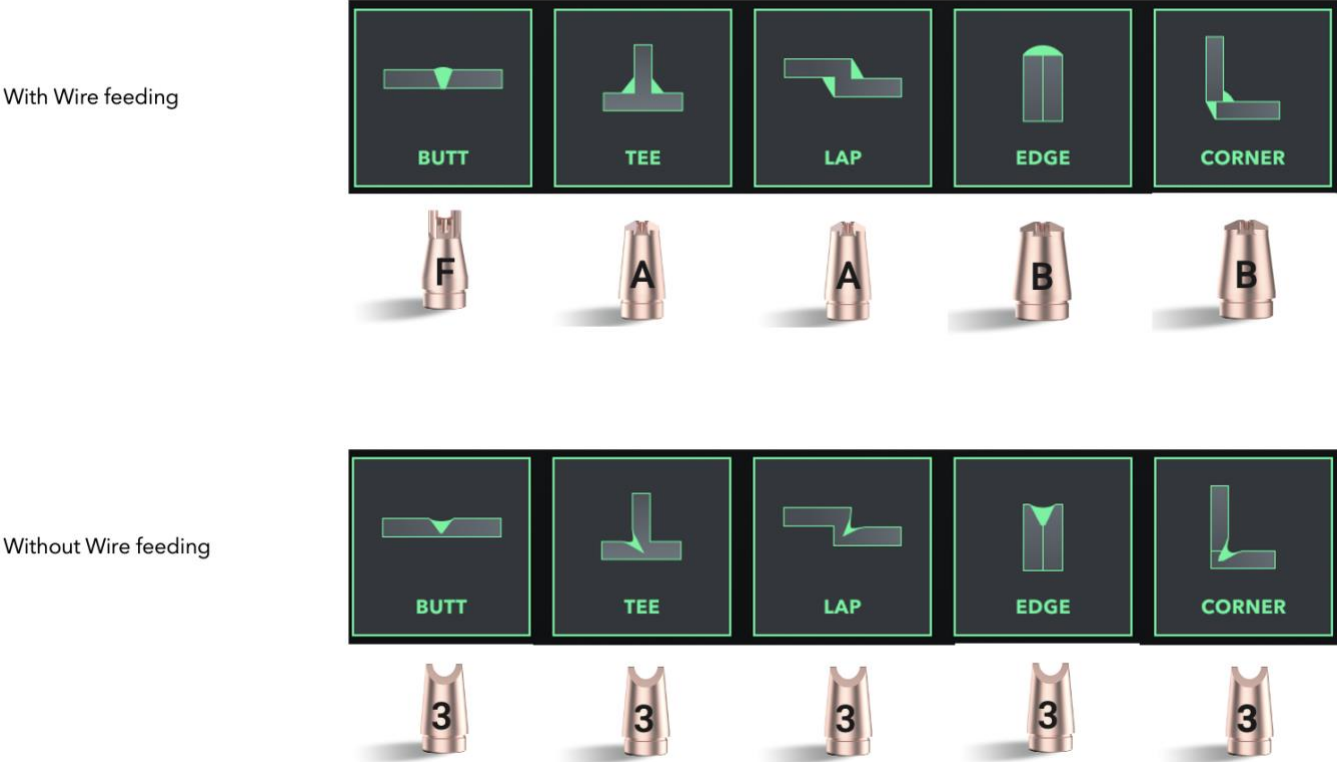
Regular Inspections: Before using the wire feeder, ensure to examine the following components for any damages:

- (1) Control cables and their connectors
- (2) Linked MA1 Power supply and functionality of the wire feeding button
- (3) Switch locking mechanism

11. Routine Maintenance

- (1) Inspect the wire spool and mounting hardware, wire roller wheels and pressing wheel:
 - (1) 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:
- (3) 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.
- (4) Check the motor: Listen for any abnormal sounds coming from the motor.
- (5) Clean the equipment: Thoroughly clean and purge the equipment at least once a month or when visibly soiled. Excessive metal dust can damage any electronic device.

Selecting the Appropriate Wire Feeder and Welding Tip:



When it comes to wire-assisted welding, it's essential to choose a contact tip with a proper wire slot to ensure accurate welding wire position and smooth wire feeding.



WIRE FEED NOZZLE 0.8-1.6MM

Wire feed speed may be adjusted under Wire Feeder Settings in the Advanced Options menu of the MA1 UI. Ensure wire feeder mechanisms are configured and aligned properly whenever changing filler wires or if there are inconsistencies in wire feed rate.

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.
 - *NEVER look at the laser outlet during operation. Always wear appropriate safety gear such as protective laser safety eyewear, soundproof earplugs if necessary, and masks before operating the laser.*
 - *Prior to wiring, make sure all the power switches of the laser are switched to the off position.*

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 shielding gas tubing (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
 - (1) parameters (laser power, wobble width and frequency, gas pre-flow and/or post-flow, power ramp-up and/or ramp-down options, light output mode, etc.).
- (7) Manually activate gas flow using the "Gas Manual" option in Advanced Settings and adjust the protective gas flow to 15-20 L/min or roughly 25 to 40 CFH to start.
- (8) Attach the interlock alligator clip to the workpiece intended for welding.
- (9) Activate the "Laser Enable" switch. A final eye protection warning should display. Don the included or comparable IR safety glasses at this point if you haven't already.

- (10) Perform a dry run with the visible guide beam before firing the process laser. This is a good opportunity to visualize your own approach to welding the joint and adjust wobble width to match joint width if necessary. Press and hold the torch trigger to fire the process beam.

13. Welding Process Parameters

HHW WELDING PROCESS PARAMETER TABLE								
Material	Welding Form	Thickness (mm)	Power (%)	Wobble (mm)	Wobble Frequency (Hz)	Defocus (mm)	Gas Flow (L/min)	Performance
Carbon Steel (Q235B)	Stitch	1	45	2-3	60~80	-1~1	15~20	Penetration
	Stitch	1.5	100	2-3	60~80	-1~1	15~20	Penetration
	Stitch	2.5	100%/D2	1.5-2	50~70	-2~1	15~20	Penetration
Stainless steel (SUS304)	Stitch	1	45	2-3	60~80	-1~1	15~20	Penetration
	Stitch	2	100	2-3	60~80	-1~1	15~20	Penetration
	Stitch	2.5	100%/D2	1.5-2	50~70	-2~1	15~20	Penetration
Galvanized sheet	Stitch	1	55	2-3	60~80	-1~1	15~20	Penetration
	Stitch	2	80	2-3	60~80	-1~1	15~20	Penetration
	Stitch	2.5	100%/D2	1.5-2	50~70	-2~1	15~20	Penetration
Aluminum alloy (Al6061)	Stitch	1	80	2-3	60~80	-4~-2	15~20	Penetration
	Stitch	2	100%/D2	1.5-2	60~80	4~-2	15~20	Penetration

Remark	<ol style="list-style-type: none"> 1. The welding form is splicing welding, welding head ratio of 60:120,800 W laser fiber core diameter of 20 microns. 2. Shielding gas: steels - nitrogen (purity 99.99%), other materials - argon (purity 99.99%); 3. The power percentage is 10-100%, the wobble width is 0-4mm (2-3mm is recommended), the wobble frequency is 0-220hz (40-80hz is recommended for manual welding, and the gas flow rate is 15- 20L/min 25 - 40 CFH). Under the condition that other parameters remain unchanged, the wobble width or travel speed increases, and the laser power also needs to increase accordingly. 4. Welding speed = welding length/welding time (welding process travel speed is influenced by human factors; average travel speed is roughly 10-20mm/s) 5. Due to different customer welding process (gas flow rates, travel speed, degree of power density, welding approach angle), this data is for reference only. 6. D mode enabling condition: D mode can be enabled if the power is $\geq 90\%$ 7. MA1 unit operators must wear IR protective glasses, handheld laser welding machine welding operation needs to be carried out in an enclosed space with laser protection; non-welding personnel and combustible and flammable materials should be kept away from the laser welding area, 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	Thick ness (mm)	wire feed speed(mm/s)	Power (%)	Wobble(mm)	Wobble frequency	Defocus	Air flow (L/min)	Wire	Wire Diameter (mm)	Welding Effect
Carbon Steel (Q235B)	1	12~15	85%	2	40~80	1~-1	15~20	ER70S-6	0.8-1.0	Penetration
	2	8~10	100%/D2	2	40~80	1~-3	15~20	ER70S-6	0.8-1.0	Penetration
Stainless steel (SUS304)	1	12~18	85%%	2	40~80	1~-1	15~20	308 LSi Stainless steel	0.8-1.2	Penetration
	2	8~10	100%/D2	2	40~80	1~-3	15~20	308 LSi Stainless steel	0.8-1.2	Penetration
Galvanized sheet	1	12~18	85%	2	40~80	1~-1	15~20	ER70S-2	0.8-1.0	Penetration
	2	8~10	100%/D2	2	40~80	1~-3	15~20	ER70S-2	0.8-1.0	Penetration

HANDHELD LASER WELDING PROCESS PARAMETER TABLE - WIRE FEEDING

Aluminum alloy (Al6061)	1	12~18	95%	2	40~80	1~1	15~20	ER5356 Aluminum alloy	0.8-1.0	Penetration
	2	12~15	100%/D2	2	40~80	1~3	15~20	ER5356 Aluminum alloy	1.0	Penetration

Remark	<ol style="list-style-type: none"> 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 wobble width is 0-4mm (2-3mm is recommended), the wobble frequency is 0-220hz (40-80hz is recommended for manual welding, and the gas flow rate is 15-20L/min 25 - 40 CFH). Under the condition that other parameters remain unchanged, the wobble width or travel 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, Factory presets built into the MA1 system are calibrated to match laser power with wire feed speed consistently for a uniform bead deposit. 5. D mode enabling condition: D mode can be enabled if the power is $\geq 90\%$ 6. Process parameters are adjusted according to the actual wire material and wire diameter 7. Due to the different equipment configuration (wire feeding machine differences) and welding methods (wire feeding speed, gas flow rate, degree power density, tool approach 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:

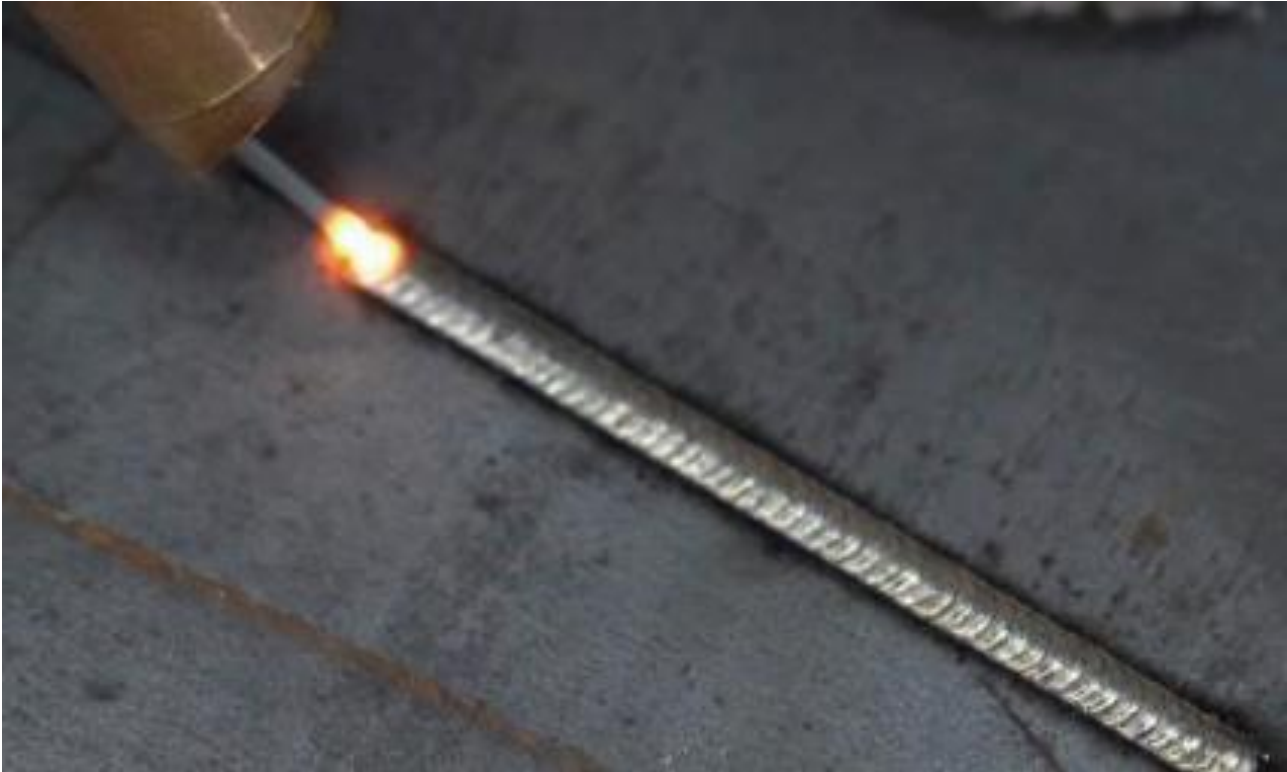
1. Ignition duration: 150ms (this parameter affects the size of the weld pool (toe width))
2. Interval time:40ms (this parameter affects the interval between two striatum) Fish scale pattern welding (In this mode, only the laser is turned off during the interval, and other settings such as on/off time 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 an aggressive tool-approach angle and use appropriate positive defocus (gun barrel scale: -2 to +4 range) to reduce back reflection, increase gas flow and reduce welding spatter. 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

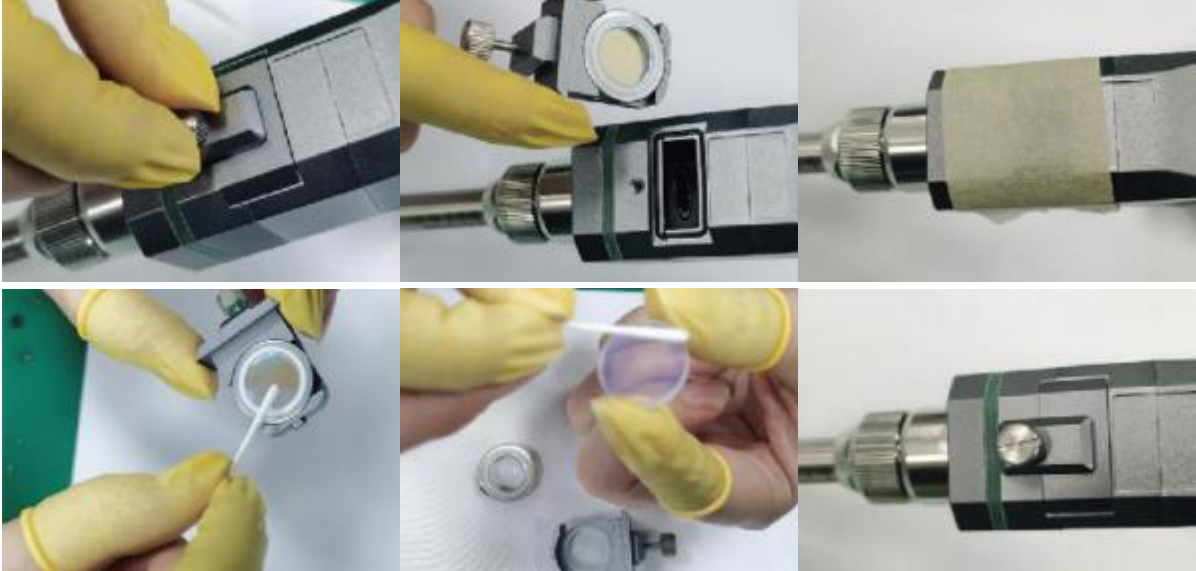
1. INSPECTING PRODUCT ACCESSORIES:

- (1) To clean the tip protective 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 or magnifier if necessary

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 (focus lens, gas tube, etc.) and affect welding quality.*
- *Unauthorized disassembly of the gun head and laser products will void the THEO warranty.*
- *Please wear powder-free gloves or finger cots when cleaning the product in a dust-free environment. THEO is not responsible for tip damage due to improper operation or incorrect cleaning procedures.*
- *When cleaning, the concentration of alcohol should be equal to or greater than 99.5%.*

2. CLEANING STEPS FOLLOW THESE PROCEDURES TO CLEAN AND MAINTAIN THE LASER WELDING MACHINE.



PROTECTIVE WINDOWS

The most common wear item to fail is the protective window in the torch. Regularly inspect the protective window and ensure its' cleanliness and integrity. Laser welding with a dusty or damaged protective window may cause damage to the welding torch hardware and optics and degrade welding quality.

Generally, a fouled protective window will result in the weld beam ramping down after a few seconds or less. A protective window with light dust or debris contamination may be cleaned with the steps outlined below. A chipped, burnt or otherwise physically deformed protective window must be discarded and replaced with a new one.

You will need the following supplies to clean the protective window:

- Powder-free rubber gloves or finger cots
- Lint-free microfiber cleaning cloth and cotton swabs
- Optical grade alcohol (purity >99.5%). If unavailable, 91% or purer Isopropyl may be used as a substitute.
- Artificial light source - white LED or fluorescent shop lighting should be adequate to spot surface contaminants.
- Masking or painter's tape - low-tack tape such as painters' tape is recommended as too much adhesive may lead to further contamination.
- Magnifier or microscope (not required, but helpful for easier viewing)

PROTECTIVE WINDOW CLEANING INSTRUCTIONS

- Turn off the laser switch and disconnect the power supply.
- Clean the area around the window housing. Do not blow air down onto the housing as this may force debris onto optical surfaces.
- If the protective lens holder cannot be immediately reinstalled, seal the lens cavity shell with low-tack tape.
- Loosen the locking screw of the protective lens holder shell.
- Unfasten the protective mirror housing thumbscrew from the gun head and pull out the mirror holder.
- Carefully examine the protective lens surface under a light source, using a magnifier if necessary. If dust or tiny particles are present, use a cotton swab to clean them:
- Dampen a cotton swab with alcohol, shaking off any excess.

- Position the cotton swab on the dust location on the lens
- Gently wipe the dust with the swab, moving it towards the edge of the lens, and discard the swab after use.
- Gently wipe the front of the lens with a clean cotton swab or clean cloth dipped in alcohol.
- Insert the protective window into the protective window sleeve, push the assembly into the protective mirror port on the torch and refasten the thumbscrew before powering on the MA1 unit.

IMPORTANT:

- *Use only NEW, LINT-FREE cleaning cloths and cotton swabs.*
- *DO NOT touch the protective window or cotton swab tip with bare fingers.*
- *DO NOT blow directly on the lens surface with your mouth as this may introduce new debris. Computer duster or clean compressed air may be used. Avoid blowing debris directly at the surface - instead use a side-blowing technique.*
- *DO NOT leave protective window portal open to outside air any longer than is necessary.*
- *Remember to wipe the protective window port cover and sleeve down with alcohol when cleaning or replacing a protective window.*

Replace Focus Lens Instruction

First, prepare 1 piece of new focusing lens, alcohol, cotton swabs, lint-free cloth, finger cots, patterned paper, and a Phillips screwdriver.

1. Prepare the tools.



2. Remove the nut above the protective lens.



3. Install the removed nut into the upper hole of the focusing lens drawer.



4. Loosen the two screws of the focusing drawer using a Phillips screwdriver.



5. Slowly pull out the nut from the focusing lens drawer



6. After pulling out the focusing lens, place the drawer aside



7. Cut a suitable amount of patterned paper to seal the gun body of the focusing lens to prevent dust from entering.



8. The focusing drawer has two lens pieces, with the focusing lens piece having a nut on one side.



9. Remove the plug seal.

10. Remove the old focusing lens to be replaced.



11. Install the new focusing lens, ensuring that the convex side of the lens faces downward.



12. After installing the plug seal, gently press with your finger to secure it in place.



13. After installation, check the focusing lens for dust and stains. If there are any stains, use a cotton swab dipped in a small amount of alcohol to clean it.



15. Tighten the two screws with a Phillips screwdriver to secure it.



14. Install the cleaned focusing lens drawer back into the gun body.



16. The focusing lens replacement is complete.



Chapter 7

Service and Maintenance

1. Maintenance Notes

CAUTION:

- *There are no user-serviceable parts inside. For all servicing needs, please consult with qualified THEO personnel.*
- *To ensure that repairs or replacements within the warranty scope can be carried out and to protect your interests, please contact THEO Technical Support or your local sales agent 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 THEO without first contacting Technical Support and obtaining an RMA.*
- *If the product is beyond the warranty period or outside the warranty scope, customers will be responsible for any repair costs.*

CHANGE:

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

Chapter 8

Warranty Statement

1. General Provisions

THEO Lasers Inc and 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, THEO Lasers Inc and 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.
- (5) 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 THEO within 31 days of discovery to be eligible for warranty coverage.*
- *THEO does not authorize any third party to repair or replace parts, equipment, or other THEO products.*

Chapter 9

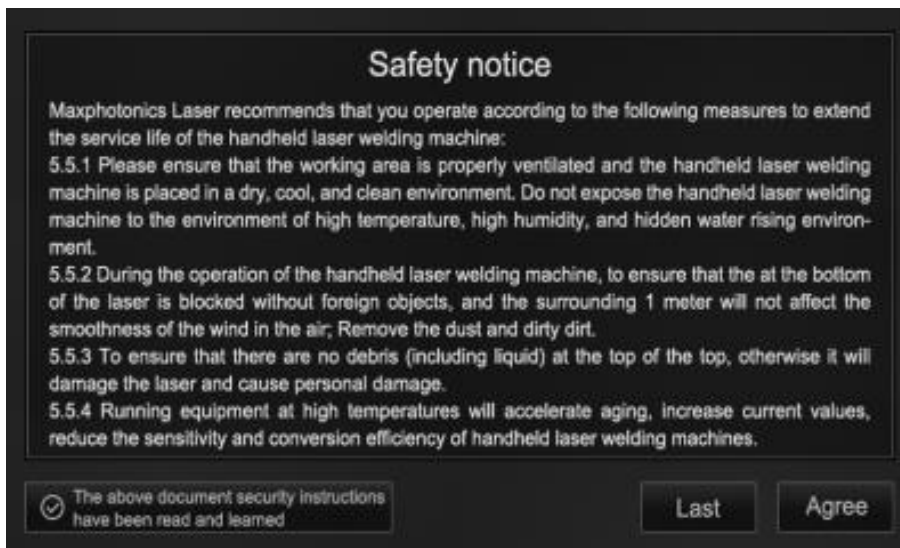
Operation GUI Description

The machine features a 7-inch touchscreen that is connected to the host via the UART interface. This connection enables equipment control and status monitoring functionalities.

1. Startup safety instructions

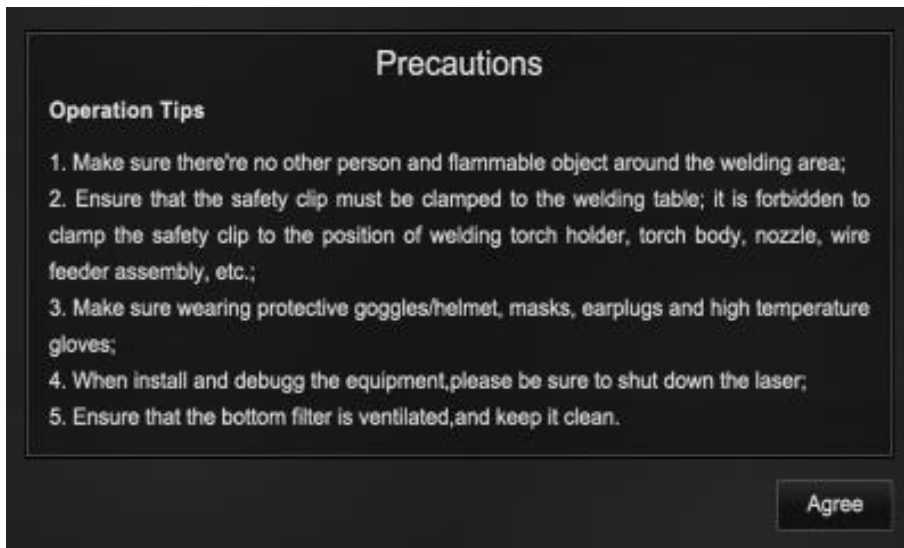
Upon first use, a detailed safety notice page will be displayed. It is important to carefully read and understand the safety notice. once you have read and

agreed to the safety notice, click the "Safety Notice of the above documents have been read and noted" button. Afterward, click the "Agree" button to access the operation interface in simplified mode.



The simplified safety notice Interface will be displayed every time the machine is powered on. It is crucial to carefully read and understand the safety notice.

Once you have read and agreed to the safety notice, click the "Accept" button to access the Basic mode operation interface.



2. Operation Interface

The operation interface offers two modes: Basic mode and Expert mode.

(1) Basic mode

operating in Basic mode is straightforward. Simply select the appropriate material, plate thickness, and welding mode. Then, click Laser Enable button. If all components of the machine are functioning correctly, you can begin welding. To initiate wire feeding, click wire feed button. To start fish scale welding, click the fish scale button.

The D mode has several options: off, -1, -2, +1, and +2. D+ mode can only be activated when the machine's power is $\geq 90\%$. By selecting different gears, the machine will increase the power accordingly to achieve better penetration. D- mode can only be enabled when the machine's power is between 11% and 49%.

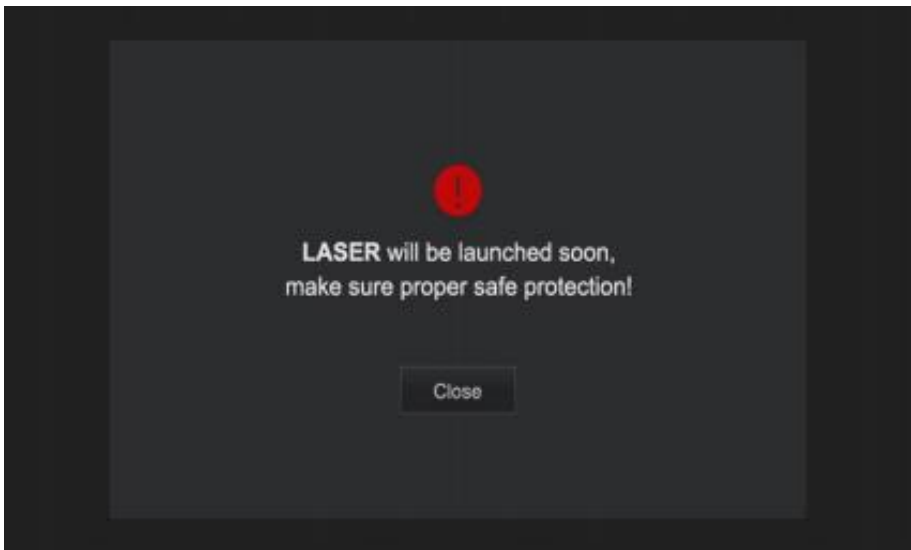
Different gears adjust power and light mode, facilitating the welding of thin plates with improved performance. (D mode is exclusive to MA1-35).

To access the professional mode operation interface and perform more advanced and detailed settings, click the Expert mode button on the left. In Expert mode, you can configure parameters and check the machine's status. This mode allows you to troubleshoot and resolve any alarm faults before starting the machine.

The operation interface of Basic Mode is as follows:



When in Basic mode, click Laser Enable button. A pop-up window will appear, indicating that the laser has been activated and protective gear must be worn. Please ensure safety precautions and click confirm to officially start the device.



(2) Expert mode

The expert mode operation interface enables advanced welding settings and detailed configurations.

Expert mode consists of four sub-interfaces: Home, Status, Warning, and Details.

HOME

Here, you can set the Wobble Width, Laser Power, and Wobble Frequency. Tapping the input box in the middle of the dial will display a numeric keypad, allowing you to enter the desired values.

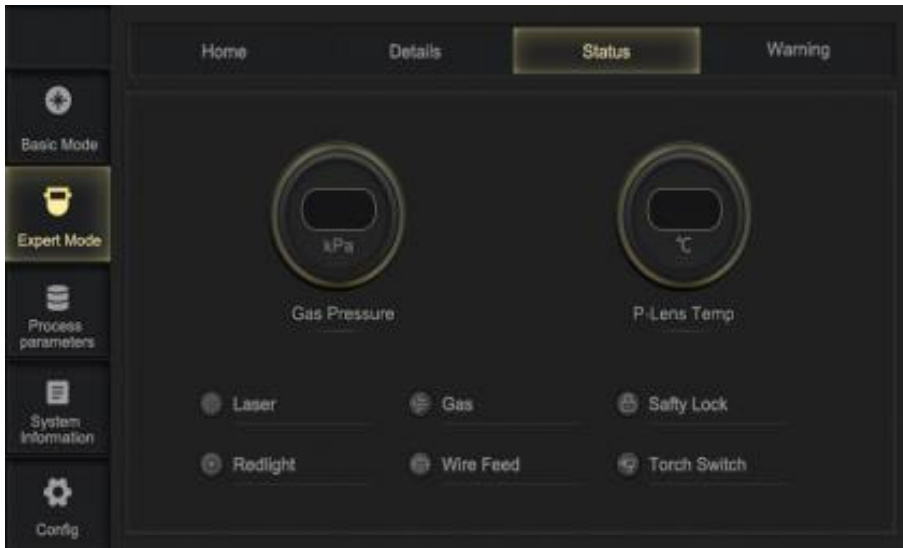


FUNCTIONAL CLASSIFICATION	FUNCTIONAL	REMARK
Action buttons	Laser Enable	Laser Enable button for starting laser welding.
	Laser power	0~100% adjustable, 100% power setting for the machine nominal maximum power.
	Wobble Frequency	Laser reciprocating scanning frequency, the maximum scanning frequency is 220Hz in full amplitude state, and the scanning frequency can be raised accordingly in small amplitude state.
	Wobble Width	0 ~ 4 mm is adjustable.
Setting item	Laser Enable	Working laser enable, mainly used for making adjustment machine without laser state. Red enables laser, gray disables laser.
	Gas Manual	Manual gas delivery can be enabled or disabled. Manual gas purge/flow is enabled in red, and off in gray.

FUNCTIONAL CLASSIFICATION	FUNCTIONAL	REMARK
D mode (only for MA1-35)		1. When power is $\geq 90\%$, D+ can be opened; 1-2gear adjustable, the same power under the maximum power of 2 gear 2. When power is $11\% \leq \text{power} \leq 49\%$, D- can be opened and -1 and -2 gears are adjustable
Wire feed		Wire feed can be enabled or disabled.

STATUS

This interface displays the current gas pressure and optics temperature. It also provides information about the machine's working status, giving you real-time updates on its performance.

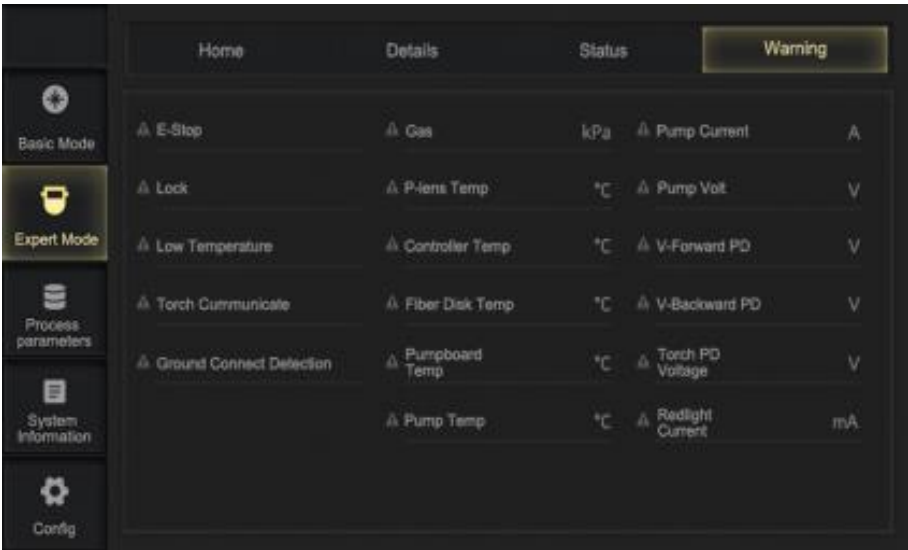


FUNCTIONAL CLASSIFICATION	FUNCTIONAL	REMARK
The numerical state	Gas pressure	Indicates the current guard gas pressure.
	The lens temperature	Indicates the current gun optics temperature.
Enabling state	Laser	Green: laser emitting. gray: standby
	Redlight	Green: red light emitting, gray: standby
	Gas	Green: protective gas output, gray: standby
	Wire Feed	Green: wire feeding, gray: standby
	Communication	Green: in communication. Gray: on standby
	Safety Lock	Green: safety lock closed, gray: safety lock open

FUNCTIONAL CLASSIFICATION	FUNCTIONAL	REMARK
	Torch Switch	Green: The gun switch is down. Gray: The gun switch is not down

WARNING

In this interface, you can view any alarm information generated by the machine. It alerts you to any issues or potential problems that may require attention or troubleshooting.



FUNCTIONAL CLASSIFICATION	FUNCTIONAL	REMARK
laser Use the alarm	Torch communication	The communication between the laser and the hand-held welding gun head is abnormal. Please check whether the connection is abnormal and contact the after-sales service.
	Ground Connect Detection	When the PE is not properly connected, the machine will alarm. If it is confirmed that there is no abnormal grounding, the machine will still alarm. Please contact the after-sales service.
	Lock	After the machine locks, please contact after- sales service.

FUNCTIONAL CLASSIFICATION	FUNCTIONAL	REMARK
	Low temperature	When the environment around the machine reaches the set low temperature alarm value, the low temperature alarm will light up.
	E-Stop	Laser emergencies stop alarm, please check whether press the emergency stop switch, confirm the correct contact after-sales treatment.
	Gas	The pressure of the protective gas is not normal. Please check whether the protective gas is opened and whether the gas cylinder is short of gas. Contact the after-sales service after confirming it.
Temperature and humidity Alarm	P-lens Temp	The temperature of the protective window is abnormal. Please check: 1. Whether the shielding gas is turned on and the pressure and flow rates are normal. 2. Whether the protective window is dirty or damaged. 3. Contact the after-sales service after confirmation.
	Controller Temp	
	Fiber Disk Temp	The temperature exceeds the threshold alarm, please check whether the air outlet is blocked, whether the filter screen is dirty and clean the air outlet and filter screen; Don't work long hours in a place with high ambient temperature. Check whether all fans work properly. If any exception occurs, contact the after-sales service.
	Pump Board Temp	
	Pump Temp	
The current alarm	Pump Current	If the current exceeds the threshold, please restore the factory Settings and try again. If the fault still exists, please contact the after-sales service.
	Redlight Current	
Voltage alarm	Pump Volt	If the voltage exceeds the threshold, the alarm is generated. Please restore the factory Settings and try again. If the fault still exists, contact the after-sales service.

FUNCTIONAL CLASSIFICATION	FUNCTIONAL	REMARK
---------------------------	------------	--------

	Torch PD Voltage	

	V-Forward PD	

	V-Backward PD	

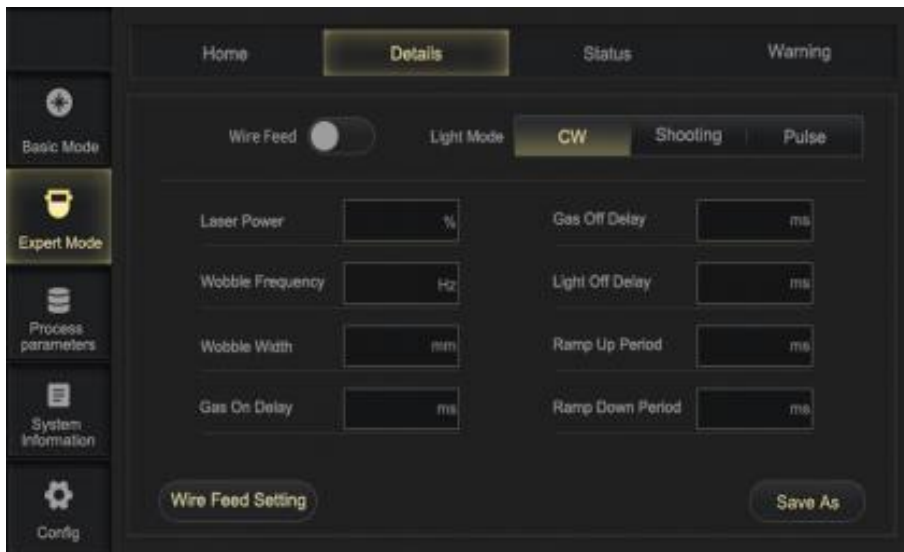
DETAILS:

This interface provides a comprehensive display of the detailed parameters currently set in Expert mode. It allows you to view and modify these parameters according to your specific requirements.

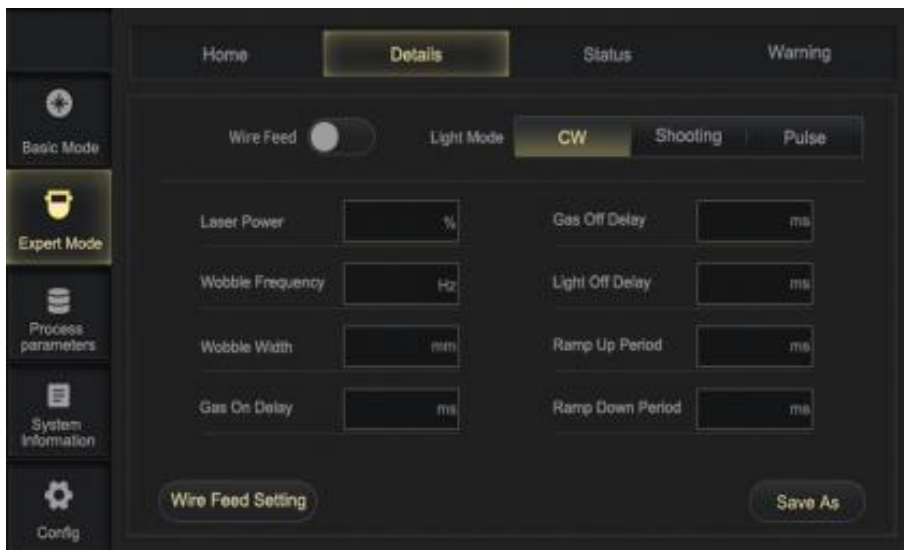
NOTE:

- *The laser power, wobble frequency, and wobble values in this interface are the same as those displayed on the main page.*

Click on any space to enter editable mode.



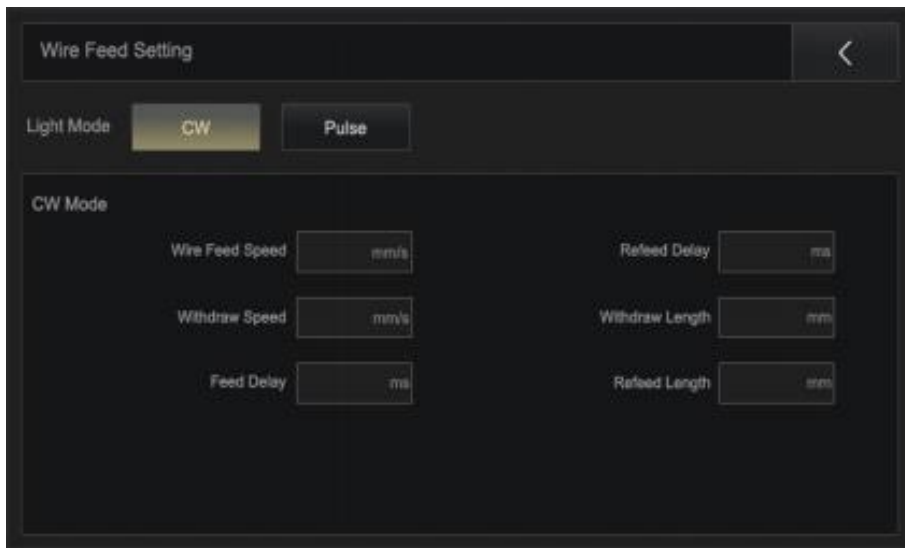
In editable mode, you can make changes to the parameters. After editing, click the "Save" button to save the changes. The edited document will be stored in the parameter customize library for future reference.



To access the wire feeding parameter setting interface, click the "Wire Feeding Setting" button. This will allow you to modify the wire feeding parameters as needed. Please ensure that the machine is successfully connected to the wire feeding machine before attempting to modify these settings.

NOTE:

- *Modifying the wire feeding parameter settings requires a successful connection between the machine and the wire feeder. This connection is necessary to complete the parameter modification process.*



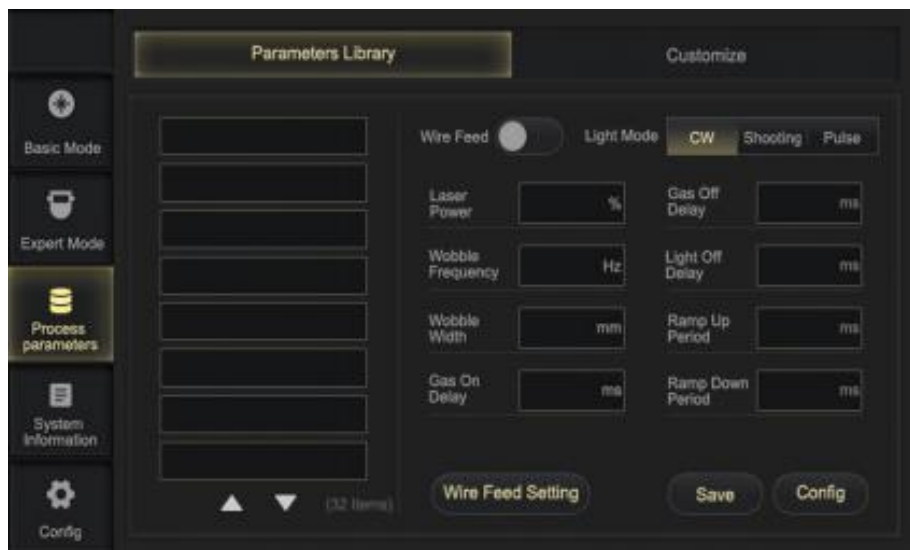
FUNCTIONAL CLASSIFICATION	FUNCTIONAL SPECIFICATIONS	REMARK
Pattern Adjustment	Light Mode	The light mode includes three kinds: continuous, shooting and pulse. Continuous: output laser continuously. Shooting: a single laser output. Pulse: output pulse laser continuously according to the duty cycle.
	Wire Feed	orange: Wire feeding is synchronized with laser. White: Wire feeding is not performed in mode.
	Laser Power	Set the laser output power
	Wobble Frequency	Set the laser scanning frequency
	Wobble Width	Set the laser scan amplitude
	Gas on Delay	Set the lead time before the laser is emitted.
	Gas off Delay	Set the turn-off delay time after laser turn-off.
Pattern Adjustment	Light off Delay	Set the delay time from stopping wire feeding to turning off the laser, which is used to cut the welding wire.
	Laser Frequency	Setting laser frequency
	Duty Cycle	Set duty cycle of laser output in pulse/ shooting mode.
	Shooting Interval	Set the shooting Interval
	Ramp Up Period	Set the lasing time in pulse mode.
	Ramp Down Period	Set the laser slow descent time in pulse mode.

FUNCTIONAL CLASSIFICATION	FUNCTIONAL SPECIFICATIONS	REMARK
Set wire feeding parameters		CW: continuous wire feeding Pulse: Intermittent wire feeding according to the set pulse period
	Wire feed speed	Set the wire feed speed (this function only works with its own wire feed head)
	Withdraw Speed	Set the pumping speed; Speed of wire drawing after welding.
Wire feeding parameter Settings - Continuous wire feeding mode	Feed delay	Set wire feed delay
	Refeed Delay	Set the delay time of filling wire; To prevent secondary bonding, represents the waiting time between withdraw and refeed
	Withdraw Length	Set the withdraw length, When the welding is complete, pull back the length of the welding wire.
	Refeed Length	Set their feed length; Represents the length from tinning to red light position.
	Wire feeding parameter setting - pulse wire feeding mode	Pulse Duration
Pulse Wire Feed Speed		Set pulse wire feed speed
Texture Smoothness		Set pulse smoothness; Represents the smoothness of the lines in fish scale welding. The larger the value is, the smoother it is, and the less obvious the fish scale effect is.

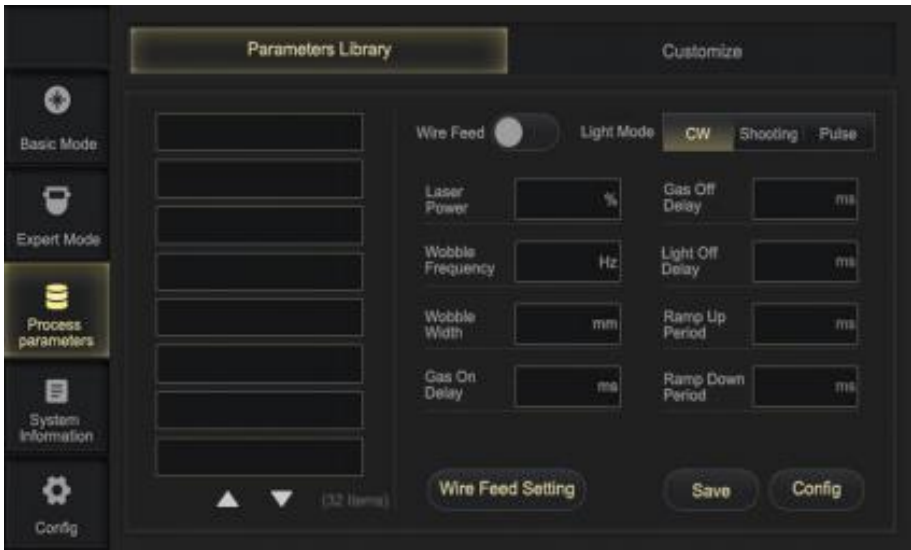
The process parameters interface consists of two sub-interfaces: Parameters Library and Customize.

Parameters Library:

This section provides four pages where you can store up to 32 welding process parameter sets (recipes).. This feature allows you to easily switch between parameter sets to accommodate various welding applications.

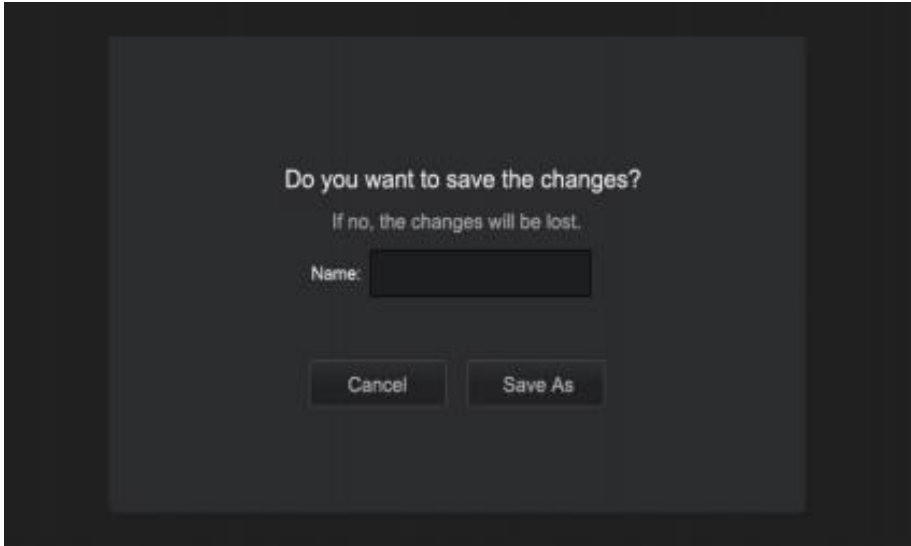


To access the detailed view and modification of parameters, simply click on the name of any parameter document. This will take you to the interface where you can view and modify the specific parameters, as shown below.



When in editable mode, you can click on any blank space within the interface. This will allow you to make changes to the parameters as needed. Once you have made the desired modifications, click 'Save' in the pop-up prompt box.

If you wish to modify the name of the parameter document, click on the blank space within the name box. Then, click 'Save As' to save the parameters with the new name. The modified parameters will be saved to the parameter customization interface for future use.

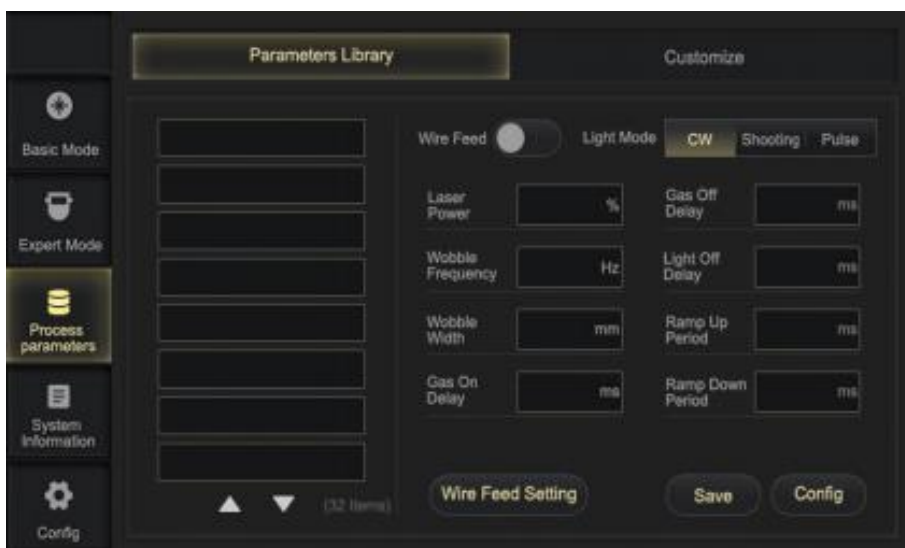


FUNCTIONAL CLASSIFICATION	FUNCTIONAL SPECIFICATIONS	REMARK
Process Parameters	or So Pages	The process library surface comes with 32 sets of process parameters, so that customers can use them in different situations.
	Parameter Document	Click any parameter document to enter the parameter detail interface, where the specific parameters of the parameter document are displayed. Click the configuration button and the process parameter will be loaded into the main interface as the current parameter.
Process Mode	Modifying Parameter Documents	Click any parameter document to enter the parameter detail interface, click any blank to enter the parameter modification interface, enter the name of the new document, click the "Save As" button after modification, and the process data will be saved in the custom midpoint, and click the line setting button, and the process parameters will be loaded into the main interface as the current parameter.

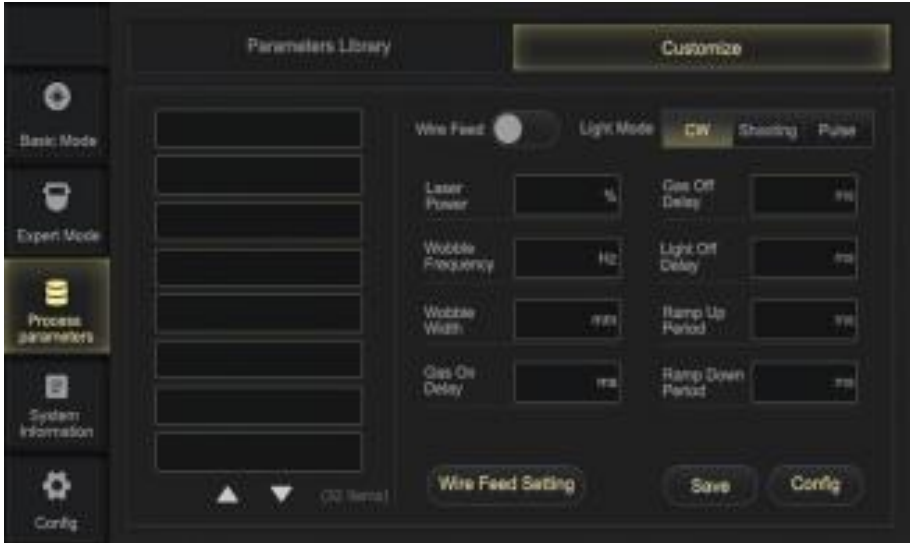
CUSTOMIZE:

This section allows you to display and customize custom parameter documents . There are a total of four pages available, each capable of storing up to 8 welding process parameter sets (recipes).

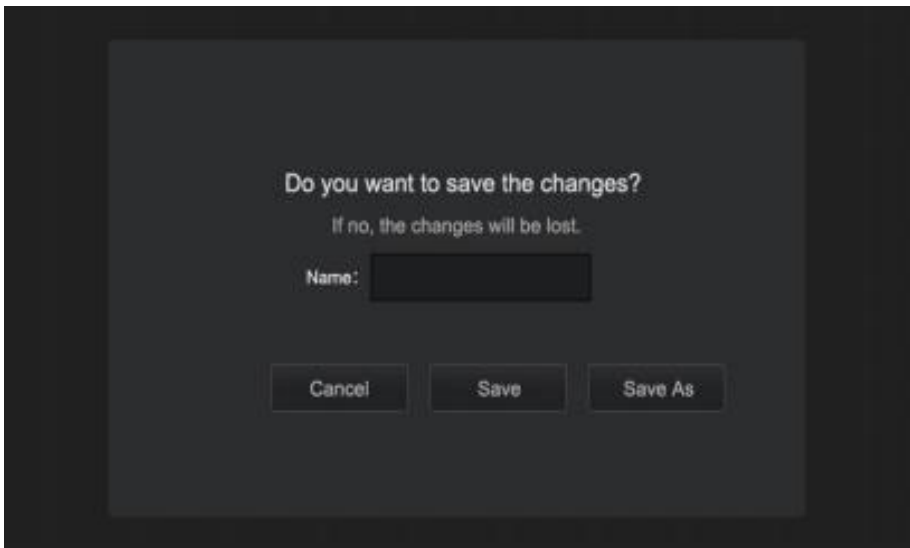
To view the details of a specific parameter, simply click on its name. In this view, the parameters are read-only and cannot be modified.



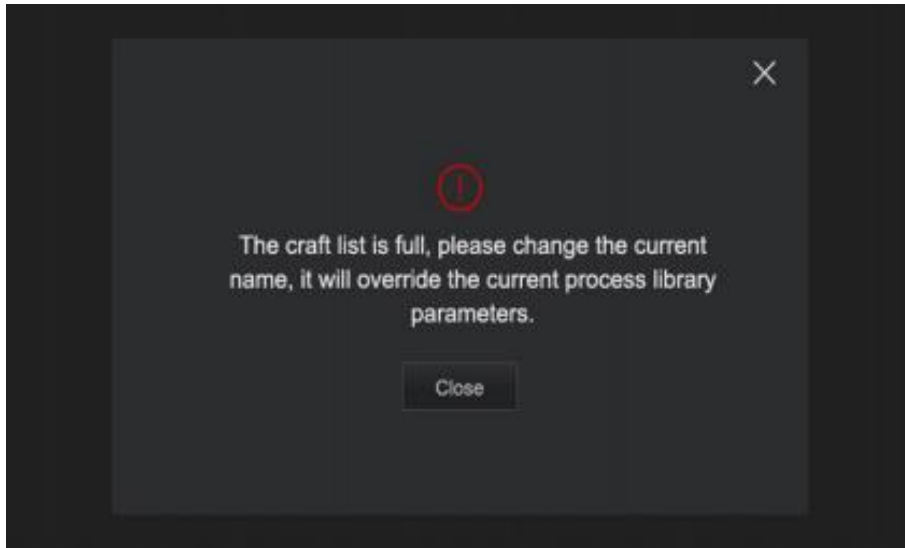
To enter edit mode and make changes to the parameters, click on any blank space within the interface. This will enable both reading and writing capabilities for the parameters.



After making the desired modifications, click 'Save' in the pop-up prompt box. If you wish to modify the name of the parameter document, click on the blank space within the name box. Clicking 'Save As' will save the parameters with the new name, while clicking 'Cancel' will return you to the custom interface.



If the storage for parameters is already full, modifying a file and clicking 'Save As' will prompt a pop-up box. At this point, you can change the existing name to "EMPTY" to clear that particular process entry.



(4) Setting interface

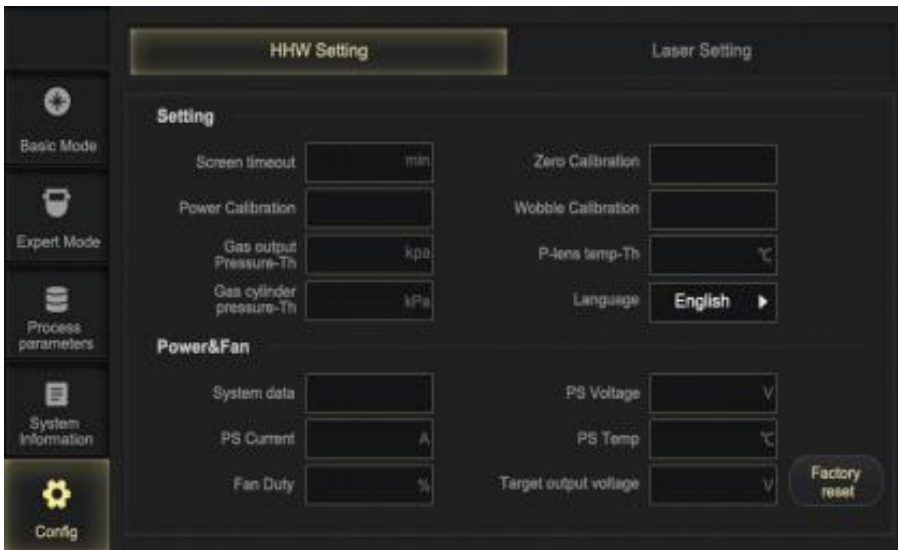
To access the setting interface, first click on the "Config" interface. A pop-up box will appear, prompting you to enter the login password.

1. The Config Interface is displayed only after entering the password successfully.
2. In case of a password input error, the box will display the message: "Login password error, please check and try again!"

The setting interface consists of two sub-interfaces: HHW Settings and Laser Settings.

HHW SETTINGS:

This section includes manufacturer settings, power and fan status information view, and the option to restore factory settings.



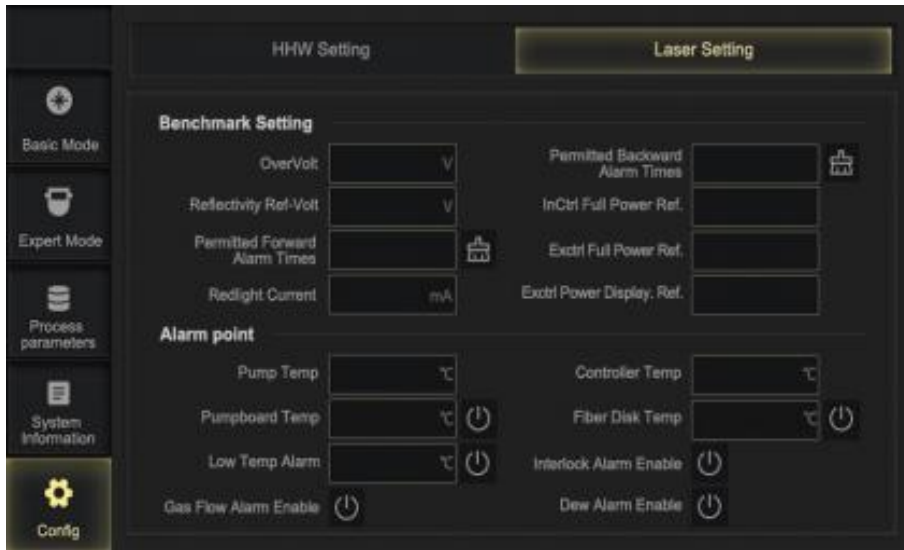
FUNCTIONAL CLASSIFICATION	FUNCTIONAL SPECIFICATIONS	NOTE
	Screen timeout	You can customize the screen saver duration. The value ranges from 1 to 120 min. In this way, you can enter the standby state when not in use.
	Zero Calibration	The user can customize the zero-correction value. The parameter can be set within the range of -300 to 300. Note: Clicking the Restore Factory Settings button cannot reset this data.

FUNCTIONAL CLASSIFICATION	FUNCTIONAL SPECIFICATIONS	NOTE
Setting	Power Calibration	The user can customize the full power correction of external control. The parameter can be set from 1 to 4095. Note: Clicking the Restore Factory Settings button cannot reset this data.
	Wobble Calibration	The user can customize the full wobble profile in conjunction with the galvanometer. The parameter can be set in the range of 128-1024. Note: Clicking the Restore Factory Settings button cannot reset this data.
	P-lens temp-Th	The user can customize the temperature threshold of the protective window. The parameter can be set within the range of 0-100°C. This parameter value is associated with the warning boundary value. Note: Clicking the Restore Factory Settings button cannot reset this data.
	Gas Pressure- Th	the user can customize the shielding gas pressure threshold, and the parameter can be set within the range of 0-500KPa.
	Gas cylinder pressure-Th	The user can customize the cylinder pressure threshold, and the parameter can be set within the range of 0-500KPa; This parameter value is associated with the warning boundary value.
Language	Users can customize the language. Note: Clicking the "Restore factory Settings" button cannot reset this data.	
Power & Fan	System data	The unit is 10 minutes. This value shows the total machine usage time.
	PS Voltage	Display the current power supply voltage of the machine.
	PS Current	Display the current power supply of the machine.
	PS Temp	Display machine current power supply temperature.
	Fan Duty	Displays the current fan duty cycle. The larger the value, the faster the fan.

FUNCTIONAL CLASSIFICATION	FUNCTIONAL SPECIFICATIONS	NOTE
	Target output voltage	Displays the target output voltage of the machine in the current state.
other	Factory Reset	Click factory reset, the machine reset data, restore to factory Settings data

LASER SETTING:

This screen contains a series of Settings for reference points and alarm points.



FUNCTIONAL CLASSIFICATION	FUNCTIONAL SPECIFICATIONS	NOTE
	overVolt	Users can customize the overcurrent reference voltage. The value ranges from 0.00V to 5.00V. Note: Clicking Factory Reset button cannot reset this data.
	Permitted Backward Alarm Times	The user can customize the number of continuous optical lock, the parameter can be set range: 1-20; Note: Clicking the Restore Factory Settings button cannot reset this data.
	Reflectivity Ref-Volt	Reflectivity Ref-Volt Users can define 10% reference voltage. The parameter can be set within the range of 0.00-2.50V. Note: Clicking Factory Reset button cannot reset this data.
	Redlight Current	Users can customize the red-light current value, the parameter can be set range: 0-150mA; This parameter value is associated with the warning boundary value. Note: Clicking Factory Reset button cannot reset this data.
	Permitted Forward Alarm Times	The user can customize the number of continuous forward optical lock, and the parameter can be set within the range of 1-20; Note: Clicking Factory Reset button cannot reset the data.
Benchmark Setting	Exctrl Full Power Ref.	Exctrl Full Power Ref. The user can customize the full power calibration value of external control. The parameter can be set within the range of 0-100; Note: Clicking Factory Reset button cannot reset this data.
	Inctrl Full Power Ref.	The user can customize the internal control full power calibration value, and the parameter can be set from 0 to 255. Note: Click the "restore factory Settings" button, and the data cannot be reset.
	Exctrl Power Display Ref.	The user can customize the calibration value of external control power display, and the parameter can be set within the range of 50-150; Note: Clicking Factory Reset button cannot reset this data.
	Pump Temp	The user can customize the pump source temperature alarm value. The parameter can be set within the range of 0-100 ° C. This parameter value is associated with the face value of the alarm boundary. Note: Clicking Factory Reset button cannot reset this data.
	Controller Temp	The user can customize the temperature alarm value of the controller. The parameter can be set within the range of 0-100°C. The value of this parameter is associated with the face value of the alarm boundary. Note: Clicking Factory Reset button cannot reset this data.

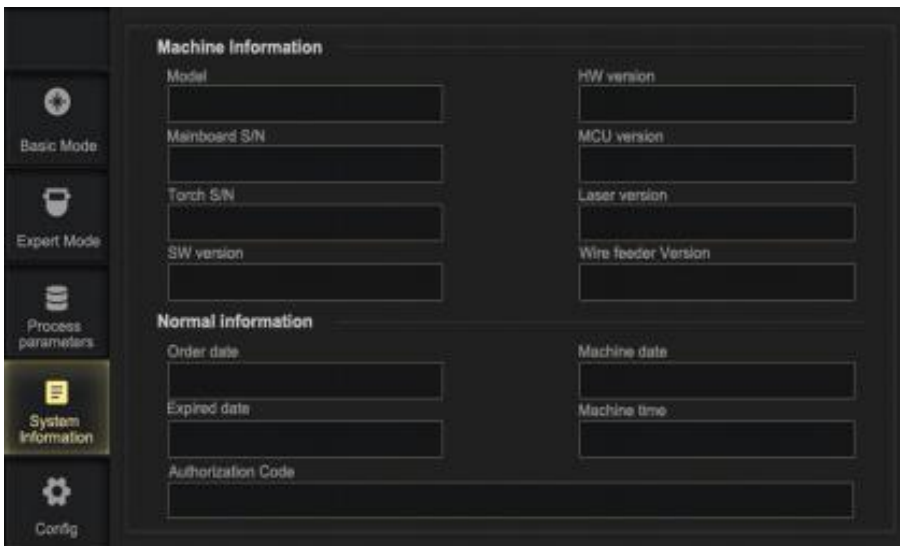
FUNCTIONAL CLASSIFICATION	FUNCTIONAL SPECIFICATIONS	NOTE
Alarm point	Pump board Temp	<p>The user can customize the temperature alarm value of the pump source plate, and the parameter can be set within the range of 0-100°C; This value is followed by an Enable button.</p> <p>When this item is enabled, the button is on. When it is not enabled, the button is off. This parameter value is associated with the warning boundary value. Note: Clicking the Restore Factory Settings button cannot reset this data.</p>
	Fiber Disk Temp	<p>The user can customize the temperature alarm value of the optical fiber disk. The parameter can be set within the range of 0-100°C. This value is followed by an Enable button.</p> <p>When this item is enabled, the button is on. When it is not enabled, the button is off. This parameter value is associated with the warning boundary value. Note: Clicking the Restore Factory Settings button cannot reset this data.</p>
	Low Temp Alarm	<p>The user can customize the low temperature alarm value, and the parameter can be set within the range of 0-100°C; This value is followed by an Enable button. When this item is enabled, the button is on. When it is not enabled, the button is off. This parameter value is associated with the warning boundary value. Note: Clicking the Restore Factory Settings button cannot reset this data.</p>
	Interlock Alarm Enable	<p>When the user enables interlock alarm, the button lights up. If not enabled, the button is off. Note: Clicking the Restore Factory Settings button cannot reset this data.</p>
	Gas flow Alarm Enable	<p>When the user enables the gas flow alarm, the button will light up. If not enabled, the button is off. Note: Clicking the Restore Factory Settings button cannot reset this data.</p>
	Dew Alarm Enable	<p>When the user enables the startup condensation alarm, the button will light up. If not enabled, the button is off. Note: Clicking the Restore Factory Settings button cannot reset this data.</p>

(5) System Information

There is an information interface called the System Information interface. This interface consists of two sections: Machine Information and Normal Information.

MACHINE INFORMATION:

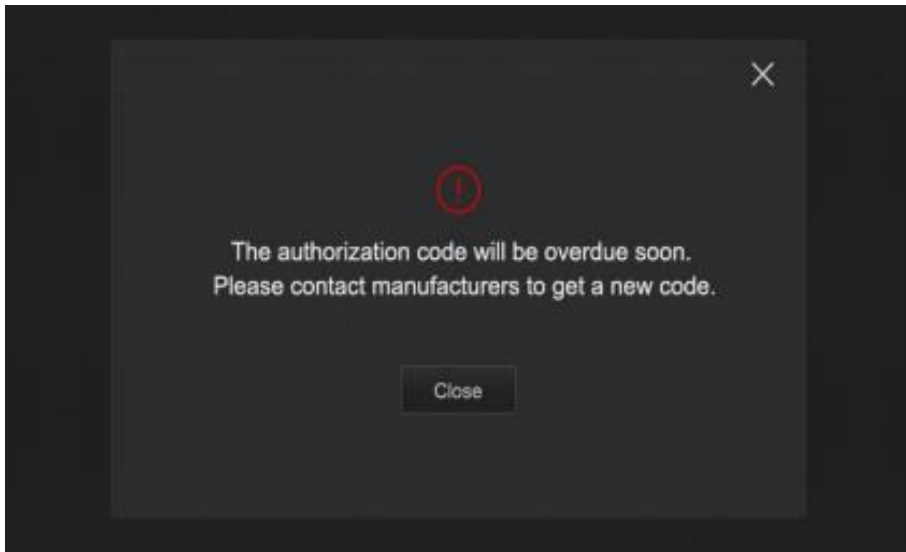
The Machine Information section primarily displays important details about the machine, such as its version information and business-related data. Additionally, users can enter an authorization code through this interface to unlock the machine's working period



The screenshot displays a dark-themed user interface for system information. On the left is a vertical sidebar with five menu items: 'Basic Mode' (star icon), 'Expert Mode' (shield icon), 'Process parameters' (cylinder icon), 'System Information' (document icon, highlighted in yellow), and 'Config' (gear icon). The main content area is divided into two sections. The 'Machine Information' section contains two columns of input fields: the left column includes 'Model', 'Mainboard SN', 'Torch SN', and 'SW version'; the right column includes 'HW version', 'MCU version', 'Laser version', and 'Wire feeder Version'. The 'Normal information' section contains two columns: the left column includes 'Order date', 'Expired date', and 'Authorization Code'; the right column includes 'Machine date' and 'Machine time'.

It is important to note that the license code for the device is nearing its expiration date. When this occurs, a dialog box will appear, notifying the user about the impending expiration. To ensure uninterrupted usage of the device, it is necessary to contact the manufacturer and request a new license code.

By doing so, the device can continue to be used normally without any disruption



FUNCTIONAL CLASSIFICATION	FUNCTIONAL SPECIFICATIONS	NOTE
	Model	The machine model
	HW Version	Hardware version number of the machine
	MCU Version	Machine firmware version number
	Torch S/N	Head serial number (unique number for each head)
	Mainboard S/N	Machine Serial number (unique number of each host)
Machine Information	Laser Version	Complete machine version number
	SW Version	Machine Software System Version number
	Wire feeder Version	Software version of the wire feeder
Normal Information	order date	Machine factory date
	Machine date	The current date of the machine's built-in clock
	Machine time	The current time is always built into the machine
	Expired date	Expiration warning time of machine lock
	Authorization Code	Authorization code login to unlock the machine work date. Authorization code input error, system prompt: Authorization code error, please check and try again!

Company Profile

Introduction

About THEO

Theo Laser Inc. is at the forefront of transforming the welding industry with cutting-edge laser technology, built on a foundation of innovation, quality, and safety. We are committed to empowering professionals by enhancing their craftsmanship and productivity, while minimizing the barriers to entry in advanced welding techniques.

At Theo, our mission extends beyond providing tools—we're building a future where professionals can work smarter and faster without compromising precision or safety. Our advanced handheld laser products are designed to deliver unmatched performance in speed, quality, and ease of use, ensuring that every operator, from seasoned experts to beginners, can experience high-quality results with minimal training.

As a subsidiary of Maxphotonics, a global leader in laser manufacturing, we leverage nearly two decades of expertise in laser technology and precision engineering. This partnership allows us to integrate advanced fiber laser innovations with the agility needed to respond to the evolving needs of modern professionals.

Our philosophy is simple: we aim to be the sidekick for smart professionals, offering tools that streamline workflows, increase productivity, and redefine the standards of efficiency in welding. Whether tackling labor shortages or minimizing energy consumption, Theo is committed to providing solutions that help businesses Say No to Slow and achieve excellence at the speed of light.

Backed by Maxphotonics' industry-leading manufacturing and research capabilities, Theo remains committed to delivering the highest levels of reliability, affordability, and safety in every product we develop. With a focus on creating user-friendly solutions, we aim to simplify even the most complex welding tasks, enabling professionals to unlock their full potential with confidence.

We are driven by a vision where every professional has access to the best tools for the job, designed to boost productivity and reduce operational costs without sacrificing quality. Theo products are crafted with precision, empowering professionals to make an impact in their field by combining innovation with craftsmanship.

About Maxphotonics

A Legacy of Innovation in Fiber Laser Technology

Founded in 2004, Maxphotonics has established itself as a global leader in fiber laser manufacturing. With nearly two decades of experience, Maxphotonics has been at the forefront of research and development in core optical technologies, providing high-performance fiber laser sources, systems, and solutions across various industries.

- **Global Leadership:** A top brand in the fiber laser market with global influence.
- **Deep Expertise:** Nearly 20 years of experience in R&D and manufacturing fiber lasers and optical components.
- **In-House Development:** Vertically integrated, producing key optical components in-house to ensure unmatched quality.
- **Quality Assurance:** ISO 9001:2015 certified, adhering to globally recognized quality standards.
- **Production Scalability:** With an annual capacity exceeding 200,000 units, Maxphotonics is equipped to meet growing market demands.

Maxphotonics provides Theo with a robust foundation for manufacturing, development, and service excellence. Headquartered in Shenzhen, China, Maxphotonics maintains a strong global presence, enabling rapid responses to customer needs and close collaboration with industrial partners.

Products and Services

Maxphotonics specializes in a wide range of high-quality products and services:

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

Optical Components: Designing and manufacturing high-performance components such as fiber Bragg gratings, optical isolators, optical circulators, couplers, and other passive photonic system components.

Laser Solutions: Delivering turnkey laser solutions and customized systems for industries like automotive, aerospace, electronics, and semiconductors, enhancing efficiency, productivity, and cost-effectiveness.

Engineering Services: Offering technical consulting, system integration, and customer training through a skilled team of engineers to ensure optimal performance from laser systems.

Quality and Certifications

Maxphotonics is committed to delivering world-class quality products and services. With stringent quality control procedures, the company has achieved certifications such as ISO 9001, CE, and RoHS, reflecting its dedication to international quality standards.

Research and Development (R&D)

Maxphotonics continuously invests in R&D to drive technological advancements and product innovation. The in-house R&D team collaborates with leading research institutions and universities to explore new technologies and materials, aiming to create breakthroughs in photonics.

Customers and Partners

Maxphotonics serves a global customer base, ranging from small businesses to Fortune 500 companies, across industries such as automotive, aerospace, electronics, telecommunications, and semiconductors. The company has forged strategic partnerships with industry leaders, leveraging combined expertise to deliver premium solutions.

Core Values and Vision

Maxphotonics' core values center around innovation, customer focus, and excellence. The company is committed to advancing photonic technology and delivering reliable, cutting-edge solutions that exceed customer expectations.

Maxphotonics envisions becoming a global industry leader in advanced fiber lasers, expanding its product portfolio, and providing solutions that empower businesses to revolutionize their operations, contributing to a better world.

Conclusion

With over 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 dedicated to its core values, ensuring sustainable growth and success for its customers and partners.

For more information, visit our website: [**http://maxlasers.com**](http://maxlasers.com)