

**DENALIWELD**

# User Manual

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



 224-802-8809

 [www.denaliweld.com](http://www.denaliweld.com)

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# TABLE OF CONTENTS

Copyright Notation .....	3
Preface .....	3
Company Profile .....	3
Characteristic Explain .....	4
General Safety Information .....	4
General Safety Instructions .....	7
Admission	
1. Technology profile .....	16
2. Product presentation .....	16
3. Product parameter .....	17
4. Features and Benefits .....	18
5. Scope of application .....	18
Chapter I. The Structure of the Machine	
1. Construction of the Machine .....	19
2. Control panel .....	24
3. Auxiliary Function .....	33
4. Laser source .....	36
5. Cooler/Chiller .....	37
Chapter II. Instructions for the Installation and Commissioning of the Device	
1. Preparation before installation .....	38
2. Installation process .....	38
3. Principles of operation of the welding process .....	39
Chapter III. Safety Rules, Daily maintenance and After-Sales Service	
1. Safety rules .....	39
2. Safety rules for the use of equipment .....	40
3. Daily maintenance .....	41
4. Cleaning and replacing the protective lens .....	42
5. Possible problems and ways to solve them .....	43
6. The issue of regular cleaning .....	44
7. Repair process .....	45
8. Storage requirements .....	45
9. Equipment transportation requirements .....	45
10. Instructions for abandoning equipment .....	45
11. Loss of Warranty .....	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 take time to read and understand this User's Guide and familiarize yourself with the operating and maintenance instructions before you use the product. We strongly recommend that the operator read the Section 2 titled "Safety Information" prior to operating the product.

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.

Within this document, we've identified information that you need to pay special attention to with an underscore. Please make note of these to prevent unnecessary damages.

## Company Profile

DENALIWELD is a US based laser welding company specializing in manual and automatic laser welding and cleaning solutions. Adhering to the profound professional ability, numerical control system, optical system, and other core technologies, we are committed to providing high-quality welding and cleaning solutions to customers in various industries around the world. After decades of development, the company has become a modern high-tech enterprise integrating research and development, sales, production, and service.

We are an American professional team, with standardized process management. Through years of industry experience, the scope of services has covered major economies on all continents of the world.

DENALIWELD is a professional manufacturer of manual and automatic laser welding and cleaning machines. It is a company integrating research and development, production and sales of laser equipment and has formed a complete

supply platform for laser equipment series. Professional technical personnel, rich management experience and clear development direction ensure our rapid development in the laser industry.

Company has a professional independent core research and development team, including software engineers, mechanical engineers, electrical engineers, industrial designers, and other professional teams. It has a stable customer base and extensive technical recognition worldwide. DENALIWELD has mastered the core technologies such as numerical control system, precision welding head and precision field mirror system to realize higher precision and faster processing products. The swing welding head and control system independently developed in welding make laser welding more widely used.

More information, please visit our website:

<http://www.denaliweld.com>

## Characteristics Explain

CR water-cooled series is a series of water-cooling high-efficiency, high-reliability, maintenance-free high-power lasers joint developed by DENALIWELD. It adopts phase-change heat dissipation method, the wavelength range is 1060-1100 nm, and the laser efficiency is >25%.

DENALIWELD CR series lasers belong to Class 4 (Class 4) laser products, and throughout the product design and testing we have focused upon safety first.

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, equipment or assemblies associated with these products, unauthorized disassembly may result in voiding the warranty.

## General Safety Information

### 1. Handheld Laser Welding Machines are Safe to Use

Handheld laser welding machines are classified as hazardous, invisible laser radiation Class 4 laser products. This product emits infrared laser radiation with a wavelength of 1060-1100nm, and the average power radiated by the welding head is greater than 100W, which can cause damage to eyes and skin directly or indirectly exposed to such light intensity. This infrared radiation is invisible, and the laser beam can cause irreversible damage to the retina or cornea. Be sure to wear appropriate and certified 1060-1100nm near-infrared laser safety glasses or helmets before operating the handheld laser welding machine.

(1) For the safety of you and others, it is strictly forbidden to point the welding head at yourself or others.

(2) Appropriate and certified 1060-1100nm near-infrared band laser safety glasses, helmets, and anti-high temperature gloves must be worn before using the handheld laser welding machine.

(3) For the safety of you and others, the alligator clip must be clamped to the welding workpiece before triggering the laser, it is strictly prohibited to clamp it on any other place except the workpiece, to avoid safety hazards caused by abnormal light output.

(4) The handheld laser welding machine is equipped with double emergency stop buttons, which are located at the top of the welding machine and the tail of the welding gun head, and can stop the machine immediately in case of emergency.

(5) The welding operation of the hand-held laser welding machine should be carried out in an independent workspace with laser protection; non-welding personnel and combustible and flammable materials should be kept away from the welding operation table for at least 30 feet, and a fire extinguisher should always be present near the welding area;

(6) Wear a mask and helmet when welding highly reflective materials.

(7) Make sure that the hand-held laser welding machine is properly grounded, otherwise it may cause the product shell to be electrified, resulting in personal injury to the operator; if the grounding is not operated as required, it may cause a laser alarm, no light, laser instability and or other hidden faults.

(8) Please do not operate in rain or direct sunlight, doing so may cause high temperature and high humidity alarm or short circuit, affecting the normal use of the laser, and causing additional potential safety hazards.

## 2. Safety Conventions

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

SYMBOLS	DESCRIPTION
	<p>WARN:</p> <p>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.</p>
	<p>NOTICE:</p> <p>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.</p>

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

**NOTE:**

© The wavelength range for DENALIWELD handheld laser welding machine, is 1060-1100nm, which is not in the visible light range, these beams may cause irreversible damage to the retina and cornea. DENALIWELD recommends that you wear qualified safety protective glasses or helmets when operating the handheld welding machine at all times.

### 3.Laser protection

#### 1.Laser Safety Goggles and helmet Requirements

Laser safety goggles or helmets should be selected based on the ability to shield the entire wavelength range of the laser emitted by the hand-held laser welding machine. When operating this device, please wear appropriate laser safety helmet or goggles. Selecting the appropriate laser safety helmet or goggles requires the end user to accurately identify the laser safety helmet or goggles. The wavelength range emitted by the product. If the device is a tunable laser or Raman product, it emits light in a range of wavelengths. End users should verify that the laser safety glasses and helmets used are capable of blocking light emitted by the device over its entire wavelength range. Please check the safety label on the product and verify that personal protective equipment (i.e. safety shield, viewing window or windows, helmet, goggles, etc.) is adequate for output power and wavelength range. Decisions regarding safety glasses and helmets must also consider any secondary radiation hazards posed by the welding process (see Chapter II, Section 4-1)

#### 2.Laser Protective Equipment Suppliers

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, please contact DENALIWELD or your dealer if additional helmets are needed.

### 4.Weld Feature Safety

#### 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 flammable materials are near the welding area, the heat and sparks generated during welding can cause a fire or explosion. Laser welding is only possible if the area is free of combustible materials. Never weld containers containing flammable or combustible materials. If the contents of the containers are unknown, they should be assumed to be flammable or combustible. Fire extinguishers should be located nearby, easily accessible, and have personnel trained in their use.

## **4.Smoke Hazard**

Welding "fume" can consist of very fine particles and gases. Welding fumes and gases come from a combination of welding materials, or any filler materials used, shielding gases used, paints, coatings, chemical reactions, and air pollutants. Welding fumes can adversely affect the lungs, heart, kidneys, and central nervous system.

- (1) When welding, keep your head away from the smoke. Always weld in a well-ventilated area for safe breathing 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 and other situations.
- (4) Routine air monitoring should be performed to determine the level of noxious fumes in the welding area.

## **5.Cylinder Safety**

The gas cylinder may explode if damaged or placed near the welding area. Shielding gas cylinders should be placed where they will not be bumped or damaged. Keep them away from heat, sparks, or flames. Cylinders must be stored upright and secured to a fixed stand. A working regulator for the required gas and pressure is required. All hoses and fittings should also be suitable for the application and in good working order.

# **General Safety Instructions**

## **1.Reflection of the Mirror**

The location of the hand-held laser welder's output port may generate a secondary laser beam or divergent beam, that radiates outward at multiple angles after being reflected on a plane. This phenomenon is called specular

reflection. Although the energy of the secondary laser beam is much less than that of the primary laser beam, this intensity can also cause damage to eyes, skin, and some material surfaces.

**WARNING:**

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



**2. Accessories Safety Instructions**

The photosensitive elements integrated in the optical accessories related to the hand-held laser welding machine may be damaged due to laser exposure, related device protection should be paid attention to.

**WARNING:**

© The output laser intensity of DENALIWELD handheld laser welding machine is enough to weld metal, burn skin, clothing, and paint, and ignite volatile substances such as alcohol, gasoline, ether, etc. Therefore, during operation and use, be sure to isolate the flammable items around the handheld laser welding machine.

**3. Optical Handling Precautions**

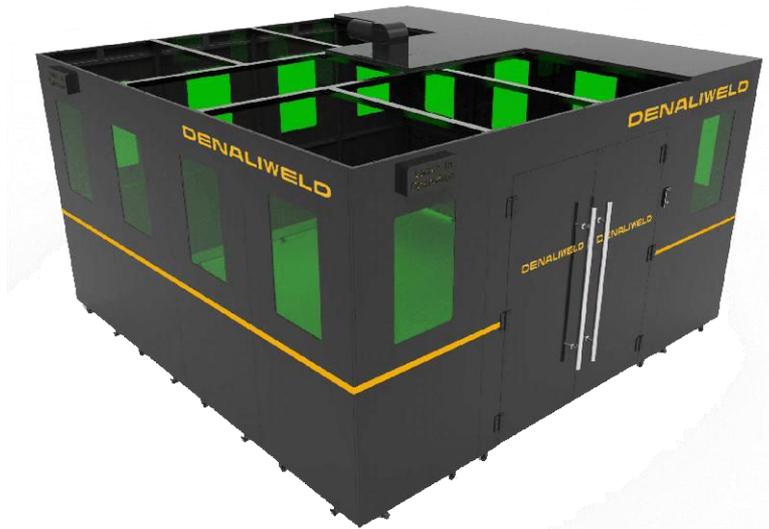
DENALIWELD strongly recommends that you read the following operating points before operating the handheld laser welding machine:

- (1) Do not look directly at the light-emitting hole of the handheld laser welding machine.
- (2) Avoid placing the hand-held laser welding machine and related optical output devices on the same level as your eyes.
- (3) Reasonable selection of safety protective equipment according to the output power and wavelength requirements of the handheld laser welding machine to ensure the safety of operators.
- (4) A warning sign should be posted in the area where the handheld laser welding machine is placed, to identify the operational area for the handheld laser welding machine.
- (5) Do not use the handheld laser welding machine in a dark environment.
- (6) It is strictly forbidden to turn on the hand-held laser welding machine without installing the optical coupling fiber or optical output connector.

- (7) Please ensure that the protective lens, copper nozzle and wire feeding structure are installed and cleaned when the handheld laser welding machine is turned off and the power supply is disconnected.
- (8) When debugging, calibrating, and focusing, please turn the laser off, turn it on after the debugging is completed.
- (9) Please operate the equipment strictly in accordance with the instructions in this document, otherwise the protection device and performance of the equipment will be impaired, and DENALIWELD will not warranty it.

**WARNING:**

- © Reasonable selection of safety protection equipment according to the laser output power and wavelength requirements.
- © 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 Operating Instructions**

DENALIWELD strongly recommends that you read the following operating points before operating the handheld laser welding machine:

- (1) Please ensure that the equipment shell is well grounded, any interruption in the grounding loop may cause personal injury.
- (2) Please make sure that the power supply connected to the device is connected to the protective ground before use.
- (3) To reduce the risk of fire, when necessary, replacement of line fuses can only be of the same type and level and cannot be replaced by other fuses or materials.
- (4) Make sure that the input AC voltage of the handheld laser welding machine is the normal AC mains voltage (single phase voltage 220-240VAC), and the wiring is correct. Any wrong wiring may cause personal or equipment damage.

- (5) Except for the gun head consumables, there are no other parts to repair, components by themselves, and all maintenance operations need to be completed by professionals from DENALIWELD.
- (6) It is strictly forbidden to disassemble and assemble the hand-held laser welding machine without authorization, and damage the relevant labels, otherwise there will be a danger of electric shock or burns.
- (7) There should be no flammable materials near the welding area. The heat and sparks generated during the welding process may cause fire or explosion. Laser welding can only be performed in areas free of combustible materials.
- (8) Never weld on containers containing flammable or combustible materials. If the contents of a container are unknown, you should assume they are flammable or combustible. Fire extinguishers should be nearby, easily accessible, and personnel trained to use them.
- (9) Any product that has been disassembled without permission will void the warranty rights.

**WARNING:**

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

## **5. Operating Environment Requirements for Handheld Laser Welding Machines**

This equipment is commonly used in: (1) below 2000 meters (6561 feet) above sea level, (2) overvoltage category II, (3) environmental pollution degree 2, (4) dry location. For more information, please refer to the product specifications.

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

Cooling and temperature: The laser unit is cooled by water. Operating at higher temperatures accelerates aging, increases threshold current and reduces slope efficiency. If the device overheats, do not use it and call DENALIWELD for help.

When the temperature of the laser is too high, the device will trigger an alarm and stop emitting light.

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

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

Please make sure that the working area is properly ventilated and place the hand-held laser welding machine in a dry, cool, and clean environment. Do not expose the hand-held laser welding machine to high temperature, high humidity, and water hazards.

During the operation of the hand-held laser welding machine, make sure that there is no foreign matter blocking the air suction port at the bottom of the laser, and ensure that there is no debris within 1 meter (3') that affects the smooth air intake; ensure that the top air outlet is 1M high. (3')

It is necessary to ensure that no debris (including liquid) enters the laser, otherwise it will damage the laser and cause personal injury.

Running the equipment at high temperature will accelerate aging, increase the current threshold, and reduce the sensitivity and conversion efficiency of the handheld laser welding machine. If the device overheats, please stop using it and seek help from DENALIWELD.

**NOTICE:**

© Please operate the equipment carefully to avoid accidental damage.

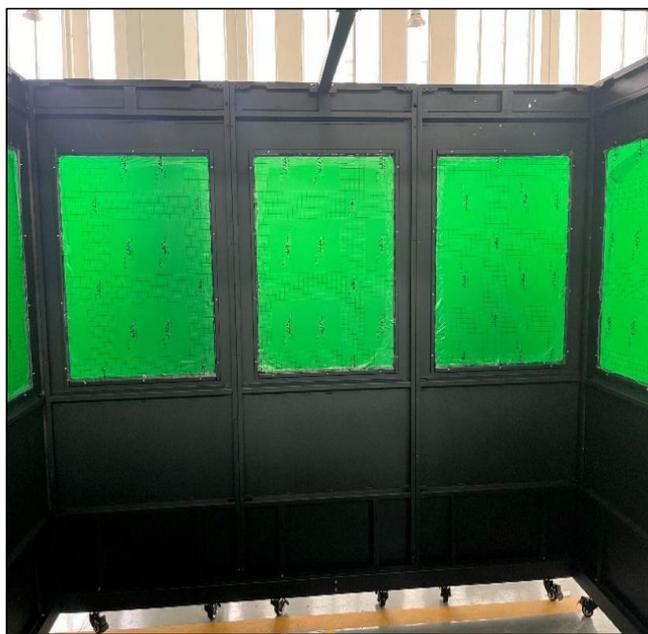
© The filter at the bottom of the laser needs to be cleaned to remove dust and dirt from the air inlet from time to time.

## 6. Workstation installation

The screw holes between the plates are secured with screws as shown below.



Below is a diagram of the left side and the right side, with the 3 plates fixed to each other as a single unit.



As shown in the picture below, the rear consists of 4 plates as a whole.



The picture below shows the front of the workstation, which also has a total of 4 panels.

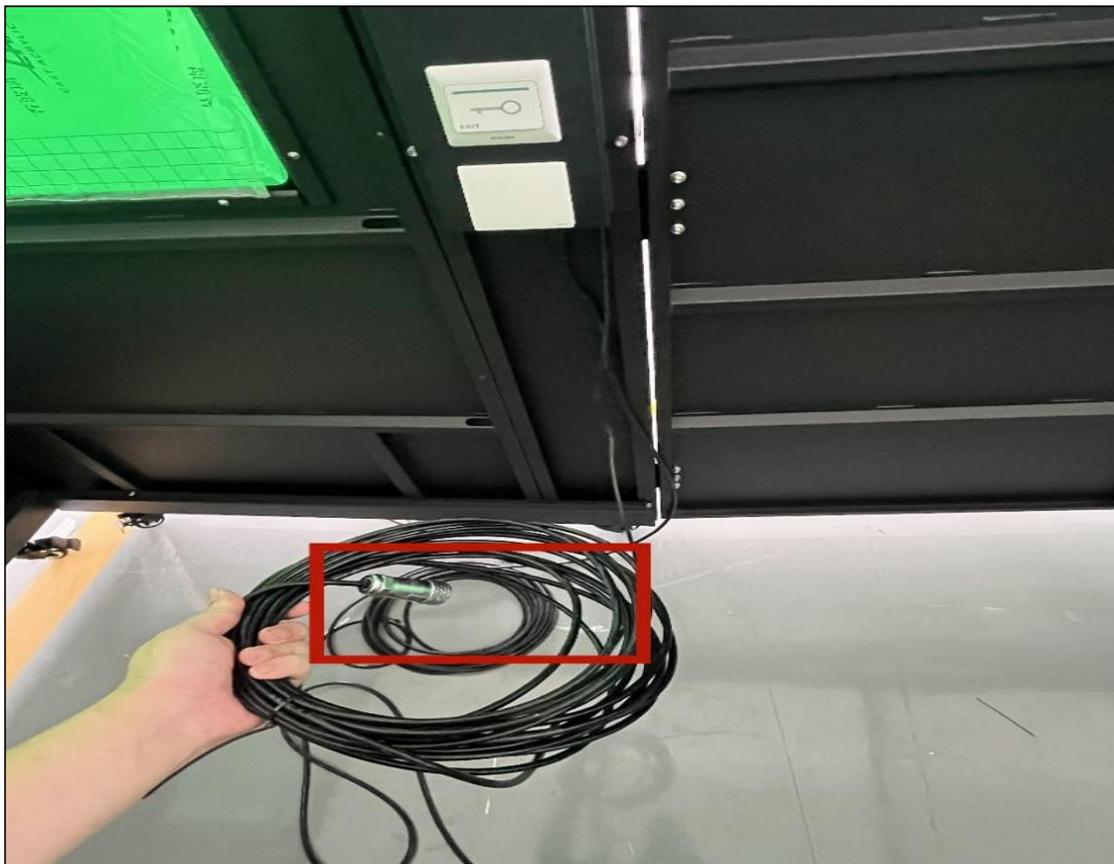
It consists of 2 door blocks with 2 panels.



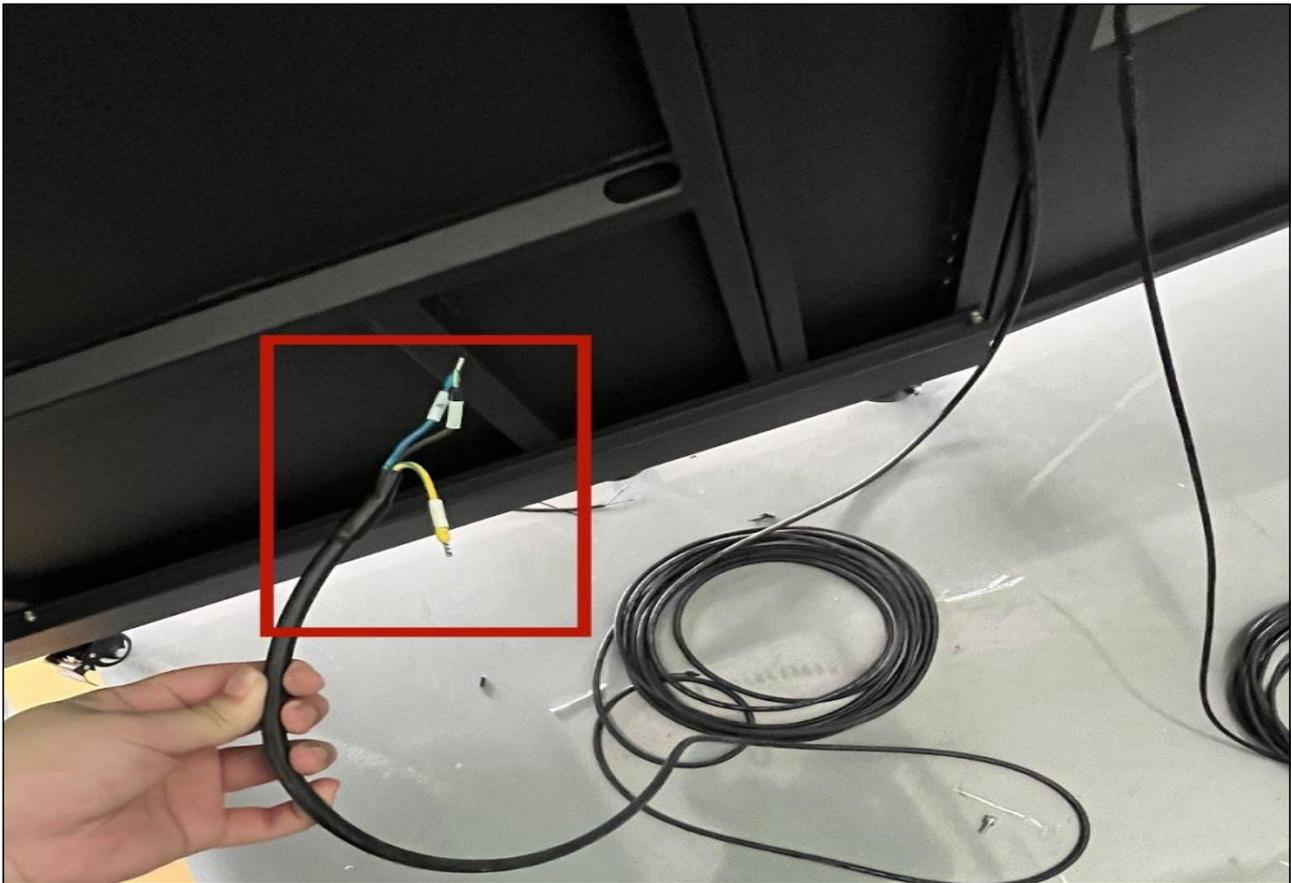
Workstation fixed beam connection as shown below.



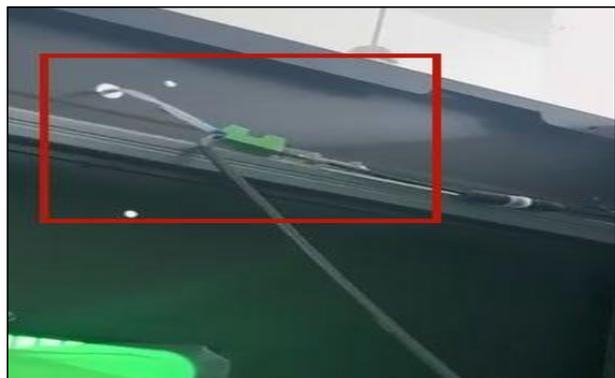
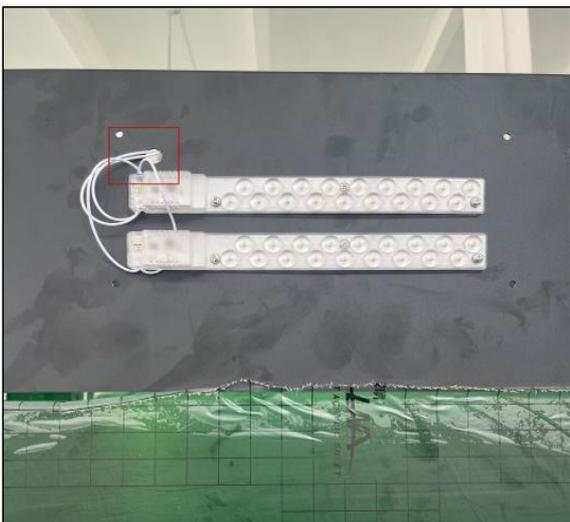
The picture below shows the safety door connection cable, which is connected to the machine's safety door socket when in use.



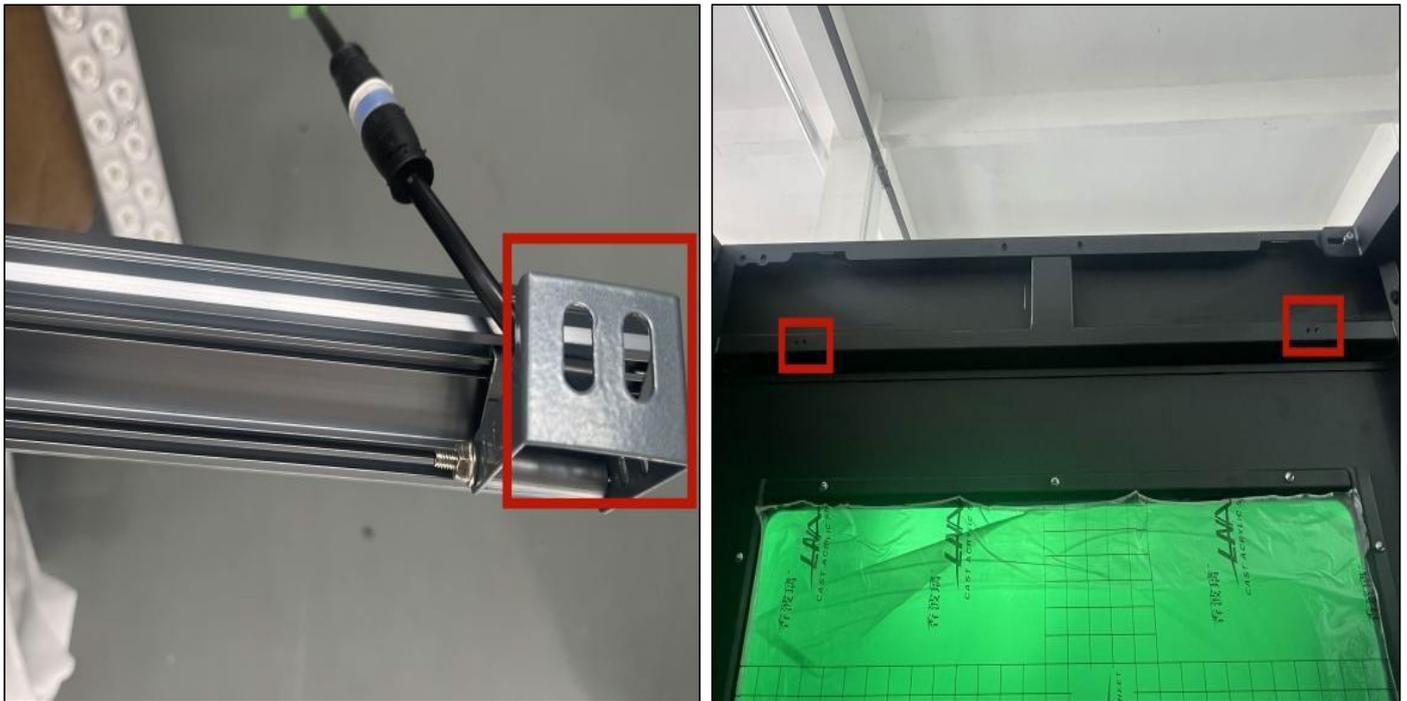
The following diagram shows the 220-volt power connection cables that are supplied to the lampposts,access control unit.



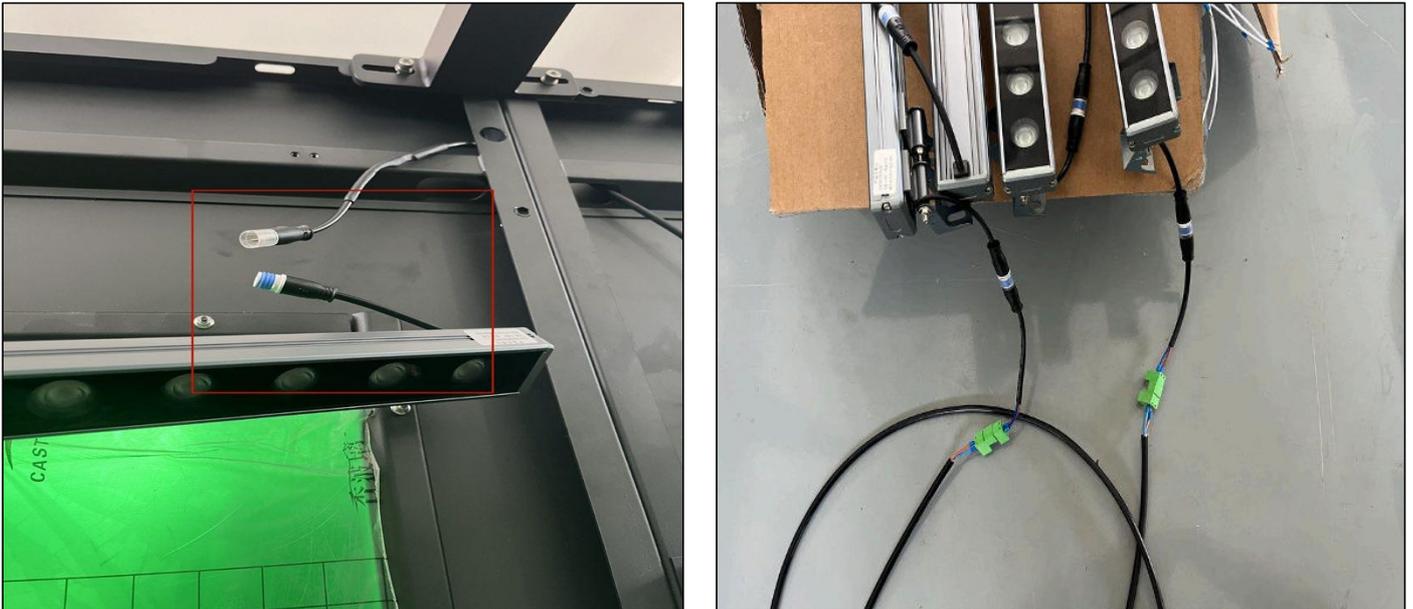
The following diagram shows the mounting of the light sign, screw hole position fixing.



Lamp post, mounted to both side panels at the front and back of the workstation, aligned with the screw holes.



The diagram below shows, where the lamp post connection begin, The front and back sides are fitted with lamp posts, four in total, connected to each other as in the picture below.



## 7. More 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 Electro-technical Commission

IEC 60825-1, Edition 1.2

Center for Devices and Radiological Health

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

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

Equipment Laurin Publishing

Laser safety equipment and Buyer's Guides

## Admission

### 1. Technology Profile

The laser welding process consists of fusing the contact area of the joined elements with the heat obtained by bringing a concentrated beam of light with very high energy and density to the welded area. The single-module fiber supply provides the device with constant, stable, high-quality power & beam. The laser power range is adjustable depending on the production needs. This solution guarantees unrivaled flexibility of use and high reliability. Laser welding is a method particularly efficient in multiple series, automated or robotic production.

### 2. Product Presentation

The DENALIWELD handheld laser welder uses the latest fiber laser, equipped with a self-developed welding head with an oscillating motor, which fills the empty space in manual laser welding. The equipment is easy to use, has good welding quality, high welding speed and very low consumption of consumables. It can perfectly replace traditional argon arc welding, electric welding and other processes when welding thin stainless-steel sheet, iron sheet, galvanized sheet, or other metal materials. The handheld laser welding machine is used for welding cabinets, kitchen products, stairs, lifts, racks, ovens, stainless steel doors, window railings, distribution boxes, stainless steel materials and other complex welding processes.



### 3. Product Parameters

1. Name: Handheld Laser Welding Machine
2. Laser power: 1000W, 1500W, 2000W, 3000W
3. Laser wavelength: 1060-1070 nm
4. Fiber optic cable length: Standard: 15m optional 20m (Standard 50' optional 65')
5. Technical parameters: Continuous / modulating wave
6. Welding speed: 0 ~ 120 mm / s
7. Cooling: Water Cooling
8. Operating temperature range: -20 ~ 45 °C (-4°F~113°F)
9. Working humidity: <70% RH
10. Recommended welding thickness: 0.5-8 mm
11. Joint width:  $\geq 0.5$  mm
12. Working voltage: AC 220V / 400V - customized in different countries, please refer to nameplate.

## 4. Features and Benefits

DenaliWeld welding heads are created by DenaliWeld, we have developed a method of oscillating laser welding. Our products overcome the shortcomings of traditional laser products with an alternating point zone and high resistance to damage, ensuring better weld formation.

- A. Different ways of welding with a variety of welding heads that can be realized with a simple operation.
- B. Fast welding speed, 2-10 times faster than traditional welding; each machine can save at least 2 welders per year; less consumables; long service life; safer and greener welding.



## 5. Scope of application

Many industries will benefit from laser welding such as the manufacturing of cabinets, railings, stairs, shelves, ovens, distribution boxes, stainless steel furniture, etc. The range of laser welding applications is unparalleled.

# Chapter I . Machine structure

## 1.Construction of the Machine

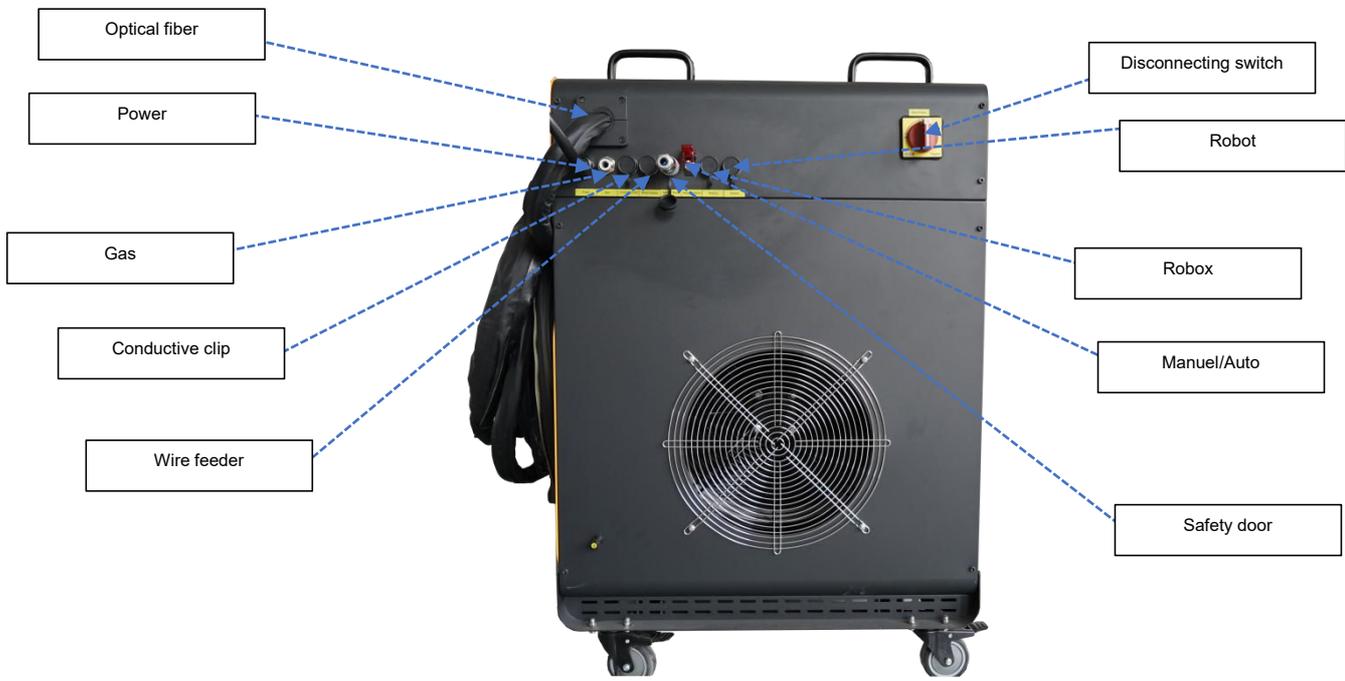
The CR welder has solid wheels that allow the machine to move freely between workstations. The clear and easy-to-use touch screen allows you to load previously saved welding parameters, which speeds up the selection of parameters for various details.



Front view

There are two emergency stop buttons, respectively located on the top of the machine and the head of the welding torch, its main role is to quickly stop the operation of the equipment in emergency situations to protect the safety of personnel and equipment.

The main switch and shielding gas connection are located in the rear part of the housing. In addition, there is also a socket for connecting an automatic wire feeder and a safety clamp.

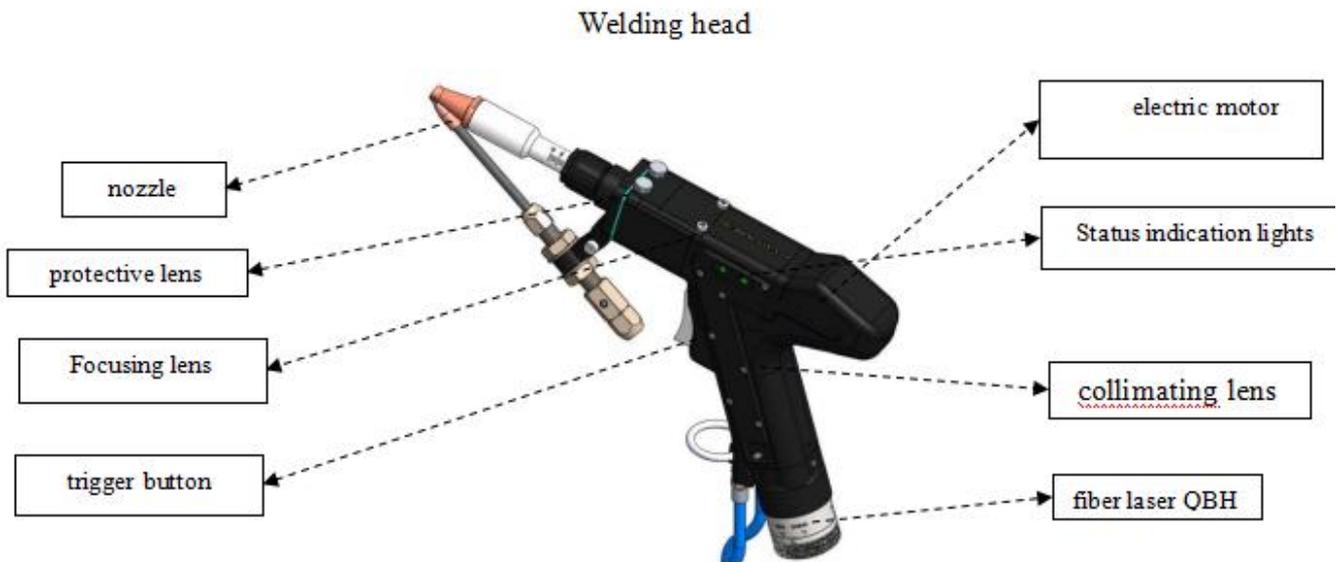


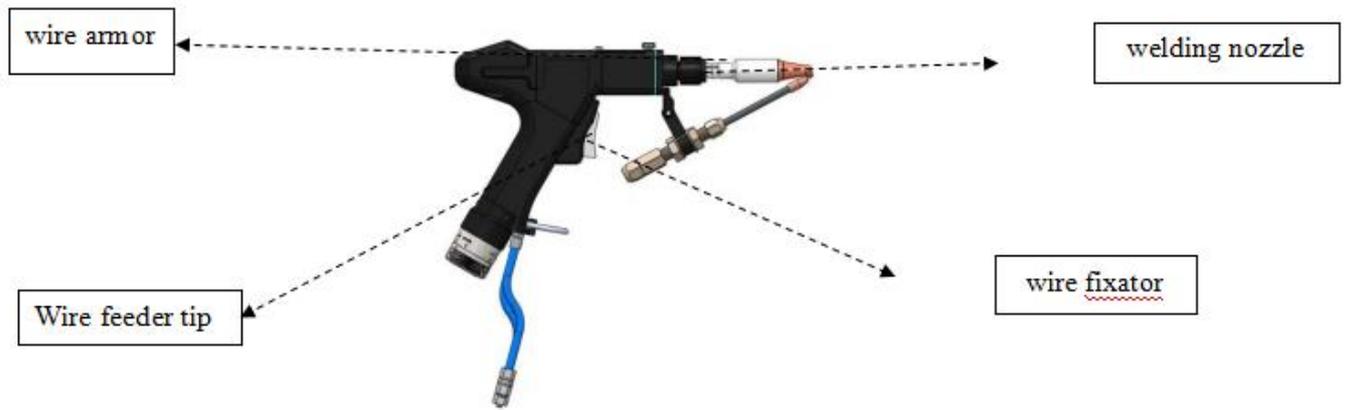
Back View

The heat from the source cooler and the head is dissipated by fans at the backside of the machine. This design ensures that the temperature of each component remains constant.

### Main welding head

The DENALIWELD welder is equipped with a proprietary, modern head with an electric system of the moving beam WOBBLE. It has a patented mechanism that drives the focusing lens through an electric motor, which allows you to automatically change its position, and thus change the width of the beam. In this way, the width of the desired joint can be easily adjusted. The head is water-cooled, which allows it to work stably and without interruptions. The device has an ergonomic design and lies securely in the hand.





### QBH Connection



Remove the dust cover of the optical fiber and check whether the protective cap of fiber crystal head is locked. Clean the optical fiber head with a dust-free cotton swab and absolute ethanol to ensure that the optical fiber section is clean and dust-free.

- ◆ Place the welding head horizontally.
  - ◆ Align the red point at the end of the QBH interface to the red point of the handwheel.
  - ◆ Remove QBH dustproof cover.
  - ◆ Align the red mark of male fiber end to red mark on female QBH of cutting head when you insert the fiber end
- straightly to bottom of QBH interface of cutting head.

Turn the QBH handwheel clockwise. It is in place when you hear the "Da" sound, pull the handwheel up and turn clockwise to end.

### Daily Inspection

- Check whether the cover glass is dirty before daily use and replace it if necessary.
- Check whether the QBH connector is loose before daily use and ensure that the lock does not shake before it can work normally.

- Check whether the copper nozzle is blocked and whether it is conductive between the copper nozzle and safety lock before daily use. If it is blocked and the welding slag cannot be removed, replace the copper nozzle. If the conductivity is poor, replace the copper nozzle.

- Check to see if there is water leakage anywhere on or around the machine.

- Pay attention to the right connection of gas (middle) and water (both sides, one inlet and one outlet) as shown below. Both gas and water pipes are  $\phi$  6mm.

Automatic wire feeder



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

Correctly mounting the wire feeder at the head ensures good wire guiding in the nozzle groove. It should be mounted rigidly, ensuring good guidance. The wire feeding speed is adjusted to the specific welding technology. The feeding speed is regulated by a potentiometer on the feeder.

**Attention information**

- 1) Make sure you have a reliable ground before supplying power.
- 2) The wire feed wheel matches the wire warp and corresponds to the wire feeding tube
- 3) Don NOT twist the wire feeding tube

## Troubleshooting of Wire Feeder

S/N	Faults	Reason	Solution
1	Power LED not ON	24V power cable breaks	Change power cable
		Power switch fails	Change power switch
		Poor welding / disconnection of internal wire inside switch plug of welding head	Replace the plug and check the connecting wire
		Wire feeding motor fails	Replace the wire feeding motor
		Out of wire	Replace the welding wire disc
		Motor plug loose on motion card	Re-plug
2	Wire feeding fails by operating welding head	Welding wire knotted	Loosen the tension regulator and rewind the wire
		Wire feeding tube knotted	Straighten out the wire feeding tube

## Daily Maintenance of Wire Feeder

### 1 Daily Maintenance

- When not in use, the wire feeder should be shut down and placed in a cool, dry place away from dust.
- Do not put other objects on the wire feeder to avoid damage.
- Before installing a new welding wire reel, blow inside of feeding tube with compressed air to remove the impurities in the wire feeding tube.
- The wire guide tube shall be kept smooth without extrusion, deformation and folding.
- Regularly clean any dust in the machine and check the smooth rotation and noise of the motor.

### 2 Cautions

#### Operation Environment

- This machine is for indoor use and its protection grade is IP2X. Do not use it close to water or in the rain.
- Please use it at ambient temperature of - 10 °C to 40 °C. (14°F~113°F)
- Do not locate it on a surface with any strong vibrations or significant impacts.

#### Use Attention

- When installing the welding wire reel or inserting the welding wire into the wire guide tube, use extreme caution to avoid winding accidents caused by the rotation of rotating parts.

- Please confirm the weight of the welding wire reel. The weight of the welding wire shall not be greater than 20kg. (44lbs.)
- During welding, make sure that the right-side plate of the wire feeder is closed to prevent electric shock or any winding accidents that may occur due to the rotation.
- Before welding, please confirm whether the disc shaft end cover is tightened otherwise the welding wire reel may fall off due to the inclination.

## 2. Control panel

From the control panel, we regulate all machine functions, such as: power, frequency, beam diameter.

We provide several languages choices: Chinese, English, French, Korean, Japanese, Spanish, Russian, Polish.



Control Panel

The operating instructions of the control panel: selection of parameters and their definition can be found in the appendix of the documentation. (Operation manual of the control panel)

## 2.1 Home

- DENALIWELD: entry of multifunction “Weld/Remote clean/WeldSeam Clean”.

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 Setting

### 2.2.1 Basic Setting

- Gas in Advance: gas blow duration from laser on to beam out.
- Gas Delay: gas blow duration after laser off.
- Beam Off Delay: laser shooting duration after laser off. It is used to weld off welding wires.
- On Power: starting power of ascent process. It is to be adjusted as per ascent duration.
- Off Power: ending power of descent process. It is to be adjusted as per descent duration.
- Ascent: duration from on power to set power after beam on.
- Descent: duration from set power to off power after beam off.

- Max Power: set as per the rating power of exact laser. The limit of max power is 3000W.
- Alarm Signal: PNP 24V effective.
- Nozzle Break Duration: duration of beam shooting when the nozzle temporarily is not in contact with workpiece.

The beam will be off if the non-contact duration is longer than nozzle Break Duration.

- Scale Weld Duration: adjust the beam shooting duration as per spot welding application.
- Scale Weld Interval: beam off interval while spot welding.

### 2.2.2 Galvanometer Setting



- Wobble switch: swing on / off
- Wobble graph: a line or a point.
- Wobble Width: a line range of 0-5 mm.
- Wobble frequency: 0-200Hz, which can be adjusted according to the process.
- X-axis center offset: Central alignment. Beam alignment is essentially done before delivery and further slight can be adjusted to align with the wire center. Nonseless adjustment is prohibited.
- X-axis amplification factor: debugging before delivery, and further slight adjustment can be made if required. Nonseless adjustments are prohibited.

## 2.3 Process

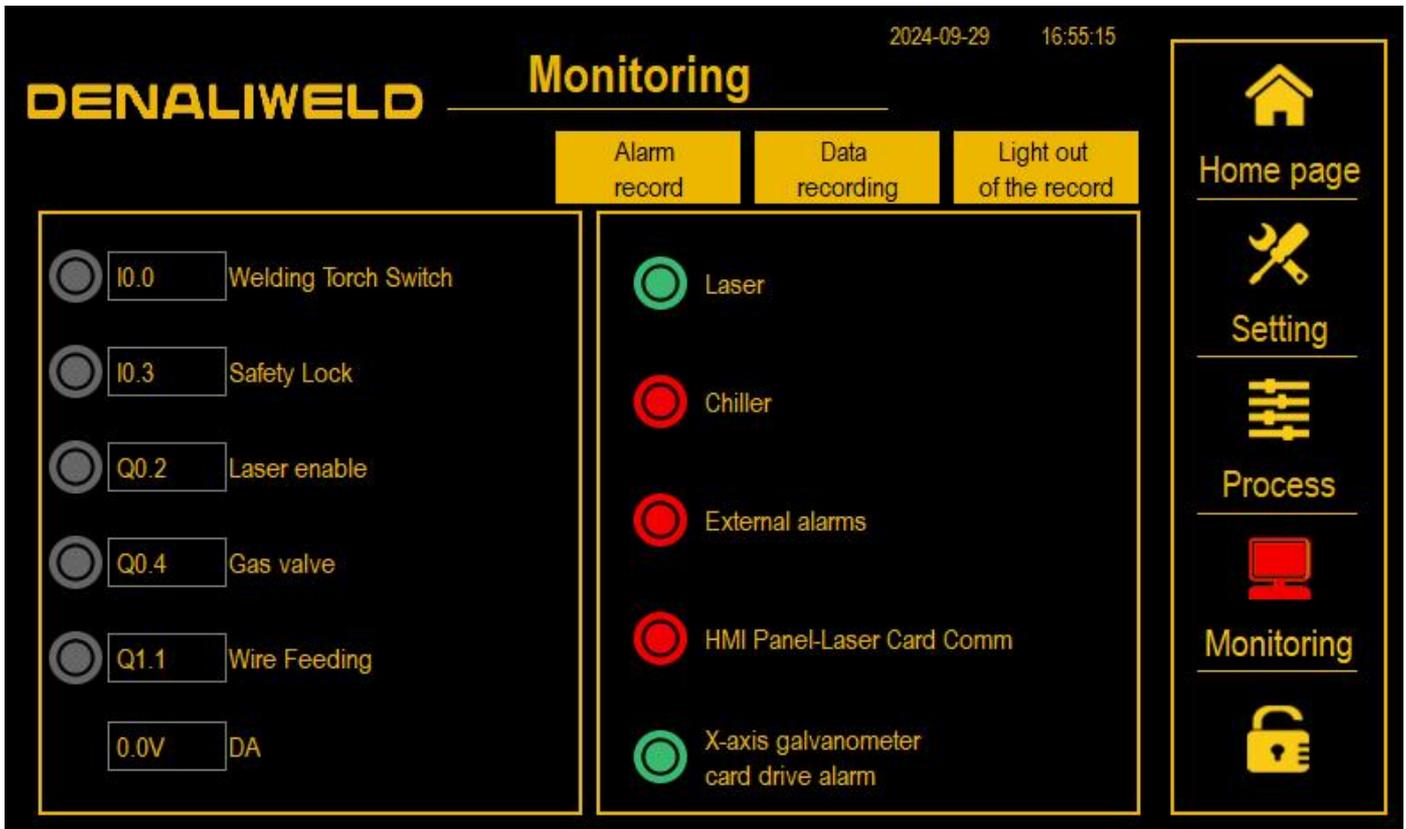
The screenshot displays the DENALIWELD Process control interface. At the top, the date is 2024-09-29 and the time is 16:54:29. The main title is "DENALIWELD Process". A dropdown menu shows "No Feeding". Below this is a table with the following data:

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

At the bottom, there is a "Process No." field with the value "0" and three buttons: "Import", "Shutdown-save", and "Restore". On the right side, there is a sidebar with navigation options: "Home page", "Setting", "Process", and "Monitoring".

- No Feeding: To switch between wire feeding and non-wire feeding.
- Process No: running process number. Each process parameter could be modified and saved.
- Import: to import selected process number for operation.
- Shutdown-save: to save modified process by clicking this button.
- Restore: restore the default process by clicking this button.

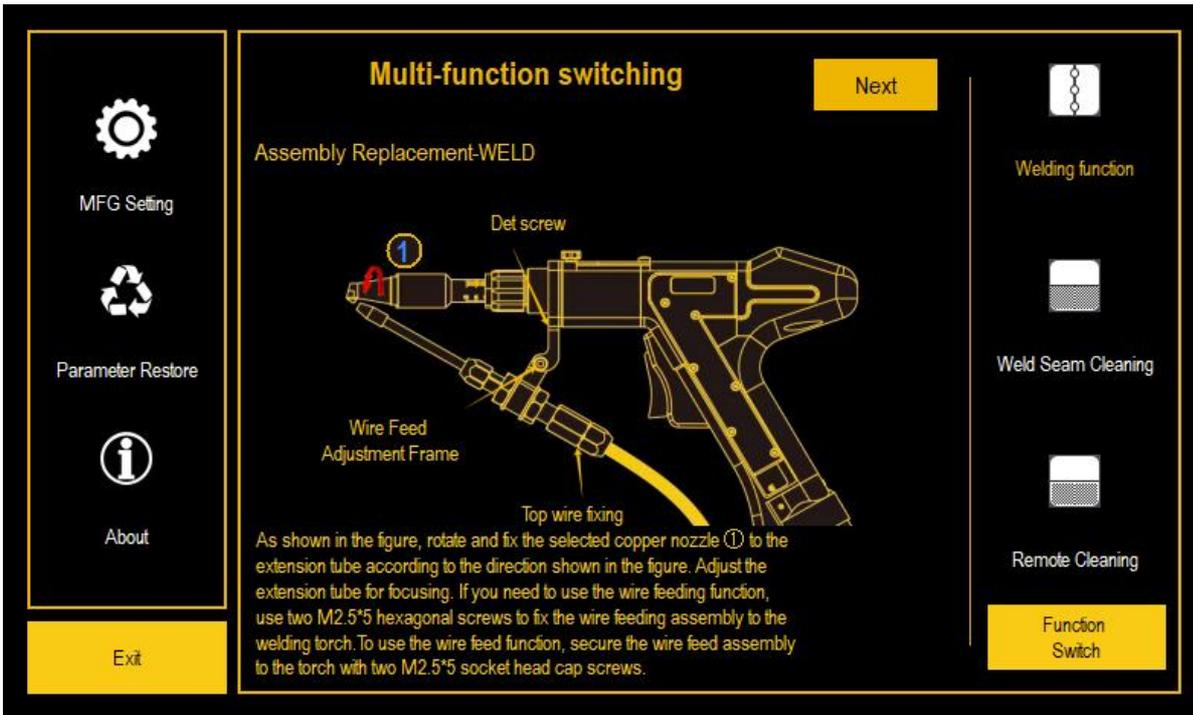
## 2.4 Monitoring



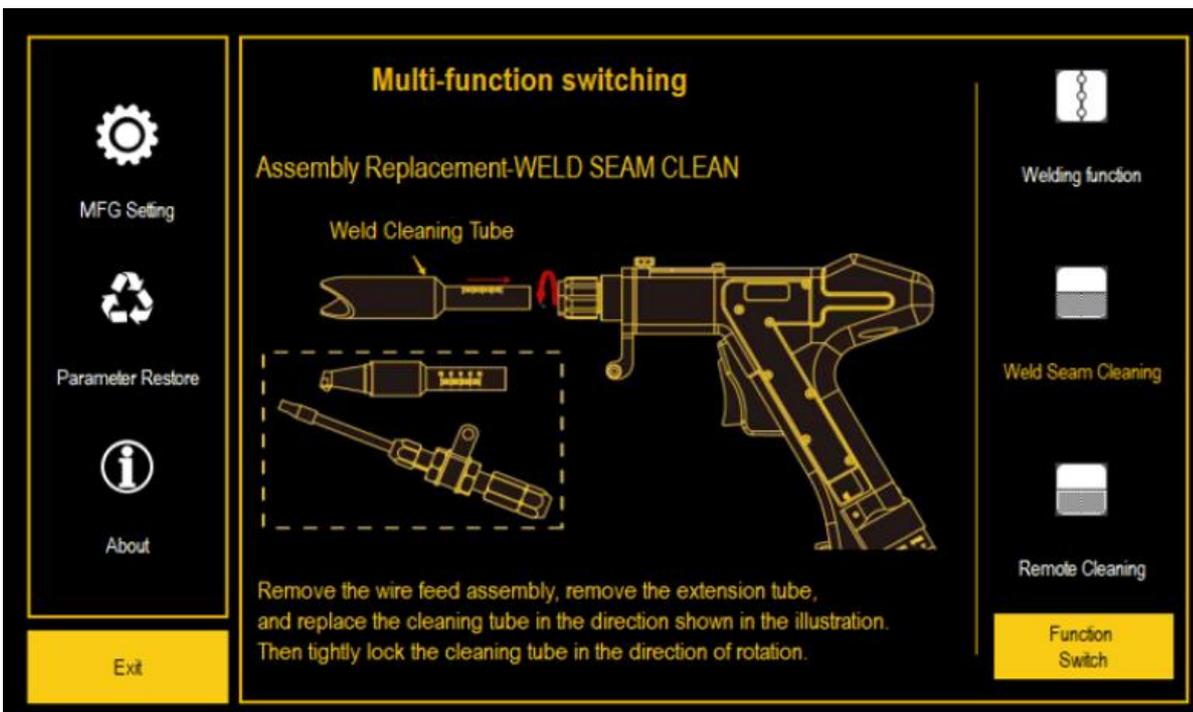
- I0.0 Welding Torch Switch: trigger button status of head.
- I0.3 Safety Lock: indicate if head is in contact with workpiece. Laser shooting is allowed when in contact.
- Q0.2 Laser Enable: output status of laser enable signal.
- Q0.4 Gas Valve: output status of gas valve.
- Q1.1 Wire Feeding: feeding signal of wire feeder.
- Laser: green-normal, red-abnormal.
- Chiller: green-normal, red-abnormal.
- External alarms: green-normal, red-abnormal.
- HMI Panel-Laser Card Comm: communication status from HMI panel to laser control card. green-normal, red abnormal.
- X-axis galvanometer card drive alarm: communication status from HMI panel to galvo motion card. green-normal, red abnormal.

## 2.5 Function Switch

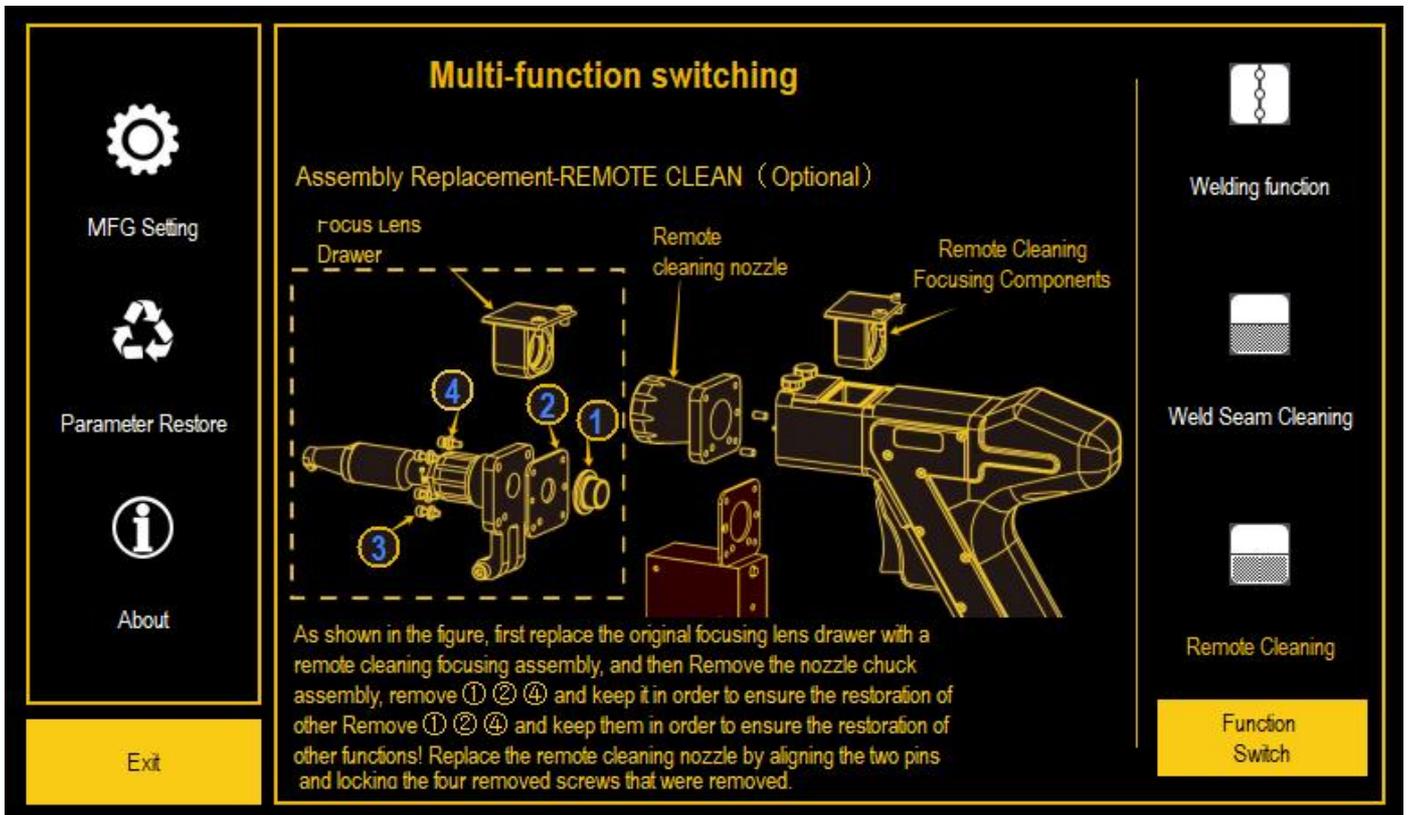
- Enter the multifunction switch page by clicking the logo in “Home” page.
- Weld: show assembly replacement diagram. Nozzle option could be selected by clicking “next”.



- Weld Seam Cleaning: show assembly replacement diagram.



- Remote Clean: show assembly replacement diagram.



- Function Switch: select required function and click “Function Switch” to enter sub-interface of selected function.
- MFR Setting: 1-key recovery of default factory setting. It will clean all customized parameters. Keep caution.
- About: show hardware version like HMI panel, laser control card and galvo motion card.

## 2.6 About

Each generation of products from us has corresponding supporting versions for control and traceability. This will correspond to the versions of HMI panel, laser control card and galvo motion card. Version upgrade shall be subject to our confirmation.

## 2.7 Auxiliary function

### 2.7.1 Cleaning of the welding joints

### 2.7.2 Config

Handheld weld laser cleaning is one of the three-in-one functions.

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



- Select the weld cleaning function, and modify the process parameters according to the process requirements.

### 2.7.3 functions and features

#### function

- Remove the paint and coating of metal or glass.
- Rapid removal of iron rust and various oxides.
- Remove grease, resin, glue, dust, stains and production residues.
- Remove paint, rust and oil stains before welding or bonding, and treat oxides and residues after welding.
- Mold cleaning, such as tire molds, electronic molds, and food molds.
- Oxide handling, paint removal and rust removal in the production or maintenance of aerospace weapons and ships.shipping.

#### characteristic

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

## 2.8 Remote cleaning

### Function



- Remove the paint and coating of metal or glass.
- It can quickly remove rust disease and various oxides.
- Remove grease, resin, glue, dust, stains and production residues.
- Remove paint, rust and oil before welding or bonding, and treat oxides and residues after welding.
- Mold cleaning, such as tire die, electronic molds and food molds.
- Oxide treatment, paint removal and rust removal treatment

### Feature

- Low power consumption, medium scanning range, no contact with the workpiece, flexible and friendly operation

## **3.Auxiliary Function**

### **3.1 WeldSeam Clean**

#### **3.1.1 Configuration**

- Handheld weld seam laser cleaning is one of 3-in-1 functions.
- Remove wire feeding mechanism, welding nozzle and extension tube.
- Mount the clean tube.
- Select WELD SEAM CLEAN function and modify process parameters as per process requirements.

#### **3.1.2 Function and Feature**

##### Function

- Remove the paint and coatings of metal or glass.
- Fast removing of rust and various oxides.
- Remove grease, resin, glue, dust, stains, and production residues.
- Remove paint, rust and oil before welding or bonding and treatment of oxides and residues after welding.
- Mold cleaning such as tire mold, electronic mold, and food mold.
- Oxide treatment, paint removal and rust removal in the production or maintenance of aerospace weapons and ships.

##### Feature

- Low power, small scan range, flexible and friendly operation.

#### **3.1.3 Software Setting**

##### Home:

- Laser Power: laser output power from 0 to 3000W.
- Laser Freq: number of laser pulses emitted by the laser per second.
- Wobble Freq: 0-150Hz.
- PWM: the ratio of pulse duration to pulse cycle, 0-100%.

- Clean Width: to adjust the line spot width 0-10mm while cleaning.
- Laser: turn on/off laser.
- 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: show status of 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 to prevent other people from touching the screen by mistake in case of beam off or beam on when the operator is cleaning or debugging. It is used to secure the safety of the operator. HMI could be locked or unlocked by clicking the lock mark.

#### Basic Setting

- Gas Delay: gas blow duration after laser off.
- Max Power: set as per the rating power of exact laser. The limit of max power is 3000W.
- Alarm Signal: PNP 24V effective.
- Nozzle Break Duration: duration of beam shooting when the nozzle temporarily is not in contact with workpiece.

The beam will be off if the non-contact duration is longer than nozzle Break Duration.

#### Galvo Setting

- Wobble: turn on/off wobble function of red beam. It is only used for commissioning of red beam. Pattern: only line available for cleaning.
- Wobble Size: 0-10mm of line range.
- Wobble Freq: 0-150Hz adjustable as per process.
- X Center Offset: center alignment. Beam alignment is basically to be done before ex-works and a further slight adjustment to align with cleaning objects could be done if it is required for cleaning.

Nonsense adjustment is prohibited.

X Magn: it is to be debugged before ex-works and a further slight adjustment could be made if it is required.

Nonsense adjustment is prohibited.

## 3.2 Remote Clean

### 3.2.1 Configuration

### 3.2.2 Function and Feature

#### Function

- Remove the paint and coatings of metal or glass.
- Fast removing of rust and various oxides.
- Remove grease, resin, glue, dust, stains, and production residues.
- Remove paint, rust and oil before welding or bonding and treatment of oxides and residues after welding.  
Mold cleaning such as tire mold, electronic mold, and food mold.
- Oxide treatment, paint removal and rust removal in the production or maintenance of aerospace weapons and ships. Feature
- Low power, medium scan range, non-contact with workpiece, flexible and friendly operation.

### 3.3.3 Software Setting

#### Home:

- Laser Power: laser output power from 0 to 3000W.
- Laser Freq: number of laser pulses emitted by the laser per second.
- Wobble Freq: 0-100Hz.
- PWM: the ratio of pulse duration to pulse cycle, 0-100%.
- Clean Width: to adjust the line spot width 0-80mm while cleaning.
- Laser: turn on/off laser.
- Gas-Manual: continuous gas blow for independent test.
- Process No: 16 processes in total including full parameters could be saved for various applications.
- 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 to prevent other people from touching the screen by mistake and cause beam off or beam on when the operator is cleaning or debugging. It is used to secure the safety of the operator. HMI could be locked or unlocked by clicking the lock mark.

#### Basic Setting

- Gas in Advance: gas blow duration from laser on to beam shooting.
- Gas Delay: gas blow duration after laser off.
- Max Power: set as per the rating power of exact laser. The limit of max power is 3000W.
- Alarm Signal: PNP 24V effective.
- Safety Lock Interval: the beam out will be triggered when the trigger button of head is pressed twice. Single pressing will not trigger beam out as a safety protection. The interval between 2-time pressing is called the safety lock interval. The beam out will not be triggered if it is more than interval.

## Galvo Setting

- Wobble: turn on/off wobble function of red beam. It is only used for commissioning of red beam.
- Wobble Size: 0-80mm of line range.
- Wobble Freq: 0-100Hz adjustable as per process.
- X Center Offset: center alignment. Beam alignment is basically to be done before ex-works and a further slight adjustment to align with cleaning objects could be done if it is required for cleaning. Nonsense adjustment is prohibited.
- X Magn: it is to be debugged before ex-works and a further slight adjustment could be done if it is required. Nonsense adjustment is prohibited.

## 4. Laser source

(The laser cannot operate in an environment with a temperature lower than 20 °C , (60°F) to prevent laser condensation from damaging the internal light source)!



DENALIWELD Laser source is a highly efficient, reliable, and maintenance-free high-power device. The wavelength range is from 1060-1100 nm. When using water cooling, the photoelectric conversion efficiency is 25% higher. This brand is a top-class product, the design and testing fully take the safety into consideration.

Accurate operation of the laser source in strict accordance with this manual instruction guarantees the reliability and safety. This type of laser source has some unique features that may present some safety hazards and therefore cannot be treated like other light or low power laser sources. All personnel who operate this laser or are around it must be informed of these dangers. To ensure utmost safety, the disassembling of this device is not allowed. This product has no user-serviceable parts or components. There will be no warranty if the laser source is disassembled without authorization. All laser parameters were set before leaving the factory. Unauthorized personnel or engineers should not perform the installation, setting, maintenance or other operations.

Please refer to the separate laser source user manual.

## 5. Cooler/Chiller



The cooler is responsible for maintaining a constant water temperature, which removes the heat of the laser source and the welding head. All parameters of the radiator module have been set before leaving the factory. Do not change the settings if not authorized by the supplier. Only the purified water should be poured into the chiller and the purified water should be changed every month.

The table below shows the errors and codes that may happen during the operation of the cooler

Error Code Table	
Code	The name of the error
E01	Water temperature probe failure
E02	High temperature of the water cooling the laser source
E03	Compressor failure (pressure)
E04	Phase connection error
E05	Flow error
E06	Water level error
E07	Compressor overload
E08	Outdoor temperature probe failure

## Chapter II Installation and Start-up of the Device and Guidelines on Operation

### 1. Preparation before installation

Requirements:

The equipment should be installed in an independent space of not less than 15 m<sup>2</sup> (12'X13') with access to a suitable gas and electricity connection. The floor should be level, hard and shockproof, and the laser warning logo sticks on the front door.

Environmental Requirements:

Lighting in the work room should be in good condition. Within 20 meters (60') from the device, there should be no interference from equipment with strong vibrations and electromagnetic field.

The ambient temperature must be between -10 ° C and 45 ° C, (14°F & 113°), the humidity should be below 70% and the absolute altitude should be less than 1000m (3280') to ensure the equipment is in the best working condition. The ambient temperature must be stable, and the working space should be equipped with air conditioning.

To ensure clean air in the workroom, the customer should install a smoke exhaust system in accordance with the conditions prevailing on site after installation and commissioning of the device.

D. It cannot be used in an explosive and dangerous environment.

(3) Power Requirements:

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

Frequency: 60 Hz frequency, 60 Hz ± 0.2 Hz fluctuation allowed.

---power supply may be customized as per different countries requirements. Please refer to nameplate.

### 2. Installation process

Connect the machine to the power supply, 220V single phase for 1000W, 1500W and 2000W machines.

380V three phase for 3000W machines

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

(1) Turn-on process:

- 1) Turn the main switch (on the back of the machine) to the "ON" position
- 2) Turn on the POWER (front panel of the machine)
- 3) Make sure shielding gas is supplied
- 4) Make sure the protective glass is clear
- 5) Log in on the operator panel (read: Control panel operating manual)
- 6) Enter the parameters

(2) Shutdown Process:

- 1) Turn off the START (panel on the front of the machine)
- 2) Turn the main switch to the "OFF" position
- 3) Secure the welding heads

### 3. Principles of operation during the welding process

To emit an active laser beam, the head must firstly be unlocked (the safety button) - the green button is ready for operation. Then press the trigger button to activate the laser.

The operator must be equipped with gloves suitable for laser welding, protecting goggles against the reflected laser and a protection helmet.

On the operation control panel, set the parameters conform to the material that to be welded and the desired effect.

By adjusting the extension of the nozzle, you must correctly set the focal length of the head, i.e. the focus of the beam. ATTENTION! Working on an inadequately matched focus may damage the optical components of the head.

Keep the correct angle between the nozzle and the welded material, aim the laser beam (red dot / dash) between two connected elements and activate the beam with the trigger button. Make the welding by moving the head along the joint.

## Chapter III Equipment Safety Regulations, Daily Maintenance and After-sales Service

### 1. Safety rules

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

Warning 1: Since the laser wave is not visible, special care is required to avoid mirror reflection.

Warning 2: The energy of the laser beam from the welding head is sufficient to cut or weld metal, to burn skin, clothing, and paint, and to ignite volatile substances such as alcohol, gasoline, ether etc. Therefore, isolate flammable materials around the laser on work.

Explanatory table below:

Warning Mark	Description
	<p>This sign represents laser radiation and is matched to the laser performance of the product.</p>
	<p>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.</p>
	<p>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.</p>

For more information, please check all labels on the body of the machine!

## 2. Safety rules for the use of equipment

When operating laser equipment, it can be very dangerous if a breakdown happens. The operator must strictly follow the rules of the safe operation of the laser system which not only ensures the safety of the person who is working and using the equipment, but also the standard operation of the laser device itself. By following the rules, you'll achieve technical efficiency, and take full advantage of processing benefits. Therefore, during operation, safety regulations must be strictly observed.

(1). Comply with the safety regulations for the equipment operation.

(2). The operator must undergo initial training, master the construction and operation of the equipment, familiarizes himself with operating procedures and be qualified before starting independent work.

(3). While operating the laser welder, the operator should wear the personal protective equipment in accordance with health and safety regulations, e.g. safety glasses, helmets, protective visor, welding apron, welding gloves. It is totally forbidden to emit lasers on unprocessed products and human bodies.

(4). After starting the device, the operator should not leave the dedicated, specialized workstation or entrust it to unauthorized persons, the machine should be turned off when it is necessary to move away from the workplace.

(5). Keep a fire extinguisher within easy reach, turn off the laser when not in use, and do not put paper, fabric, or other flammable materials around an unprotected laser beam.

(6). Keep the area around the device clean, tidy and without oil stains. Make sure that items, tools, and waste are properly stored.

(7). When using shielding gas cylinders, do not crush wires, cables, or gas pipes to avoid accidents and gas leaks. The use and transportation of gas cylinders should conform to the regulations provided by the supplier of industrial gas. It is forbidden to expose the gas cylinder to sunlight or to a heat source. The operator must stand on the side of outlet of the cylinder when opening the valve.

(8). If any abnormalities are detected during the operation of machine, the equipment should be turned off to minimize potential damage.

(9). The operator must concentrate all his attention while operating the device and do not talk, play, listen to music or do other activities not related to welding work.

(10). If the machine will not be used for more than thirty minutes, turn off the power to the entire machine.

(11). When installing, repairing, and maintaining the machine, turn off the main power source. Any inadequate operations while the equipment is running could have fatal consequences. Inadvertent exposure to high-voltage electric shock may cause cardiac arrest, burns or other serious injury.

(12). The emergency stop has priority over any other control operations; it will disable the

laser operation, stops the power supply, and stops power to all system controls and potentially dangerous functional parts. IF you notice any errors from the laser light, you should immediately release the trigger button and press the emergency stop button to check and find the cause of the error.

(13). In addition to trained operators, other unrelated personnel should stay as far as possible away from the welding operation area as possible. Avoid unqualified welding operators or operating errors that may cause damage.

(14). Unqualified personnel who do not operate welding machines or unauthorized laser engineers are not allowed to operate any peripheral device of the hand-held welding machine without direct permission. DenaliWeld is not responsible for any consequences caused by private activity or non-compliance with the operational process.

(15). Before starting the machine for the first time, check that there is enough water in the chiller, and the temperature and water pressure are correct. If the water level is insufficient, add enough water before starting the machine to avoid additional damage.

(16). If the machine will not turn on, please check the laser alarm lights, GREEN: normal action; RED: malfunction. All parameters were preset on the laser. Do not disassemble the laser and the water chiller without permission of manufacturer.

### **3. Daily maintenance**

Clean the machine from dust and dirt to maintain its beautiful appearance.

Check the integrated dust cover, remove dust from it.

Check and make sure the protective glass is clean.

Check and make sure that the cooling water temperature and hydraulic pressure are correct.

Check the voltage stabilizer. Monitor input / output voltage and gas pressure.

Make sure there are no leaks.

## 4. Cleaning and replacing the protective lens

During cleaning and replacement, any contamination will affect the light transmittance of the lens which will shorten its lifespan.

Here are the precautions to take before starting work:

Before removing the drawer with the protective glass, clean the area of the drawer to minimize the chance of dirt getting inside the head.

Replacing the protective glass

Before putting on the protective lens, wear powder-free gloves / rubber gloves / latex gloves.

Carefully install the protective glass with tools, do not scratch it.

Cleaning the protective glass:

Hold the edge of the glass without touching the top surface. Always put glass on lenticular paper.

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

Only alcohol (99%) can dissolve contaminations without damaging the lens.

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



Main cleaning tools: Aurilave ball, alcohol (99%), dust-free swabs

If there is dust on the lens: firstly, use the Aurilave ball to blow the dust off, then clean the lens carefully with a dry cotton swab, without using force.

For stains on the lens: take a dry cotton swab and dip your head in anhydrous ethanol. Make sure that no dust particles are visible on the surface. Clean the lens in a circular motion starting from the center, do not use an anterior-posterior movement.

When lens surface is still wet, wipe the lens in the same way with a dry cotton swab. Do not re-use cotton balls. If contamination persists, an anhydrous mixture of ethanol and anhydrous diethyl ether can be used for final treatment.

The ability to clean lenses is very important. You can exercise with a damaged laser protective lens. However, regardless of the technique, slight damage may occur on the surface of the lens.

After removing the drawer with the protective glass, immediately cover the opening in the head, e.g. with paper tape, to minimize the risk of contamination to the lower focusing lens.

## 5. Possible problems and ways to solve them

No	Problem	Likely cause of the error	Comment
1	No laser	<ul style="list-style-type: none"> <li>- Turn off the laser.</li> <li>- The laser alarms and does not start the source; - The water chiller is turned off or indicates an alarm.</li> <li>- Damage to the laser button, damage to the indicator light, or opening of the safety lock when the components are not connected.</li> <li>- Damage to the laser source.</li> </ul>	<ul style="list-style-type: none"> <li>- Check that the laser power button turns on.</li> <li>- Verify the laser source is on or alerting and reading signal alert information.</li> <li>- Check the operation of the cooler.</li> <li>- Check signal line for laser connection and safety line.</li> </ul>
2	No oscillation	<ul style="list-style-type: none"> <li>- Oscillation function disabled, - Invalid oscillation parameter.</li> <li>- Electric motor defective.</li> <li>- No signal, broken wire.</li> </ul>	<ul style="list-style-type: none"> <li>- Check if the oscillation function is on turned on - Check the correct operation of the power supply 24 V</li> <li>- Check if the set oscillation value is standard, if the IO output on the touch screen is working and if the motor signal line is connected.</li> </ul>
3	Weak Laser power	<ul style="list-style-type: none"> <li>- Damaged protective glass, focusing lens or collimating lens.</li> <li>- Problem with the temperature inside the radiator.</li> </ul>	<ul style="list-style-type: none"> <li>- Damage or contamination of the protective lens / focusing lens / collimating lens can cause the laser to refract, weakening it.</li> </ul> <p>The condensation of the collimating / focus lens caused by the large temperature difference between the high-temperature water and the surroundings weakens the laser.</p>

4	The oscillating red light decreases	<ul style="list-style-type: none"> <li>- Badly adjusted electric motor, -</li> <li>- Damaged electric motor or its control.</li> <li>- Incorrect angle of the angular lens.</li> </ul>	<ul style="list-style-type: none"> <li>- Check that the electric motor is working,</li> <li>- Check the position of the angular lens and the correct reflection of the laser light, - Unscrew the cover screw.</li> </ul> <p>Block first.</p>
5	Laser Source alarm	<ul style="list-style-type: none"> <li>- Faulty tip of QBH</li> <li>- Too low / high water temperature in the cooler</li> <li>- Source blockage due to reflected beam</li> <li>- Other factors</li> </ul>	<ul style="list-style-type: none"> <li>- Active laser source extinction alarm can be read by decoding laser software input string.</li> <li>- Other faults are also read by the alarm information of the laser software and check that the water line and the amount of water in the tank are adequate.</li> </ul> <p>QBH alarm: check QBH connection or thermistor on break line</p>
6	A common problem with the chiller	<ul style="list-style-type: none"> <li>- No power</li> <li>- Lower cooling capacity</li> <li>- Water temperature rise</li> </ul>	<ul style="list-style-type: none"> <li>- Check that the voltage supplied to the plug is sufficient and that the fuse on the plug is not blown.</li> <li>- Check if the water level in the tank is sufficient,</li> <li>- The water level is too low, the cooling capacity is low, the ambient temperature in the workshop is too high, the radiator reservoir is damaged.</li> </ul>

## 6. Regular cleaning

- 1) Cooler/chiller maintenance
  - a. The water in the cooler should be changed every month,
  - b. Check the water pipe connections in the chiller every week.
- 2) Dust removal: keep the machine clean - remove dust from the head, clean / replace the filters behind the fans at the back of the machine to ensure adequate ventilation.
- 3) Nozzle cleaning: After a long period of use, the nozzle tip will show residues and deposits which will block the shielding gas and affect the laser energy on the surface of the processing material.

## **7. Repair process**

Repair requests can be sent by mail, email, telephone, or online APP to contact with the related salesman or after sales services engineers. We ensure that the requests are constantly followed up and processed within no more than 48 hours from their receipt.

## **8.Storage requirements**

Storage temperature 10 °C ~ 30 °C, (50°F -86°F) humidity 10% ~ 70%.

## **9.Equipment transportation requirements**

When transporting the device, make all possible protective measures. When transporting the device in weather below freezing, you must drain all water from the cooler, laser head and laser source. Detailed instructions can be obtained from DenaliWeld.

## **10.Equipment abandonment instructions**

The power cord should be removed and marked as scrap.

## **11. Loss of Warranty**

It is forbidden to make any modifications to the device without prior written authorization from the manufacturer. It is forbidden to use an external service that is not authorized by the manufacturer. It is forbidden to use consumables and service parts not authorized by the manufacturer.