

DENALIWELD

User Manual

CR Water Cooled Series Laser Welding Machine
(1000W,1500W,2000W,3000W)



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TABLE OF CONTENTS

Copyright.....	3
Preface.....	3
Company Profile.....	3
Product Characteristics.....	4
General Safety Information.....	4
General Safety Instructions.....	7

Introduction

1. Technology Overview.....	16
2. Product Overview.....	16
3. Product Parameters.....	17
4. Features and Benefits.....	18
5. Applications.....	18

Chapter I. Machine Structure

1. Construction of the Machine.....	19
2. Control Panel.....	24
3. Auxiliary Functions.....	33
4. Laser Source.....	36
5. Cooler/Chiller.....	37

Chapter II. Installation, Commissioning, and Operating Guidelines

1. Pre-Installation Preparation.....	38
2. Installation Procedure.....	38
3. Welding Operation Principles.....	39

Chapter III. Equipment Safety, Daily Maintenance, and After-Sales

Service

1. Safety Rules.....	39
2. Safety Rules for Equipment Use.....	40
3. Daily Maintenance.....	41
4. Cleaning and Replacing the Protective Lens.....	42
5. Troubleshooting.....	43
6. Regular Cleaning.....	44
7. Repair Proces.....	44
8. Storage Requirements.....	44
9. Equipment Transportation Requirements.....	44
10. Equipment Disposal Instructions.....	44
11. Warranty Exclusions.....	45

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Preface

Thank you for using the handheld laser welding products of DENALIWELD. We compiled this document to ensure that the laser is used and maintained properly. Thank you again for using DENALIWELD products.

Please read this User's Guide carefully and become familiar with the operating and maintenance instructions before using the product. We strongly recommend that every operator review the section titled "Safety Information" before operating the equipment.

This User's Guide should stay with the product to provide you and all future users and owners with important operating, safety, and other pertinent information.

Important information that requires special attention is identified in this document. Please review these notices carefully to help prevent unnecessary damage.

Company Profile

DENALIWELD is a U.S.-based laser welding company specializing in manual and automated laser welding and cleaning solutions. We combine expertise in control systems, optical systems, mechanical design, and process development to provide high-quality solutions for customers in a wide range of industries worldwide.

Our U.S.-based professional team follows standardized process-management practices. Through years of industry experience, our services have expanded to major markets worldwide.

DENALIWELD designs and manufactures manual and automated laser welding and cleaning equipment. Our integrated capabilities span research and development, production, sales, and technical service, supporting a complete range of laser-processing equipment.

Our independent R&D team includes software engineers, mechanical engineers, electrical engineers, and industrial designers. DENALIWELD develops core technologies in control systems, precision welding heads, and optical systems to improve processing accuracy, speed, and ease of use. Our welding-head and control-system development continues to expand the practical applications of laser welding.

For more information, visit our website:

<https://www.denaliweld.com>

Product Characteristics

The CR Water-Cooled Series consists of high-efficiency, high-reliability, maintenance-free, high-power laser systems developed by DENALIWELD. The series uses a phase-change heat-dissipation design, operates over a wavelength range of 1060-1100 nm, and provides laser efficiency greater than 25%.

DENALIWELD CR Series lasers are Class 4 laser products. Safety is a primary consideration throughout product design and testing.

Laser light exhibits unique characteristics that may pose safety hazards. Therefore, the laser light cannot normally be associated with other light sources, and all operators and personnel near the laser must be aware of these special hazards.

To ensure the safe operation and optimal performance of the product, please follow all warnings and safety instructions in this guide during operation, maintenance, and service.

Do not open the sealed laser head or laser source. There are no user-serviceable parts or assemblies inside these products; unauthorized disassembly may void the warranty.

General Safety Information

1. Handheld Laser Welding Machines are Safe to Use

This handheld laser welding machine is a Class 4 laser product and emits hazardous, invisible infrared laser radiation in the 1060-1100 nm range. The average power emitted from the welding head exceeds 100 W and can injure the eyes or skin through direct or indirect exposure. Because the radiation is invisible and can cause irreversible damage to the retina or cornea, always wear appropriate, certified laser safety eyewear or a protective helmet rated for 1060-1100 nm before operating the machine.

- (1) Never point the welding head at yourself or another person.
- (2) Before operating the handheld laser welding machine, wear appropriate, certified 1060-1100 nm near-infrared laser safety eyewear or a protective helmet, along with heat-resistant gloves.
- (3) Attach the alligator clip directly to the workpiece before triggering the laser. Do not attach the clip anywhere else, as improper placement may result in unsafe laser output.
- (4) The handheld laser welding machine has two emergency-stop buttons: one on top of the machine and one at the rear of the welding gun. Either button can be used to stop the machine immediately in an emergency.
- (5) Operate the handheld laser welding machine only in a dedicated, laser-protected workspace. Keep non-welding personnel and combustible materials at least 30 feet from the welding area, and keep an appropriate fire extinguisher readily accessible.
- (6) Wear a mask and helmet when welding highly reflective materials.
- (7) Make sure the handheld laser welding machine is properly grounded. Improper grounding may energize the machine enclosure and cause electric shock. It may also cause laser alarms, loss of laser output, unstable operation, or other faults.
- (8) Do not operate the machine in rain or direct sunlight. These conditions may trigger temperature or humidity alarms, cause a short circuit, interfere with normal laser operation, and create additional safety hazards.

2. Safety Conventions

As shown in the table below, all safety warning signs during the operation of the handheld laser welding machine include:

SYMBOLS	DESCRIPTION
	WARN: Text marked with an electrical warning symbol indicates a potential personal hazard. Failure to follow certain procedures may cause certain or fatal hazards to you or others.
	NOTICE: There is a potential hazard to the product; certain procedures need to be followed, otherwise your equipment or components may be damaged. Do not violate the requirements of the attention signs during operation to ensure the normal use of the equipment.

	This logo represents laser radiation, and we have affixed this logo to the laser output of the product.
	This symbol means wearing protective eyewear. Please be sure to wear appropriate and certified 1060-1100 near-infrared band laser protective eyewear.
NO SYMBOL	IMPORTANT: Refers to any information regarding the operation of the product. Please do not overlook this information.

NOTE:

- The DENALIWELD handheld laser welding machine operates at 1060-1100 nm, outside the visible-light range. Exposure can cause irreversible damage to the retina and cornea. Always wear qualified laser safety glasses or a protective helmet when operating the handheld welding machine.

3. Laser Protection

1. Laser Safety Eyewear and Helmet Requirements

Select laser safety goggles or helmets that provide protection across the full wavelength range emitted by the handheld laser welding machine. Always wear appropriate laser safety eyewear or a helmet while operating the device. The end user is responsible for verifying that all protective eyewear, viewing windows, shields, and other personal protective equipment are rated for the product's output power and full wavelength range. Also consider any secondary radiation hazards generated by the welding process (see Chapter II, Section 4-1).

2. Laser Protective Equipment

Whether the laser is being used in a new facility or retrofitting an existing system, the end user is solely responsible for determining the suitability of all personal protective equipment.

DENALIWELD provides a laser protective helmet with the machine. Contact DENALIWELD or your dealer if additional protective equipment is needed.

4. Welding Safety Hazards

1. Radiation Hazard

Visible and invisible radiation is generated during welding. The interaction between the high-power laser beam and the target material to be welded can create a plasma that generates ultraviolet radiation and "blue light," which can lead to conjunctivitis, photochemical damage to the retina, or a sunburn-like reaction to the skin. Welders exposed to invisible UV light without proper protection can suffer permanent eye damage.

2. Skin Hazard

Exposure to infrared and ultraviolet radiation during welding can damage skin. Infrared and ultraviolet light can cause skin burns, increase welders' risk of skin cancer, and accelerate signs of skin aging. Welding sparks can also cause burns. Laser material processing can transfer large amounts of energy into parts. Even after the cutting process is complete, parts can be very hot to the touch. Make sure to use proper personal protective equipment to prevent potential burns. Take precautions to prevent skin damage by wearing protective clothing such as fire-resistant gloves, hats, leather aprons, and other fire-resistant clothing. Sleeves and collars should be buttoned.

3. Fire Hazard

If flammable or combustible materials are present near the welding area, heat and sparks may cause a fire or explosion. Perform laser welding only in areas free of combustible materials. Never weld containers that hold flammable or combustible substances. If the contents are unknown, treat the container as if it contains flammable material. Keep an appropriate fire extinguisher nearby and make sure trained personnel know how to use it.

4. Fume Hazard

Welding fumes can contain very fine particles and gases generated by the base material, filler material, shielding gas, paints, coatings, chemical reactions, and airborne contaminants. Exposure to welding fumes may adversely affect the lungs, heart, kidneys, and central nervous system.

- (1) Keep your head out of the welding fumes and work in a well-ventilated area with adequate clean air.
- (2) Use a fume extraction system to remove vapors, particulates, and hazardous debris from the welding process area.
- (3) A respirator may also be required in confined spaces or other conditions where ventilation is insufficient.
- (4) Routine air monitoring should be performed to determine the level of noxious fumes in the welding area.

5. Gas Cylinder Safety

A damaged gas cylinder may rupture or explode. Position shielding-gas cylinders where they cannot be struck or damaged, and keep them away from heat, sparks, and open flames. Store cylinders upright and secure them to a fixed support. Use a properly functioning regulator rated for the required gas and pressure, and make sure all hoses and fittings are suitable for the application and in good condition.

General Safety Instructions

1. Specular Reflection

A secondary or divergent laser beam may be produced when the primary beam is reflected from a flat surface. This phenomenon is called specular reflection. Although the reflected beam carries less energy than the primary beam, it can still injure the eyes or skin and damage some material surfaces.

WARNING:

- Since the laser radiation is invisible, you must exercise extreme care to avoid or reduce specular reflections.



2. Optical Accessory Safety

Photosensitive elements in optical accessories may be damaged by laser exposure. Take appropriate measures to protect all related devices.

WARNING:

- The output intensity of the DENALIWELD handheld laser welding machine is sufficient to weld metal, burn skin, clothing, and paint, and ignite volatile substances such as alcohol, gasoline, and ether. Keep all flammable materials away from the machine during operation.

3. Optical Handling Precautions

Review the following precautions before operating the handheld laser welding machine:

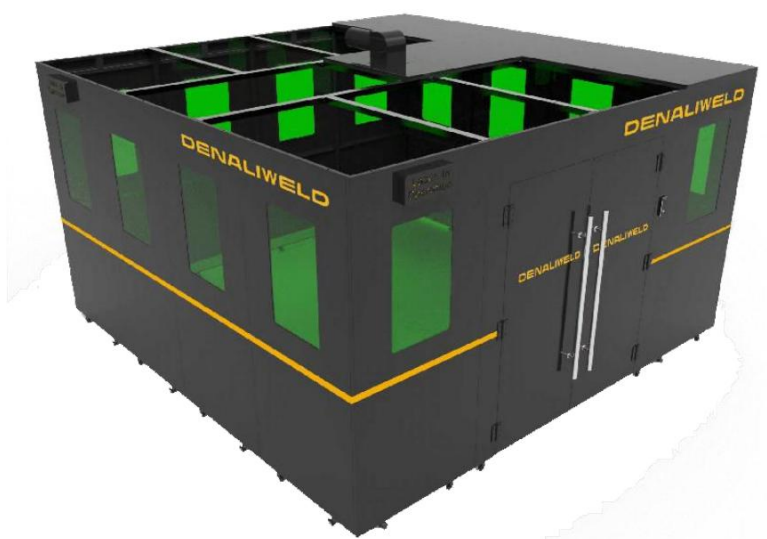
- (1) Do not look directly at the light-emitting hole of the handheld laser welding machine.
- (2) Avoid placing the handheld laser welding machine and related optical output devices on the same level as your eyes.
- (3) Select personal protective equipment that is appropriate for the machine's laser output power and wavelength.
- (4) Post appropriate laser warning signs to clearly identify the controlled operating area.
- (5) Do not use the handheld laser welding machine in a dark environment.
- (6) Do not turn on the handheld laser welding machine unless the optical coupling fiber or optical output connector is properly installed.
- (7) Install, inspect, or clean the protective lens, copper nozzle, and wire-feeding assembly only when the machine is turned off and disconnected from the power supply.

(8) Keep laser output disabled while debugging, calibrating, or focusing. Enable the laser only after these procedures are complete.

(9) Operate the equipment strictly in accordance with this manual. Failure to follow these instructions may impair safety functions or equipment performance and may void the warranty.

WARNING:

- **Select protective equipment that is appropriate for the laser output power and wavelength.**
- **Do not look directly at the tip of the gun and ensure that safety glasses or helmets are always worn during each operation.**



4. Electrical Safety Instructions

Review the following precautions before operating the handheld laser welding machine:

(1) Make sure the machine enclosure is properly grounded. Any interruption in the protective-ground circuit may cause personal injury.

(2) Before use, verify that the power supply is connected to protective earth ground.

(3) To reduce the risk of fire, replace line fuses only with fuses of the same type and rating. Do not substitute other fuse types or materials.

(4) Verify that the machine is connected to the correct AC mains voltage (220-240 VAC single phase, where applicable) and that all wiring is correct. Incorrect wiring may cause personal injury or equipment damage.

(5) Except for designated welding-head consumables, the machine contains no user-serviceable components. All maintenance and repair work must be performed by qualified DENALIWELD service personnel.

(6) Do not disassemble the handheld laser welding machine or damage its safety labels without authorization. Doing so may expose personnel to electric shock or burn hazards.

(7) Keep flammable materials away from the welding area. Heat and sparks generated during welding may cause a fire or explosion. Perform laser welding only in areas free of combustible materials.

(8) Never weld containers that contain flammable or combustible materials. If the contents are unknown, treat the container as if it contains flammable material. Keep an appropriate fire extinguisher nearby and make sure trained personnel know how to use it.

(9) Unauthorized disassembly may void the product warranty.

WARNING:

- The input voltage of the handheld laser welding machine is single-phase alternating current (220-240 VAC), and there is a danger of electric shock. All associated cables and connections may be hazardous.

5. Operating Environment Requirements

This equipment is intended for use under the following conditions: (1) below 2,000 meters (6,561 feet) above sea level; (2) Overvoltage Category II; (3) Pollution Degree 2; and (4) a dry location. Refer to the product specifications for additional requirements.

Humidity: Do not expose the device to relative humidity above 85%.

Cooling and temperature: The laser unit is water-cooled. Operation at elevated temperatures accelerates aging, increases threshold current, and reduces slope efficiency. If the device overheats, stop using it and contact DENALIWELD for assistance.

If the laser temperature becomes too high, the machine will trigger an alarm and stop laser output.

Interaction between the laser and the workpiece can generate high temperatures, gases, sparks, and debris, creating additional hazards. Operators must receive appropriate assessment and training and be familiar with general laser-safety requirements.

DENALIWELD recommends that you take the following measures to prolong the service life of the handheld laser welding machine:

Make sure the work area is properly ventilated, and operate the handheld laser welding machine in a dry, cool, and clean environment. Do not expose the machine to excessive heat, high humidity, or water.

During operation, make sure no foreign material blocks the air inlet at the bottom of the machine. Keep at least 1 meter (3 feet) of clearance around the air-intake area and above the top air outlet to maintain proper airflow.

Make sure no debris or liquid enters the laser. Contamination may damage the laser and cause personal injury.

Operating the equipment at elevated temperatures accelerates aging, increases the current threshold, and reduces sensitivity and conversion efficiency. If the machine overheats, stop using it and contact DENALIWELD for assistance.

NOTICE:

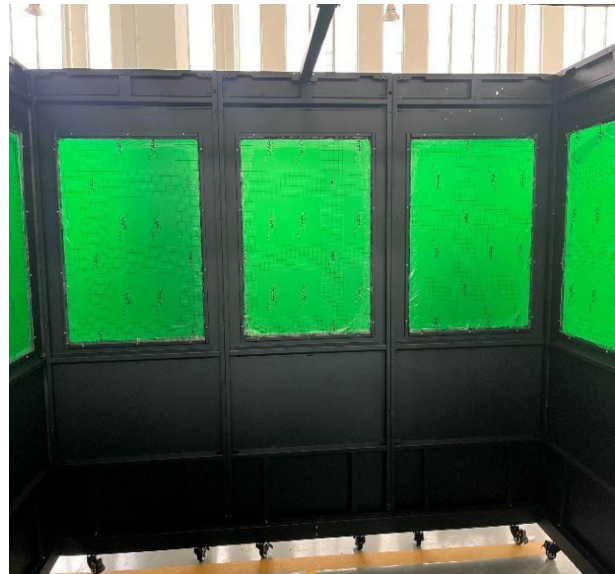
- Please operate the equipment carefully to avoid accidental damage.
- Clean the filter at the bottom of the machine periodically to remove dust and debris from the air inlet.

6. Workstation Installation

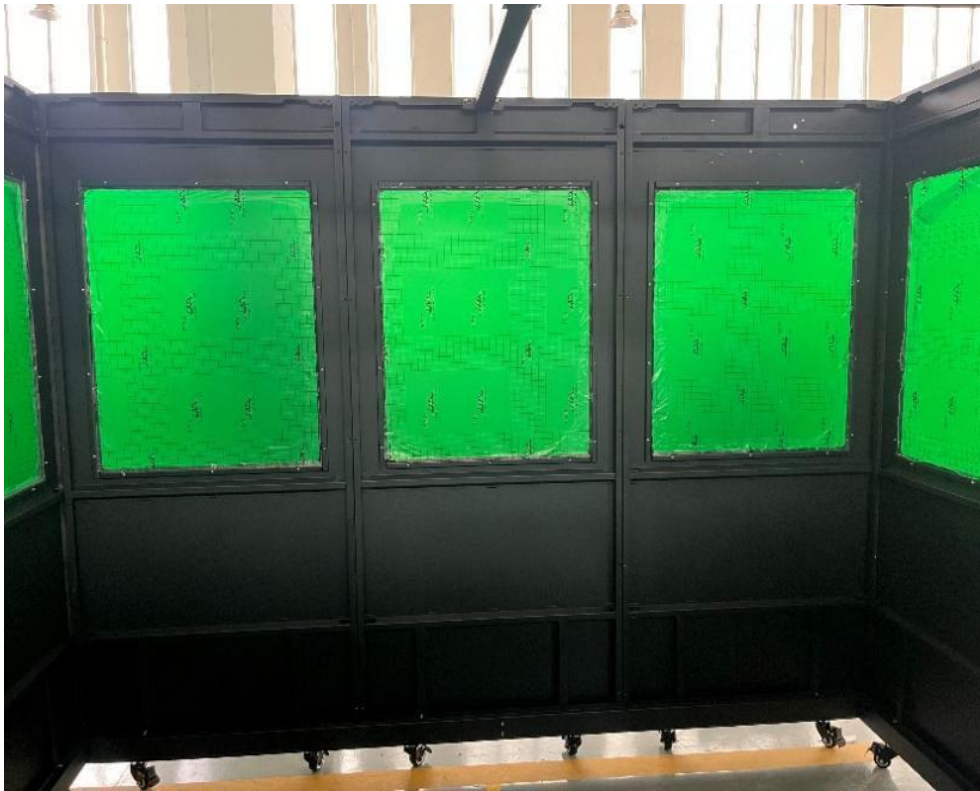
Secure the panels together with screws through the mounting holes, as shown below.



The diagrams below show the left and right sides, with the three panels fastened together as a single assembly.



As shown below, the rear section consists of four panels assembled as one unit.



The image below shows the front of the workstation, which also consists of four panels.

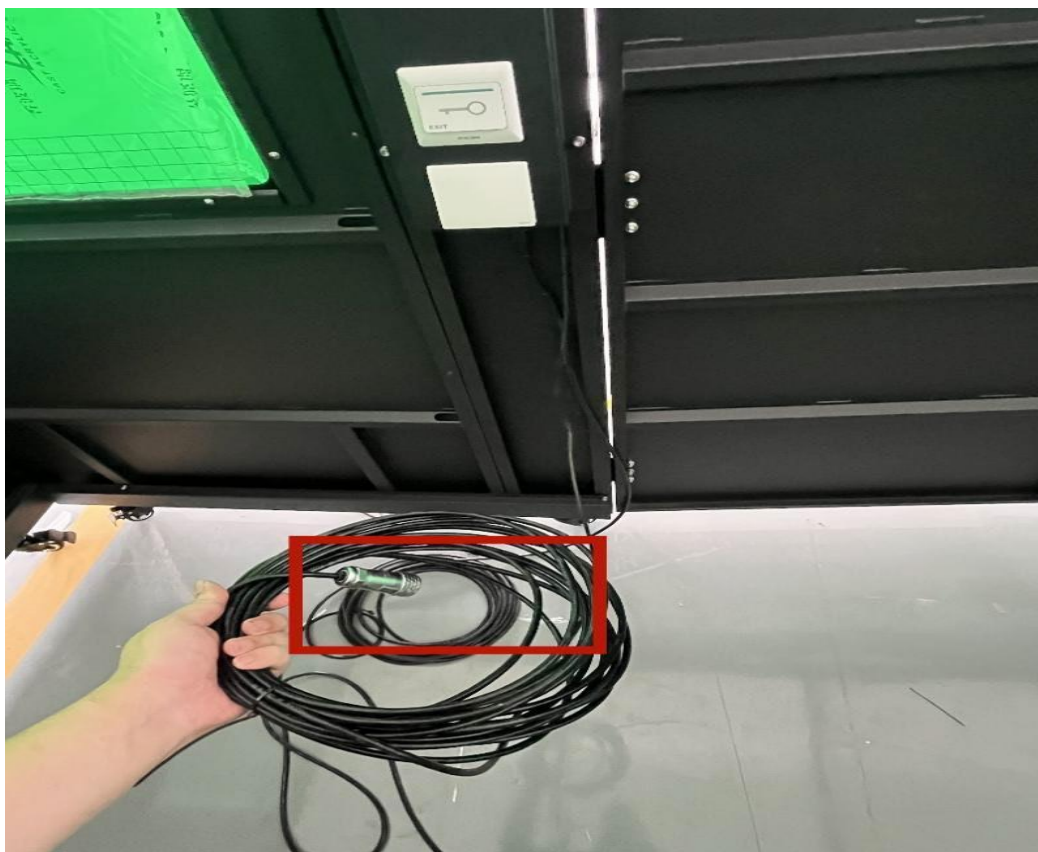
The front consists of two door sections and two fixed panels.



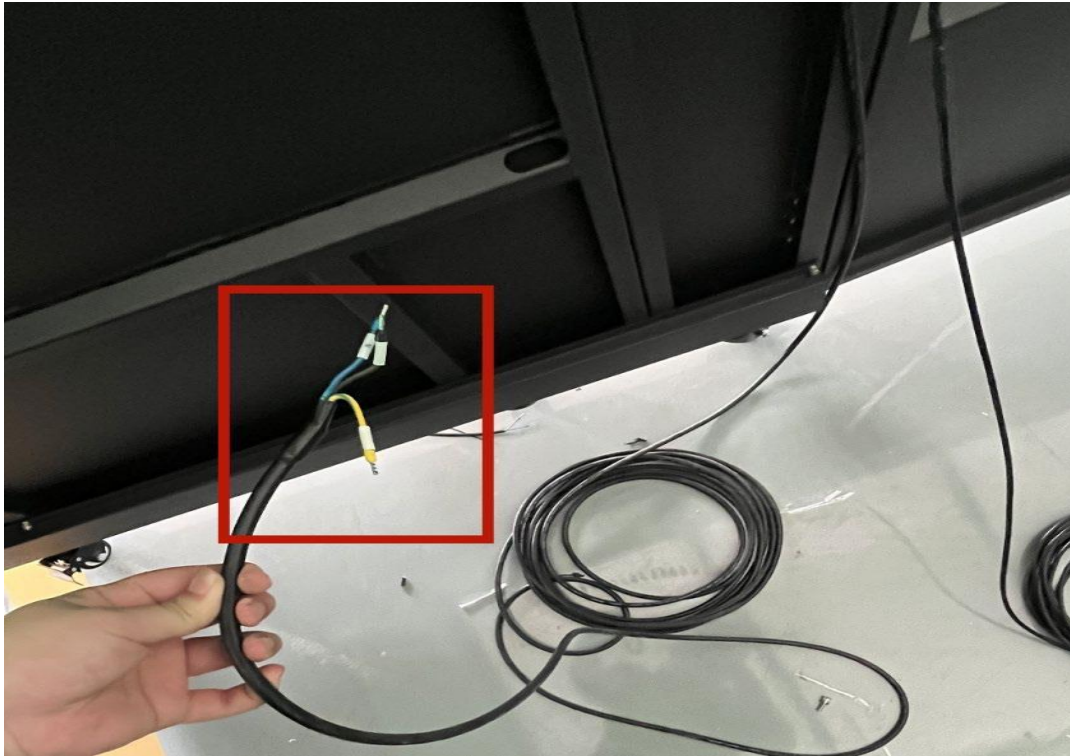
The workstation fixed-beam connection is shown below.



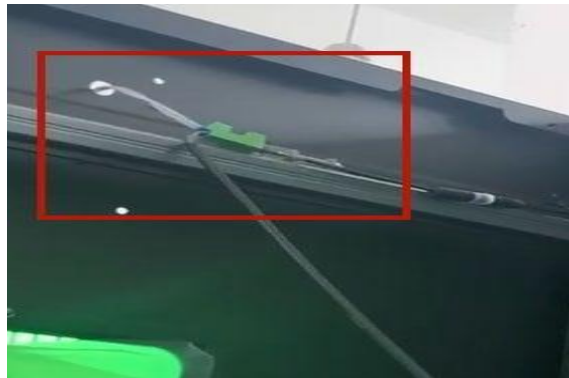
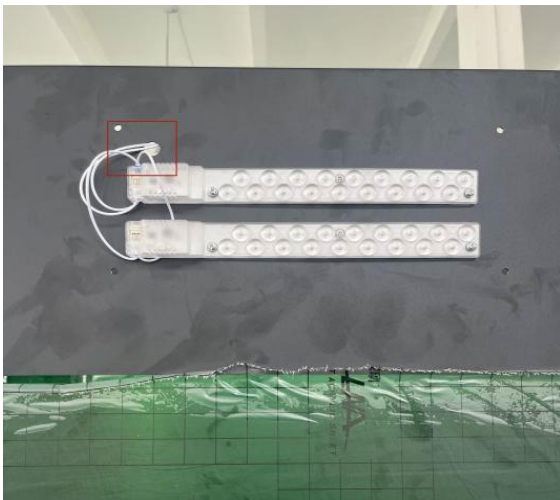
The image below shows the safety-door connection cable. Connect this cable to the machine's safety-door socket during operation



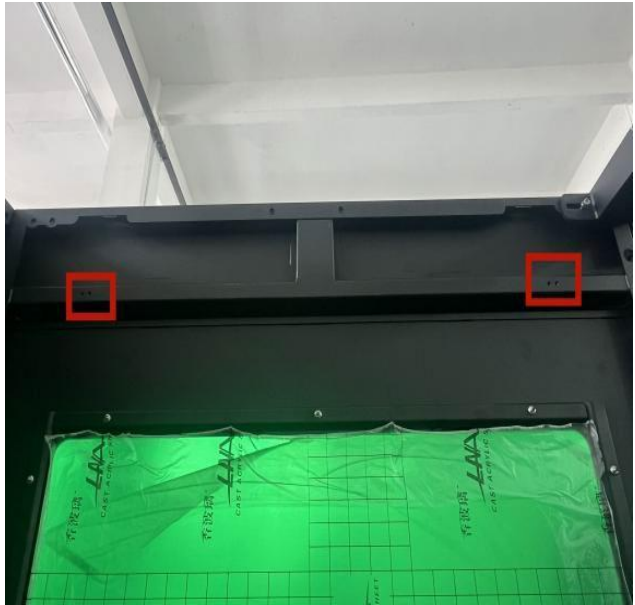
The diagram below shows the 220 V power cables supplied for the light bars and access-control unit.



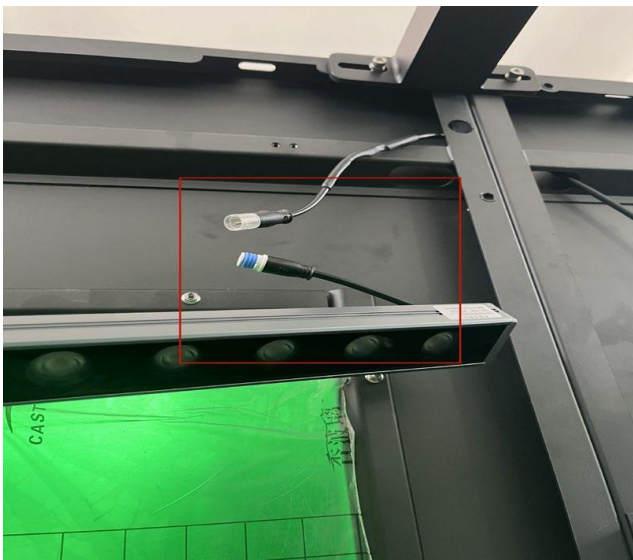
The diagram below shows the mounting points for the illuminated sign and the screw-hole locations.



Mount the light bars to the side panels at the front and rear of the workstation, aligning them with the screw holes.



The diagram below shows the light-bar connection points. Four light bars are installed at the front and rear of the workstation and are connected to one another as shown.



7. Additional Safety Information

If you need more laser safety information, please refer to:

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 Electrotechnical 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

Introduction

1. Technology Overview

Laser welding joins components by melting the contact area with a highly concentrated, high-energy-density beam. The single-module fiber source provides stable, high-quality laser power and beam characteristics. Laser power can be adjusted to suit production requirements, providing flexibility and reliable operation. Laser welding is especially effective for high-volume, automated, or robotic production.

2. Product Overview

The DENALIWELD handheld laser welder uses a modern fiber laser and a proprietary welding head with an oscillating motor. The system is easy to operate and provides high welding quality, fast welding speeds, and low consumable use. For many thin-sheet applications involving stainless steel, mild steel, galvanized steel, and other metals, it can replace conventional processes such as argon-arc and electric welding. Typical applications include cabinets, kitchen equipment, stairs, lifts, racks, ovens, stainless steel doors, railings, distribution boxes, and other complex metal-fabrication work.



3. Product Parameters

1. Name: Handheld Laser Welding Machine
2. Laser power: 1000 W, 1500 W, 2000 W, 3000 W
3. Laser wavelength: 1060-1070 nm
4. Fiber-optic cable length: 15 m (50 ft) standard; 20 m (65 ft) optional
5. Laser operating mode: Continuous / modulated wave
6. Welding speed: 0-120 mm/s
7. Cooling: Water-cooled
8. Operating temperature range: -20 to 45 °C (-4 to 113 °F)
9. Working humidity: <70% RH
10. Recommended welding thickness: 0.5-8 mm
11. Joint width: ≥ 0.5 mm
12. Operating voltage: 220 V / 400 V AC (varies by country; refer to the machine nameplate)

4. Features and Benefits

DENALIWELD develops its own welding heads and has developed an oscillating laser-welding method. This design addresses limitations of conventional fixed-spot laser welding and improves resistance to damage while supporting better weld formation.

- A. Multiple welding modes can be achieved with different welding-head configurations and simple setup.
- B. Welding speed can be 2-10 times faster than conventional welding. Each machine can reduce labor requirements, lower consumable use, provide long service life, and support a safer, more environmentally friendly welding process.



5. Applications

Laser welding is suitable for many industries and applications, including the manufacture of cabinets, railings, stairs, shelves, ovens, distribution boxes, stainless steel furniture, and other fabricated metal products.

Chapter I. Machine Structure

1. Construction of the Machine

The CR welder is equipped with durable casters that allow the machine to move easily between workstations. The clear, easy-to-use touchscreen lets operators load previously saved welding parameters, making it faster to select settings for different applications.



Front View

Two emergency-stop buttons are provided: one on top of the machine and one on the welding torch. Their purpose is to stop equipment operation quickly in an emergency and help protect personnel and equipment.

The main power switch and shielding-gas connection are located at the rear of the enclosure. Additional connections are provided for the automatic wire feeder and safety clamp.

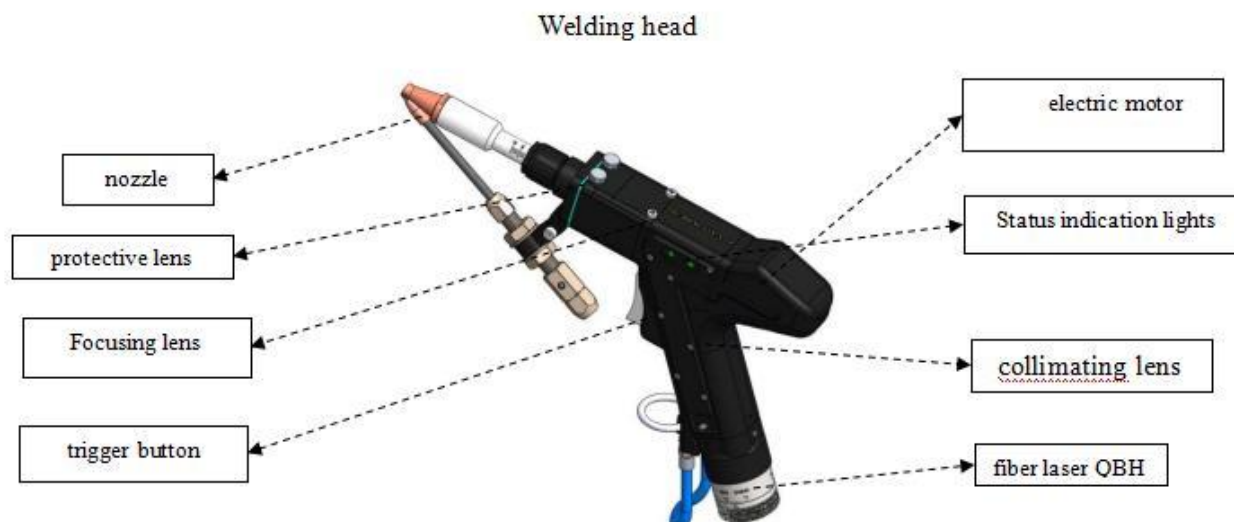


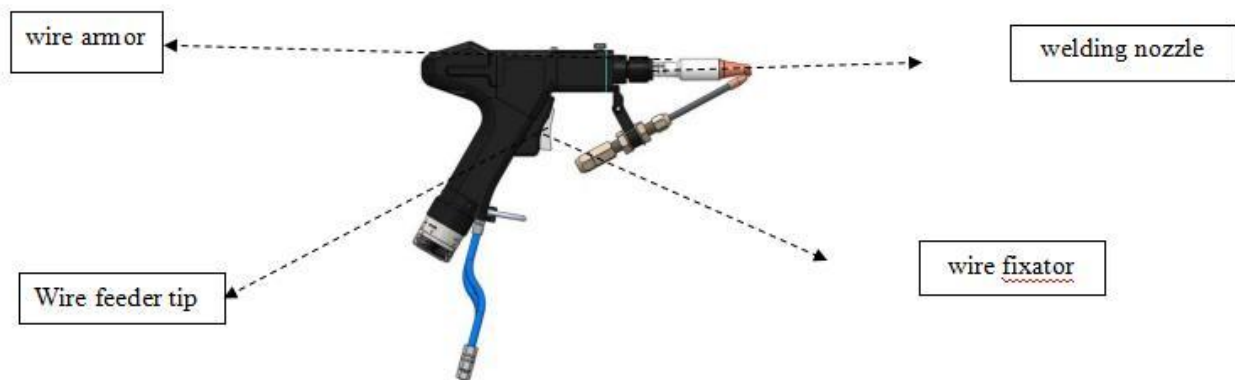
Rear View

Heat from the laser source, cooler, and welding head is dissipated through fans at the rear of the machine. This design helps maintain stable component temperatures.

Main Welding Head

The DENALIWELD welder is equipped with a proprietary welding head featuring an electrically driven WOBBLE beam system. A motor-driven focusing mechanism changes the lens position to adjust beam width, allowing the operator to match the beam to the desired weld joint. The head is water-cooled for stable, continuous operation and has an ergonomic design that fits securely in the operator's hand.





QBH Connection



Remove the optical-fiber dust cover and verify that the protective cap on the fiber connector is secure. Clean the fiber connector with a lint-free swab and absolute ethanol so that the optical surface is clean and free of dust.

- Place the welding head horizontally.
- Align the red mark at the end of the QBH interface with the red mark on the handwheel.
- Remove the QBH dust cover.
- When inserting the fiber connector, align the red mark on the male fiber end with the red mark on the female QBH connector of the welding head, then insert the fiber connector

straight into the QBH interface until fully seated.

- Turn the QBH handwheel clockwise until you hear a click. Pull the handwheel upward and continue turning it clockwise until it stops.

Daily Inspection

- Before each use, inspect the protective cover glass for contamination and replace it if necessary.
- Before each use, check the QBH connector for looseness and verify that the locking mechanism is secure before operating the machine.

- Before each use, check the copper nozzle for blockage and verify electrical continuity between the copper nozzle and the safety lock. If welding slag cannot be removed or conductivity is poor, replace the copper nozzle.
- Check the machine and surrounding area for signs of water leakage.
- Verify the correct gas and water connections: the gas connection is in the center, and the water connections are on both sides (one inlet and one outlet), as

shown below. Both the gas and water tubing are 6 mm in diameter.

Automatic Wire Feeder



Supply voltage (V)	220 ± 10%VAC50/60Hz
Place the environment	Flat, no vibration and shock
Working environment temperature (℃)	10~40
Working environment humidity (%)	<70
Maximum support wire weight	25KG
Maximum support for wire feeding wire warp	2.0mm

Properly mounting the wire-feeding mechanism on the welding head ensures smooth wire guidance through the nozzle groove. Secure the mechanism firmly and adjust the wire-feed speed to suit the welding process. Feed speed is controlled by the potentiometer on the wire feeder.

Important Notes

- 1) Verify a reliable protective-ground connection before applying power.
- 2) Make sure the wire-feed roller and guide tube match the welding-wire diameter.
- 3) Do not twist or kink the wire-feeding tube.

Troubleshooting of Wire Feeder

S/N	Fault	Possible Cause	Solution
1	Power LED does not turn on	24 V power cable damaged	Replace the power cable.
		Power switch failure	Replace the power switch.
		Loose or disconnected internal wiring / welding-head switch wiring	Reconnect the plug and inspect the welding-head connection wiring.
		Wire-feed motor failure	Replace the wire-feed motor.
		Out of wire	Replace the welding-wire reel.
		Motor plug loose on motion card	Reconnect the plug.
2	Wire does not feed when the welding head is operated	Welding wire tangled	Release the tension regulator and rewind the wire.
		Wire-feeding tube kinked	Straighten or replace the wire-feeding tube.

Wire Feeder Maintenance

1. Daily Maintenance

- When not in use, shut down the wire feeder and store it in a cool, dry, dust-free location.
- Do not place other objects on the wire feeder, as this may cause damage.
- Before installing a new welding-wire reel, blow compressed air through the feeding tube to remove debris and contaminants.
- Keep the wire-guide tube free of crushing, deformation, and kinks.
- Regularly remove dust from the machine and check the motor for smooth rotation and abnormal noise.

2. Cautions

Operating Environment

- This equipment is intended for indoor use and has an IP2X protection rating. Do not use it near water or in the rain.
- Operate the wire feeder at an ambient temperature of -10 °C to 40 °C (14 °F to 113 °F).
- Do not place the wire feeder on a surface subject to strong vibration or impact.

Operating Precautions

- When installing the welding-wire reel or inserting wire into the guide tube, use extreme caution to avoid entanglement injuries from rotating parts.
- Verify the welding-wire reel weight before installation. The reel must not exceed 25 kg (55 lb).
- During welding, keep the right-side cover of the wire feeder closed to reduce the risk of electric shock or entanglement with rotating parts.

- Before welding, verify that the reel-shaft end cover is securely tightened. Otherwise, the welding-wire reel may come loose or fall off if the reel is tilted.

2. Control Panel

The control panel is used to adjust machine functions such as laser power, frequency, and beam width.

The control interface supports multiple languages, including Chinese, English, French, Korean, Japanese, Spanish, Russian, and Polish.



Control Panel

Detailed instructions for selecting and defining control-panel parameters are provided in the control-panel operating manual included with this documentation.

2.1 Home

- DENALIWELD: opens the multifunction menu for Weld, Remote Clean, and Weld-Seam Clean modes.

Mode Function	Weld	Remote clean	WeldSeam clean
Laser Power	300-3000W	300-3000W	300-3000W
Pattern	Spot / Line		
Laser Freq	0-50000HZ	0-50000HZ	0-50000HZ
Wobble Freq	0-200HZ	0-100HZ	0-150HZ
PWM	0-100%	0-100%	0-100%
Wobble Size	0-5mm	0-80mm	0-10mm
Laser	turn on/off laser		
Wire Feeding	turn on/off wire feeding		
Scale Weld	turn on when spot-welding is required		
Gas-Manual	continuous gas blow for independent test		
Process No	16 processes in total including full parameters could be saved for various applications.		
Safety Lock	Green indicates conduction and grey indicates non-conduction.		
Setting	enter submenu of basic setting or galvo setting to modify parameters.		
Process	enter submenu of process to modify parameters or select process for running.		
Monitoring	show red if alert occurs. Enter the submenu to check I/O status and faults.		
Lock HMI	Lock the human-machine interface to prevent the operator from touching the screen by mistake. It is used to ensure the safety of the operator.		
language selection.	English		

2.2 Settings

2.2.1 Basic Settings

- Gas in Advance: shielding-gas pre-flow time from laser activation to beam output.
- Gas Delay: shielding-gas post-flow time after the laser is turned off.
- Beam Off Delay: laser-output duration after the laser-off command. This setting is used to finish the end of the weld and burn off the welding wire.
- On Power: starting laser power during the ramp-up process. Adjust it according to the Ascent setting.
- Off Power: ending laser power during the ramp-down process. Adjust it according to the Descent setting.
- Ascent: time required to ramp from On Power to the set operating power after beam activation.
- Descent: time required to ramp from the set operating power to Off Power when ending beam output.
- Max Power: set according to the rated power of the installed laser. The maximum setting is 3000 W.

- Alarm Signal: PNP 24 V effective.
- Nozzle Break Duration: sets how long laser output continues when the nozzle temporarily loses contact with the workpiece.

Laser output is disabled if the no-contact time exceeds the Nozzle Break Duration setting.

- Scale Weld Duration: adjusts beam-output duration for spot-welding applications.
- Scale Weld Interval: beam-off interval between spot welds.

2.2.2 Galvanometer Settings



- Wobble Switch: turns the wobble function on or off.
- Wobble Graph: selects a line or point pattern.
- Wobble Width: sets the line width from 0 to 5 mm.
- Wobble Frequency: adjustable from 0 to 200 Hz to suit the welding process.
- X-Axis Center Offset: used for center alignment. Beam alignment is factory-set before shipment; make only minor adjustments as needed to align the beam with the wire center. Unnecessary adjustments are prohibited.
- X-Axis Amplification Factor: factory-set during commissioning. Make only minor adjustments if required. Unnecessary adjustments are prohibited.

2.3 Process

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DENALIWELD

Process

No Feeding

Num	Sheet	Thickness (mm)	Power (W)	PWM (%)	Freq (Hz)
0	MATL	0.0	300	100	1000
1	SS	1.0	550	100	1000
2	SS	1.5	800	100	1000
3	SS	2.0	1000	100	1000
4	SS	2.5	1200	100	1000

Process No. 0

Import Shutdown-save Restore

Home page
Setting
Process
Monitoring

- No Feeding: switches between wire-feeding and non-wire-feeding operation.
- Process No.: selects the active process number. Parameters for each process can be modified and saved.
- Import: loads the selected process for operation.
- Shutdown-Save: saves the modified process settings.
- Restore: restores the default process settings.

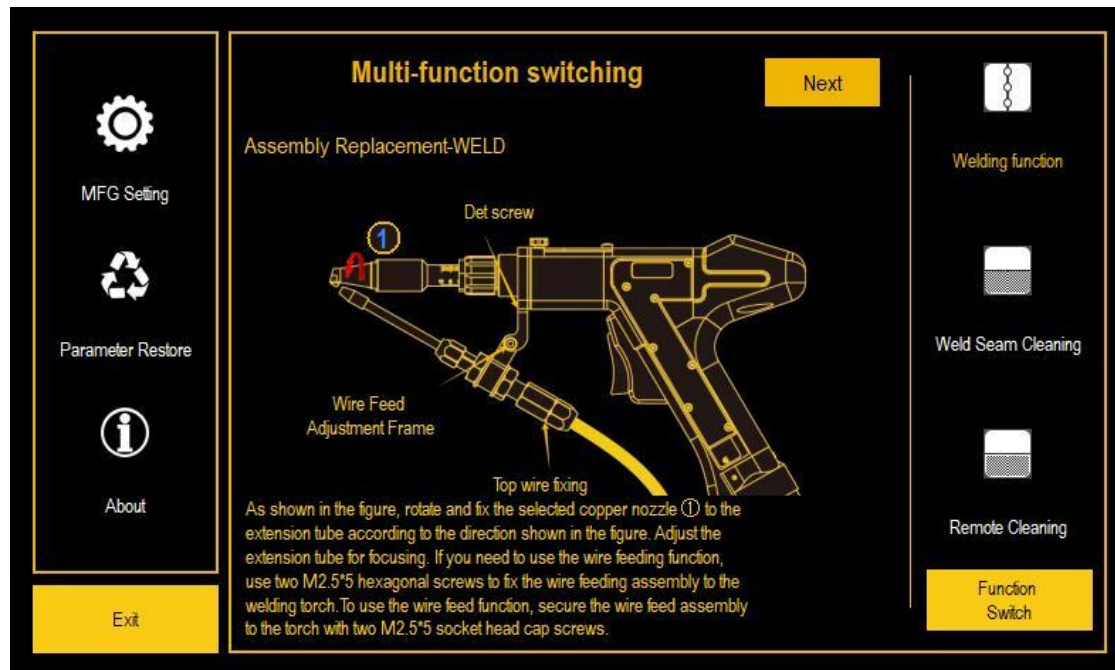
2.4 Monitoring



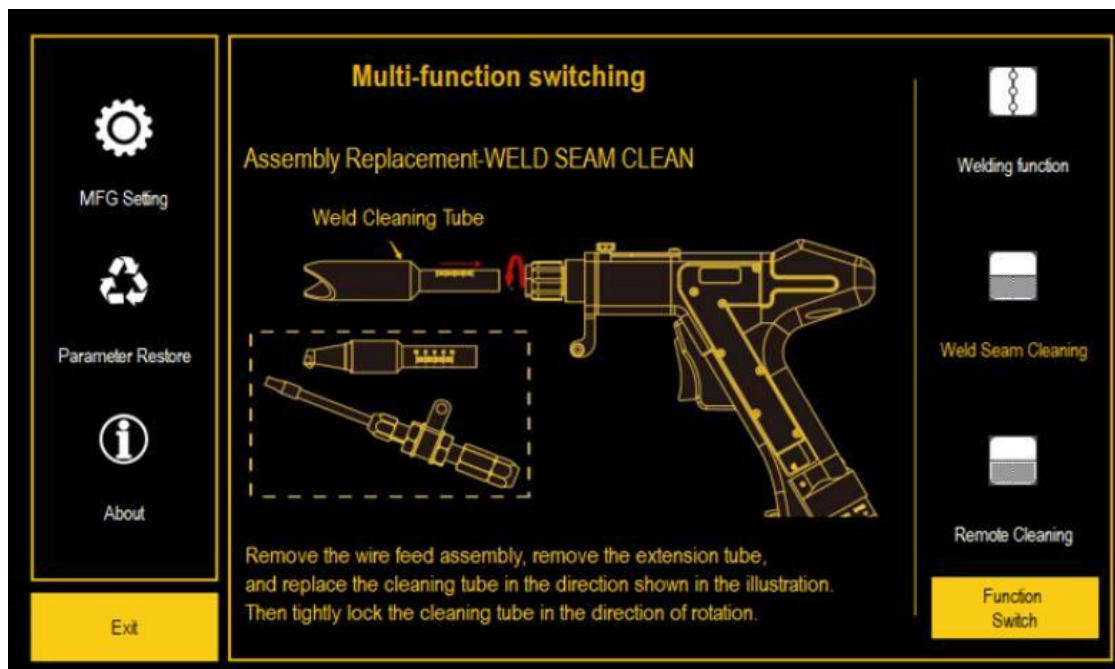
- I0.0 Welding Torch Switch: displays the status of the welding-head trigger button.
- I0.3 Safety Lock: indicates whether the head is in contact with the workpiece. Laser output is permitted only when contact is detected.
- Q0.2 Laser Enable: displays the output status of the laser-enable signal.
- Q0.4 Gas Valve: displays the output status of the gas-valve signal.
- Q1.1 Wire Feeding: displays the wire-feeder command signal.
- Laser: green = normal; red = fault.
- Chiller: green = normal; red = fault.
- External Alarms: green = normal; red = fault.
- HMI Panel-Laser Card Comm: displays communication status between the HMI panel and laser control card. Green indicates normal communication; red indicates an abnormal condition.
- X-Axis Galvanometer Card Drive Alarm: displays communication status between the HMI panel and galvanometer motion card. Green indicates normal communication; red indicates an abnormal condition.

2.5 Function Switch

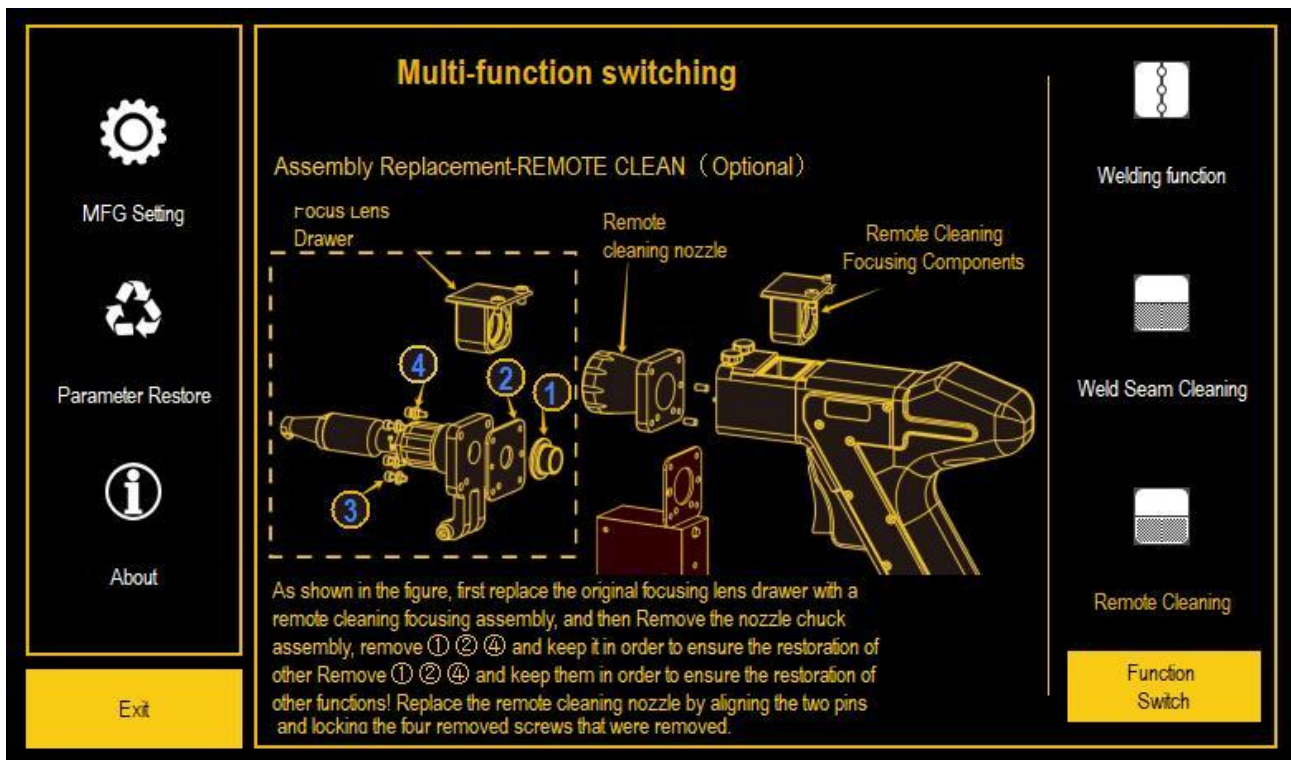
- Open the multifunction switch page by clicking the logo on the Home page.
- Weld: displays the assembly-change diagram. Select the desired nozzle option by clicking Next.



- Weld-Seam Cleaning: displays the assembly-change diagram.



- Remote Clean: displays the assembly-change diagram.



- Function Switch: select the required function, then click Function Switch to open the selected function interface.
- MFR Setting: restores factory-default settings with one action. This erases all customized parameters. Use with caution.
- About: displays hardware and software version information for the HMI panel, laser control card, and galvanometer motion card.

2.6 About

Each product generation has corresponding hardware and software versions for control and traceability. These versions correspond to the HMI panel, laser control card, and galvanometer motion card. Version upgrades must be confirmed by DENALIWELD.

2.7 Auxiliary Functions

2.7.1 Weld-Seam Cleaning

2.7.2 Configuration

Handheld laser cleaning is one of the machine's three-in-one functions.

- Remove the wire-feeding mechanism, welding nozzle, and extension tube. Install the cleaning tube.



- Select the weld-cleaning function and adjust the process parameters to suit the application.

2.7.3 Functions and Features

Functions

- Remove paint and coatings from metal or glass.
- Rapidly remove rust and various oxides.
- Remove grease, resin, adhesive, dust, stains, and production residue.
- Remove paint, rust, and oil before welding or bonding, and remove oxides and residues after welding.
- Clean molds such as tire molds, electronic molds, and food-industry molds.
- Remove oxides, paint, and rust during the production or maintenance of aerospace equipment and ships.

Features

Low power consumption, a small scanning range, and flexible operation.

2.8 Remote Cleaning

Function



- Remove paint and coatings from metal or glass.
- Quickly remove rust and various oxides.
- Remove grease, resin, adhesive, dust, stains, and production residue.
- Remove paint, rust and oil before welding or bonding, and treat oxides and residues after welding.
- Clean molds such as tire molds, electronic molds, and food-industry molds.
- Remove oxides, paint, and rust from workpiece surfaces.

Features

- Low power consumption, a medium scanning range, non-contact cleaning, and flexible, user-friendly operation.

3. Auxiliary Functions

3.1 Weld-Seam Cleaning

3.1.1 Configuration

- Handheld weld-seam laser cleaning is one of the machine's three-in-one functions.
- Remove the wire-feeding mechanism, welding nozzle, and extension tube.
- Install the cleaning tube.
- Select the WELD SEAM CLEAN function and adjust the process parameters to suit the application.

3.1.2 Functions and Features

Function

- Remove paint and coatings from metal or glass.
- Quickly remove rust and various oxides.
- Remove grease, resin, glue, dust, stains, and production residues.
- Remove paint, rust, and oil before welding or bonding, and remove oxides and residues after welding.
- Clean molds such as tire molds, electronic molds, and food-industry molds.
- Remove oxides, paint, and rust during the production or maintenance of aerospace equipment and ships.

Features

- Low power consumption, a small scanning range, and flexible, user-friendly operation.

3.1.3 Software Settings

Home:

- Laser Power: laser output power from 0 to 3000 W.
- Laser Freq: number of laser pulses emitted by the laser per second.
- Wobble Freq: 0-150 Hz.
- PWM: the ratio of pulse duration to pulse cycle, 0-100%.
- Clean Width: adjusts the line-spot width from 0 to 10 mm during cleaning.
- Laser: turns laser output on or off.
- Gas-Manual: provides continuous gas flow for independent testing.
- Process No.: stores up to 16 complete parameter sets for different applications.
- Safety Lock: displays the safety-lock status. Green indicates continuity; gray indicates no continuity.

- Settings: opens the Basic Settings or Galvanometer Settings submenu to modify parameters.
- Process: opens the Process submenu to edit parameters or select a process for operation.
- Monitoring: turns red when an alarm occurs. Open the submenu to check I/O status and fault information.



- Lock HMI: locks the touchscreen to prevent accidental input while the operator is cleaning or debugging. Use the lock icon to lock or unlock the HMI.

Basic Settings

- Gas Delay: shielding-gas post-flow time after the laser is turned off.
- Max Power: set according to the rated power of the installed laser. The maximum setting is 3000 W.
- Alarm Signal: PNP 24 V effective.
- Nozzle Break Duration: sets how long laser output continues when the nozzle temporarily loses contact with the workpiece.

Laser output is disabled if the no-contact time exceeds the Nozzle Break Duration setting.

Galvanometer Settings

- Wobble: turns the red-beam wobble function on or off. Use this function only when commissioning the red aiming beam. For cleaning, only the line pattern is available.
- Wobble Size: sets the line width from 0 to 10 mm.
- Wobble Freq: adjustable from 0 to 150 Hz to suit the process.
- X Center Offset: used for center alignment. Beam alignment is factory-set before shipment; make only minor adjustments if needed to align the beam with the cleaning area.

Avoid unnecessary adjustments.

- X Magn: factory-set before shipment; make only minor adjustments if required.

Avoid unnecessary adjustments.

3.2 Remote Cleaning

3.2.1 Configuration

3.2.2 Functions and Features

Function

- Remove paint and coatings from metal or glass.
- Quickly remove rust and various oxides.

- Remove grease, resin, glue, dust, stains, and production residues.
- Remove paint, rust, and oil before welding or bonding, and remove oxides and residues after welding.

Clean molds such as tire molds, electronic molds, and food-industry molds.

- Remove oxides, paint, and rust during the production or maintenance of aerospace equipment and ships.
- Low power consumption, a medium scanning range, non-contact cleaning, and flexible, user-friendly operation.

3.2.3 Software Settings

Home:

- Laser Power: laser output power from 0 to 3000 W.
- Laser Freq: number of laser pulses emitted by the laser per second.
- Wobble Freq: 0-100 Hz.
- PWM: the ratio of pulse duration to pulse cycle, 0-100%.
- Clean Width: adjusts the line-spot width from 0 to 80 mm during cleaning.
- Laser: turns laser output on or off.
- Gas-Manual: provides continuous gas flow for independent testing.
- Process No.: stores up to 16 complete parameter sets for different applications.
- Settings: opens the Basic Settings or Galvanometer Settings submenu to modify parameters.
- Process: opens the Process submenu to edit parameters or select a process for operation.
- Monitoring: turns red when an alarm occurs. Open the submenu to check I/O status and fault information.
- Lock HMI: locks the touchscreen to prevent accidental input that could turn laser output on or off while the operator is cleaning or debugging.

Use the lock icon to lock or unlock the HMI.

Basic Settings

- Gas in Advance: shielding-gas pre-flow time from laser activation to beam output.
- Gas Delay: shielding-gas post-flow time after the laser is turned off.
- Max Power: set according to the rated power of the installed laser. The maximum setting is 3000 W.
- Alarm Signal: PNP 24 V effective.
- Safety Lock Interval: beam output is triggered only when the welding-head trigger is pressed twice within the specified interval. A single press will not trigger beam output. If the time between the two presses exceeds this interval, the beam will not activate.

Galvanometer Settings

- Wobble: turns the red-beam wobble function on or off. Use this function only when commissioning the red aiming beam.
- Wobble Size: sets the line width from 0 to 80 mm.
- Wobble Freq: adjustable from 0 to 100 Hz to suit the process.
- X Center Offset: used for center alignment. Beam alignment is factory-set before shipment; make only minor adjustments if needed to align the beam with the workpiece. Unnecessary adjustments are prohibited.
- X Magn: factory-set before shipment; make only minor adjustments if required.

Avoid unnecessary adjustments.

4. 4. Laser Source

CAUTION: Do not operate the laser when the cooling-water temperature is below 20 °C (60 °F), as condensation may form and damage internal optical components.



The DENALIWELD laser source is a highly efficient, reliable, maintenance-free high-power device operating at 1060-1100 nm. With water cooling, the photoelectric conversion efficiency is 25% higher. The product is designed and tested with safety as a primary consideration.

Operate the laser source strictly in accordance with this manual to help ensure reliable and safe performance. This high-power laser has unique hazards and must not be treated like ordinary light sources or low-power lasers. All operators and nearby personnel must be informed of these hazards. Do not disassemble the device. It contains no user-serviceable parts, and unauthorized disassembly will void the warranty. All laser parameters are preset at the factory. Installation, setup, maintenance, and service must be performed only by authorized personnel.

Please refer to the separate laser source user manual.

5. Cooler/Chiller



The cooler maintains a stable water temperature and removes heat from the laser source and welding head. All chiller parameters are preset at the factory. Do not change these settings unless authorized by the supplier. Use only purified water in the chiller, and replace the water once a month.

The table below lists error codes that may occur during cooler operation.

Error Code Table

Code	The name of the error
E01	Water-temperature sensor failure
E02	High laser-source cooling-water temperature
E03	Compressor failure (pressure)
E04	Phase-connection error
E05	Water-flow error
E06	Low water-level alarm
E07	Compressor overload
E08	Ambient-temperature sensor failure

Chapter II. Installation, Commissioning, and Operating Guidelines

1. Pre-Installation Preparation

Requirements:

Install the equipment in a dedicated area of at least 15 m² (approximately 12 ft × 13 ft) with suitable gas and electrical connections. The floor must be level, solid, and resistant to vibration, and a laser warning label must be posted at the entrance.

Environmental Requirements:

The work area must have adequate lighting. Keep equipment that generates strong vibration or electromagnetic interference at least 20 meters (60 feet) away from the device.

Maintain an ambient temperature between -10 °C and 45 °C (14 °F to 113 °F), relative humidity below 70%, and altitude below 1,000 meters (3,280 feet) for optimal operation. The ambient temperature should remain stable, and the workspace should be climate-controlled as needed.

To maintain clean air in the work area, install an appropriate fume-extraction system based on site conditions after the equipment has been installed and commissioned.

Do not use the equipment in an explosive or otherwise hazardous environment.

(3) Power Requirements:

Voltage: 220 / 400 V AC, allowing 220 / 400 V ± 10% fluctuations.

Frequency: 60 Hz; allowable fluctuation: ±0.2 Hz.

Power requirements may vary by country. Refer to the machine nameplate.

2. Installation Procedure

Connect 1000 W, 1500 W, and 2000 W machines to a 220 V single-phase power supply.

Connect 3000 W machines to a 380 V three-phase power supply.

Europe: All machines sold in Europe use 400 V three-phase power.

Connect the gas hose to the cylinder with a shielding gas regulator.

(1) Startup Procedure:

- 1) Turn the main switch on the rear of the machine to the ON position.
- 2) Turn on POWER at the front panel.
- 3) Verify that shielding gas is available.
- 4) Verify that the protective glass is clean and clear.
- 5) Log in at the operator panel (refer to the Control Panel Operating Manual).
- 6) Enter the required process parameters.

(2) Shutdown Procedure:

- 1) Turn off START at the front panel.
- 2) Turn the main switch to the OFF position.
- 3) Secure the welding head and cable assembly.

3. Welding Operation Principles

To enable laser output, first unlock the welding head using the safety button. The green indicator confirms that the system is ready. Then press the trigger to activate the laser.

The operator must wear gloves suitable for laser welding, protective goggles rated for reflected laser radiation, and a protective helmet.

On the control panel, set parameters appropriate for the material being welded and the desired result.

Adjust the nozzle extension to set the correct focal position of the welding head. CAUTION: Operating with an incorrect focus may damage optical components in the welding head.

Maintain the correct angle between the nozzle and the workpiece. Aim the red aiming beam at the joint between the two parts, then activate the laser with the trigger. Perform the weld by moving the welding head smoothly along the joint.

Chapter III. Equipment Safety, Daily Maintenance, and After-Sales Service

1. Safety Rules

The table below shows all safety warning signs during the operation.

Warning 1: Because the laser beam is invisible, use extreme caution to avoid specular reflections.

Warning 2: The laser beam from the welding head has enough energy to cut or weld metal, burn skin, clothing, and paint, and ignite volatile substances such as alcohol, gasoline, and ether. Keep all flammable materials away from the laser work area.

The warning symbols are explained below:

Warning Mark	Description
	This sign represents laser radiation and is matched to the laser performance of the product.
	There is a potential risk to the product; follow the specified procedure, otherwise the equipment or components may be damaged. Do not violate the warning requirements during operation to ensure the standard use of the device.
	There is a potential for damage to the human body; it is necessary to follow certain procedures, otherwise it may harm you or others. Don't disregard the warning signs while working to ensure complete safety.

For additional safety information, review all labels on the machine.

2. Safety Rules for Equipment Use

Laser-equipment malfunctions can create serious hazards. Operators must strictly follow all laser-system safety procedures to protect personnel, maintain proper equipment operation, and achieve reliable processing performance. Observe all safety regulations at all times during operation.

- (1) Follow all applicable equipment-safety and operating requirements.
- (2) Operators must complete initial training, understand the machine's construction and operation, become familiar with all operating procedures, and be qualified before working independently.
- (3) Wear all personal protective equipment required by applicable safety rules, including appropriate laser safety eyewear or helmet, a protective face shield where required, a welding apron, and welding gloves. Never direct laser output toward people or unintended targets.
- (4) Do not leave the operating area or allow unauthorized persons to control the machine while it is running. If you must leave the workstation, shut the machine down safely.
- (5) Keep an appropriate fire extinguisher within easy reach. Turn off laser output when it is not in use, and keep paper, fabric, and other flammable materials away from any unprotected laser beam.
- (6) Keep the area around the machine clean, orderly, and free of oil. Store tools, materials, and waste properly.

- (7) When using shielding-gas cylinders, do not pinch or crush wires, cables, or gas hoses. Handle and transport cylinders in accordance with the industrial-gas supplier's safety requirements. Keep cylinders away from direct sunlight and heat sources. When opening a cylinder valve, stand to the side of the outlet, not directly in front of it.
- (8) If any abnormal condition occurs during operation, shut down the equipment safely to minimize potential damage.
- (9) Give the machine your full attention while it is operating. Do not engage in conversations, listen to music, or perform unrelated activities that could distract you from the welding process.
- (10) If the machine will not be used for more than 30 minutes, turn off the main power.
- (11) Turn off and isolate the main power supply before installation, repair, or maintenance. Working on energized equipment may cause fatal electric shock, cardiac arrest, burns, or other serious injury.
- (12) The emergency stop overrides all other controls and disables laser operation and power to hazardous machine functions. If abnormal laser output or another serious fault occurs, immediately release the trigger, press the emergency-stop button, and identify the cause before resuming operation.
- (13) Keep all personnel who are not trained operators away from the welding area. Do not allow unqualified personnel to operate the machine.
- (14) Unauthorized or unqualified personnel must not operate the machine or its peripheral devices. DENALIWELD is not responsible for consequences resulting from unauthorized operation or failure to follow the prescribed procedures.
- (15) Before the first startup, verify that the chiller contains sufficient water and that cooling-water temperature and pressure are within the required ranges. Add water as needed before starting the machine.
- (16) If the machine does not start, check the laser alarm indicator: GREEN indicates normal status; RED indicates a fault. Laser parameters are factory-set. Do not disassemble the laser source or chiller without authorization from the manufacturer.

3. Daily Maintenance

Remove dust and dirt from the machine regularly to maintain its appearance and performance.

Inspect the integrated dust cover and remove accumulated dust.

Inspect the protective glass and make sure it is clean.

Verify that the cooling-water temperature and water pressure are within the specified ranges.

Check the voltage stabilizer and monitor input voltage, output voltage, and gas pressure.

Make sure there are no leaks.

4. Cleaning and Replacing the Protective Lens

Contamination during cleaning or replacement can reduce lens transmission and shorten lens life.

Here are the precautions to take before starting work:

Before removing the protective-lens drawer, clean the surrounding area to minimize the chance of dirt entering the welding head.

Replacing the Protective Glass

Before handling the protective lens, wear clean, powder-free rubber or latex gloves.

Install the protective glass carefully using appropriate tools. Do not scratch the surface.

Cleaning the Protective Glass:

Hold the glass by its edge without touching the optical surface. Place it only on clean lens paper.

Keep the protective lens as far away from dirt as possible.

Use 99% alcohol to remove contamination without damaging the lens.

Clean the lens as thoroughly as possible in a dust-free room.



Main cleaning tools: air blower bulb, 99% alcohol, and lint-free swabs

If dust is present, first use the Aurilave blower ball to remove loose particles, then gently clean the lens with a dry, lint-free swab. Do not apply excessive pressure.

For stains, dip the tip of a clean, dry swab in anhydrous ethanol. Make sure no loose dust remains on the surface. Clean the lens in a circular motion from the center outward; do not use a back-and-forth motion.

While the lens surface is still wet, wipe it in the same manner with a clean, dry swab. Do not reuse swabs. If contamination remains, an anhydrous mixture of ethanol and diethyl ether may be used for final cleaning.

Proper lens-cleaning technique is essential. Practice on a damaged protective lens before cleaning a serviceable lens. Even with proper technique, slight surface damage may occur.

After removing the protective-lens drawer, immediately cover the opening in the welding head (for example, with clean paper tape) to minimize the risk of contamination reaching the focusing lens.

4.Troubleshooting

No.	Problem	Possible Cause	Corrective Action
1	No laser output	Laser is turned off; laser-source alarm prevents startup; chiller is off or in alarm; laser button, indicator, safety-lock circuit, or laser source is faulty.	Verify that the laser power button is on. Check laser-source status and read alarm information. Check chiller operation. Inspect laser signal wiring and the safety circuit.
2	No oscillation	Oscillation function disabled; invalid oscillation parameter; motor fault; no signal or broken wire.	Verify that oscillation is enabled. Check the 24 V power supply, oscillation settings, I/O output, and motor-signal wiring.
3	Weak laser power	Protective glass, focusing lens, or collimating lens is damaged or contaminated; abnormal chiller temperature; condensation on optical components.	Inspect and clean or replace damaged optical components. Verify chiller temperature. Prevent condensation caused by excessive temperature differences between cooling water and the surrounding air.
4	Oscillating red aiming light is weak or reduced	Motor incorrectly adjusted; motor or motor control damaged; deflection-lens angle incorrect.	Check motor operation and adjustment. Check the deflection-lens position and laser reflection. Service the cover only after the system is safely shut down.
5	Laser-source alarm	QBH connector fault; cooling-water temperature too low or too high; reflected-light protection triggered; other laser-source fault.	Read the active alarm in the laser software. Check water lines and water level. For a QBH alarm, inspect the QBH connection and thermistor circuit.
6	Common chiller problem	No power; reduced cooling capacity; rising water temperature.	Verify input voltage and fuse condition. Check water level. If cooling capacity remains low, check ambient temperature and inspect the chiller reservoir and cooling system.

6. Regular Cleaning

1) Cooler/chiller maintenance:

- Replace the water in the cooler once a month.
- Check chiller water-pipe connections once a week.

2) Dust removal: Keep the machine clean. Remove dust from the welding head and clean or replace the filters behind the rear fans to maintain adequate ventilation.

3) Nozzle cleaning: After extended use, residue and deposits may build up on the nozzle tip, restricting shielding-gas flow and affecting laser energy at the workpiece surface.

7. Repair Process

Repair requests may be submitted by mail, email, telephone, or the online app to your sales representative or after-sales service engineer. Requests are followed up and processed within 48 hours of receipt.

8. Storage Requirements

Storage temperature: 10 °C to 30 °C (50 °F to 86 °F); relative humidity: 10% to 70%.

9. Equipment Transportation Requirements

When transporting the device, take all necessary protective measures. If the equipment will be transported in below-freezing temperatures, drain all water from the cooler, laser head, and laser source. Contact DENALIWELD for detailed instructions.

10. Equipment Disposal Instructions

Remove the power cord and mark the equipment for disposal in accordance with applicable requirements.

11. Warranty Exclusions

Do not modify the device without prior written authorization from the manufacturer. Do not use service providers, consumables, or replacement parts that are not authorized by the manufacturer.