DENALIWELD

JET Series Laser Welding Machine User Manual

(1000W, 1500W, 2000W)

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Copyright Notation

Preface

Thank you for using the handheld laser welding products of DENALIWELD. We compile this document for you in order that the laser is used and maintained properly. Due to the limited level of the writers, coupled with time constraints, there are some careless mistakes in this document, your understanding and suggestion to help us make an improvement will be much appreciated . 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 of the product with important operating, safety and other information.

We identify the parts to which you need to pay special attention in the document with underscore. Please notice those information to prevent the 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.

US professional team , 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 machines 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

Characteristic Explain

JET series is a series of Air 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 1060nm~1100 nm, and the laser efficiency is >25%.

DENALIWELD JET series lasers belong to Class 4 (Class 4) laser products, and the product design and testing have fully considered safety.

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

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

For ensuring the safety of operators, operators are urged not to open the equipment privately at all times. There are no user serviceable parts, equipment or assemblies associated with this product. Lasers of unauthorized dis-assembly shall not be subject to warranty.

General Safety Information

1 -Handheld Laser Welding Machine Is 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 1080nm, 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 1080nm near-infrared laser safety glasses 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 1080nm near-infrared band laser safety glasses 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, and it is strictly prohibited to clamp it in other places except the workpiece to avoid safety hazards caused by abnormal light output;

(4) The welding operation of the hand-held laser welding machine should be carried out in an independent space with laser protection; non-welding personnel and combustible and flammable materials should be kept away from the welding operation table for more than 10 meters, and a fire extinguisher should be placed near the welding area;

(5) Wear a mask when welding highly reflective materials;

(6) 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 laser alarm, no light, laser instability and other hidden faults;

(7) Please do not work in the environment of rain and direct sunlight, otherwise it may cause high temperature and high humidity alarm or short circuit, affecting the normal use of the laser, and even causing 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
	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 1080nm 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 :

◎ DENALIWELD handheld laser welding machine, the wavelength range is 1060nm~1100nm, which is not in the visible light range, but these beams may cause irreversible damage to the retina and cornea. DENALIWELD recommends that you must wear qualified and safe protective glasses when operating the handheld welding machine at all times.

3-Laser protection

1.Laser Safety Goggles Requirements

Laser safety goggles 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 goggles. Selecting the appropriate laser safety goggles requires the end user to accurately identify the laser safety 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 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, goggles, etc.) is adequate for output power and wavelength range. Decisions regarding safety glasses must also take into account any secondary radiation hazards posed by the welding process (see Chapter II, Section 4-1)

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 provide the laser protective mask along with the machine, please contact DENALIWELD if more protection is 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 accelerated 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 the 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) 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 Mirror

The location of the hand-held laser welder's output port may generate a secondary laser beam that radiates outward at multiple angles. This phenomenon that the main beam of the handheld laser welding machine produces a divergent beam after being reflected on a plane 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, for example, human eyes, skin, or 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, and 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 the 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 pasted in the area where the handheld laser welding machine is placed to limit the safe area for operating 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 do it without the laser, and turn on the laser 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 guarantee this.

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 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) In order to reduce the risk of fire, when necessary, the 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 200-240VAC), and the wiring is correct. Any wrong wiring method may cause personal or equipment injury;

(5) Except for the gun head consumables, the user does not need to repair the parts, components or 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 no longer enjoys the warranty rights.

WARNING :

◎ The input voltage of the hand-held laser welding machine is single-phase alternating current (200-240VAC), 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 above sea level, (2) overvoltage category II, (3) environmental pollution degree 2, (4) dry location. For more information, please refer to the product specifications.

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

Cooling and temperature: The laser unit is cooled by air. Operating at higher temperatures accelerates aging, increases threshold current and reduces slope efficiency. If the device overheats, do not use it and call 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, which can create additional safety hazards due to the high temperatures that generate gases, sparks and debris. The corresponding operators need to go through certain assessment and training, and be familiar with and master the general safety regulations of laser operation.

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

(1) Please ensure 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.

(2) During the operation of the hand-held laser welding machine, ensure 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 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) on the top enters the laser, otherwise it will damage the laser and cause personal injury;

(4) 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 to the equipment.

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

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

1. Technology Profile

The laser welding process consists in fusing the contact area of the joined elements with the heat obtained as a result of bringing a concentrated beam of light with a 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 equipped 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 zero 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 cabinets, kitchens, 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

3. Laser wavelength: 1064-1070 nm

4. Fiber optic cable length: Standard: 10 m

5. Technical parameters: Continuous / modulating wave

6. Welding speed: 0 ~ 120 mm / s

7. Cooling : Forced Air Cooling

8. Operating temperature range: -10 ~ 45 ℃

9. Working humidity: <70% RH

10. Recommended welding thickness: 0.5-6 mm

11. Joint width: ≥0.5 mm

12. Working voltage: AC 230V / 400V - customized in different countries, please refer to nameplate.

4. Features and Benefits

Equipped with a welding head created by us, 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

Industry of cabinets, railings, stairs, shelves, ovens, distribution boxes, stainless steel furniture, etc. The range of laser welding applications is constantly expanding with technology advancing.

Chapter Ⅰ. Machine structure

1. Construction of the Machine

The welder is located on large, solid wheels that allow the machine to move freely between the stations. 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.

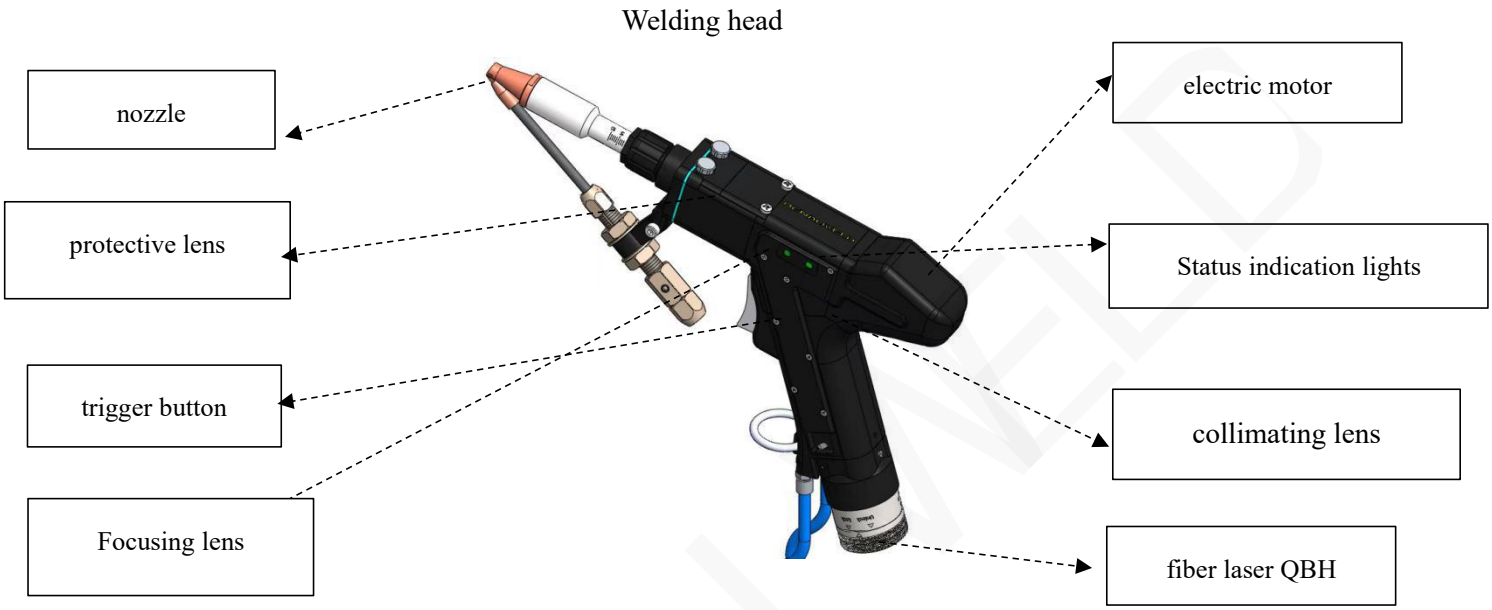
Front view

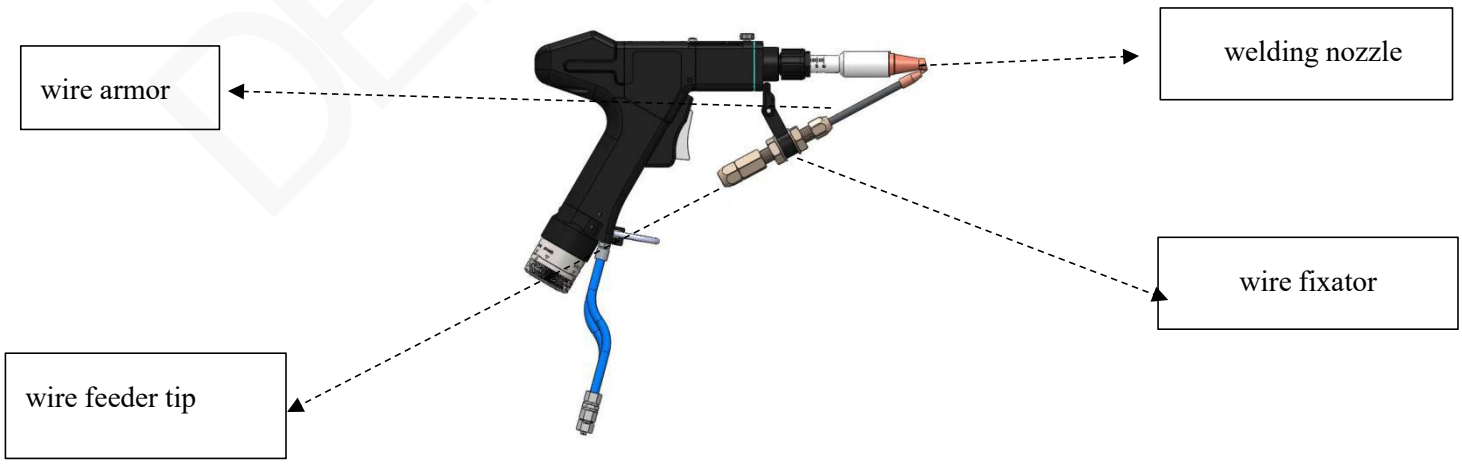
The main switch and shielding gas connection are located in the rear part of the housing. In addition, there is also a socket for connecting an automatic wire feeder and a safety clamp.

The heat from the source cooler and the head is dissipated by fans on top of the machine. This design ensures that the temperature of each component keeps constant.

Main welding head

The DENALIWELD welder is equipped with a proprietary, modern head with an electric system of the moving beam PRO 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 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" voice, then pull the handwheel up and

■ turn clockwise to end.

Daily Inspection

● Check whether the cover glass is polluted 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 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 whether there is water leakage to wiring before daily use.

● 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 φ 6mm.

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

Correctly mounted wire feeder at the head ensures good wire guiding in the nozzle groove. It is 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) Ensure reliable grounding before supplying power.

2) The wire feed wheel matches the wire warp and corresponds to the wire feed tube

3) Don't twist the wire feed 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	Replug
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
		The welding wire is blocked at the outlet of the wire feeder	Adjust the wire guide tube to align with the outlet of the wire feeder
		Wire feeding tube blocked	Replace the wire feeding tube
		Insufficient tension	Loosen the welding wire disc brake
		Control board fails	Replace the control board
		The welding wire is knotted in the welding wire reel	Remove the knotted part and rewind the wire
		Mismatch or wear of wire feeding tube	Replace wire feeding tube
		Improper wire feeding reel	Replace wire feeding reel
3	Unstable wire feeding speed and poor wire feeding	Incorrect tension by tension regulator	Modify the tension
		Wire feeding motor fails	Replace thr wire feeding motor
		Drive card fails	Replace drive card
		Jam of wire feeding tube	eplace or clean the wire feeding tube
		The bending angle of wire feeding tube is less than 30 degrees	Put the wire feedign tube straight as much as possible
		Deformation of wire feeding tube after Extrusion	Replace 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 the 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 where water drops and raindrops are available.
- Please use it at ambient temperature of - 10 ℃ to 40 ℃.
- Do not locate it on the table with strong vibration or great impact.

Use Attention

- When installing the welding wire disc or inserting the welding wire into the wire guide tube, do not wear gloves 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. Otherwise the wire reel may fall off.
- During welding, please close the right side plate otherwise electric shock or winding accident may occur due to the rotation.
- Before welding, please confirm whether the disc shaft end cover is tightened otherwise the welding wire disc may fall off due to the inclination of the welding wire disc.

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 , Sabra , 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/WeldSeam Clean/Remote Clean”.
- Laser Power: laser output power from 0 to 2000W.
- Pattern: SpotWeld or Line Wobble Weld.
- Laser Freq: number of laser pulses emitted by the laser per second.
- Wobble Freq: 0-200Hz.
- PWM: the ratio of pulse duration to pulse cycle, 0-100%.
- Wobble Size: to adjust the line spot width 0-5mm while wobble welding.
- Laser: turn on/off laser.
- Wire Feeding: turn on/off wire feeding.
- ScaleWeld: 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: 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 in order to prevent other people from touching the screen by mistake in case of beam off or beam on when the operator is welding or debugging. It is used to secure the safety of the operator. HMI could be locked or unlocked by clicking the lock mark.

- English: language selection.

2.2 Setting

2.2.1 Basic Setting

- Gas in Advance: gas blow duration from laser on to beam shooting.
- 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 2000W.
- Alarm Signal: PNP 24V effective.
- NozzleBreak 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 NozzleBreak Duration.
- ScaleWeld Duration: adjust the beam shooting duration as per spot welding application.
- ScaleWeld Interval: beam off interval while spot welding.

2.2.2 Galvo Setting

- Pattern: line or spot.
- Wobble Size: 0-5mm of line range.
- Wobble Freq: 0-200Hz 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 welding wire center could be done if it is required for wire feeding. 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.

2.3 Process

- 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 Head 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.
- I3.0 Galvo IO: input status.
- Q0.2 LaserEnable: 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.
- HMI Panel-LaserCard Comm: communication status from HMI panel to laser control card. green-normal, red-abnormal.
- HMI Panel-GalvoCard Comm: 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”.
- Cut: show assembly replacement diagram.
- WeldSeam Clean: 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.

3 Auxiliary Function

3.1 WeldSeam Clean

3.1.1 Configuration

- Handheld weld seam laser cleaning is one of 4-in-1 function.
- 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 2000W.
- 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 in order 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 2000W.
- Alarm Signal: PNP 24V effective.
- NozzleBreak 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 NozzleBreak 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 done 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.

3.2.3 Software Setting

Home:

- Laser Power: laser output power from 0 to 2000W.
- 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 in order 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 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 2000W.
- Alarm Signal: PNP 24V effective.
- Safety Lock Interval: the beam shooting will be triggered when the trigger button of head is pressed twice. Single pressing will not trigger beam shooting as safety protection. The interval between 2-time pressing is safety lock interval. The beam shooting 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.

3. Laser source

(The laser cannot operate in an environment with a temperature lower than 10 ℃, 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 nm to 1100 nm. When using water cooling, the photoelectric conversion efficiency is 25% higher. This brand is a top-class product, his the design and testing fully take the safety into account.

Accurate operation of the laser source in strict accordance with this manual instruction guarantees the reliability and safety. This kind 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 person operates this laser or around it must be informed these dangers. To ensure the safety, the disassembling of this device is not allowed. This product has no user-serviceable parts, 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 do the installation, setting, maintenance or other operations.

Please refer to the separate laser source user manual.

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

1. Preparation before installation

(1) Requirements:

The equipment should be installed in an independent space not less than 15 m^2 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.

(2) Environmental Requirements:

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

B. The ambient temperature must be between -10 ° C and 45 ° C, the humidity should be below 70% and the absolute altitude should be less than 1000m to ensure the equipment is in the best working condition. The ambient temperature must be stable and the working space should be equipped of air-conditioner.

C. To ensure clean air in the workroom, the customer should install an 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: 230 / 400V AC, allowing 230 / 400V ± 10% fluctuations.

Frequency: 50 Hz frequency, 50 Hz ± 0.2 Hz fluctuation allowed.

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

2. Installation process

Connect the machine to the power supply, 230V for 1000W and 1500W machines, 400V for 2000W 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

In order 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.

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

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

(3) 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.

(4) 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
	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 more information, please check all labels on the body of the machine!

2. Safety rules for the use of equipment

When laser equipment works, it will be very dangerous if a breakdown happens. The operator must strictly follow the rules of safe operation of the laser system which not only ensure the safety of the person who is working and using the equipment, but also ensure the standard operation of the laser device, achieve technical efficiency, and take full advantage of processing benefits. Therefore, during operation, the 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 is 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, 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, and the machine should be turned off when it is really 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. Items, tools and waste are properly stacked;

(7). When using shielding gas cylinders, do not crush wires, cables or gas pipes to avoid accidents and gas leaks. The using and transportation of gas cylinders should be conform to the regulations of safety provided by supplier of industrial gas. It is forbidden to expose the gas cylinder to sunlight or to a heat source. The operator must stands 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 concentrates all his attention while operating the device and do not talk, play, listen to music or do other activities not related to this welding work;

(10).If the machine will not be used in more than thirty minutes, turn off the power of the entire machine as required.

(11). When installing, repairing, and maintaining manually 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. Start the power supply, stop power to all system controls and potentially dangerous functional parts. Then the laser light will appear. In case of errors of 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. 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. It 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 in order to avoid additional damage.

(16). If the machine can not be turned on again, 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. All buttons, except the water switch, can be switched.

3. Daily maintenance

(1) Clean the machine from dust and dirt to maintain its clear appearance;

(2) Check integratedly the dust cover, remove dust on it;

(3) Check and make sure the protective glass is clean;

(4) Check and make sure that the cooling water temperature and hydraulic pressure are correct ;

(5) Check the voltage stabilizer. Monitor input / output voltage and gas pressure; Contact the seller if anything goes wrong;

(6) Make sure there are no leaks.

4. Cleaning and replacing the protective lens

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

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 dirty to get inside the head.

Replacing the protective glass

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

b. Carefully install the protective glass with tools, do not scratch it; Cleaning the protective glass:

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

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

e. The alcohol (99%) only dissolves the contamination without damaging the lens;

f. 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 using 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. Firstly, 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.

Then as long as the 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 wipe 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 of the lower focusing lens.

5. Possible problems and ways to solve them

No	Problem	Likely cause of the error	Comment
1	No laser	- Turn off the laser; - The laser alarms and does not start the source; - The water chiller is turned off or indicates an alarm; - Damage to the laser button, damage to the indicator light, or opening of the safety lock when the components are not connected. - Damage to the laser source.	- Check that the laser power button turns on. - Verify the laser source is on or alerting, and reading signal alert information. - Check the operation of the cooler. - Check signal line for laser connection and safety line.
2	No oscillation	- Oscillation function disabled, - Invalid oscillation parameter. - Electric motor defective. - No signal, broken wire.	- Check if the oscillation function is on turned on - Check the correct operation of the power supply 24 V - 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.
3	Weak Laser power	- Damaged protective glass, focusing lens or collimating lens. - Problem with the temperature inside the radiator.	- Damage or contamination of the protective lens / focusing lens / collimating lens can cause the laser to refract, weakening it. The condensation of the collimating / focus lens caused by the large temperature difference between the high-temperature water and the surroundings weakens the laser.
4	The oscillating red light decreases	- Badly adjusted electric motor, - Damaged electric motor or its control. - Incorrect angle of the angular lens.	- Check that the electric motor is working, - Check the position of the angular lens and the correct reflection of the laser light, - Unscrew the cover screw. Block first.

5	Laser Source alarm	- Faulty tip of QBH - Too low / high water temperature in the cooler - Source blockage due to reflected beam - Other factors	- Still active laser source extinction alarm, can be read by decoding laser software input string. - 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; QBH alarm: check QBH connection or thermistor on break line
6	A common problem with the chiller	- No power - Lower cooling capacity - Water temperature rise	- Check that the voltage supplied to the plug is sufficient and that the fuse on the plug is not blown. - Check if the water level in the tank is sufficient, - 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.

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

8. Storage requirements

Storage temperature 10 ℃ ~ 30 ℃, humidity 10% ~ 70%.

9. Equipment transportation requirements

When transporting the device, make all possible protective measures.

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.