

USE AND MAINTENANCE MANUAL AND ORIGINAL INSTRUCTIONS

4-in-1 Laser Welding Machine

(Welding, Cleaning, Cutting, Cleaning Welding)

Models:

- LZ-WH 1000W
- LZ-WH 1500W
- LZ-WH 2000W
- LZ-WH 3000W
- LZ-WHJ 1000W
- LZ-WHJ 1500W
- LZ-WHJ 2000W
- LZ-WHJ 3000W
- LZ-WHG 1000W
- LZ-WHG 1500W
- LZ-WHG 2000W
- LZ-WHG 3000W

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*PLEASE READ CAREFULLY AND RETAIN THIS MANUAL PRIOR TO INSTALLING, USING, OR MAINTAINING THE MACHINE.

DECLARATION OF CONFORMITY CE.

We, METALSELF SRL, as the authorized representative of the manufacturer within the European Union, hereby declare under our sole responsibility that the machine:

Product Description: 4-in-1 Laser Welding Machine

Brand / Model / Type: LZ-WH 1000W, LZ-WH 1500W, LZ-WH 2000W, LZ-WH 3000W, LZ-WHJ 1000W, LZ-WHJ 1500W, LZ-WHJ 2000W, LZ-WHJ 3000W, LZ-WHG 1000W, LZ-WHG 1500W, LZ-WHG 2000W, LZ-WHG 3000W

It adheres to the stipulations of the following European Directives:

- **Machinery Directive 2006/42/EC Electromagnetic Compatibility (EMC)**
- **Directive 2014/30/EU Restriction of Hazardous Substances (RoHS)**
- **Directive 2011/65/EU**

Furthermore, the subsequent harmonized standards have been implemented:

- **EN ISO 12100:2010: Safety of machinery - Fundamental principles for design - Risk assessment and mitigation.**
- **EN 60204-1:2018: Safety of machinery - Electrical equipment of machines - Part 1: General requirements.**
- **EN ISO 11553-1:2020+A11:2020: Safety of machinery - Laser processing machines - General safety standards.**
- **EN 60825-1:2014+A11:2021: Safety of laser products - Part 1: Classification and requirements for equipment.**
- **EN IEC 61000-6-2:2019: Electromagnetic Compatibility (EMC) - Part 6-2: Generic Standards - Immunity for Industrial Environments.**
- **EN IEC 61000-6-4:2019: Electromagnetic Compatibility (EMC) - Part 6-4: Generic Standards - Emission Requirements for Industrial Environments.**
- **EN IEC 61000-3-2:2019+A1:2021+A2:2024: Standards for harmonic current emission limits.**
- **EN 61000-3-3:2013+A1:2019+A2:2021: Regulation of voltage fluctuations and flicker.**
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Chapter 1

GENERAL INFORMATION

1.1.

Purpose and Content of the Manual

This manual contains all the essential information required for the safe transportation, installation, operation, and maintenance of the laser welder. It serves as a critical document that is integral to the machine. It is imperative that all personnel authorized to operate the machine read and comprehend this manual. Please ensure that this manual is kept in an easily accessible location near the machine throughout its operational lifespan.

1.2. Identification of the Manufacturer and the Representative

Manufacturer: Shandong Leize Intelligent Technology Co., Ltd. Building B6, Zone B, JOIN Zibo Advanced Manufacturing Industrial Park, Zichuan District, Zibo City, Shandong Province, China

Importer and Agent for the European Union: METALSELF SRL VAT Number: 13261560018 Address: Corso Unione Sovietica 248, 10134 Turin (TO), Italy Email: info.metalself@gmail.com Website: www.metalself.com For any inquiries regarding technical assistance, spare parts, or information, please reach out to METALSELF SRL.

1.3. Machine Identification Plate, Data

Identification Plate, and CE Marking

The identification plate of the machine, which features the CE marking, is essential for its traceability, compliance, and safety. It is permanently and clearly attached to the main body of the power supply.

Location of the Plate: The CE identification plate is situated on the front panel of the machine, positioned on the right side.

The following essential information is permanently displayed on the plate, as mandated by the Machinery Directive 2006/42/EC:

- The name and complete address of the importing company (METALSELF
- Srl). The designation of the machine.
- The CE Marking symbol.
- The designation of the model.
- The distinctive serial number.
- The year of completion.
- The aggregate weight



1.4. Overview of the Machine and Its Components

The machine is a 4-in-1 laser welding system featuring an integrated design, optimized for enhanced mobility and efficiency. All primary components, including the laser source, chiller, wire feeder, and gas cylinder housing, are consolidated into a single mobile cart.

Primary Elements:

Camera Body: The primary structure that contains all the components.
2. Fiber Laser Source: Produces the laser beam for operational tasks and is contained within the unit. 3. Touch Screen Control System: Interface for the operator to configure all settings.
parameters.
4. Welding Torch (Gun): A manual apparatus that emits the laser beam. It is connected to the machine through fiber optics and service cables.
5. Integrated Chiller: A closed-loop system for source cooling.
laser and flashlight.
6. Integrated wire feeder: A device designed for the automatic delivery of filler wire during the welding.
7. Gas Cylinder Compartment: A designated area at the rear of the cart for a gas cylinder of process (Argon or Nitrogen).
8. Emergency Stop Button: Emergency cessation mechanism
safety for the prompt cessation of all hazardous functions.
9. Ground Terminal: To be connected to the workpiece.
Processing to guarantee electrical safety.



1.5. Intended Use and Anticipated Misuses

Intended Use: The machine is specifically engineered for the following operations on metallic materials (carbon steel, stainless steel, aluminum, brass, galvanized sheet metal) by professional and trained operators within an industrial setting:

- **Manual laser welding, with or without filler material.**
- **Manual laser cleaning of metal surfaces, such as the removal of rust, paint, and**
- **oxides. Manual laser cutting of thin sheet metal.**
- **Manual cleaning of weld seams.**

Any alternative use is deemed inappropriate and hazardous.





Reasonably Foreseeable Misuses (PROHIBITED):

- Utilize the machine in settings with potentially explosive atmospheres.
- Welding, cleaning, or cutting non-metallic materials such as plastic, wood, and fabric.
- Operate the machine without proper fume extraction.
- Do not direct the laser torch at individuals, animals, or combustible materials.
- Operating the machine without the necessary personal protective equipment.
- Tampering with or circumventing safety devices.
- Operating the machine while under the influence of alcohol, drugs, or medication.
- Utilizing inappropriate process gases (e.g., pure CO2, mixed gases for arc welding).
- Allowing the machine to operate unattended.

1.6. Technical Specifications

Characteristic	Specification
Models	LZ-WH(-J/-G) 1000W / 1500W / 2000W / 3000W
Laser Classification	Continuous Wave Fiber (CW)
Laser Source Manufacturer	MAX / BWT / Reci / JPT
Wavelength	1064 - 1080 nm (Invisible - Infrared)
Laser Output	1000W / 1500W / 2000W / 3000W
Operating Mode	Welding, Cleaning, Cutting, Cable Cleaning
Blowtorch	Mod. SUP21T / SUP23T
Scanning Width 0 - 8 mm	
Cooling System	16L integrated water cooler (Model LZ-WH) / Air cooling (Model LZ-WHJ, LZ-WHG)
Wire feeder	Integrated for wire diameters ranging from 0.8 to 2.0 mm (depending on the model)
Power Supply 1500W/2000W: Single-phase 220V, 50/60Hz; 3000W: Three-phase 380V, 50/60Hz	
Total Power Consumption	1500W: ~7kW / 2000W: ~10kW / 3000W: ~12kW
IP Protection Rating	IP54
Dimensions (Length x Width x Height)	1500W/2000W: 600 x 1300 x 1600 mm 3000W: 700 x 1450 x 1700 mm
Net Weight	1500W/2000W: approximately 205 kg / 3000W: approximately 240 kg
Process Gas	Argon (Ar) or Nitrogen (N2) of high purity
Aural Disturbance	Sound pressure level at the operator's ear (LpA) < 80 dB(A) under full load conditions (Ref. MD-TCF-250403-68925)

In addition to the summarized data, it is essential to highlight the distinctions among the model series:

- LZ-WH Series: These models feature a liquid cooling system (integrated water chiller). This solution is optimal for intensive and extended use, guaranteeing maximum thermal stability of the laser source.

- LZ-WHJ and LZ-WHG Series: These models feature an air cooling system.
  This configuration, despite featuring various aesthetic designs, provides enhanced practicality in scenarios where managing a liquid circuit is either unfeasible or undesirable, while remaining appropriate for standard workloads.

1.7. Warranty Provisions

The machine is protected by a warranty in accordance with the terms and conditions set forth by METALSELF SRL.

- **Laser Source: Two years warranty.**

- **Other machine components: 1-year warranty. The warranty commences on the installation date or, at the latest, 45 days following the machine's receipt.**

The warranty becomes void under the following circumstances:

- Inappropriate use or use that deviates from the guidelines outlined in this manual.
- Tampering, alterations, or unauthorized repairs.
- Utilization of non-genuine spare parts or consumables.
- Damage arising from improper transportation, installation, or maintenance.

Chapter 2

Introduction and Overview of the Machine

THIS CHAPTER IS CRUCIAL FOR THE SAFETY OF THE OPERATOR AND THIRD PARTIES. FAILURE TO ADHERE TO THE RULES OUTLINED HEREIN MAY RESULT IN SERIOUS INJURY OR FATALITIES, AS WELL AS DAMAGE TO THE MACHINE.

2.1. General Safety Precautions

- Always read and fully comprehend this manual before operating the machine.
- The workspace must be adequately ventilated, organized, and devoid of obstructions and combustible materials.
- Install a localized fume extraction system to effectively capture welding fumes at the source.
- Do not permit unauthorized or untrained individuals to approach or operate the machine. Always verify the
- integrity of the machine, cables, and safety devices prior to each use. Never circumvent or disable safety
- interlocks.
- In the event of a malfunction, promptly press the emergency stop button and disconnect the power prior to any inspection.

2.2. Operator Qualifications and Training

The machine is to be utilized solely by authorized personnel.

- Adult.
- Professionally certified as a welder or skilled technician.
- Have undergone specialized training in the operation and safety protocols of laser welding machines. Have
- reviewed and comprehended this manual.
- He is cognizant of the specific risks associated with laser radiation and understands how to safeguard himself.
-

2.3. Personal Protective Equipment (PPE)

The following personal protective equipment (PPE) is required when operating the machine:

- **Laser safety glasses must adhere to EN 207 standards and be tailored for the specific laser wavelength (1064-1080 nm), ensuring an appropriate Optical Density (OD). Standard arc welding glasses are unsuitable and provide no protection.**
- **Welding gloves: Resistant to heat and abrasion, compliant with EN 12477.**
- **Protective clothing: Apron, jacket, and trousers constructed from flame-retardant materials (e.g., treated cotton, leather) in accordance with EN ISO 11611.**
- **Safety footwear: Featuring a safety toecap, compliant with EN ISO 20345 standards.**
- **Respiratory protection: A mask or respirator equipped with appropriate metal fume filters (e.g., FFP3) that comply with EN 149, should local exhaust ventilation prove inadequate.**



2.4. Clarification of Safety Symbols

The symbols presented on the machine and within this manual are crucial to comprehend.

SYMBOL	MEANING
	**GENERAL DANGER: Signifies a potentially hazardous situation. Please read the instructions thoroughly.**
	**ELECTRIC SHOCK HAZARD: Potential for electric shock due to contact with energized components.**
	**BURN HAZARD: Machine components and the workpiece attain elevated temperatures.**
	**OPTICAL RADIATION HAZARD: The welding arc produces ultraviolet and infrared radiation that poses a risk to the eyes and skin.**
	**FUME INHALATION HAZARD: Welding fumes and gases pose a risk to your health.**
	**COMPULSORY USE OF LASER PROTECTION GLASSES.**
	**MANDATORY USE OF PERSONAL PROTECTIVE EQUIPMENT (PPE).**
	**MUST READ THE INSTRUCTION MANUAL PRIOR TO USE.**
	**EARTHING**

2.5. Analysis of Residual Risk

Despite the secure design and implemented protective measures, certain risks persist that the operator must recognize and address.

2.5.1. Risks Associated with Laser Radiation 

- **Nature of Risk: The machine incorporates a Class 4 laser source, classified as the most hazardous, in accordance with the EN 60825-1 standard. The emitted radiation is invisible (infrared at 1064-1080 nm) and can inflict permanent and irreversible damage to the retina, even with brief, direct, or reflected exposure. Additionally, it poses a risk of severe skin burns and can ignite fires.**
- **Integrated Protection Strategies:**

  Protective Enclosure: Under standard operating conditions, the origin and trajectory of the fiber are fully enclosed, rendering the machine a Class 1 laser product, inherently safe.

  Safety Interlocks: A safety interlock on the torch (the grounding terminal) (acts as a safety contact) halts laser emission if the torch is not in contact with or in proximity to the properly grounded workpiece.
- **Residual Risk:**

  Accidental exposure during use: Inaccurate aiming of the torch may direct the reflective surfaces or individuals.

  Exposure during maintenance: Accessing internal components may expose you to Class 4 radiation.
- **Actions to be undertaken by the operator:**

  Always wear appropriate laser safety glasses (EN 207, sufficient OD).
  Never direct the torch towards individuals or any body parts.
  Ensure that the work area is secured and shielded by anti-laser barriers for protection.
  third parties.

  Remove reflective materials, such as watches and jewelry, prior to operation.

The risks associated with laser radiation warrant particular consideration.

- **Classification and Hazard: As noted, the internal source is classified as Class 4. This indicates that even the dispersed or specularly reflected beam poses a risk. A polished metal surface can function as a mirror, reflecting the invisible beam with sufficient energy to inflict immediate eye damage from a distance.**
- **Laser Controlled Area (LCA): The zone in which the machine operates must be designated as a Laser Controlled Area. Access to this zone should be restricted to authorized and trained personnel exclusively. The area must be distinctly marked with appropriate laser radiation hazard signage. Whenever feasible, implement physical barriers or laser safety curtains (in accordance with EN 12254) to shield the work area and prevent exposure to unprotected individuals.**
- **Laser Safety Officer (LSO): In numerous industrial environments, regulations mandate the designation of a Laser Safety Officer, an individual trained and accountable for overseeing the safe operation of Class 4 laser equipment.**

2.5.2. Electrical Hazards 

- **Nature of Risk: The risk of electrocution arises from contact with live components, particularly within electrical panels or in cases of damaged cables.**
- **Integrated Protection Strategies:**

  the Enclosures featuring an IP54 protection rating.

  - Earthing of all accessible metallic components (equipotential protection circuit).
  - Main power disconnect switch.
- **Residual Risk: Unintentional contact during maintenance activities on the machine. Actions to be**
- **undertaken by the operator:**

  Always disconnect the main power supply prior to opening any panel or **electrical distribution board.**

  Do not operate the machine if the power cords are damaged.
  Work on the electrical system must be conducted exclusively by qualified personnel.
  (PES/PAV).

2.5.3. Thermal Hazards 

- **Nature of Risk: Burns resulting from contact with the newly welded component, the torch nozzle, or other heated machine parts. There is also a risk of fire due to the interaction of flammable materials with these hot components.** or sparks.
  Residual Risk: Unintentional contact.
- **Actions to be undertaken by the operator:**
-

  Always don gloves and protective attire.
  Allow the components to cool prior to handling them.
  Ensure that the workspace remains devoid of flammable liquids or materials.

2.5.4. Mechanical Hazards 

- **Nature of Risk: Crushing or impact during machine operation. Entrapment of fingers or clothing in the wire feeder mechanism.**
- **Residual Risk: Negligent handling and intervention with the wire feeder while in operation.**
- **Actions to be undertaken by the operator:**

  - Exercise caution when relocating the machine.
  - Refrain from operating the wire feeder without first shutting down the machine.

2.5.5. Hazard of Fumes and Dust 

- **Risk Nature: Welding, cutting, and cleaning produce fumes and metal nanoparticles that, when inhaled, pose significant health risks and can lead to chronic respiratory diseases and other severe illnesses.**
- **Residual Risk: Inhalation of vapors in the absence of sufficient extraction.**
- **Actions to be undertaken by the operator:**
  - Always utilize a localized and efficient fume extraction system.
  - Ensure adequate general ventilation in the work environment.
  Utilize suitable respiratory protection (e.g., FFP3 mask).

The fumes produced during laser welding comprise metal oxides, fine particulate matter (PM2.5), and ultrafine particles (nanoparticles) capable of penetrating deep into the lungs. The chemical composition of these fumes is influenced by the base material, filler metal, and process gas. Metals such as hexavalent chromium (from stainless steel), zinc (from galvanized sheet metal), and aluminum are especially hazardous. It is the employer's obligation to perform a chemical risk assessment and to implement the most effective collective (exhaust) and individual (respiratory PPE) protective measures.

2.5.6. Ergonomic Hazards 

The machine was engineered in accordance with ergonomic principles to reduce operator fatigue and stress, especially concerning the handling of the torch and the clarity of the control interface. Nevertheless, the manual nature of the process necessitates the implementation of sound working practices to address the following residual risks:

- **Posture and Repetitive Motions:**
  Risk: Extended use of the hand torch may lead to musculoskeletal disorders.
  back, neck, shoulders, and arms.
  Preventive Strategies:
    - Adjust the workpiece to a comfortable working height to prevent bending.
    Maintain an appropriate and balanced posture throughout the operation.
    - Take regular breaks to alleviate muscle tension.
    -
- **Physical Exertion:**
  Risk: The manual handling of heavy components or gas cylinders may result in
  injuries.
  Preventive Strategies:
    - Utilize mechanical aids (trolleys, hoists) for the transportation of heavy loads.
    - Always employ proper lifting techniques.

- **Ocular Fatigue:**
  the **Risk: Extended focus on the welding point and the display may lead to eye strain.**

  Preventive Strategies:
    - Ensure sufficient, glare-free illumination in the workspace.
    - Take brief, regular visual breaks by diverting your gaze from your work.

2.6. Safety Devices for Machinery

- **Emergency Stop Button: Red, prominently displayed, and easily accessible. When activated, it initiates a Category 0 stop (immediate power interruption to the actuators), disabling the laser source and motion functions. Resetting (rotation or traction) does not reactivate the machine.** but it merely facilitates a new start command.

- **Torch Safety Interlock (Ground Contact): Laser emission is activated solely when** The ground clamp is securely attached to the workpiece, and the torch's safety circuit is engaged, typically through contact between the nozzle and the workpiece. This arrangement prevents unintended "free-run" laser emissions.

- System Alarms: The system continuously monitors the temperatures of the laser and chiller, gas ,pressure, and other essential parameters. Should any irregularities arise, laser emission is suppressed .and an alarm message is displayed

- Protective Enclosure: All hazardous laser and electrical components are housed within secure .enclosures, accessible solely with tools

2.7. Emergency Procedures In the case of an accident or

imminent threat:

1. Promptly engage the EMERGENCY STOP button.
If required, disconnect the main power supply by utilizing the disconnect switch.
3. Administer first aid to the injured individual and contact emergency services (112).



In the event of a fire:

1. Activate the EMERGENCY STOP button and disconnect the power supply.
2. Employ an appropriate fire extinguisher for electrical equipment (e.g., CO2 or powder).
DO NOT UTILIZE WATER.

2.8. Fire Prevention

Nature of Risk: The interaction between the high-power laser beam and various materials can produce sparks and elevated temperatures, which may ignite fires when combustible materials are present.

Preventive Measures:
Maintain a clean work area, ensuring it is devoid of flammable materials, including paper, rags, solvents, oils, and greases.
Do not weld or cut containers or tanks that have not undergone prior decontamination.
Ensure that sparks do not come into contact with flammable areas or materials.
Keep an appropriate fire extinguisher readily available (Class D for metal fires, CO2 or powder for electrical equipment). AVOID USING WATER.

Chapter 3 TRANSPORTATION, INSTALLATION, AND COMMISSIONING

3.1. Transportation and Handling

The machine is dispatched in protective packaging. Handle the package using a forklift with sufficient capacity, adhering to the instructions provided on the packaging. The weight of the machine is specified on the CE plate (approximately 205-240 kg, depending on the model).

Once unpacked, the machine can be manually relocated on flat, smooth surfaces utilizing the provided wheels and handles. Exercise utmost caution to avoid tipping.

3.2. Unpacking and Examination

Upon receipt of the machine:

1. Inspect the packaging for any damage incurred during transport.
2. Carefully remove the packaging.
3. Inspect the machine for any visible damage.
4. Verify that all components enumerated in the packing list are accounted for. In the event of damage or missing parts

If you are missing something, please contact METALSELF SRL immediately.

3.3. Environmental Considerations for Installation

Install the machine in a location that satisfies the following criteria:

- **Floor: Firm, level, and secure.**
- **Space: Adequate space surrounding the machine (a minimum of 1 meter on all sides) to facilitate access, ventilation, and maintenance.**
- **Ambient Temperature: Ranging from +5°C to +40°C.**
- **Relative Humidity: Below 50% at 40°C to prevent condensation.**
- **Environment: Clear of excessive dust, corrosive gases, and vibrations.**
- **Ventilation: A well-ventilated area equipped with a fume extraction system.**

3.4. Installation Procedure

WARNING:

Installation must be conducted by qualified personnel, adhering closely to the provided instructions.

3.4.1. Equipment Alignment

Position the machine in the selected location and engage the wheel brakes to secure stability. 3.4.2. Filling the Chiller

1. Remove the chiller fill cap situated at the top of the machine.
Fill the tank exclusively with distilled or deionized water. The use of tap water
irreparably damages the laser source and nullifies the warranty.
3. Fill to the level indicated on the gauge. The tank has a capacity of 16 liters.
You may need to replenish after the initial start-up, as the water circulates.
4. Secure the cap firmly.

3.4.3. Electrical Connection

HAZARD: 

The electrical connection must be performed by a qualified electrician in accordance with current regulations.

1. Verify that the voltage and frequency of the electrical network align with those specified on the machine plate (220V single-phase or 380V three-phase).
The power supply line must include a differential circuit breaker.
sufficient to the capabilities of the machine.
3. Connect the machine's power cable to the mains. Connecting the power cable is mandatory.
protection (yellow-green) to a reliable and certified earthing system.
4. Attach the provided ground clamp to the corresponding terminal on the machine.

3.4.4. Process Gas Connection

1. Install a cylinder of Argon (Ar) or Nitrogen (N2) with sufficient purity (recommended 99.99%).
Insert it into the designated slot on the rear of the machine and fasten it with the strap.
2. Install an appropriate pressure regulator on the cylinder.
3. Attach the gas hose from the pressure reducer outlet to the gas inlet of the machine.
Ensure that the connections are secure.
4. AVOID THE USE OF CO2 or other
gases.

3.4.5. Installation of the Wire Feeder

1. Install the filler wire spool of the appropriate diameter and material onto the designated holder. Insert the end of the wire into the drag system, ensuring that the rollers are appropriate for the wire diameter.
3. Insert the wire into the welding torch manually.



Action	Item	Note
1	**Positioning**	Position the machine on a level, stable surface. Secure the braked wheels. Verify that there is a minimum of 1 meter of unobstructed space on all sides.
2	**Visual Examination**	Verify that there is no visible damage to the machine body, torch, cables, and connectors.
3	**Filling the Chiller Open (solo mod. LZ-WH)**	**the fill cap. Pour ONLY distilled or deionized water up to** at the appropriate level.
4	**Install the belt cylinder. Gas**	Position the Argon or Nitrogen cylinder within the housing and fasten it securely with the **Secure the pressure reducer. Attach the gas hose to the** machine.
5	**Electrical Connection Fiber**	Executed by a certified electrician. Verify the compatibility of voltage and frequency. Attach the power cord to a socket or panel equipped with appropriate differential circuit breaker protection. Connect the grounding wire.
6	**Optic Link**	Verify that the QBH connector of the optical fiber (located between the torch and the source) is clean, properly inserted, and securely locked.
7	**Wire Installation**	Mount the wire spool onto the wire feeder. Insert the wire into the rollers and guide it to the torch.

3.5. Commissioning and Initial Inspections (Detail)

1. Opening the Gas: Gradually open the main valve on the cylinder. Inspect for leaks using soapy water. Modify the outlet pressure on the regulator (recommended values: Argon 15-20 L/min, Nitrogen 20-25 L/min).

2. Sequential Ignition:

the Activate the primary switch.
Release the emergency switch.
Activate the chiller switch. Allow the water temperature to stabilize.
24°C). Activating the laser while the chiller is turned off or in alarm mode may result in irreversible damage.
Activate the Control System switch.
the Activate the power switch.

Laser Source.

3. Interface Verification: Ensure that the display initializes correctly and does not exhibit any persistent alarms. 4. Safety Assessment:

Press the emergency stop button: the machine should cease operation and signal.
the emergency. Disengage and reset the alarm.
Without connecting the ground clamp, attempt to activate the emission: the laser must not.
issue.

5. Verify Red Beam Alignment:

Connect the ground clamp to a section of scrap metal.
the From the display, activate the red light indicator ("Indication of red light").
Aim the torch at the waste piece and press the activation button. A
only the crimson targeting beam.
Ensure that the red dot or line is precisely centered over the nozzle hole.
If not, proceed with the necessary adjustments (refer to Chapter 6).

This step is essential to prevent the nozzles from burning during the cutting process.

6. Brief Weld Test: Execute a short weld bead on a scrap piece to assess.
the proper operation of all systems (laser, gas, wire feeder).

The machine is now prepared for production.

Chapter 4

UTILIZATION OF THE DEVICE

4.1. Description of the Control Panel

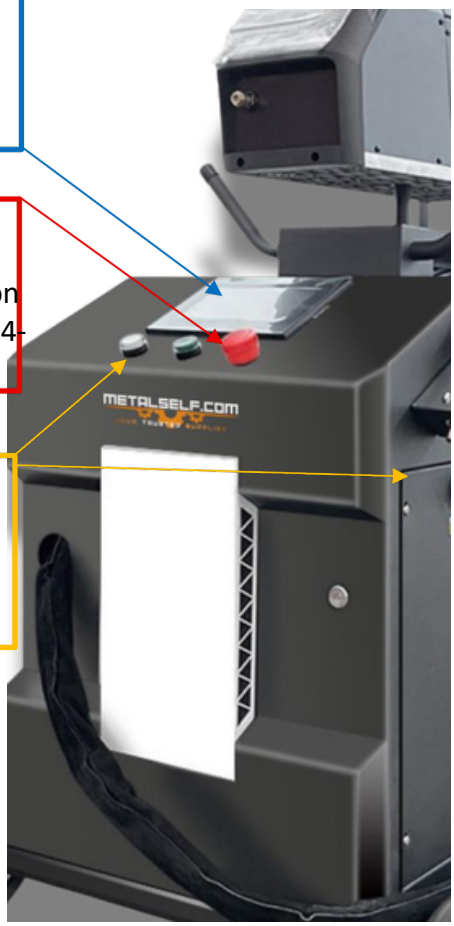
Human-machine interaction (HMI) takes place through a color touch-screen display interface and physical controls for critical safety functions.

Physical Elements of the Interface:

- **Touchscreen Display: Central unit for parameter input, mode selection, status monitoring, and alarm notification.**
  All operational parameters are presented on the display.

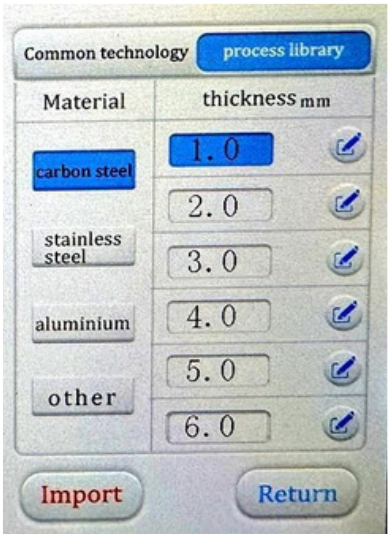
- **Emergency Stop Button: Red mushroom-shaped actuator**
  on a yellow background. Its activation results in the immediate cessation of all hazardous functions (Category 0 Stop in accordance with EN 60204-1).

- **Key Selectors/Switches: Varying by model,**
  There may be switches for the independent activation of the Chiller, the Control System, and the Laser Source.



Software Interface (SUP System): The software interface is crafted to be user-friendly and multilingual. The primary screens differ based on the chosen mode.





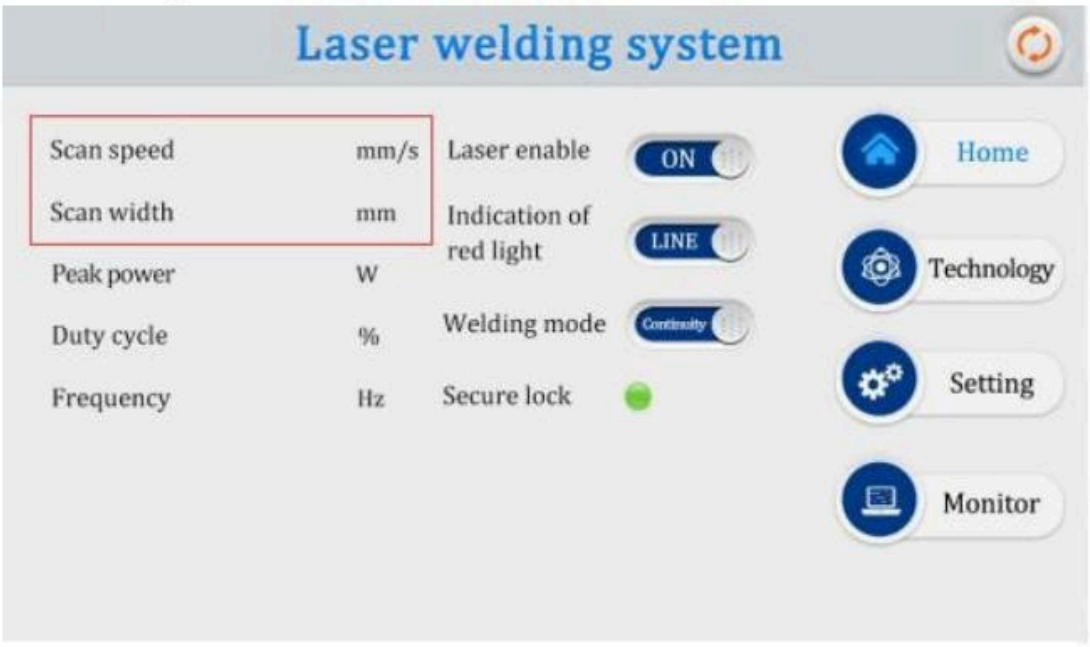
Navigation and Primary Functions:

- **Mode Switch: A designated button, usually located in the top right corner, enables you to alternate between the machine's various functions (e.g., Welding, Cleaning).**

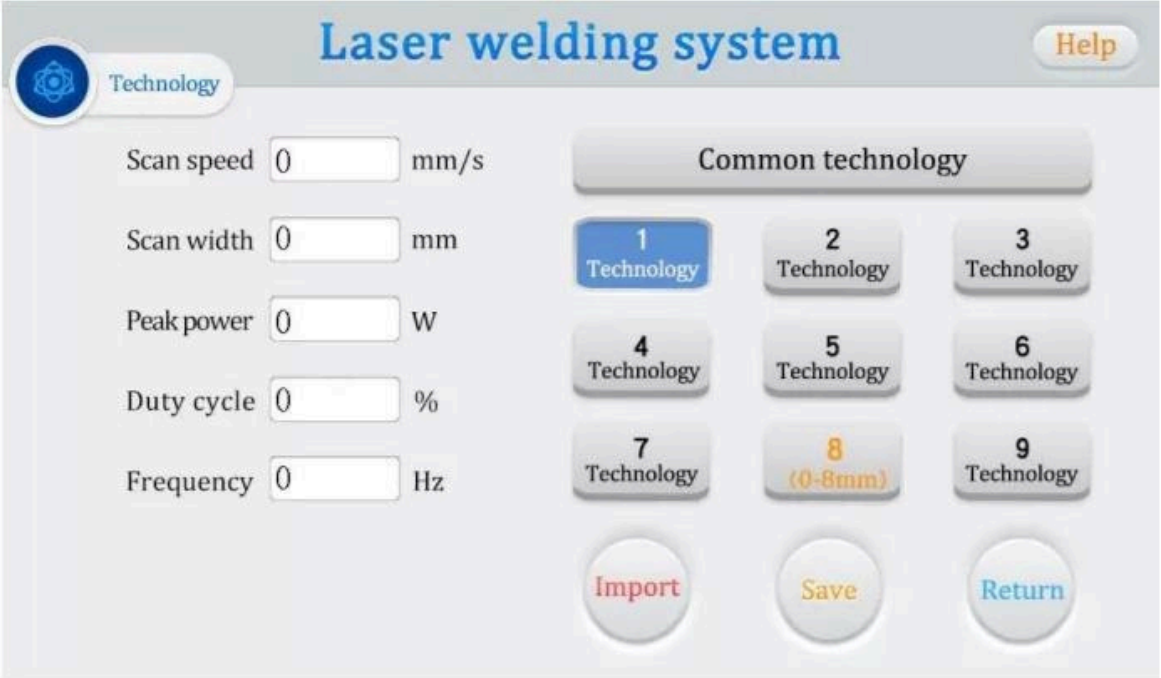
Click above to modify the function.



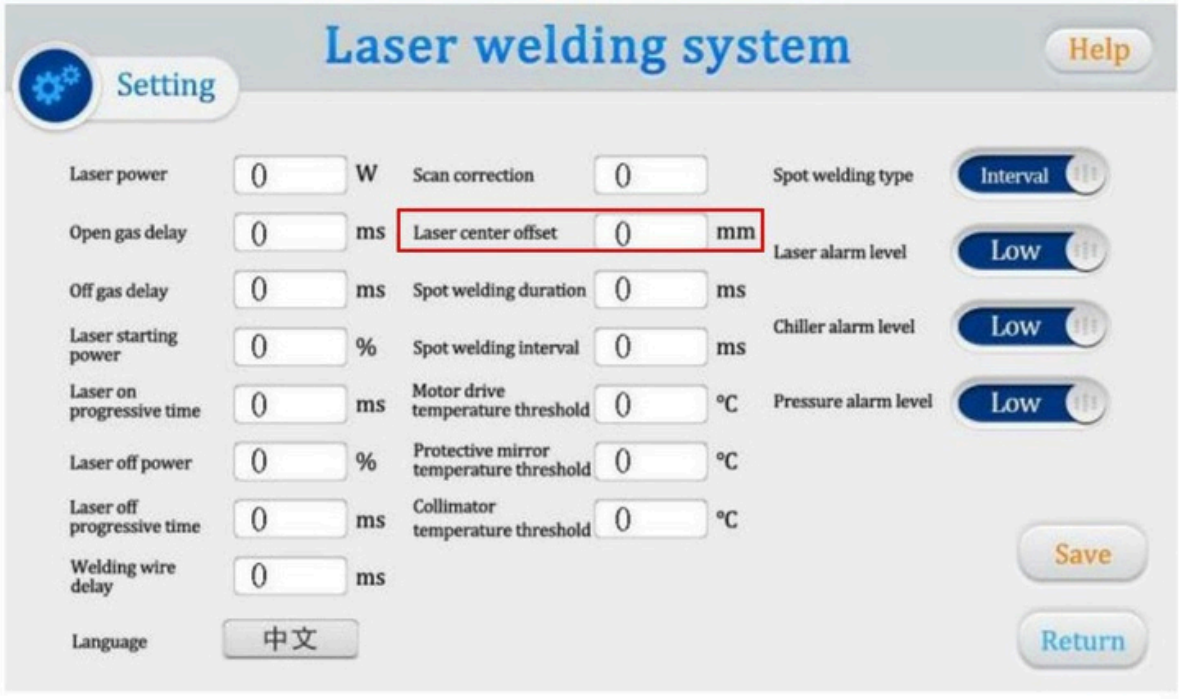
- **Home Page: Presents critical operating parameters for the active mode, including Peak Power, Width, and Scan Speed.**



- **Technology Page: Explore a repository of predefined processes for various materials.** and thicknesses. The operator can load ("Import") a set of parameters or save new ones ("Save").



- **Settings Page: Provides access to advanced system parameters. Access is secured by a password (default: 123456). This page facilitates the fine-tuning of cycles and alarms.**



Comprehensive Table of Parameters on the "Settings" Page

Parameter	Technical Description Establishes the nominal	Unit
Laser intensity	power of the installed laser source. This serves as a reference value.	W should be activated prior to engaging the
Open gas delay; gas begins to flow.	Defines the gas pre-flow latency.	laser to purge the air and establish a protective atmosphere at the welding initiation point.
Off-gas delay	Defines the gas post-flow delay, during which the gas continues to flow. This refers to the	after deactivating the laser to safeguard the still hot weld pool from atmospheric oxidation.
Laser initiation	percentage of power applied at the onset of the emission, facilitating a gradual start, often termed a "soft start."	%
power Laser activation duration	Duration required for the laser to transition from "starting power" to the designated operating power.	ms
Laser off power	Percentage of power utilized prior to total shutdown, for the sealing the final crater. Laser	%
off incremental time.	Decline time from operational power to "inactive power."	ms
Spot welding type Spot	Select the pulse welding mode, such as "Interval" or "Fish Scale."	-
welding duration Spot	Duration (ON time) of each individual laser pulse in dot mode.	ms
welding interval	Interval (OFF time) between two successive pulses in dot mode.	ms
Laser center displacement	Facilitates software micro-adjustment of the laser beam's central position for precise alignment. Adjust the sensitivity threshold (High/Low)	mm
Alarm levels	for the Chiller, Gas Pressure, and Laser alarms.	High/Low

4.2. Power On/Off Sequence

A proper operating sequence is crucial for the safety and durability of the components. Startup Sequence:

1. Preliminary Inspections: Verify that the machine is connected to a power source and grounded. compliant, ensuring that the level of distilled water in the chiller is appropriate and that the gas cylinder is open with adequate pressure.

2. Power Activation: Engage the primary switch of the machine.

3. Emergency Release: Deactivate the emergency stop button by rotating or pulling it.

4. Activating the Peripherals: Proceed in the following order: a. Engage the Chiller switch. Wait. that the water temperature stabilizes within the operational range (e.g., 23-28°C).

ATTENTION:

Do not activate the laser source if:
The chiller is inactive and stable.
b. The Control System switch will activate the display. c. The Laser Source switch.

5. **Final Inspection: Ensure that no alarms are present on the display. Attach the ground clamp to the workpiece. The machine is prepared for operation.**

Shutdown Sequence:

1. Laser Deactivation: Ensure the current operation is complete. 2. Sequential

Shutdown: Deactivate in the following order:

a. The Laser Source Selector.
b. The Control System toggle.
c. The chiller control.

3. Safety: Activate the emergency stop button.
4. Power Off: Engage the main switch to entirely disconnect the power. power source for the machine.
5. Gas Shut Off: Secure the main valve of the gas cylinder.

4.3. Functionality in Welding Mode

4.3.1. Preparation of the Component



The quality of joint preparation is directly correlated with the quality of the final weld.

- **Cleanliness: Surfaces designated for welding must be devoid of contaminants.**
  such as oils, greases, oxides, paints, and moisture.
  Utilize solvents and specialized metal brushes (such as stainless steel brushes for stainless steel, etc.).



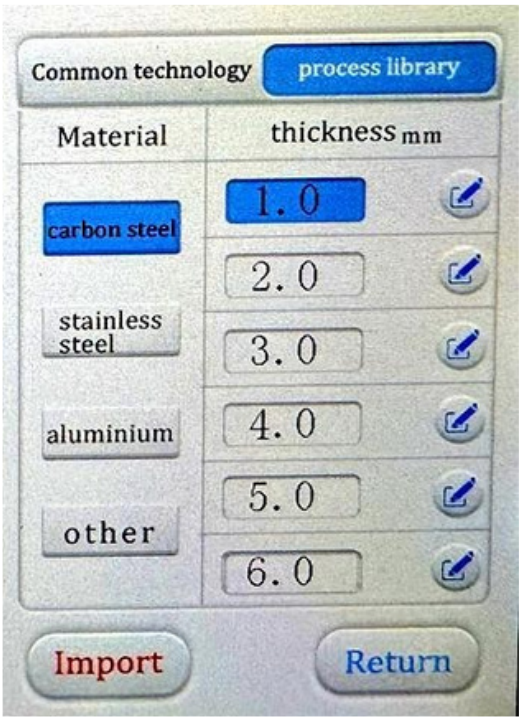
- **Mating: Components should be aligned with minimal gaps. An excessive gap may necessitate**
  the utilization of filler wire or undermine the integrity of the joint.



- **Ground Clamp: Attach the ground clamp directly.**
  on the workpiece or the metal bench upon which it is situated, ensuring optimal electrical contact. A subpar connection may lead to process instability and electrical hazards.

4.3.2. Choosing Parameters from the Technology Database

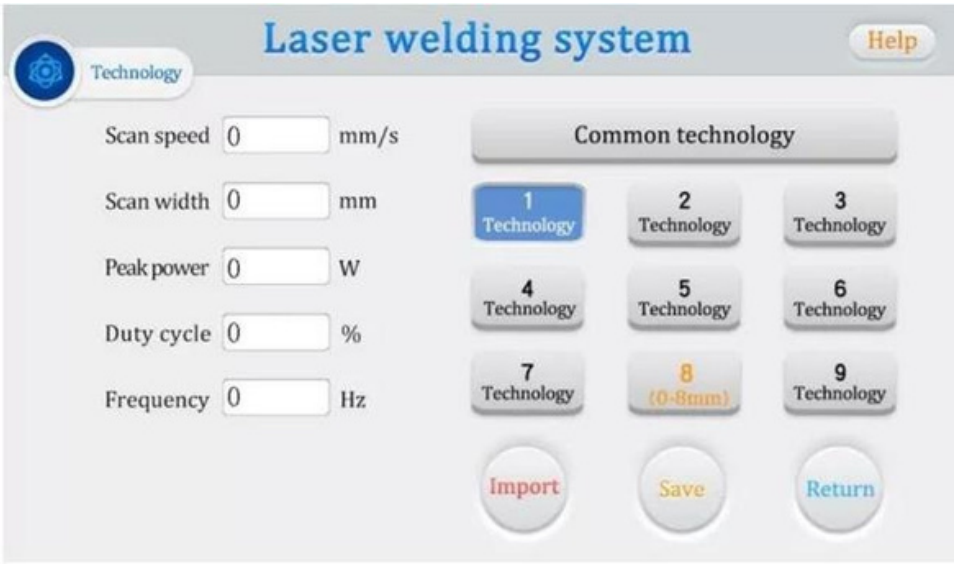
The software incorporates a library of process parameters tailored for various applications.
From the main screen, select the button.
"Technology".
In the menu that appears, choose the material to be welded (e.g., carbon steel, stainless steel, aluminium).
3. Choose the material thickness in millimeters.
4. Choose the diameter of the filler wire, if applicable. 5. Press
"Import" to transfer the reference parameters into the operational interface.
These parameters can be further refined manually.



4.3.3. Manual Parameter Modification

For particular applications, you may manually modify the primary parameters from the "Home" screen:

- **Scan speed: Specifies the oscillation frequency of the internal galvanometric mirror, which affects the heat input per unit length.**
- **Scan Width: Specifies the width of the laser beam oscillation (ranging from 0 to 6-8 mm), which determines the width of the weld bead. Set to 0 for a flat weld.**
  stationary "point."
- **Peak Power: The most critical parameter. It governs the energy of the laser beam and, consequently, the penetration depth. Increase the power for greater thicknesses or for more reflective or conductive materials (e.g., aluminum).**
- Duty Cycle: In continuous welding (CW), this value is generally 100%. In pulsed mode, defines the ratio of the duration of the pulse that is on time to the total duration of the pulse.
- **Frequency: In pulsed mode, it specifies the number of pulses per second (Hz).**



Correct parameter selection is crucial for achieving optimal results. The table below, derived from manufacturer tests, offers initial values for seam welding.

Reference Welding Parameters Table

Material	Thickness (millimeters)	Scanning Velocity	Scan Width (millimeters)	Peak Power (W) (%)	Duty Cycle	Pulse Frequency (Hz)	Wire Speed (cm/s)	Wire Type
Carbon Steel	1	300	3	350	100	2000	60	1
	2	300	3	700	100	2000	60	1.2
	3	300	3	1100	100	2000	60	1.2
	4	300	3	1500	100	2000	60	1.6
	5	220	3	1800	100	2000	50	1.6
	6	220	3	2200	100	2000	50	1.6
	8	220	3	3000	100	2000	40	2 ER5356
Aluminum	1	300	3	500	100	2000	60	1.0 ER5356
	2	300	3	800	100	2000	60	1.2 ER5356
	3	300		1400	100	2000	60	1.2 ER5356
	4	300		1800	100	2000	60	1.6 ER5356
	5	220		2000	100	2000	50	1.6
	6							
	8							
Stainless Steel	0.5	300	2	260	100	2000	80	ER304 0.8
	0.8	300	2	300	100	2000	60	ER304 0.8
	1	300	2	350	100	2000	60	ER304 1.0
	2	300	3	700	100	2000	60	ER304 1.0
	3	300	3	1100	100	2000	60	ER304 1.2
	4	300	3	1500	100	2000	60	ER304 1.2
	5	220	3	1800	100	2000	50	ER304 1.6
	6	220	3	2200	100	2000	50	ER304 1.6
	8	220	3	3000	100	2000	40	ER304 2.0

Note:

- The parameters are suggestive and should be tailored to the specific application.
- For aluminum welding, it is advisable to increase the power by 20-30% relative to the parameters used for stainless steel.
- To configure Fish Scale Welding, navigate to the "Settings" page, select "Spot welding type" as either "Fish Scale" or "Interval," and modify "Spot welding duration" and "Spot welding interval" to attain the desired outcome.



4.3.4. Selection and Utilization of Filler Wire

The filler wire is essential for bridging gaps or for forming beads with increased build-up.

- **Wire Selection: Utilize wires specifically engineered for laser or TIG welding.**
  - oh **Stainless Steel: ER304, ER308, ER316L wire.**
  - oh **Carbon Steel: Iron welding wire.**

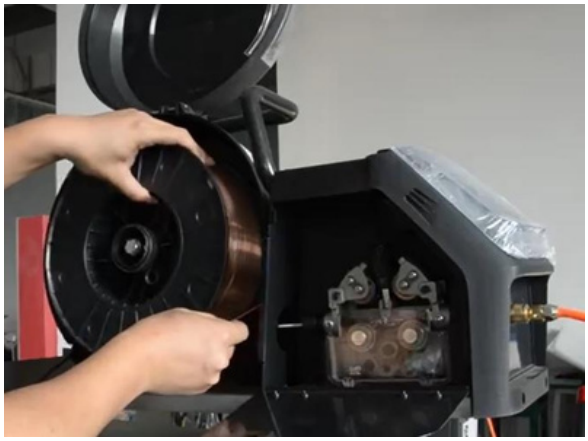
  or Aluminum: ER5356 or ER4043 welding wire.

  The utilization of flux-cored wire or gas welding wire is STRICTLY PROHIBITED.

  protective (MIG/MAG), as the contained fluxes may harm the optics.

- **Wire Feeder Configuration:**

1. Install the wire reel.

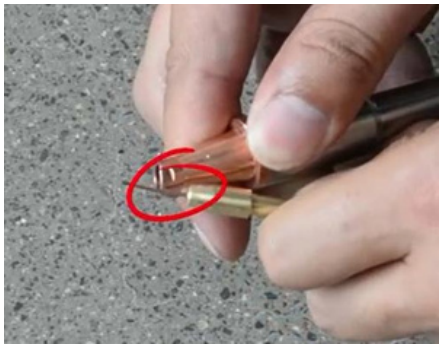


2. Select drive rollers that correspond to the appropriate groove for the wire diameter in use.

3. Insert the wire and adjust the roller pressure: it should be adequate to draw the wire without causing deformation.



4. Advance the wire until it emerges from the wire guide tip of the torch.



4.3.5. Welding Method

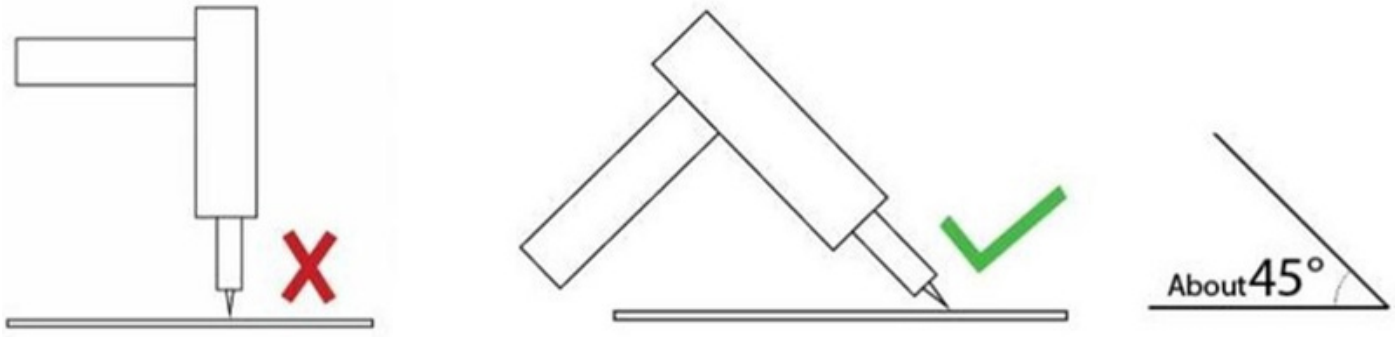
Nozzle Selection: Select the copper nozzle that is most appropriate for the type of joint (flat, corner). internal/external) and wire diameter. The appropriate nozzle guarantees adequate gas coverage and precise wire placement.

Focus Adjustment: The positioning of the focus in relation to the surface of the workpiece significantly impacts the configuration and penetration of the cord.

0 Focus: The emphasis is placed on the surface of the workpiece, achieving maximum energy density, which is optimal for maximum penetration on thin substrates.

- the **Negative defocus: The focal point lies beneath the surface, resulting in a broader bead.** and profound penetration, appropriate for continuous welding.
- the **Positive defocus: The focal point is positioned above the surface, resulting in a broad,** with minimal penetration, suitable for aesthetic welding or surface sealing.
- the Adjustment is achieved by rotating the graduated tube on the torch.

3. Execution: Position the torch at an angle of approximately 45°. Activate the emission and proceed. with continuous motion. If utilizing wire, the torch may be advanced or retracted based on the application.



DANGER: Ensure the use of all personal protective equipment (PPE). Verify that the fume extraction system is activated and properly positioned.

1. Firmly attach the ground clamp to the workpiece or metal workbench.
2. Grasp the torch securely.

Position the nozzle on the joint to be welded at an angle of approximately 45 degrees to the surface.

NEVER POSITION THE TORCH PERPENDICULAR (90°) to the piece, as this may cause reflected radiation to re-enter the torch and damage the optics.

Press the activation button on the torch to initiate the laser emission.

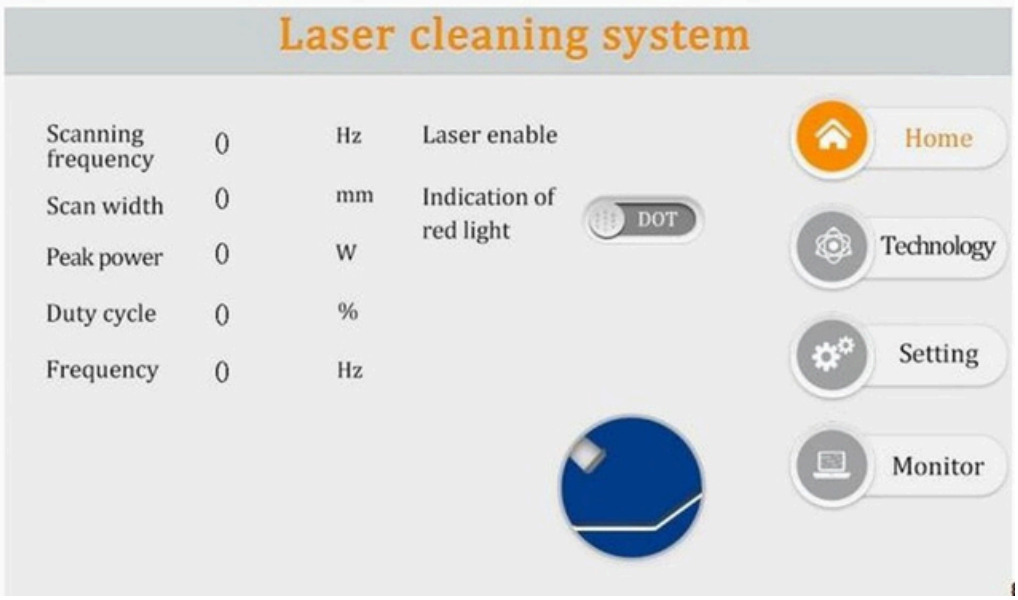
5. Ensure a consistent and uniform feed speed throughout the joint. 6. Upon completion of welding, release the trigger.

4.4. Operation in Cleaning Mode

4.4.1. Transitioning to Cleaning Mode

To initiate cleaning mode, press the mode switch button until the "Laser Cleaning System" screen is displayed.
Following the modification, a system RESTART may be necessary.

Click above to modify the function.





4.4.2. Substituting the Focusing Lens

MANDATORY: For the cleaning function, it is essential to install a dedicated focusing lens with a specific focal length (e.g., F150, F400, F800). The replacement procedure is detailed in Chapter
Once the lens has been replaced, navigate to the cleaning system's "Settings" menu and select the appropriate focal length (e.g., "400 mm focal length - 70 mm width"). The system will automatically adjust the scanning parameters.

4.4.3. Sanitation Method

Parameters: Establish the cleaning parameters.

- **Scanning frequency: 10-100 Hz (recommended at 80 Hz).**
- **Scan width: The width of the cleaning pass is determined by the installed lens.**

Peak power: Laser output. Increase for more tenacious contaminants.

2. Focus Search: Optimal cleaning efficiency is attained at the appropriate focal distance. Adjust the focus to a closer position.

and move the torch away from the surface until you ascertain the distance it generates **the most intense sound and the most brilliant sparks. This represents the appropriate working distance.**

Approximate distance with F400 lens: roughly 35-40 cm.



3. **Procedure: Maintain the optimal focal distance while moving the torch across the surface at a consistent and uniform speed. Utilize filtered compressed air or nitrogen as the assist gas.**

STANDARD PARAMETERS CLEANING MODE

Power (W)	Contaminant Classification	Cleaning Efficiency	Cleaning Width	Cleaning Depth	Cleaning Efficiency (m^2/h)
1000	Surface corrosion Oil-based paint	25 mm/s	150 mm	20um	6
1000	Corrosion	25 mm/s	150 mm	100um	4
1000	Surface corrosion	25 mm/s	150 mm	120um	2.5
1500	Oil-based paint Corrosion	50 mm/s	150 mm	20um	15
1500	Surface corrosion	50 mm/s	150 mm	100um	6 4
1500	Oil-based paint	50 mm/s	150 mm	120um	
2000	Corrosion	50 mm/s	300mm	20um	20
2000	Surface corrosion	50 mm/s	300mm	100um	8 5
2000	Oil-based paint	50 mm/s	300mm	120um	
3000	Corrosion	50 mm/s	300mm	20um	30
3000		50 mm/s	300mm	100um	14
3000		50 mm/s	300mm	120um	9

4.5. Operation in Cutting Mode WARNING: This is an auxiliary function intended for non-precision cutting on materials of limited thickness (maximum 2-3).

mm).
4.5.1. Transitioning to Cutting Mode

Click above to modify the function.



Cutting is executed through the "Laser Welding System" interface utilizing designated parameters. 4.5.2. Installing the Cutting Nozzle Substitute the welding nozzle with the suitable cutting nozzle provided in the kit.

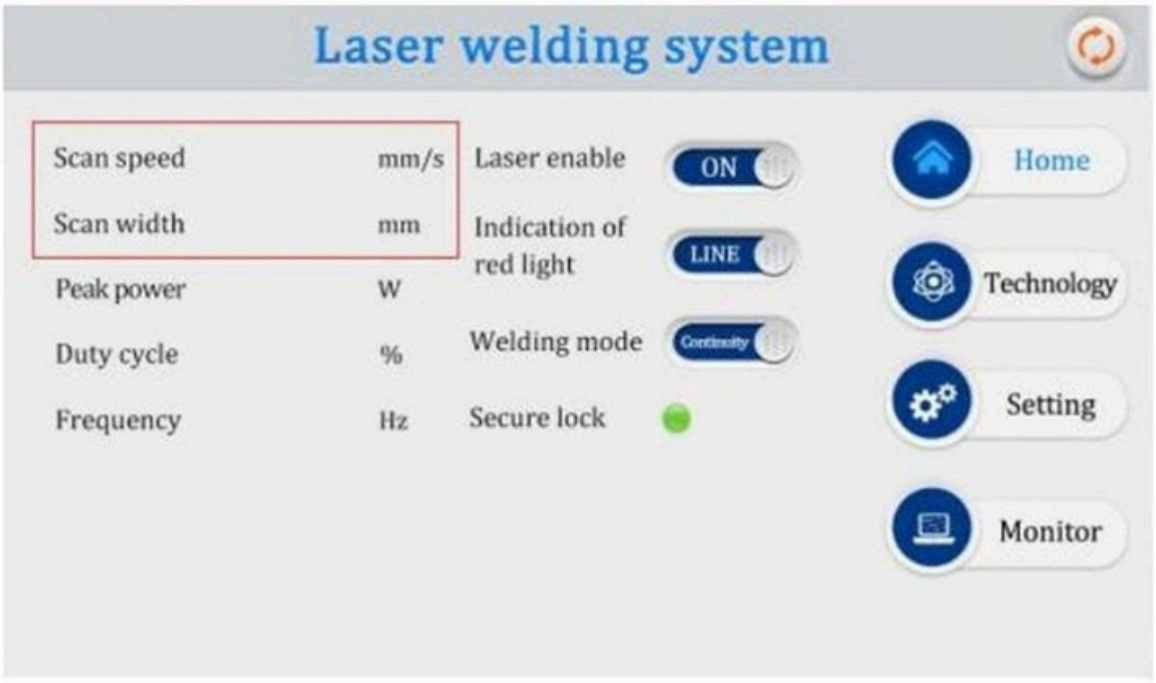


CRITICAL: Before proceeding, ensure that the red aiming beam is precisely centered within the nozzle hole. An improperly aligned beam will result in immediate melting of the nozzle.

4.5.3. Cutting Method

1. Parameters:

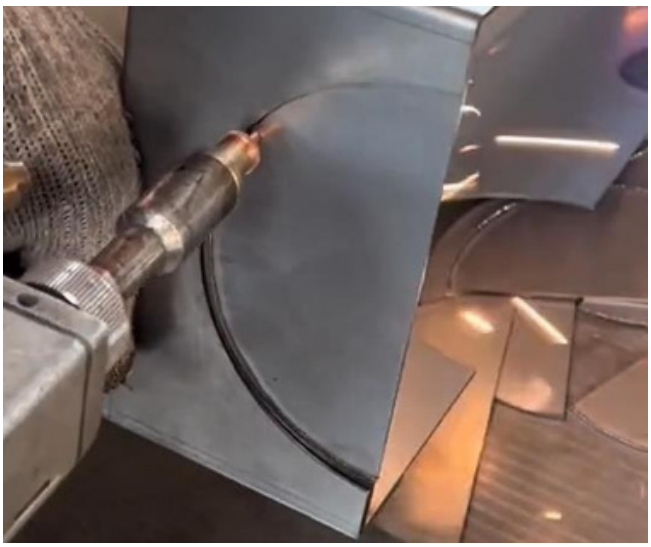
o Scan width: Set to 0 mm.
Peak power: Configured to 100% of the machine's capacity.
oh **Duty cycle: 100%.**
oh **Frequency: 1,000 Hz.**



2. Focus: Employ a negative focus (focal point beneath the surface) to facilitate concentration.
the ejection of the molten substance.

3. Gas: Utilize Nitrogen for a clean cut or Oxygen/Air for a quicker, albeit oxidized, cut.
(black). Elevated pressure is necessary (e.g. > 6 bar).

4. Execution: Maintain the nozzle in contact with or in close proximity to the sheet metal, ensuring the torch is perpendicular to the surface. Advance at a slow and steady manual pace.



4.6. Operation in Weld Bead Cleaning Mode

This function employs specific parameters within the welding system to cleanse and aesthetically

enhance a previously completed weld bead by eliminating oxides and paint.
Procedure:

1. Ensure you are in the "Laser Welding System" interface. 2.
Press the button.

"Technology".

3. Choose process preset number 8. 4.

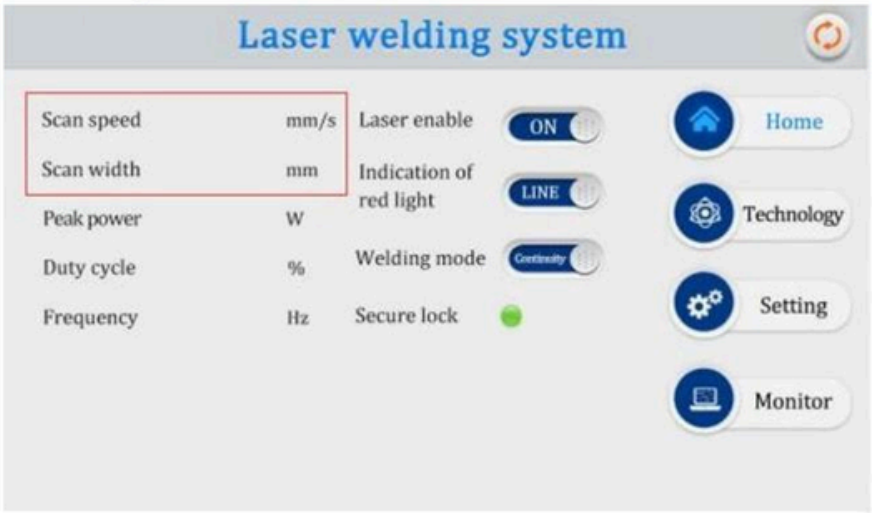
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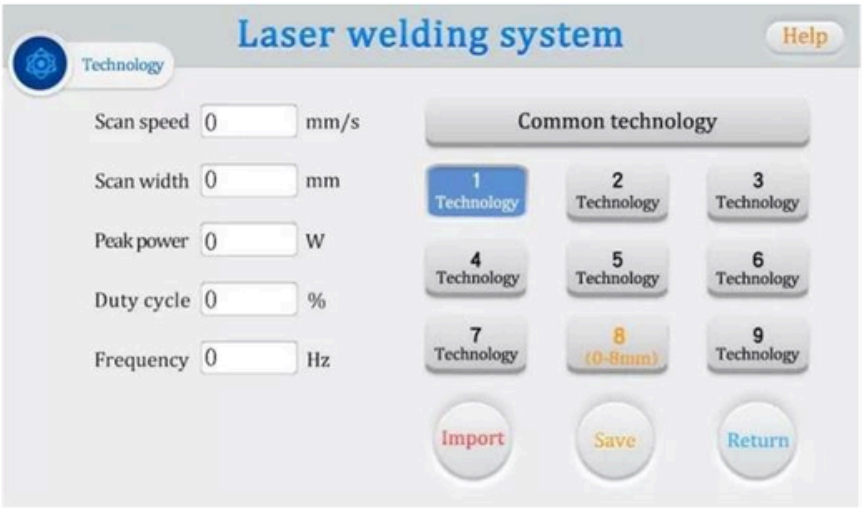
Modify the parameters as follows:

o Set "Scan width" to 8 mm. o Set
"Peak power" to 500 W.

5. Click "Save" and then "Import" to enable the parameters.

6. Continue by passing the torch.
above the welding seam to
be cleaned, maintaining
a consistent distance and velocity.





Chapter 5

MAINTENANCE

This chapter outlines the procedures required to guarantee the effective operation, safety, and durability of the laser welder. Consistent and comprehensive maintenance is crucial for sustaining the machine's performance and averting malfunctions and hazardous conditions. Maintenance is categorized into routine maintenance, which can be conducted by a trained operator, and extraordinary maintenance, which is solely the responsibility of authorized technical personnel.

5.1. Maintenance Safety Warnings

Prior to undertaking any maintenance, adherence to the Lockout/Tagout (LOTO) procedure is essential. Noncompliance with these regulations may subject personnel to life-threatening electrical, mechanical, or laser radiation hazards.

Mandatory Safety Procedure (Lockout/Tagout):

1. NOTIFICATION: Inform all pertinent personnel regarding the commencement of maintenance activities. 2. SHUTDOWN: Execute the standard machine shutdown procedure through the interface.
   software and specialized switches.
3. ISOLATE: Fully disconnect the machine from all energy sources:
   o Electrical Power: Set the main power switch to the "OFF" (0) position. o Pneumatic Power: Shut the main valve of the process gas cylinder.
4. LOCKOUT/TAGOUT:
   Apply a personal lock to the main switch to prevent reactivation.
   accidental.
   Place a warning sign ("MAINTENANCE IN PROGRESS - DO NOT ACTIVATE") on the
   disconnector, specifying the name of the maintenance technician and the date.
5. DISSIPATE REMAINING ENERGY:
   Please wait a minimum of 5 minutes to ensure that the internal capacitors have completely discharged.
   to power electronics.
   Bleed the gas line by adjusting the pressure reducer to relieve the pressure.
   residual.
6. VERIFY: Prior to commencing work, utilize a suitable tool to ensure that there is no
   voltage in the circuits requiring attention.
7.

Supplementary Warnings:

- **Laser Optics: The lenses (protective, focusing, collimating) serve as essential components.** Extremely delicate. Handle them exclusively while wearing clean, powder-free nitrile gloves to prevent leaving fingerprints. Operate in an environment that is as clean and dust-free as possible. Work on
- Open Circuits: Any tasks necessitating the removal of panels or access to internal components must be conducted only after the completion of the LOTO procedure.
- Authorized Personnel: Operations not explicitly designated as being executable by the operator in this manual shall be regarded as extraordinary maintenance and are reserved for qualified technicians. and authorized by METALSELF SRL.

5.2. Planned Maintenance Schedule

The table below summarizes the maintenance operations.

Frequency	Components / Area	Maintenance Procedure	Executed by	Notes and References
DAILY (Prior to each shift)	Welding Torch	Visual inspection and external cleaning of the copper nozzle.	Operator	Eliminate any welding spatter. Replace if distorted.
	Protective Lens	Conduct a visual inspection of the drawer. Examine it for stains, burns, or cracks.	Operator	**If soiled or impaired, replace immediately (refer to § 5.3.2).**
	Chiller	Verify the coolant level (distilled/deionized water) using the indicator.	Operator	Replenish if required.
	Gas System	Verify the residual pressure in the cylinder utilizing the pressure gauge.	Operator	Replace the cylinder if the pressure is inadequate.
	Work Area	Comprehensive cleaning and elimination of flammable substances or processing residues.	Operator	Maintain the area in a clear and safe condition.
WEEKLY	Air Filtration Systems	Inspect and clean the dust filters and electrical panels of the chiller.	Operator	Utilize low-pressure compressed air for cleaning purposes.
	Cables and Conduits	Visual assessment of the integrity of the torch umbilical cable and power cable.	Operator	Inspect for lacerations, contusions, or thermal injuries.
	Wire feeder	Cleaning the drive rollers and the wire guide sheath of metal dust.	Operator	Ensures seamless and uniform wire feeding.
MONTHLY	Protective Lens	Preventive replacement should occur irrespective of visual conditions, or more frequently in instances of intensive use.	Operator	**Refer to the detailed procedure in § 5.3.2.**
	Machine Chassis	Internal cleaning of electrical panels utilizing aspirator (conducted by certified personnel).	LOTO maintenance technician.	**Execute solely post-procedure.**
	Safety Circuits	Functional testing of the emergency stop button and ground terminal interlock.	Operator	Ensure they properly activate the machine shutdown.
HALF-YEARLY	Chiller	Thorough replacement of distilled or deionized water and cleaning of the tank.	Circuit technician.	Prevents the development of algae and deposits that may obstruct the
	Internal focusing	Inspection and cleaning of the lens, if required. and collimation optics.	Maintainer	**Delicate operation designated for technical personnel. Refer to § 5.3.3 and** § 5.3.4.

5.3. Routine Maintenance

This section outlines the operational procedures for maintenance activities that may be conducted by the operator or internal maintenance technician.

5.3.1. Comprehensive Cleaning of the Equipment

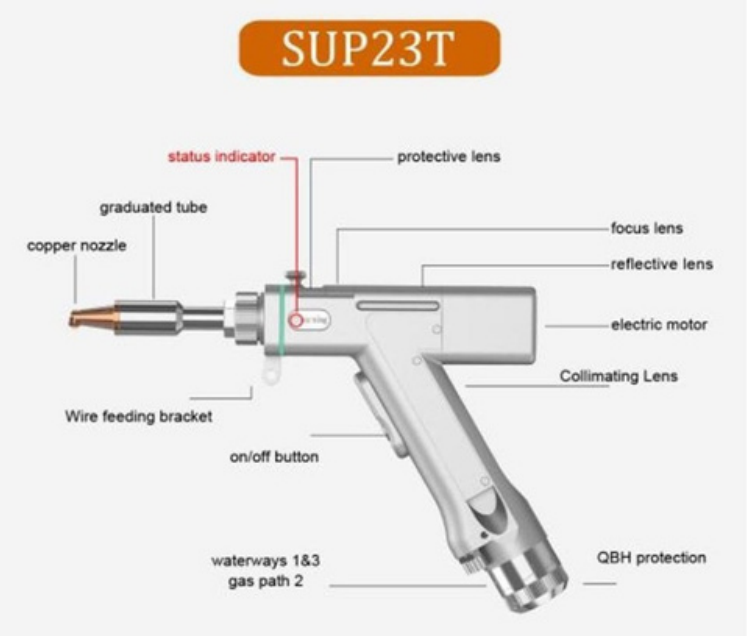
Maintaining a clean machine is crucial for effective heat dissipation and the prevention of malfunctions.

- **Exterior Surfaces: Utilize a soft, dry cloth. For more persistent dirt, employ a cloth that is lightly moistened with water and a mild, neutral detergent. Avoid the use of solvents, benzene, or alcohol.**
- **Touchscreen Display: Utilize a soft cloth specifically intended for screens.**
- **Air Vents and Fans: Ensure that the ventilation grilles of the chiller and electrical panels remain unobstructed and free from dust to facilitate optimal airflow.**

5.3.2. Substituting the Protective Lens

The protective lens serves as the principal optical consumable. Its integrity is essential for safeguarding the internal optics.

Procedure for Model SUP23T:

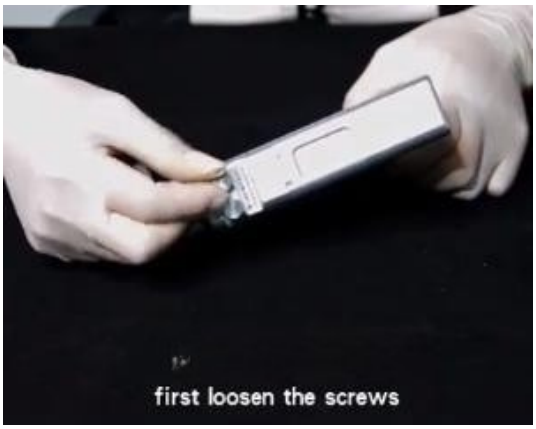


SPECIFICATION

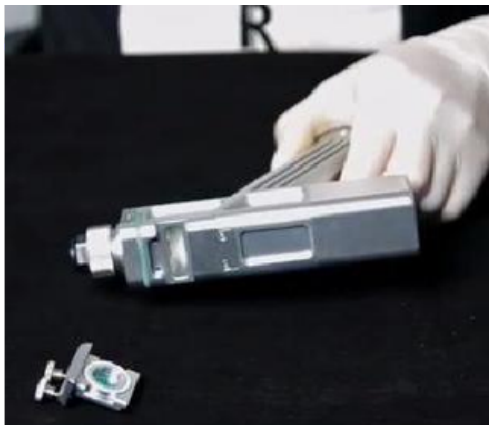
model name	SUP23Tlaser welding head
power	3000W
range of application	⩽3000W
Collimating focal length	60mm
Focusing focal length	150mm
Maximum air pressure	15Bar
Vertical focusing range	±10mm
Spot adjustment range	Line 0-5mm
Applicable wavelength	1070nm
weight	0.75kg

1. Execute the Logging Out Procedure (LOTO).
2. Don clean nitrile gloves.
3. Remove the thumbscrew that secures the lens drawer.
4. Carefully extract the drawer.
5. Promptly seal the opening of the torch with clean paper tape to prevent any entry.
   of pollutants.
6. Remove the threaded locking ring from the drawer.
7. Detach the old lens along with its sealing O-ring.
8. Clean the seat in the drawer using an optical cloth and isopropyl alcohol.
9. Carefully insert the new lens (handling it solely by the edges) along with the new O-ring.
10. Retighten the locking ring until it is securely fastened, taking care not to overtighten. 11.
Remove the paper tape from the torch and reinsert the drawer.
Secure the drawer using the thumb screw.

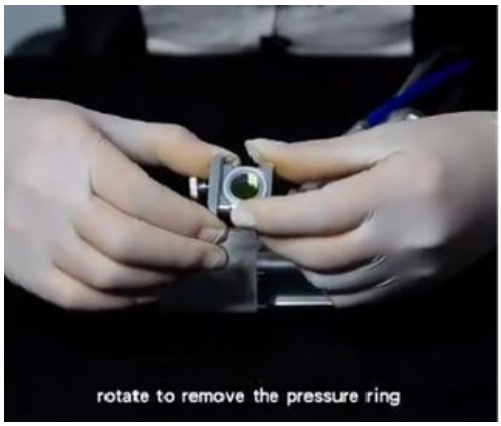
Protective Replacement Lens













Replacing the focal lens













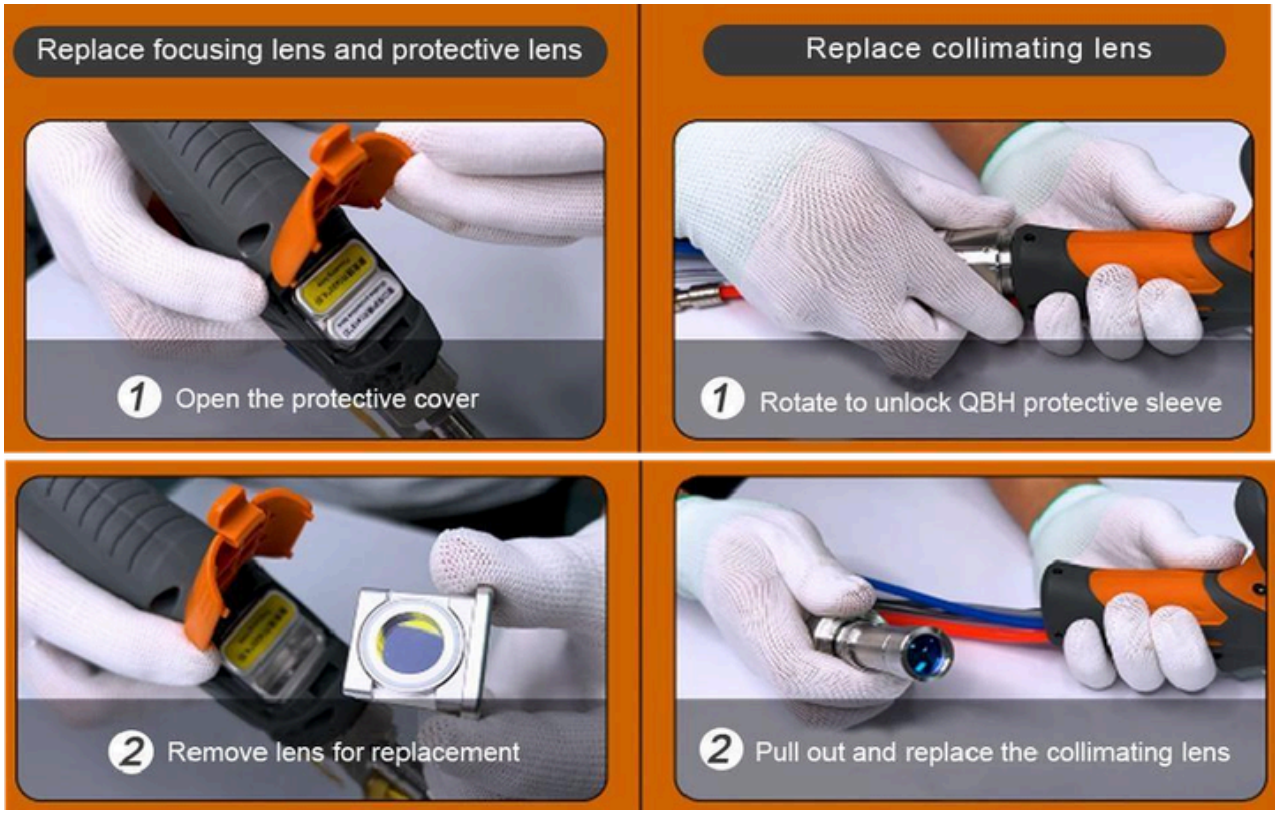
Procedure for Model SUP21T:



SPECIFICATION

model name	SUP21Tlaser welding head
power	3000W
range of application	⩽3000W
Collimating focal length	60mm
Focusing focal length	150mm
Maximum air pressure	15Bar
Vertical focusing range	±10mm
Spot adjustment range	Line 0-8mm
Applicable wavelength	1070nm
weight	0.7kg

1. Execute the Logging Out Procedure (LOTO).
2. Don clean nitrile gloves.
3. Open the orange protective door located at the top of the torch body to access the lens drawer. Remove the drawer that holds both the focusing lens and the protective lens.
4. The protective lens serves as the initial accessible lens. Adhere to a procedure akin to that of the
5. SUP23T to detach the corresponding ring and replace it.
   Reinsert the drawer and shut the door.
6.



Chapter 6

TROUBLESHOOTING

6.1. System Alerts and Their Significance

The machine features a self-diagnostic system that continuously monitors essential operating parameters in real time. In the event of an anomaly, the system promptly inhibits laser emission to guarantee optimal safety and presents an alarm message on the touchscreen display.

Main Alarms Register

Alarm Displayed on Display	Likely Cause and Significance	Primary Remedial Action				
"CHILLER ALARM"	Overtemperature alarm or malfunction. This is a One of the most crucial alarms, as insufficient cooling can irreparably harm the laser source.	cooling circuit refrigerator (e.g.	Probable causes: • Insufficient distilled water level in the tank. • Obstruction or bending of the hydraulic circuit pipes. • Ambient temperature exceeding operational limits (> 40°C). • Clogged dust filters in the chiller, hindering effective heat dissipation. • Internal malfunction of the unit. compressor, fans). • Misconfiguration of the "Chiller alarm level" parameter on the "Settings" page.	1.	CHECK CHILLER: Inspect the chiller display for any specific error codes. 2.	CHECK WATER LEVEL: If low, replenish with distilled or deionized water exclusively. 3. CLEAN FILTERS: Examine and clean the chiller's dust filters. 4. CHECK ENVIRONMENT: Ensure sufficient ventilation around the unit. 5. RESTART: After addressing the issue, cycle the unit in the proper sequence. 6. If the alarm continues, reach out to technical support.
"PRESSURE ALARM" (Gas Pressure Alert)	Anomaly detected in the process gas circuit. Insufficient or absent gas pressure undermines the quality of welding and the protection of the optics. Likely causes include: • Empty gas cylinder or closed main valve. • Pressure reducer.	1. VERIFY THE CYLINDER: Ensure that the cylinder valve is completely open and that the pressure gauge displays adequate pressure. 2. VERIFY THE REGULATOR: Confirm that the flow meter/pressure gauge on the regulator is adjusted to the appropriate values (e.g. Argon: 15-20 L/min. 3. INSPECT FOR LEAKS: Verify the integrity of the pipes and fittings. 4. RESTART: Reset				

	pressure triggers the alarm. If it continues, too low or defective. • Contact support. Leaks in the pneumatic system. • Incorrect configuration of the "Pressure alarm level" parameter on the "Settings" page.					
"LASER ALARM"	Generic alarm originating from the laser source. Indicates a fault within the internal generator. Likely causes include: • Overheating of the internal source. Anomaly in the power supply of the source. • Malfunction of an internal component of the source.	1. POWER OFF AND RESTART: Execute a full power cycle of the machine. 2. INSPECT THE SOURCE: Examine any status LEDs or indicators on the laser source itself (if accessible). 3. detected by the chiller. • CONTACT SERVICE: This alarm generally necessitates specialized technical intervention. Please note any error codes that are displayed and • Error in establishing communication with the METALSELF service control system immediately. and the SRL.				
"QBH ALARM" (QBH Connector Alert)		Fiber optic connection fault (QBH connector). This alarm signifies a safety interlock issue at the junction between the fiber and the torch, frequently resulting from a loose connection.	Probable causes: • The QBH connector on the rear of the torch may have become loose due to vibration or an accidental impact. • The safety interlock contacts may be dirty or damaged.	1. EXECUTE LOTO PROCEDURE: Deactivate and isolate the apparatus. 2. ACCESS THE CONNECTION: Remove any tape or protective film that is covering the QBH connector. on the reverse side of the torch. 3.	TIGHTEN THE CONNECTOR: Locate the "lock" and "unlock" symbols on the connector. In the unlocked position, fully insert the QBH connector. Ensure that the machine is properly inserted, and then verify whether the alarm can be forcefully activated. Block until the conclusion of the stroke. 4.	RESTART: Restart disappeared. Should the issue continue, please reach out to support.

6.2. Frequently Encountered Troubleshooting Guide

Problem	Probable Cause	Solution
The torch does not produce the laser.	1. Emergency button activated. 2. Active alarm displayed (chiller, gas, etc.). 3. Ground clamp improperly connected. 4. "Laser Activation" switch deactivated. 5. Laser power adjusted to 0.	1. Deactivate the emergency button. 2. Address the source of the alarm. 3. Verify proper and secure connection of the terrestrial terminal. 4. Engage the "Laser Enable" option on the display. 5. Establish a suitable power value.
Chiller alarm (overheating condition)	1. The water level in the chiller is excessively low. 2. Ambient temperature excessively elevated. 3. Impeded water flow. 4. Protective lens is dirty or damaged due to the reflective anomalous. 5. Erroneous alarm level configuration.	1. Replenish with distilled water. 2. Verify environmental requirements. 3. Ensure that the water pipes are neither kinked nor obstructed. 4. Examine and replace if necessary the protective lens. 5. In the settings, consider adjusting the alarm level from "High" to "Low" or the other way around.
Substandard welding (inadequate penetration, porosity)	1. Inaccurate welding parameters (power, speed). 2. Misguided emphasis. 3. Protective lens is either dirty or damaged. 4. Inadequate gas flow or gas circulation. absent. 5. Incorrect gas type or wiring.	Adjust the parameters or utilize those from the library. 2. Modify the focus position by utilizing the graduated ring. 3. Clean or substitute the protective lens. 4. Inspect the cylinder, the reducer, and the 5. Utilize the appropriate gas and wire for the base material.
The red aiming beam is misaligned within the nozzle.	1. The mechanical misalignment due to impact or oscillation. 2. Incorrect offset parameter (password 123456); please adjust the parameter. in the application.	1. Proceed with the mechanical adjustment of the screws on the motor within the torch's body, as detailed on page 24 of the original manual. 2. Access Configuration "Laser Center Displacement".

Chapter 7

SCRAPING AND DISPOSAL

7.1. Removing the Machine from Service

To permanently decommission your machine, adhere to the following procedure:

1. Power down and disconnect the machine from all energy sources (electricity, gas).
2. Thoroughly drain the chiller cooling circuit, ensuring the collection of the distilled water for appropriate disposal.
3. Detach the gas cylinder.
4. Eliminate any consumables (e.g., spool of thread).

7.2. Guidelines for WEEE Compliant Disposal

The machine, upon reaching the end of its useful life, is classified as Waste Electrical and Electronic Equipment. **Electronic Equipment (WEEE) must not be discarded with regular municipal waste.**
[IMAGE: Crossed-out wheeled bin symbol (WEEE).] It is mandated by law to deliver the device to an authorized WEEE collection center. Please reach out to METALSELF SRL or your local waste management service for details regarding the nearest collection centers.

Separation of Materials:

- **Electronic Components: Control boards, displays, and laser sources. These items contain valuable materials as well as potentially hazardous substances. They should be managed by professionals.**
- **Liquids: Chiller water must be disposed of in compliance with local regulations.**
- **Metal Components: The primary steel/aluminum framework is eligible for metal recycling.**
- **Plastic Components: Should be disposed of separately.**

The unlawful disposal of the product will lead to the enforcement of the administrative penalties stipulated by existing legislation.

Chapter 8

REPLACEMENT COMPONENTS

8.1. Spare parts included and available for order Recommended Spare Parts Table

Item	Standard Quantity	Quantity with Complimentary Consumables
Main Machine Body Welding	1 set	1 set
Torch Water Cooler (integrated)	1 set	1 set
Wire Feeder Wire Feeder Toolkit	1 set	1 set
Ground Clamp Protective Lenses	1 set	1 set
Nozzle Set	1 set	1 set
	1 Pz	1 Pz
	5 Pz	20 pieces in
	1 Set (8 nozzles + 1 graduated	total 2 sets in
	cylinder)	total

Inventory of Consumables and Replacement Parts

The primary consumables include protective lenses and nozzles. It is advisable to maintain a consistent supply of these items.

- **Protective Eyewear:**
  - oh Description: Protective lenses for SUP21T/SUP23T torches.
  - oh Estimated price: $3.00 each (available in sets of 5).
- **Copper Nozzle Collection:**
  - the Description: A set of 8 nozzles designed for various applications, including welding, cutting, and bead cleaning, accompanied by 1 graduated tube for focus adjustment.
  - the Approximate price: $20.00 per set.

To request spare parts or consumables, please contact METALSELF SRL and provide the model and serial number of the machine.