



JET EZ Laser Welding Machine User Manual

(500W, 800W)

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Preface

Thank you for choosing DENALIWELD for your handheld laser welding projects. We have compiled this easy-to-follow instruction manual to help familiarize you with the machine's functions, safety requirements, and maintenance schedule.

Thank you again for using DENALIWELD products. Please take the time to read and understand this User's Guide and familiarize yourself with the operating and maintenance instructions before using the product. We strongly recommend that the operator read Section 2, "Safety Information," before operating the product.

This User's Guide should remain with the product so that you and all future users have access to important operating, safety, and other relevant information.

Information that requires special attention is identified with an underscore. Please note this information to help prevent unnecessary damage.

Company Profile

DENALIWELD is a U.S.-based laser welding company specializing in manual and automated laser welding and cleaning solutions. With professional expertise in numerical control systems, optical systems, and other core technologies, we are committed to providing high-quality welding and cleaning solutions to customers in a wide range of 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.

DENALIWELD is a professional manufacturer of manual and automated laser welding and cleaning machines. We integrate research and development, production, and sales of laser equipment and have established a complete platform for laser equipment sales and support. Our professional technical personnel, extensive management experience, and clear development direction support our continued growth in the laser industry.

Our company has an independent core research and development team that includes software engineers, mechanical engineers, electrical engineers, industrial designers, and other professionals who strive for continuous improvement. DENALIWELD has a stable customer base and broad technical recognition worldwide. We have developed core technologies such as numerical control systems, precision welding heads, and precision field-mirror systems to achieve higher precision and faster processing in laser welding applications.

For more information, please visit our website:

<http://www.denaliweld.com>

Characteristics Explained

The JET EZ consists of high-efficiency, high-reliability, ultra-portable, maintenance-free, low-power laser systems developed by DENALIWELD. The series uses a phase-change heat dissipation method, has a wavelength range of 1060-1100 nm, and achieves laser efficiency greater than 25%.

DENALIWELD JET EZ lasers are Class 4 laser products, and safety has been a primary consideration throughout product design and testing.

Laser light has unique characteristics that may create safety hazards. It must not be treated like ordinary light sources, and all operators and personnel near the laser must be aware of these hazards.

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

Do not open the handheld laser head or laser source. This product contains no user-serviceable parts or assemblies. Unauthorized disassembly may void the warranty.

General Safety Information

1. Handheld Laser Welding Machines Are Safe to Use When Operated Correctly

Handheld laser welding machines are Class 4 laser products that emit hazardous, invisible laser radiation. This product emits infrared laser radiation with a wavelength of 1060-1100 nm, which can damage the eyes and skin through direct or indirect exposure. This infrared radiation is invisible, and the laser beam can cause irreversible damage to the retina or cornea. Always wear appropriate, certified near-infrared laser safety glasses rated for 1060-1100 nm before operating the handheld laser welding machine.

- (1) For your safety and the safety of others, never point the welding head at yourself or anyone else.
- (2) Appropriate, certified 1060-1100 nm near-infrared laser safety glasses or helmets and heat-resistant gloves must be worn before using the handheld laser welding machine.
- (3) For your safety and the safety of others, the alligator clip must be attached to the welding workpiece before the laser is triggered. Do not attach it anywhere other than the workpiece, as abnormal laser output may create a safety hazard.
- (4) Handheld laser welding must be performed in a separate area with appropriate laser protection. Keep non-welding personnel, combustible materials, and flammable materials away from the welding area, and always keep a fire extinguisher nearby.
- (5) Wear an approved welding helmet when welding any material.
- (6) Make sure the handheld laser welding machine is properly grounded. Improper grounding may energize the machine enclosure and cause personal injury. It may also cause laser alarms, no laser output, unstable laser operation, or other faults.
- (7) Do not weld in rain or direct sunlight. These conditions may trigger high-temperature or high-humidity alarms or cause a short circuit, which may affect normal laser operation and create additional safety hazards.

2. Safety Conventions

The table below describes the safety warning symbols used during operation of the handheld laser welding machine:

SYMBOLS	DESCRIPTION
	WARNING: Text marked with an electrical warning symbol indicates a potential personal hazard. Failure to follow the specified procedures may result in serious or fatal injury to you or others.
	NOTICE: Indicates a potential hazard to the product. Follow the specified procedures to prevent damage to the equipment or its components and to ensure normal operation.
	This symbol indicates laser radiation. This symbol is affixed near the laser output of the product.
	This symbol indicates that protective eyewear is required. Always wear appropriate, certified near-infrared laser protective eyewear rated for 1060-1100 nm.
NO SYMBOL	IMPORTANT: Refers to important information regarding product operation. Do not overlook this information.

NOTE:

On DENALIWELD handheld laser welding machines, the wavelength range is 1060-1100 nm, which is outside the visible-light range. These beams may cause irreversible damage to the retina and cornea. DENALIWELD recommends wearing qualified laser safety glasses or helmets at all times while operating the handheld welding machine.

3. Laser Protection

1. Laser Safety Goggles and Helmet Requirements

Laser safety goggles and helmets must be selected to provide protection across the entire wavelength range emitted by the handheld laser welding machine. When operating this device, wear appropriate laser safety goggles or a suitable laser safety helmet. The end user is responsible for confirming that the selected protective equipment is rated for the wavelength range emitted by the product. If a tunable laser or Raman product is used, it may emit light across a range of wavelengths. Verify that the selected glasses or helmet block radiation across the entire emitted wavelength range. Check the product safety label and confirm that all personal protective equipment, including shields, viewing windows, goggles, and helmets, is appropriate for the laser output power and wavelength range. Selection of laser safety eyewear must also account for any secondary radiation hazards created by the welding process (see Chapter II, Section 4-1).

Laser Protective Equipment Suppliers

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

4. Welding Safety

1. Radiation Hazard

Visible and invisible radiation is generated during welding. The interaction between the high-power laser beam and the material being welded can create plasma that generates ultraviolet radiation and “blue light.” This radiation can cause conjunctivitis, photochemical retinal damage, or a sunburn-like reaction on the skin. Welders exposed to invisible ultraviolet radiation without proper protection may suffer permanent eye damage.

2. Skin Hazard

Exposure to infrared and ultraviolet radiation during welding can damage the skin. Infrared and ultraviolet light can cause burns, increase the risk of skin cancer, and accelerate signs of skin aging. Welding sparks can also cause burns. Laser material processing transfers large amounts of energy into the workpiece, and parts may remain extremely hot after processing. Use appropriate personal protective equipment to prevent burns. Wear protective clothing such as fire-resistant gloves, a hat, a leather apron, and other flame-resistant garments. Keep sleeves and collars fastened.

3. Fire Hazard

If flammable or combustible materials are near the welding area, the heat and sparks generated during welding may cause a fire or explosion. Laser welding may be performed only in an area that is free of combustible materials. Never weld containers that contain flammable or combustible materials. If the contents of a container are unknown, assume that they are flammable or combustible. Keep fire extinguishers nearby and easily accessible, and make sure personnel are trained to use them.

4. Fume Hazard

Welding fumes may contain very fine particles and gases. These fumes may come from the base material, filler materials, shielding gases, paints, coatings, chemical reactions, and airborne contaminants. Welding fumes may adversely affect the lungs, heart, kidneys, and central nervous system.

- (1) When welding, keep your head away from the fumes. Always weld in a well-ventilated area with a safe supply of breathing air.
- (2) Use a fume extraction system to remove vapors, particulates, and hazardous debris from the welding area.
- (3) A respirator may also be required in confined spaces or other situations.
- (4) Routine air monitoring should be performed to determine the level of hazardous fumes in the welding area.

5. Cylinder Safety

A gas cylinder may explode if it is damaged or placed too close to the welding area. Position shielding-gas cylinders where they will not be struck or damaged. Keep them away from heat, sparks, and flames. Store cylinders upright and secure them to a fixed stand. Use a properly functioning regulator that is suitable for the required gas and pressure. All hoses and fittings must also be suitable for the application and in good working condition.

General Safety Instructions

1. Mirror Reflection

The output port of the handheld laser welder may create a secondary or divergent laser beam that radiates outward at multiple angles after reflecting from a surface. This phenomenon is called specular reflection. Although the secondary beam contains less energy than the primary beam, it can still damage the eyes, skin, and certain material surfaces.

WARNING: Because laser radiation is invisible, exercise extreme care to avoid or minimize specular reflections.

2. Accessory Safety Instructions

Photosensitive elements integrated into optical accessories used with the handheld laser welding machine may be damaged by laser exposure. Protect all related devices accordingly.

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

3. Optical Handling Precautions

DENALIWELD strongly recommends reviewing the following precautions before operating the handheld laser welding machine:

- (1) Do not look directly into the light-emitting aperture of the handheld laser welding machine.
- (2) Do not position the handheld laser welding machine or related optical output devices at eye level.
- (3) Select safety protective equipment that is appropriate for the laser output power and wavelength to ensure operator safety.
- (4) Post a warning sign in the area where the handheld laser welding machine is used to identify and control the laser operating area.
- (5) Do not use the handheld laser welding machine in a dark environment.
- (6) Do not turn on the handheld laser welding machine unless the optical coupling fiber or optical output connector is properly installed.
- (7) Install and clean the protective lens, copper nozzle, and wire-feeding components only when the handheld laser welding machine is turned off and disconnected from the power supply.
- (8) Perform debugging, calibration, and focusing with the laser disabled. Turn the laser on only after these procedures are complete.
- (9) Operate the equipment strictly according to the instructions in this document. Otherwise, the protective functions and performance of the equipment may be impaired, and DENALIWELD cannot guarantee proper operation.

WARNING: Select safety equipment according to the laser output power and wavelength. Never look directly at the gun tip, and always wear approved laser safety goggles or a helmet during operation.

4. Electrical Operating Instructions

DENALIWELD strongly recommends reviewing the following precautions before operating the handheld laser welding machine:

- (1) Ensure that the equipment enclosure is properly grounded. Any interruption in the grounding circuit may cause personal injury.
- (2) Make sure the power supply connected to the device is connected to protective ground before use.
- (3) To reduce the risk of fire, any replacement in-line fuse must be of the same type and rating recommended by DENALIWELD.
- (4) Ensure that the input AC voltage to the handheld laser welder is the normal mains voltage (AC 230 V) and that the wiring is correct. Incorrect wiring may cause personal injury or equipment damage.

- (5) Except for welding-gun consumables, users should not repair parts or components themselves. All maintenance must be performed by qualified DENALIWELD service personnel.
- (6) Do not disassemble or reassemble the handheld laser welding machine without authorization, and do not damage or remove safety labels. Doing so may create a risk of electric shock or burns.
- (7) Keep all flammable materials away from the welding area. Heat and sparks generated during welding may cause a fire or explosion. Laser welding may only be performed in areas free of combustible materials.
- (8) Never weld containers that contain flammable or combustible materials. If the contents are unknown, assume that they are flammable or combustible. Keep a fire extinguisher nearby and accessible, and make sure personnel are trained to use it.
- (9) Any product that has been disassembled without authorization may no longer be covered by the warranty.

WARNING: The input voltage of the handheld laser welding machine is AC 230 V. A risk of electric shock is present. All associated cables and connections may be hazardous.

5. Operating Environment Requirements for Handheld Laser Welding Machines

This equipment is intended for use under the following conditions: (1) below 2,000 meters (1.2 miles) above sea level; (2) overvoltage category II; (3) pollution degree 2; and (4) a dry location. For more information, refer to the product specifications.

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

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

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

To maintain a safe laser work area, be aware that interaction between the laser and the work surface can create additional hazards because high temperatures may generate gases, sparks, and debris. Operators must receive appropriate assessment and training and must be familiar with the general safety requirements for laser operation.

DENALIWELD recommends the following measures to extend the service life of the handheld laser welding machine:

- (1) Ensure that the work area is properly ventilated and keep the handheld laser welding machine in a dry, cool, and clean environment. Do not expose the machine to high temperatures, high humidity, or water.
- (2) During operation, make sure no foreign material blocks the air inlet at the front of the laser. Keep at least 1 meter (3 ft) of clear space around the intake and at least 1 meter (3 ft) of clear space behind the rear air outlet.
- (3) Prevent debris, including liquids, from entering the laser. Foreign material or liquid may damage the laser and may cause personal injury.

(4) Operating the equipment at high temperatures accelerates aging, raises the current threshold, and reduces sensitivity and conversion efficiency. If the device overheats, stop using it and contact DENALIWELD.

NOTICE:

- Operate the equipment carefully to avoid accidental damage.
- Clean the filter at the front of the laser periodically to remove dust and debris from the air inlet.

For More Safety Information, Refer to:

Laser Institute of America (LIA)

13501 Ingenuity Drive, Suite 128

Orlando, Florida 32826

Phone: 407 380 1553 Fax: 407 380 5588

Toll Free: 1 800 34 LASER

American National Standards Institute

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

International Electrotechnical Commission

IEC 60825-1, Edition 1.2

Center for Devices and Radiological Health

21 CFR 1040.10 - Performance Standards for Light-Emitting Products

U.S. Department of Labor - OSHA

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

Laser Safety Equipment

Laurin Publishing

Laser safety equipment and Buyers' Guides

1. Technology Profile

Laser welding fuses the contact area of joined components by applying a concentrated beam of light with very high energy density to the weld area. The single-module fiber system provides constant, stable, high-quality power and beam output. Laser power can be adjusted according to production requirements, providing excellent flexibility and high reliability. Laser welding is particularly efficient for series production, automated production, and robotic applications.

2. Product Presentation

The DENALIWELD handheld laser welder uses a modern fiber laser and a proprietary welding head equipped with an oscillating motor. The equipment is easy to operate and provides high weld quality, high welding speed, and minimal consumable use. It can replace traditional argon-arc welding, electric welding, and similar processes for thin stainless steel sheet, iron sheet, galvanized sheet, and other metal materials. The handheld laser welding machine can be used for cabinets, kitchen products, racks, ovens, stainless steel doors, distribution boxes, stainless steel components, and other complex welding applications.



3. Product Parameters

1. Name: Portable Laser Welding Machine
2. Laser power: 500W, 800W
3. Laser wavelength: 1060-1100 nm
4. Fiber optic cable length: Standard: 5 m (32 ft)
5. Technical parameters: Continuous
6. Welding speed: 0-80 mm/s
7. Cooling: Forced Air Cooling
8. Operating temperature range: -10 to 45 °C (14°F to 113°F)
9. Working humidity: <70% RH
10. Recommended welding thickness: 0.5-3 mm
11. Joint width: ≥0.5 mm
12. Working voltage: AC 230 V - customized for different countries; refer to the nameplate.

4. Features and Benefits

DENALIWELD welding heads are developed by DENALIWELD using an oscillating laser welding method. This design addresses limitations of traditional fixed-spot laser welding and improves resistance to damage while supporting better weld formation.

- A. Multiple welding methods can be achieved using different welding-head configurations with simple operation.
- B. Welding speed can be 2-10 times faster than traditional welding. Each machine may reduce annual labor requirements, uses fewer consumables, provides a long service life, and supports safer, cleaner welding.

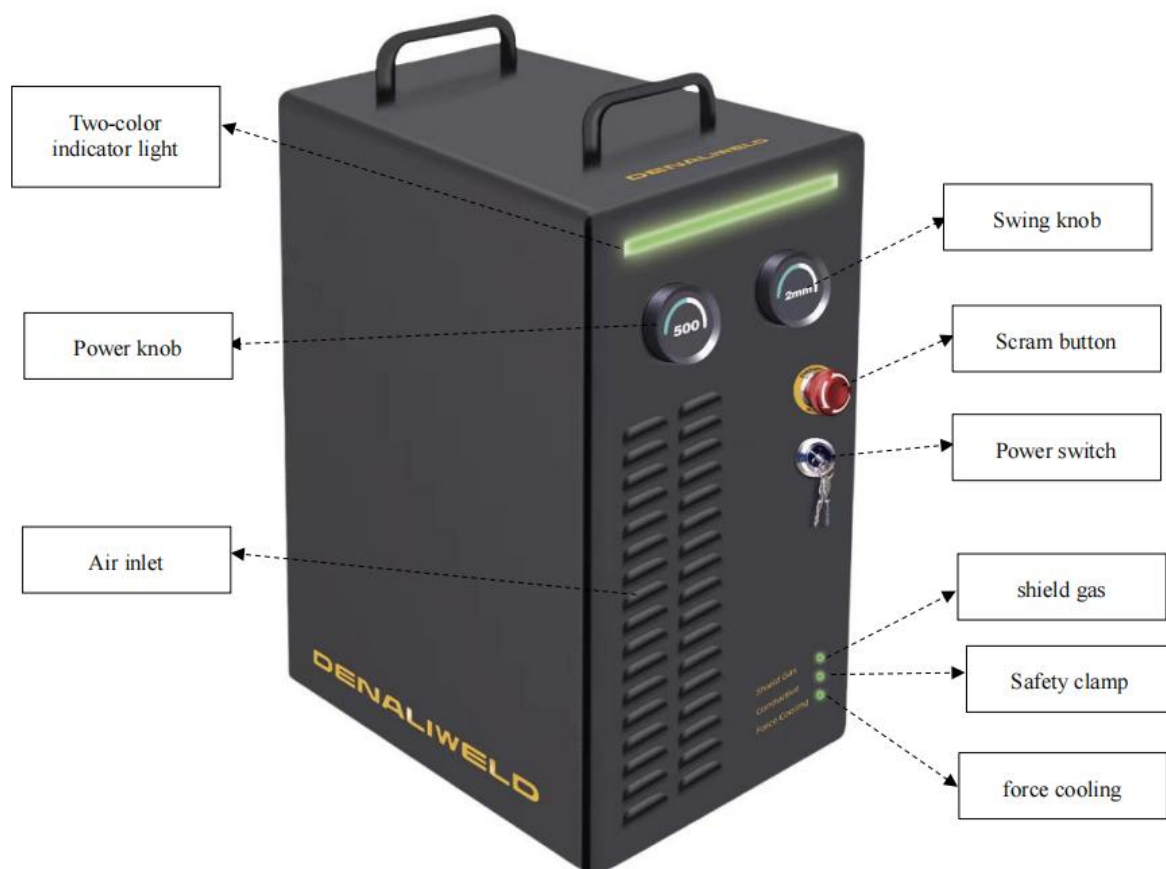
5. Scope of Application

Many industries can benefit from laser welding, including the manufacture of cabinets, shelves, ovens, distribution boxes, stainless steel furniture, and similar products. The range of laser welding applications is extensive.

Chapter I. Machine Structure

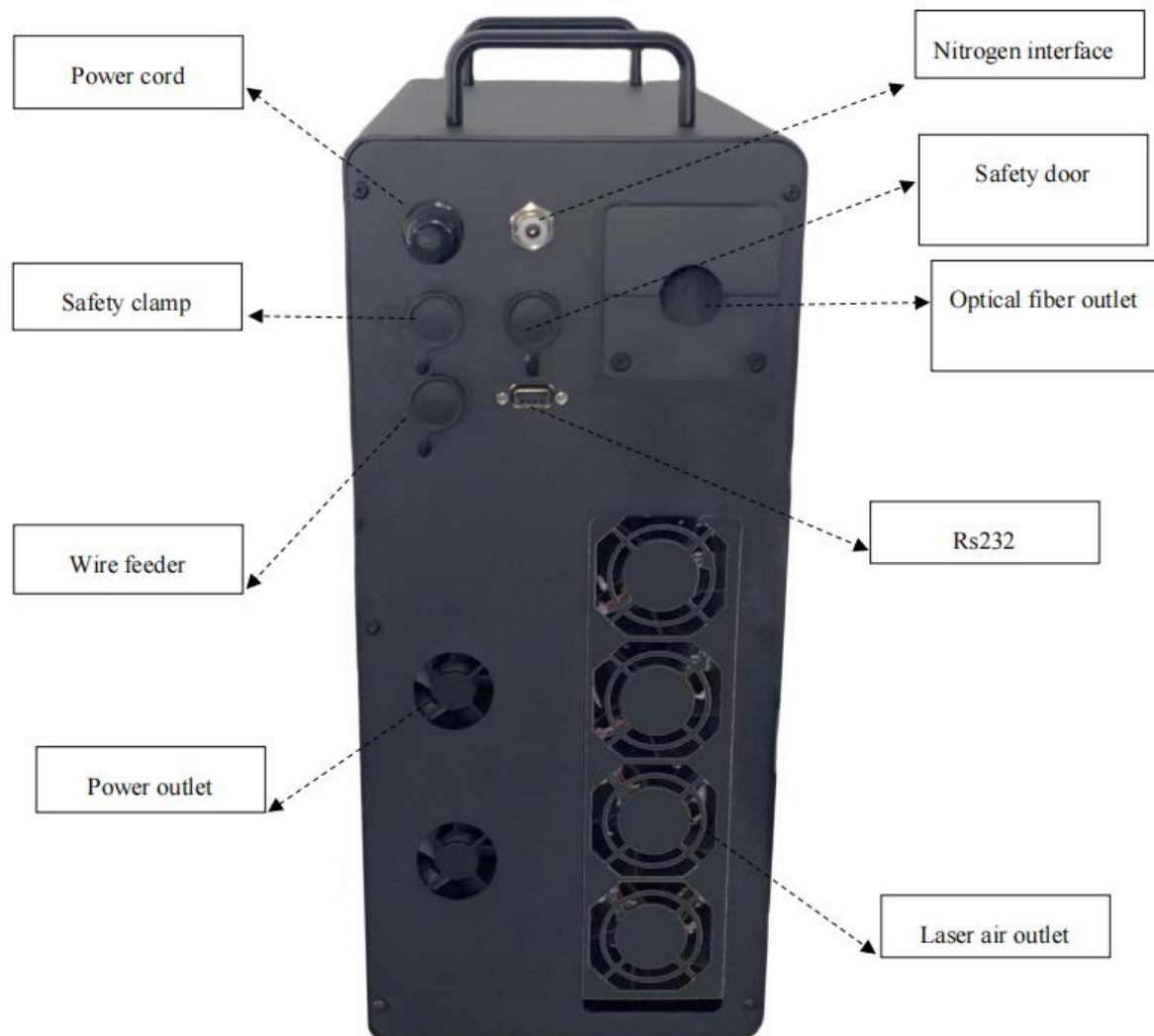
1. Construction of the Machine

The ultra-portable welding machine is compact, lightweight, and easy to carry. It is suitable for outdoor and field welding operations, especially for maintenance or installation work over long distances. Its simple, lightweight structure and operating system make it easy to use and require minimal technical training.



Front View

The shielding-gas connection is located on the rear of the housing. A socket is also provided for connecting an automatic wire feeder and a safety clamp.



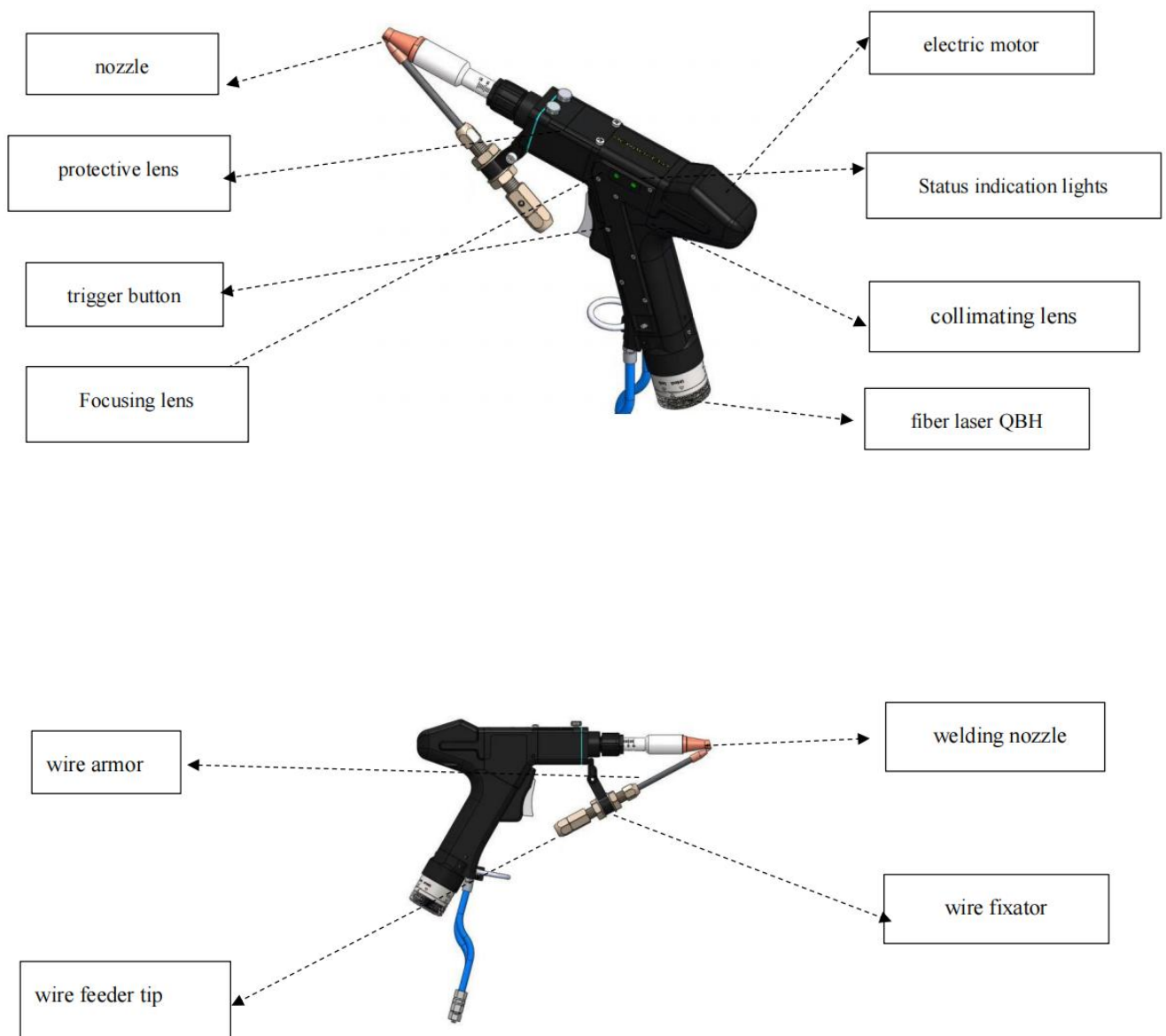
Back View

Heat from the laser source and welding head is dissipated by a fan at the rear of the machine. This design helps keep component temperatures stable.

Main Welding Head

The DENALIWELD welder is equipped with a proprietary, modern welding head featuring the PRO WOBBLE moving-beam system. A patented mechanism uses an electric motor to move the focusing lens, allowing the beam position and width to be adjusted automatically. This makes it easy to adjust the desired weld width. The head is water-cooled, allowing stable and uninterrupted operation. Its ergonomic design provides a secure grip.

Welding Head



QBH Connection



Remove the dust cover from the optical fiber and verify that the protective cap on the fiber crystal head is locked. Clean the optical fiber head with a lint-free cotton swab and absolute ethanol to ensure that the fiber end face is clean and free of dust.

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

Insert the fiber straight into the QBH interface until it is fully seated.

- Turn the QBH handwheel clockwise. When you hear a click, pull the handwheel upward and continue turning it clockwise until it reaches the end position.

Daily Inspection

- Check the cover glass before each day of use. Replace it if it is dirty or damaged.
- Check the QBH connector before each day of use and make sure it is securely locked and does not move.
- Check the copper nozzle for blockage and verify conductivity between the copper nozzle and the safety lock. If welding slag cannot be removed, replace the copper nozzle. If conductivity is poor, replace the copper nozzle.
- Check for any water leakage near the wiring before daily use.
- Make sure the gas connection is correct. The gas hose diameter is ϕ 6 mm.

Automatic Wire Feeder



Power source	24V DC
Rated power	80W
Time delay	0-800 ms
Feeding speed	5-100 mm/s
Retract speed	100 mm/s
Retract length	0-100 mm, continuously adjustable
Filling time	0-800 ms, continuously adjustable
Filling speed	0-100 mm, continuously adjustable
Customized	Available

Correctly mounting the wire feeder on the welding head ensures smooth wire guidance through the nozzle groove. Mount it securely so the wire remains properly guided. Adjust the wire-feeding speed according to the welding process. The feeding speed is adjusted using the control on the feeder.

Attention:

- 1) Ensure reliable grounding before applying power.
- 2) Make sure the wire-feed wheel matches the welding wire and the wire-feed tube.
- 3) Do not twist the wire-feed tube.

Troubleshooting the Wire Feeder

No.	Fault	Possible Causes	Solution
1	Power LED does not turn on	• 24V power cable is damaged • Power switch failure • Poor connection or disconnected internal wire in the switch plug • Wire-feeding motor failure • Out of welding wire • Motor plug loose on the motion card	• Replace the power cable. • Replace the power switch. • Replace the plug and check the welding-head connecting wire. • Replace the wire-feeding motor. • Replace the welding wire spool. • Reconnect the motor plug.
2	Wire feeding fails when the welding head is operated	• Welding wire is knotted • Wire-feed tube is kinked • Welding wire is blocked at the wire-feeder outlet • Wire-feed tube is blocked • Insufficient tension • Control board failure • Welding wire is knotted on the spool • Wire-feed tube is worn or mismatched • Improper wire-feed reel	• Loosen the tension regulator and rewind the wire. • Straighten the wire-feed tube. • Adjust the guide tube so it aligns with the outlet. • Replace the wire-feed tube. • Adjust the welding-wire spool brake. • Replace the control board. • Remove the knotted section and rewind the wire. • Replace the wire-feed tube. • Replace the wire-feed reel.
3	Unstable wire-feeding speed or poor wire feeding	• Incorrect tension-regulator setting • Wire-feeding motor failure • Drive-card failure • Jammed wire-feed tube • Wire-feed tube bending angle is less than 30 degrees • Wire-feed tube is deformed after extrusion	• Adjust the tension. • Replace the wire-feeding motor. • Replace the drive card. • Replace or clean the wire-feed tube. • Keep the wire-feed tube as straight as possible. • Replace the wire-feed tube.

Daily Maintenance of the Wire Feeder

1. Daily Maintenance

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

2. Cautions

Operating Environment

- This machine is intended for indoor use. Do not use it where it may be exposed to dripping water or rain.
- Use the machine at an ambient temperature of -10 to 45 °C (14°F to 113°F).
- Do not place the machine on a surface subject to strong vibration or impact.

Operating Precautions

- When installing the welding-wire spool or inserting wire into the wire-guide tube, do not wear gloves that could become caught in rotating parts.
- Confirm the weight of the welding-wire spool. The welding wire must not weigh more than 15 kg; otherwise, the spool may fall off.
- During welding, keep the right-side plate closed to reduce the risk of electric shock or entanglement with rotating parts.
- Before welding, make sure the spool-shaft end cover is tightened; otherwise, the welding-wire spool may fall off if it tilts.

2. Control Panel

The control panel allows the operator to adjust machine functions such as laser power and wobble width.



Control Panel

The front of the welding machine is equipped with two adjustment knobs, allowing process parameters to be changed quickly.

- Laser Power: Adjusts laser output power from 0 to 500/800 W.
- Wobble Size: Adjusts the line-spot width from 0 to 5 mm during wobble welding.

Auxiliary Function

Weld Seam Clean

1 Configuration

- The 2-in-1 laser head supports both welding and weld-seam cleaning functions.
- Remove the wire-feeding mechanism, welding nozzle, and extension tube.
- Install the cleaning tube.

2 Parameter Settings

- Laser Power: Adjusts laser output power from 0 to 500/800 W.
- Clean Width: Adjusts the line-spot width from 0 to 5 mm during cleaning.

3. Laser Source

CAUTION: The laser must not be operated at an ambient temperature below 10 °C (50°F), because condensation may damage the internal laser source.

The DENALIWELD laser source is a highly efficient, reliable, maintenance-free, high-power device with a wavelength range of 1060-1100 nm. Compared with water-cooled systems, the photoelectric conversion efficiency is 25% higher. The product is designed and tested with safety as a primary consideration.

Operating the laser source strictly according to this manual helps ensure reliability and safety. This type of laser source has unique characteristics that may create safety hazards and therefore must not be treated like ordinary light sources or low-power lasers. All personnel who operate the laser or work near it must be informed of these hazards. Do not disassemble the laser source. It contains no user-serviceable parts or components. Unauthorized disassembly will void the warranty. All laser parameters are set before the equipment leaves the factory. Unauthorized personnel must not perform installation, parameter setting, maintenance, or other service operations.

Refer to the separate laser source user manual for additional information.

Chapter II. Installation and Start-Up of the Device and Operating Guidelines

1. Preparation Before Installation

(1) Requirements:

Install the equipment in an independent area with suitable gas and electrical connections. The floor should be level, rigid, and resistant to vibration. A laser warning sign should be clearly visible at the entrance.

(2) Environmental Requirements:

A. The work area must be well lit. Within 20 meters (65 ft) of the device, there should be no equipment that produces strong vibration or electromagnetic interference.

B. The ambient temperature must be between -10 and 45 °C (14°F to 113°F), humidity must be below 70%, and altitude must be below 1,000 m (3,280 ft) to maintain proper operating conditions. Ambient temperature should remain stable, and air conditioning is recommended.

C. To maintain clean air in the work area, install an appropriate fume-extraction system based on site conditions after installation and commissioning.

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

(3) Power Requirements:

Voltage: 230 VAC, with allowable fluctuation of 230 VAC $\pm 3\%$.

Frequency: 60 Hz, with allowable fluctuation of 60 Hz ± 0.2 Hz.

The power supply may be customized for different countries. Refer to the machine nameplate.

2. Installation Process

Connect the machine to the power supply. Connect the gas hose to the shielding-gas cylinder through an appropriate regulator.

(1) Start-Up Procedure:

- 1) Turn on the POWER switch on the front panel of the machine.
- 2) Make sure shielding gas is supplied.
- 3) Make sure the protective glass is clean and clear.
- 4) Enter the required welding parameters.

(2) Shutdown Procedure:

- 1) Turn off START on the front panel of the machine.
- 2) Secure the welding head.

3. Principles of Operation During the Welding Process

To emit the active laser beam, first confirm that all status indicators show normal operation, and then press the trigger button to activate the laser.

- (1) The operator must wear gloves suitable for laser welding, protective goggles rated for reflected laser radiation, and an approved protective helmet.
- (2) Use the control panel to set the process parameters required for the material and the desired welding result.
- (3) Adjust the nozzle extension to set the correct focal length of the welding head and the beam focus. **CAUTION:** Operating with an incorrect focal position may damage the optical components of the welding head.
- (4) Maintain the correct angle between the nozzle and the workpiece. Aim the laser beam (red dot or line) at the joint between the two components and activate the beam with the trigger button. Weld by moving the head along the joint.

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

1. Safety Rules

The following safety warnings apply during operation:

Warning 1: Laser radiation is invisible. Exercise special care to avoid mirror-like reflections.

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

Explanatory safety labels:

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

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

2. Safety Rules for the Use of Equipment

A malfunction while laser equipment is operating can create serious hazards. The operator must strictly follow all safe operating procedures. These procedures protect personnel, support correct operation of the laser system, improve technical efficiency, and allow the equipment to be used effectively. All safety regulations must be followed during operation.

- (1) Comply with all safety regulations for equipment operation.
- (2) Operators must receive initial training, understand the construction and operation of the equipment, become familiar with operating procedures, and be qualified before working independently.
- (3) While operating the laser welder, wear personal protective equipment required by applicable health and safety regulations, including safety glasses, a protective visor, a welding apron, welding gloves, and approved laser safety goggles or a helmet. Never emit laser radiation toward people or materials that are not intended to be processed.
- (4) After the device is started, the operator must not leave the designated workstation or transfer control to an unauthorized person. Turn off the machine if it is necessary to leave the work area.
- (5) Keep a fire extinguisher within easy reach. Turn off the laser when it is not in use, and do not place paper, fabric, or other flammable materials near an unprotected laser beam.
- (6) Keep the area around the equipment clean, orderly, and free of residue. Store tools, materials, and waste properly.
- (7) When using shielding-gas cylinders, do not crush or pinch wires, cables, or gas hoses. Use and transport gas cylinders according to the safety requirements of the industrial-gas supplier. Do not expose cylinders to direct sunlight or heat sources. When opening a cylinder valve, stand to the side of the outlet.
- (8) If any abnormal condition is detected during operation, turn off the equipment immediately to minimize potential damage.
- (9) Operators must remain fully attentive while operating the device. Do not talk, play, listen to music, or engage in other activities unrelated to the welding work.
- (10) If the machine will not be used for more than 30 minutes, turn off the power.
- (11) When installing, repairing, or maintaining the machine, turn off and disconnect the main power source. Improper work performed while the equipment is energized can have fatal consequences. Accidental exposure to high voltage may cause cardiac arrest, burns, or other serious injury.
- (12) The emergency stop takes priority over all other control functions and disables laser operation. If a laser-output error occurs, immediately release the trigger and press the emergency stop button. Disconnect power and inspect the system to identify the cause of the fault.
- (13) Keep all personnel who are not trained operators as far as practical from the welding area. Unqualified operation or operator error may cause damage.
- (14) Unqualified personnel and unauthorized laser engineers must not operate peripheral devices connected to the handheld welding machine without permission. DENALIWELD and its distributors are not responsible for consequences caused by unauthorized activity or failure to follow operating procedures.
- (15) If the machine will not turn on, check the laser alarm indicators: GREEN indicates normal operation; RED indicates a malfunction. All parameters are preset at the factory. Do not disassemble the laser without permission from DENALIWELD.

3. Daily Maintenance

- (1) Clean the machine and remove dust and dirt to maintain its appearance.
- (2) Inspect the dust cover and remove accumulated dust and debris.
- (3) Check that the protective glass is clean.
- (4) Check the voltage stabilizer and monitor the input/output voltage and gas pressure.
- (5) Make sure there are no leaks.

4. Cleaning and Replacing the Protective Lens

During cleaning and replacement, contamination can reduce the light transmission of the lens and shorten its service life.

Before removing the protective-glass drawer, clean the area around the drawer to minimize the possibility of dirt entering the welding head.

Replacing the Protective Glass

- a. Before handling the protective lens, wear powder-free, rubber, or latex gloves.
- b. Install the protective glass carefully using suitable tools. Do not scratch the glass.

Cleaning the Protective Glass

- a. Hold the glass by its edge without touching the optical surface. Always place the glass on lens tissue or another clean, nonabrasive surface.
- b. Keep the protective lens as clean as possible and protect it from dirt and dust.
- c. Use 99% alcohol to dissolve contaminants without damaging the lens.
- d. Clean the lens as thoroughly as possible in a dust-free environment.

Main cleaning tools: air blower ball, 99% alcohol, and dust-free swabs



If dust is present on the lens, use the air blower ball to remove loose particles. Then clean the lens carefully with a dry cotton swab without applying excessive force.

For stains on the lens, dip a clean, dry cotton swab in anhydrous ethanol. Before wiping, make sure no dust particles remain on the surface. Clean the lens in a circular motion from the center outward. Do not use a back-and-forth wiping motion.

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

Correct cleaning technique is very important. Practice may be performed on a damaged laser protective lens. Even with proper technique, minor surface damage may still occur.

After removing the protective-glass drawer, immediately cover the opening in the welding head, for example with clean tape, to minimize the risk of contaminating the lower focusing lens.

5. Possible Problems and Solutions

No.	Problem	Likely Cause	Recommended Action
1	No laser	• Laser is turned off. • Laser alarm prevents source start-up. • Laser button or indicator light is damaged, or the safety lock is open because components are not connected. • Laser source is damaged.	• Confirm that the laser power button turns on. • Check whether the laser source is on or in alarm, and read the alarm information. • Check the cooling system. • Check the laser signal line and safety interlock line.
2	No oscillation	• Oscillation function is disabled. • Invalid oscillation parameter. • Electric motor is defective. • No signal or broken wire.	• Confirm that the oscillation function is enabled. • Check the 24 V power supply. • Confirm that the oscillation value is within the normal range, the I/O output is working, and the motor signal cable is connected.
3	Weak laser power	• Protective glass, focusing lens, or collimating lens is damaged. • Temperature problem inside the radiator.	• Damage or contamination of the protective lens, focusing lens, or collimating lens can refract the laser beam and reduce output. Inspect and clean or replace the affected optics.
4	Oscillating red light becomes weaker	• Electric motor is improperly adjusted. • Electric motor or its controller is damaged. • Angular lens angle is incorrect.	• Confirm that the electric motor is operating. • Check the angular lens position and verify correct laser reflection. • Loosen the cover screw only after the system is safely shut down.
5	Laser Source alarm	• Faulty QBH tip. • Water temperature in the cooler is too low or too high. • Source blockage caused by reflected laser energy. • Other factors.	• If the laser source remains in an extinction alarm, read the alarm using the laser diagnostic software. • Review the laser software alarm information and confirm that the water line and water level in the tank are adequate. • For a QBH alarm, check the QBH connection or the thermistor/break line.

6. Regular Cleaning

- 1) Dust removal: Keep the machine clean. Remove dust from the welding head, and clean or replace the filters behind the rear fans to maintain adequate ventilation.
- 2) Nozzle cleaning: After extended use, residue and deposits may accumulate on the nozzle tip, restricting shielding-gas flow and affecting laser energy at the workpiece surface.

7. Repair Process

Repair requests may be submitted by mail, telephone, or the designated online application to the appropriate sales representative or after-sales service engineer. DENALIWELD will track each report and begin processing it within 48 hours of receipt.

8. Storage Requirements

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

9. Equipment Transportation Requirements

When transporting the device, use all appropriate protective measures to prevent damage.

10. Instructions for Disposing of Equipment

Before disposal, remove the power cord and clearly mark the equipment as scrap.

11. Loss of Warranty

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