Dynalasers
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User Manual

Shenzhen Dynalasers Technology Co., Ltd.

Introduction

Welcome to use the handheld laser welding products developed and produced by Shenzhen Dynalasers Technology Co., Ltd We have organized personnel to compile this document in order to facilitate the better use and maintenance of your laser equipment. If you have any comments and suggestions during use, please feel free to give us your advice to help us continuously revise and improve. Thank you again for using Dynalasers' products!

Before using this product, please carefully read the User Manual for Handheld Laser Welding Machine provided by Dynalasers to familiarize yourself with the operation and maintenance of this equipment. We strongly recommend that operators read Chapter 2 Safety Information of this manual before operating the equipment.

This Manual will be provided with the machine to provide important operation, safety and other information for our existing or potential customers.

Please be sure to read the User Manual carefully to prevent unnecessary risks.

Disclaimers

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Company Profile

Shenzhen Dynalasers Technology Co., Ltd is located in Shenzhen City, focusing on the research and development, production and sales of laser intelligent equipment, lasers and related core components, intelligent automation equipment, computer software, hardware and control systems, and artificial intelligent robots. Based on the matching technologies of electronics, mechanics, optics and control systems, the company provides complete solutions according to the needs of the market and customers, involving IT manufacturing, new energy product manufacturing, instrumentation, computer manufacturing, mobile communications, home appliances & kitchen appliances, auto parts, precision equipment, building materials, hardware tools, urban lighting, food and medical industries, etc.

Dynalasers adheres to the people-oriented principle and takes the advantages of technological innovation. It introduces industry elites from home and abroad, invests a lot of money in the field of research and development, and has won many industry technology patents. The company has independent R&D, design, quality, operation and sales teams. The R&D team has a working background in cross-industry and large enterprises such as consumer and industrial industries. The quality management team and operation management team are from well-known companies.

Dynalasers is committed to providing customers with stable, reliable and high-quality products and equipment, perfect customer service, and creating greater value for global customers!

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Chapter 1: Feature Description

The Mopa fiber laser features independently adjustable pulse width and frequency, maintaining stable peak power output even when modifying these parameters. This makes it an ideal light source for industrial laser cleaning, surface treatment, and other applications. Its air-cooled system ensures a compact, portable design with efficient heat dissipation. The integrated all-fiber design eliminates maintenance requirements, enhancing user convenience. Powered by 48V DC and compatible with standard DB25 interfaces, the product ensures excellent compatibility.

Laser has unique characteristics and may cause some safety hazards, so it cannot be treated as other light sources. All personnel operating or near the laser must be aware of these special hazards.

Dynalasers advises: Please strictly follow all warnings and safety instructions in this manual to ensure safe operation and optimal performance. During operation, maintenance, or servicing, do not disassemble the equipment without authorization to protect the operators safety.

Chapter 2 Safety Information

1 - Safety Regulations

As shown in the table below, safety warning signs (not limited to the signs on the laser body) during the operation of the handheld laser welding machine include:

Safety marking	Name	Description

	Electrical Danger	Warning: Text marked with an electrical warning symbol indicates potential personal danger. Failure to follow certain process operations may cause certain or fatal harm to you or others.
	Warning	Notes: Text with a warning symbol indicates potential product hazards. It requires an operating procedure that, if not followed correctly, it can cause damage or destruction to the product or components.
	Laser Radiation Hazard	Notes: Text with a laser radiation warning symbol indicates potential personal danger.

2 - Laser Protection

1. Requirements of Laser Safety Goggles

When operating this device, please wear safety goggles. Choosing appropriate laser safety goggles requires the end user to accurately identify the wavelength range emitted by the product. If the device is a tunable laser or Raman product, it will emit laser in a certain wavelength range. The end user should confirm that the laser safety goggles used can prevent the laser emitted by the device over its entire wavelength range. Please check the safety label on the product and verify that personal protective equipment (goggles) is sufficient for the output power and wavelength range.

2. Requirements of Laser Operating Area

The welding operation environment of the user must have a safety zone, and the safety zone must have a protective safety door or similar device. The safety door or similar device needs to be connected to the 7th and 20th pins of the external control **I0 port** of the laser host to form a safety linkage; When the safety door or similar device is triggered, the laser host cannot emit light. (Please refer to the external control//0 interface definition table on 19th page for details)

3 - Reference Standards

Electromagnetic compatibility immunity:

ENIEC 61000 - 6 - 4:2019

EN IEC 61000 - 6 - 2:2019

Electrical safety:

ISO 12100:2010

ISO 11553 - 2017

EN 60204 - 1:2018
Laser safety:
EN 60825 - 1:2014+A11:2021 CDRH 21 CFR 1040.10
Power supply safety:
EN 62368 - 1:2014+A11:2017

Please be aware:
◎ According to EU and national standards and requirements, lasers must be classified according to their output power and laser wavelength. All high-power D series laser products are Class 4 products (according to EN 60825-1)

4 - Welding Feature Safety

1. Optical Safety

Warning:

◎ Provide a housing for the laser beam.

◎ When the laser is powered, it is forbidden to look at the output port.

◎ Avoid positioning the laser and all optical components at eye level.

◎ Avoid using the laser in a dark environment.

Warning:

◎ The laser output is delivered through a window. First make sure the window is clean, any dirt at the end of the head assembly risks burning the window and damaging the machine. Check the quality of the spot emitted from the laser output at low power levels, and then gradually increase the output power.

Do not look directly at the welding tip when the equipment is powered on. When operating the product, always wear safety goggles and a helmet with protective functions. People nearby must also wear the same safety equipment. Make sure that all personal protective equipment is suitable for the output power and wavelength range listed on the laser safety label attached to this product.

Warning:

◎ Do not install or terminate the laser output tip when the laser is activated. When the machine is performing a task, make sure the switch is in the "OFF" position and the unit is disconnected from the AC power supply.

2. Equipment and solvents

Warning:

◎ Photosensitive components in the equipment, such as photodiodes, can also be damaged by laser exposure. The intensity of the laser is enough to burn the skin and ignite clothing and paint. Lasers can cut and weld metals. The laser can ignite volatile substances such as alcohol, gasoline, ether and other solvents. When installing and using this equipment, exposure to solvents or other flammable materials and gases must be avoided.

3. Electrical Safety

Warning:

◎ Before supplying power to the unit, all electrical and welding gas connections must be secured. In addition, if applicable, all connections must be secured with screws to ensure proper function. All parts of electrical cables, connectors or equipment housings should be considered hazardous.

◎ Before supplying power to the unit, all electrical and welding gas connections must be secured. In addition, if applicable, all connections must be secured with screws to ensure proper function.

◎ Ensure electrical safety: Ensure that the equipment is properly grounded through the protective conductor of the AC power cable. Protect the grounding terminal, any interruption may cause personal injury.

◎ Before supplying power to the equipment, make sure that the correct AC power voltage is used. Failure to use the correct voltage may cause damage to the laser. For the correct power connection, refer to the marking on the product model.

◎ There are no operator-serviceable parts inside, and all services require consultation with Dynalasers after-sales personnel. To prevent electric shock, please do not remove the protective cover, and any tampering with the product will invalidate the warranty.

◎ Connection of external circuits other than power connections: The external connection between this product and other external equipment is PELV (Protected Extra Low Voltage) defined by IEC 61140. The non-power outputs of other devices connected to this product should also be PELV or SELV (Safety Extra Low Voltage).

4. Environmental Safety

Warning:

◎ Electronic equipment must be disposed of in accordance with regional directives on the disposal of electronic and electronic waste.

◎ Make sure all personal protective equipment is suitable for the output power and wavelength range listed on the safety label attached to the laser.

◎ Please be careful when operating the device, or it may cause laser damage.

For more information, please refer to the product specification. This device is not used in places where unprotected people or children may be present. Keep away from shock or vibration sources. Appropriate enclosures should be used to ensure a safe working area for the laser. Do not operate the output welding tip at eye level.

Humidity requirements: Do not expose the device to high humidity environments (> 90% humidity).

This laser device is air-cooled, and operating at higher temperatures will accelerate aging, increase threshold current, and reduce slope efficiency. If the device overheats, stop using it and call Dynalasers for help.

Please ensure proper ventilation when working. Whenever a laser beam reacts with the material being welded, fumes, steam, sparks, and particle fragments are produced. Fumes produced during laser processing are often toxic and may pose additional safety hazards.

For general information about laser products, please visit Dynalasers' official website!

5. Gaps Cylinder Safety

Warning:

© Gas cylinders may explode if damaged or placed near the welding area. Gas cylinders should be placed where they cannot be hit or damaged. Keep away from heat, sparks, or flames. Gas cylinders must be stored upright and secured to the cylinder stand. A working regulator suitable for the required gas and pressure is required. All hoses and fittings should also be suitable and maintained in good working condition.

6. Radiation Hazards

Visible and invisible radiation is generated during welding. The interaction between the high-power laser beam and the material being welded may produce a plasma that produces ultraviolet radiation and "blue light" that may cause conjunctivitis, photochemical damage to the retina, or a sunburn reaction to the skin. Welders exposed to invisible UV light without proper protection may suffer permanent eye damage, so always wear safety gear during welding.

7. Skin Hazards

Exposure to infrared and UV radiation during welding can damage the skin. Infrared and UV light can cause skin burns, increasing welders' risk of skin cancer and accelerated signs of skin aging. Welding sparks can also cause burns. Laser material processing can transfer a lot of energy into the part. Parts can be very hot to the touch even after the cutting process is completed. Make sure to use appropriate personal protective equipment to prevent potential burns. Take precautions to prevent skin damage by wearing protective clothing such as flame-resistant gloves, hats, and leather aprons.

8. Fire Hazards

The heat and sparks generated during welding can cause fire or explosion if flammable or combustible materials are close to the welding area. Laser welding can only be performed when there are no flammable materials in the area. Never weld containers containing flammable or combustible materials. If the contents of the container are unknown, it should be assumed that they are flammable or combustible. Fire extinguishers should be located nearby and easily accessible.

9. Fumes Hazards

Welding "fumes" can consist of very fine particles and gases. Welding fumes and gases

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

（1）Keep your head away from the fumes while welding. Always weld in an area that is adequately ventilated to ensure safe breathing air.

（2）Respirators may also be required in confined spaces and other situations.

(3) Routine air monitoring should be performed to determine hazardous fume levels in the welding area.

(4) Use a fume extraction system to remove vapors, particles, and hazardous debris from the welding process area.

10. Safety Instructions

To ensure safe operation and optimize the performance of this product, please strictly follow the following warnings and important instructions, as well as other information contained in this manual.

Warning 1:

The output connector of this product is connected to the handheld welding connector by a fiber optic cable. Please use the handheld welding connector with caution.

Warning 2:

When using this product, please ensure that you use a properly grounded power supply.

Warning 3:

Users are not allowed to open any parts inside this product for repair. If necessary, please contact Dynalasers technicians for repair services. Any unauthorized changes to this product will invalidate the warranty.

Warning 4:

If this product is not operated in accordance with the instructions in this manual, The protection mechanism provided by this product may be affected. This product must and can only be used under normal conditions.

Warning 5:

Never look directly at the fiber output connector, and make sure to wear appropriate protective goggles when using laser products to avoid injury.

Important 1:

When operating the laser welding output connector (such as installing optical cable connectors, using optical instruments to detect connector end faces, filling wires, etc.), please be sure to keep the AC power off.

Important 2:

Operation or adjustment outside the scope of this manual may cause radiation damage.

11. Laser Output Safety Indicators

Important:

◎ When the power is activated, the laser is in a dangerous state. All precautions must be taken.

Take precautions to prevent accidental exposure to direct and reflected beams. Diffuse and specular reflections can cause severe retinal or corneal damage, leading to permanent eye damage. Class 4 laser beams also have potential fire and skin damage hazards when operating or near the equipment. When operating, all personnel must wear all recommended PPE, including safety goggles and helmets with masks. To ensure that the information on laser safety is known to you, please use the laser control measures correctly to adjust or control the execution of the program, or you may be exposed to harmful radiation environments.

12. Welding Protection and Prevention of Welding Process Hazards

Warning:

◎ Personal protective equipment must be worn during welding to avoid exposing eyes to dangerous environments! Wear masks, gloves, welding helmets and laser safety goggles. To avoid the influence of equipment wind speed noise, please wear noise-proof earplugs when welding, which can provide the best protection during laser welding (machine noise<90dB). Welding helmets can also protect welders from injuries caused by hot spatter, metal particles and sparks. All personnel working near the laser welding area must also wear personal protective equipment.

Warning:

◎ If there are flammable or combustible materials near the welding area, the heat and sparks generated during welding may cause fire or explosion. Laser welding should only be performed in areas free of flammable materials. Never weld on containers that contain flammable or combustible materials. If the contents of the container are unknown, it should be

assumed that they are flammable or combustible. Fire extinguishers should be near the welding area and welders should be trained in the use of professional fire extinguishers.

13. Hazards of Reflected Beams During Welding

Warning:

◎ A large number of secondary laser beams can usually be generated at different angles near the laser output aperture. These beams are called "specular reflections" and are generated when the laser is reflected from the surface where the main beam is incident. Laser welding systems may produce specular reflections due to the interaction between the laser beam and the processed parts. Although the power of these secondary beams is not as high as the total power emitted by the laser, their intensity is sufficient to cause damage to the eyes, skin, and materials around the laser.

Highly reflective metals, such as aluminum and copper, may cause part of the beam energy to be reflected from the target weld site and require additional precautions. Specular reflections may also be dangerous to the operators if any part of the beam is reflected from multiple surfaces. Take precautions to understand the expected specular reflection cone for each processed part and do not attempt to view the part or place any part of the body within the expected specular reflection cone.

Warning:

◎ Operators and observers must also be aware of reflections at all times. If the laser parameters are not set properly to achieve melting of the target part, more reflections may occur.

To achieve safe operating conditions: 1. Select the appropriate mode according to the material and thickness; 2. Appropriate nozzle selection based on the joint geometry.

Warning:

◎ For safety reasons, Dynalasers recommends that equipment operators only use Dynalasers nozzle tips.

5 - General Safety Instructions

1. Specular Reflection

A secondary laser beam may be generated at the output port of the handheld laser welding machine and radiate outward at multiple angles. This phenomenon of divergent beams generated after the main beam of the handheld laser welding machine is reflected on a flat surface is called specular reflection. Although the energy of the secondary laser beam is much smaller than that of the main laser beam, this intensity may also cause damage to people's eyes, skin or some material surfaces. Pay special attention when welding highly reflective materials, and make sure that there is no persons and no flammable objects opposite when welding.

Warning:

◎ Since the laser radiation light is invisible, you must operate with extreme caution to avoid or reduce specular reflection.

2. Accessory Safety Instructions

The photosensitive components integrated in the optical accessories of the handheld laser welding machine may be damaged by laser exposure, so please pay attention to the protection of related devices.

Warning:

◎ The output laser intensity of Dynalasers 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, please be sure to isolate flammable items around the handheld laser welding machine.

3. Optical Operation Instructions

Dynalasers strongly recommends that you read the following key notes for operation before operating the handheld laser welding machine:

(1) Do not look directly at the laser outlet of the handheld laser welding machine;

(2) Avoid placing the handheld laser welding machine and related optical output devices at the same level as your eyes;

(3) Reasonably select safety protection equipment according to the output power and wavelength requirements of the handheld laser welding machine to ensure the safety of the operator;

(4) Warning signs must be posted 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) Please ensure that the protective lens, copper nozzle, and wire feeding structure are installed and cleaned under the condition that the handheld laser welding machine is turned off and the power is disconnected;

(7) When performing commissioning, calibration and focusing, please perform them without laser emitting. After commissioning is completed, turn on the laser;

(8) Please strictly follow the instructions in this document to operate the equipment, or the protective device and performance of the equipment will be weakened, for which Dynalasers will not provide any warranty.

Notes:

◎ The optical output of the handheld laser welding machine will be connected to the lens with anti-reflective coating and then emitted. Before using the handheld laser welding machine, please strictly check the output lens and the rear lens of the handheld laser welding machine to ensure that there is no dust or any other debris on the lens. Any attachment visible to the naked eye will cause serious damage to the lens, resulting in burning of the handheld laser welding machine or any rear optical path equipment.

◎ Please refer to the Fiber Optic Connector Inspection and Cleaning Guide and follow the lens cleaning inspection process.

◎ Please be careful of the hot or molten metal particles that may be generated during the cleaning operation of the handheld laser welding machine.

◎ When commissioning and calibrating the output of the handheld laser welding machine, it is required to set the handheld laser welding machine to detect the quality of the laser output spot through the indicator red light without laser output, and then turn on the laser after there is no abnormality.

Warning:

◎ Reasonably select safety protection equipment according to the output power and wavelength requirements of the laser.

◎ Do not look directly at the head tip, and make sure to wear safety goggles during each operation.

4. Electrical Operation Instructions

Dynalasers strongly recommends that you read the following key notes for operation before operating the handheld laser welding machine:

(1) Make sure that the equipment housing is well grounded. Interruption at any point in the grounding loop may cause personal injury;

(2) Before using the power supply connected to the equipment, please make sure that it is connected to the protective ground;

(3) To reduce the risk of fire, when necessary, replace the circuit fuse with the same type and grade, and do not use other fuses or materials instead;

(4) Ensure that the input AC voltage of the handheld laser welder is the normal municipal AC voltage, and the wiring is correct. Any incorrect wiring method may cause personal injury or equipment damage. In the AC220V municipal power environment, the live wire identification line of the equipment is connected to the live wire terminal of the wiring box; the neutral wire identification line of the equipment is connected to the neutral wire terminal of the wiring box; the ground wire identification line of the equipment is connected to the ground wire terminal of the wiring box. In the AC110V municipal power environment, the live wire identification line of the equipment is connected to the live wire terminal of the wiring box; the neutral wire identification line of the equipment is connected to any one of the other two phase live wire terminals inside the wiring box, and the ground wire identification line of the equipment is connected to the ground wire terminal of the wiring box.

(5) Except for the head tip consumables, this product does not require the user to repair parts, components or assemblies by themselves. All maintenance work must be completed by Dynalasers personnel;

(6) It is strictly forbidden to disassemble or assemble the handheld laser welding machine without authorization and damage the relevant labels, or there will be a risk of electric shock or burns;

(7) There must 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 without flammable materials.

(8) Never weld on containers that contain flammable or combustible materials. If the contents of a container are unknown, you should assume that they are flammable or combustible. Fire extinguishers should be nearby and easily accessible, and the personnel should be trained in the use of fire extinguishers.

(9) Any product that has been disassembled or assembled without permission will no longer be covered by the warranty.

Warning:

© The input voltage of the handheld laser welding machine is single-phase AC (200 - 240VAC), which poses a risk of electric shock. All related cables and connecting wires are potentially hazardous.

5. Operating environment requirements for handheld laser welding machine

The equipment is commonly used in: (1) Environmental pollution degree 2 (2) Dry location, (3) Altitude below 2000 meters, (4) Class II overvoltage. For more information, please refer to the product specifications.

Humidity: It is strictly forbidden to expose the equipment to high humidity environments (>85% humidity)

Cooling and temperature: The laser device is cooled by air. Operating at higher temperatures will accelerate aging, increase threshold current and reduce slope efficiency. If the device overheats, do not use it and call Dynalasers for help. When the laser temperature is

too high, the device will trigger an alarm and stop emitting light.

To ensure the safety of the laser working area, the interaction between the laser and the work surface will produce gas, sparks and debris due to high temperature, which may pose additional safety hazards. The corresponding operators are required to undergo certain assessment and training, and be familiar with and master the general safety regulations for laser operation.

Dynalasers recommends that you follow the following measures to extend the service life of the handheld laser welding machine:

(1) Please ensure that the working area is properly ventilated and place the handheld laser welding machine in a dry, cool and clean environment. Do not expose the handheld laser welding machine to high temperature, high humidity or water ingress.

(2) When the handheld laser welding machine is in operation, ensure that there is no foreign object blocking the air intake at the bottom of the laser, and ensure that there is no debris within 1 meter around that affects the smooth air intake; ensure that the top air outlet is smooth within 1M height;

(3) It is necessary to ensure that no debris (including liquid) enters the laser from the top, or it will damage the laser and cause personal injury;

(4) Operating the equipment at high temperatures will accelerate aging, increase the current threshold, and reduce the sensitivity and conversion efficiency of the handheld laser welding machine. If the equipment overheats, please stop using it and seek help from Dynalasers.

Notes:

◎ Please operate the equipment with caution 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.

Chapter 3 Product Description

1-Feature Introduction

This product employs a wind-cooled system, featuring a more compact heat dissipation structure, smaller size, and enhanced portability. Moreover, its integrated all-fiber design eliminates maintenance requirements, facilitating user convenience. It exhibits notable characteristics such as simple configuration, high integration, compact size, easy operation, and advanced intelligence.

key property ：

(1) The output power is stable and consistent.

(2) The power regulation is highly precise, supporting linear and stepless adjustment.

(3) Integrated safety linkage mechanism for enhanced security;

(4) Comprehensive high-level protection;

(5) Modular components with interchangeable building blocks;

application area ：

It is widely used in hardware, building materials, kitchenware, aerospace, automobile, shipbuilding, medical and other industries.

2-Module Configuration

Dynalasers offers multiple configurable modes. This manual provides detailed explanations for all modes. For specific instructions, please refer to Chapter 6, User Guide.

3-Laser Model Description and Product Functional Safety

Model naming	Model Name
P200/P300/P500	maximum average output power per representative
product functional safety	
electrical safety	ISO12100:2010 ISO11553-2:2015EN 60204-1:2018

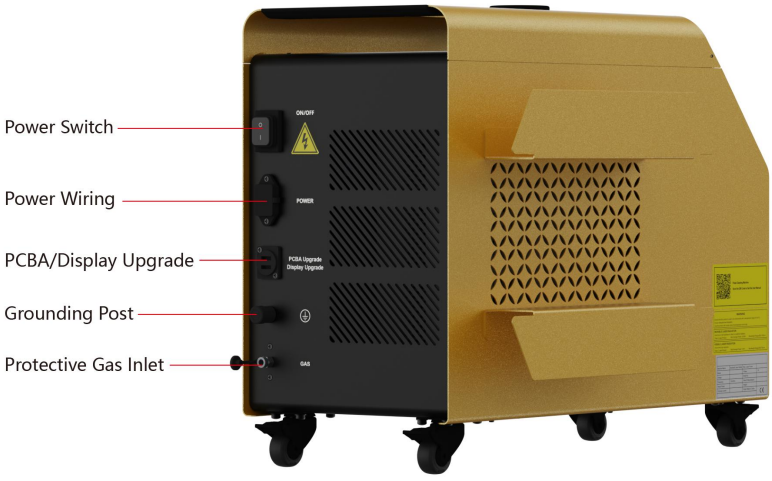
laser safety	EN 60825 -1:2014+All： 2021 CDRH 21 CFR 1040.10

4-Certificate of Qualification

Dynalasers guarantees that this product has undergone comprehensive testing and inspection prior to packaging and transportation, in compliance with published standards and procedures. Upon receipt, please inspect the packaging for any signs of external damage and check the equipment for any damage, immediately notifying the carrier and Dynalaserss after-sales personnel. When removing the product from the packaging box, exercise extreme caution to ensure the fiber optic cable is not ruptured or damaged. Please verify the attached packing list. After receiving the product, check all items against this list. Under no circumstances should you attempt to install or operate the laser equipment if any item is missing or the equipment shows obvious or suspicious damage.

5-Explanation of the Front and Rear Panel of the Laser Welding Machine

Front panel name	Function description
Indicator Light	Normal Operating Status: Green light Standby Status: Yellow light Alarm Status: Red light
LCD	Human-machine interface for parameter setting and status display Emergency Stop Switch Cuts off device power supply immediately
Safety key	Lock the device and prohibit use (it is recommended to remove the key when the machine is stopped)
Fiber	Armored cable



Back panel name	function declaration
Power Switch	On/Off button
Power Input	100-240VAC 50/60Hz AC input
Screen/Control Box Upgrade Port	Firmware upgrade for the display and control box
Grounding Terminal	Connect the chassis to ground
Protective Gas Interface	Protective gas input

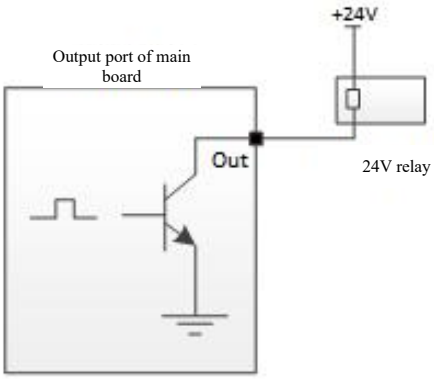
Pin#	description
1	N/A
2	RxD serial data input
3	TxD serial data output
4	N/A
5	GND
6~9	N/A

The laser welding machines external control port is an RS232 interface (DB9), with interface specifications as shown in the table above. RS232 Interface Specification Table

6-Digital IO interface

The motherboard features a universal IO interface with OC output that directly drives relays, delivering a maximum current of 500mA. External connections and relay wiring are shown in Figure 1. The internal schematic of the control cards input is illustrated in Figure 2.

Digital IO interface definition.



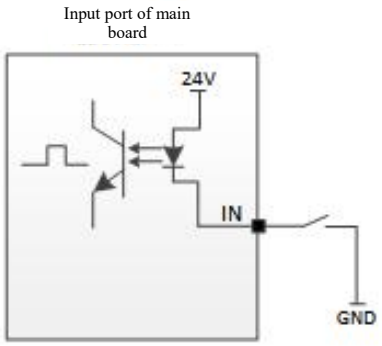


Figure 1: Wiring diagram of output port; Figure 2: Wiring diagram of input port

Digital IO Interface Definition Table

Pin	**Signal**	**Definitions**	**Instructions**
1	IN0	External linkage signal 1	Refer to the linkage instructions in the appendix
2	IN1	External linkage signal 2	Refer to the linkage instructions in the appendix

3	IN2	X-axis mirror alarm input	* Note that the motherboard needs to be wired for a 5V input.-
4	IN3	External start switch input	The general start button switch attached to the cleaning head
5	IN4	Y-axis mirror alarm input	* Note that the motherboard needs to be wired for a 5V input.
6	IN5	Maintain	-
7	GND	Power reference ground	-
8	IN8	Maintain	-
9	+5V	5V power supply output	Maximum output capacity, 500mA
10	OUT_LED3	Maintain	-
11	OUT_LED1	Maintain	-
12	OUT_G	Three-color lamp signal output - Green light	OC output, the light is on during processing
13	OUT_R	Three-color lamp signal output - Red light	OC output, the indicator light turns on when an alarm occurs
14	IN6	Maintain	-
15	IN7	Key switch signal input	This pin must be connected to PGND (which is different from GND) and used as a key switch signal.
16	OUT_0	Maintain	-
17	OUT_1	Maintain	-
18	OUT_2	Maintain	-
19	DA1	Maintain	-
20	OUT_3	Maintain	-
21	+24V	+24V power output	Maximum output current, 500mA
22	ADC_IN	Maintain	-
23	OUT_LED2	Allow optical signal output - signal light	OC output: The indicator light on the panel will be on when the switch is released.

24	OUT_Y	Three-color lamp signal output - Yellow light	OC output, the indicator light is on when the device is idle.
25	OUT_B	Air blow signal output	OC output

1. HMI interface

The HMI interface is a 5PIN green terminal, through which the main board supplies power to and communicates with the HMI. Direct connection can be made by using the 1.5m touch screen cable.

2. RS23 Interface

The RS232 interface is a DB9 female connector, used for communication with third-party systems. The pins are reserved and should not be connected.

RS232 Interface Definition Table

Pin	Signal	Definition	Explanation
1	NC	Maintain	—
2	TXD	Reserved RS232-TXD	The transmitting end of the motherboard receives the RXD signal from the communication system.
3	RXD	Reserved RS232-RXD	The receiving end of the motherboard is connected to the TXD of the communication system.
4	NC	Maintain	—
5	GND	Reference site	Reference point for communication, receiving signal from the communication system's GND
6	NC	Maintain	—
7	NC	Maintain	—
8	NC	Maintain	—
9	NC	Maintain	—

3. Sensor Interface

The Sensor interface serves as a reserved input interface for sensors and can be used to connect different types of sensors externally.

HMI interface definition table

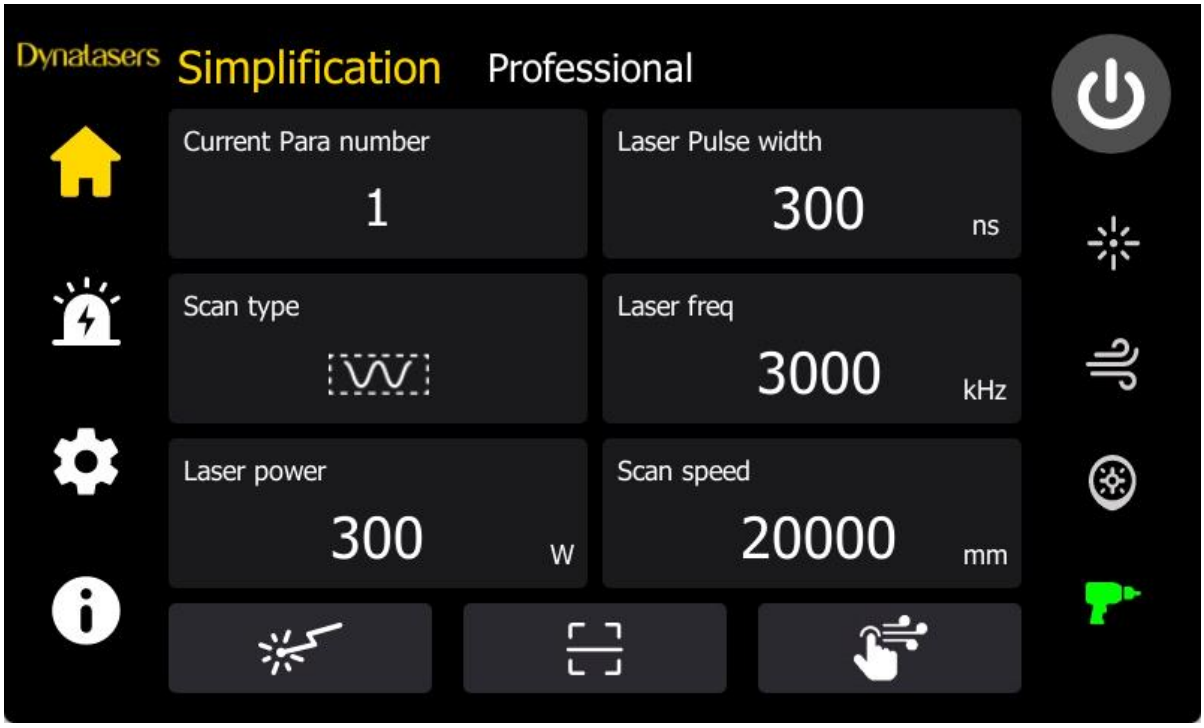
Pin	Signal	Definition	Explanation
1	+12V	+12V power output	The maximum output current is 500mA.
2	AD	Analog input interface	Support 0-10V analog quantity input detection
3	IN9	Reserved input interface	NPN Input
4	GND	Power reference ground	—

7-Operation Panel Instructions

7.1 Introduction to HMI Functions

The operation panel of the embedded laser cleaning control system (referred to as "HMI") adopts a 7-inch configurable TFT touch screen, with a beautiful interface and convenient operation. The main interface of HMI is shown in the following figure.

Main interface of HMI



The menu of the entire system is divided into four sections: [Main Interface], [Alarm Center], [Settings], and [Information Center]. The main interface allows for the setting of different scanning and laser-related parameters, and can display real-time system status and alarm status information; the alarm center can display laser alarm information and mirror alarm information; the settings page allows for the setting of system parameters and advanced parameters, and requires a password of 666888; the information center can display system information and authorization management.

7.2 Introduction to HMI Operations

The rightmost part is used to monitor the system status. From top to bottom, it shows the device enable status, laser emission status, blowing air status, red light status, and whether the head head start button is pressed.

From left to right at the bottom are the buttons for laser enablement, scanning, and manual blowing. When not in use, clicking on <Scanning> allows you to manually control the oscillating mirror, and clicking on <Manual Blowing> enables manual blowing. At this time, the icon will turn yellow to indicate.

Only when both the equipment enablement and laser enablement are in the yellow enabled state can light be emitted. During the processing, the light emission, oscillation and blowing control will be carried out according to the parameters of the parameter area. If the laser status on the right is green, it indicates that light is currently being emitted.

【Parameter Area】: This area includes scanning parameters and laser parameters. The parameter area is divided into a simplified mode and a professional mode. The professional mode supports more modifications and displays of main page parameters.

Current parameter number: The system supports setting for selecting 9 different parameters. It supports direct selection of the current parameter and also allows for selection of parameters in a mode that is linked with an external PLC. The calling method can be referred to in the system parameter linkage instructions.

Current name: The system supports setting aliases for 9 sets of parameter numbers, and it supports combinations of Chinese and English as well as numbers.

Scan Count: This option is used to set the number of scans to be performed during processing. If '∞' is selected, pressing the start button will initiate continuous scanning.

Laser power: This is used to set the peak power of the laser.

Laser frequency: This parameter is used to set the frequency of the PWM modulation signal for the laser.

Laser pulse width: This is used to set the pulse width of the pulsed laser.

Scanning speed: This is used to set the scanning speed of the galvanometer.

Scan type: Used to set the waveform for the mirror scanning. Support

‘  ’,‘  ’,‘  ’,‘  ’,‘  ’,‘  ’,‘  ’,‘  ’,‘  ’,‘

 ’,‘  ’11 different waveforms.

Scan length: This is used to set the length for the mirror scan.

Scan width: This is used to set the width of the mirror scanning.

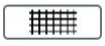
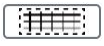
Scanning width（mm）	Scanning speed mm/s（Upper limit）
200-300	30000
50-200	20000
40-49	18000
30-39	14000
20-29	12000
10-19	6000
5-9	3000
3-5	2000
1-3	1000

Scan number: Used to set the number of sine waves during scanning‘  ’Special parameters。

Phase increment: This is used to set the change value of each phase during the scanning process.‘  ’与‘  ’Special parameters。

Scan density: This setting is used to determine the density of each sine wave during the scanning process.‘  ’Special parameters。

Scan interval: This is used to set the spacing between each line during the scan filling process.‘  ’,‘  ’Special parameters。

Fill type: Used to set the fill type when scanning, for selecting either one-way or two-way filling, including‘  ’,‘  ’,‘  ’,。‘  ’,‘  ’Special parameters。

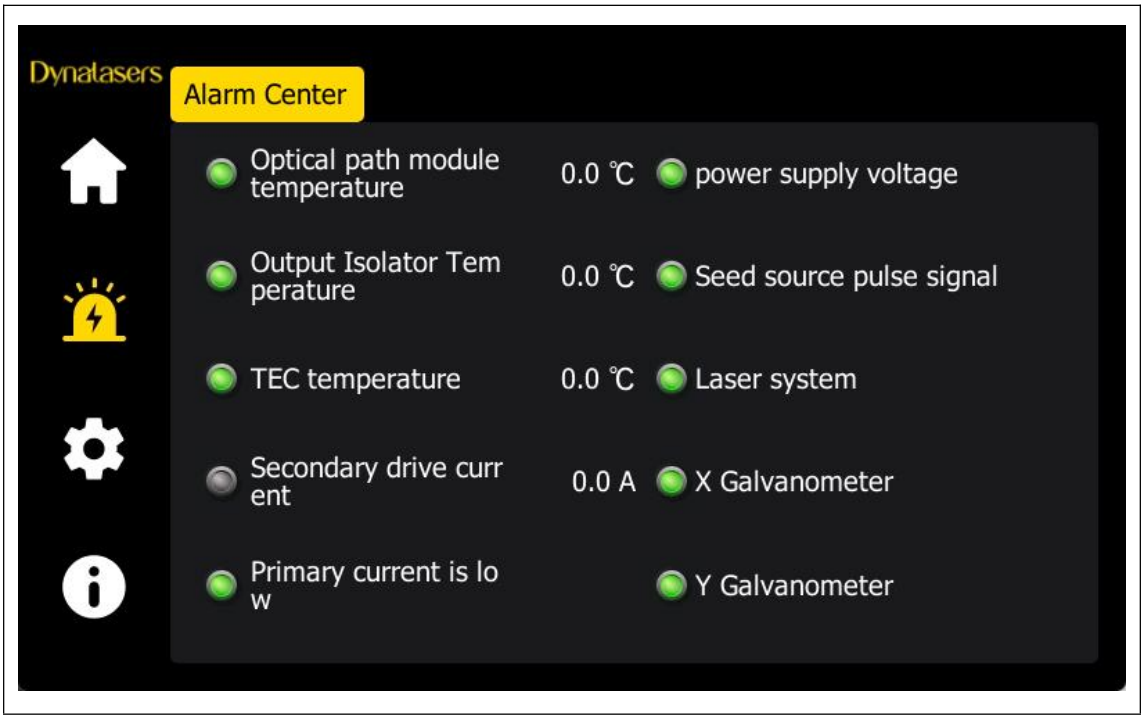
Pitch of thread: This setting is used to determine the spacing between each circle during the scanning process.‘  ’Special parameters。

Maximum diameter: Used to set the maximum diameter during scanning.‘  ’With‘  ’Special parameters。

Minimum Diameter: Used to set the minimum diameter during scanning.‘  ’With‘  ’Special parameters。

Rotation angle: This is used to set the rotation angle after each scan.‘  ’Special parameters

7.3 Alarm Center



The alarm center can be used to monitor the status of the laser, whether there is a laser alarm, whether there are alarms for the X and Y mirrors. The small light on the left is green indicating normal, and gray indicating abnormal. When the laser, X mirror, and Y mirror are in the gray alarm state, no light will be emitted. The remaining parameters are the laser information obtained through the reserved serial port.

7.4 Settings

To enter the settings, you need to enter the password 666888. The settings are divided into system parameters and advanced parameters.

[System Parameters]:

Language: For language switching.

Double-click Illumination Enable: This setting is for configuring the double-click illumination operation mode. If not enabled, single-click illumination will be used.

External linkage:It is used to switch parameter numbers through external IO. When not enabled, the main interface shows the current parameter number and allows manual selection of different parameter numbers; when enabled, the main interface changes to the linked parameter number. The parameter number needs to be switched through the external IO port. When in linkage mode, be sure to switch to the main interface for processing.

Mirror reverse: Used to deflect the scanning pattern 90 degrees on the panel.

Laser alarm enable: This is used to enable the laser alarm. When the laser generates an

alarm, an alarm signal will be generated.

Screen saver time: This setting is used to determine the duration for which the screen saver page is displayed before locking the screen. If no click is detected on the screen after the screen saver time has elapsed, the screen will lock and enter the screen saver page. If the time is set to 0, no screen saver will be applied.

X ratio coefficient: This is used to set the ratio between the scanning length of the X-direction galvanometer and the actual emitted light length. It is related to the focal length and the galvanometer. The smaller the ratio coefficient value, the longer the actual scanned length will be.

Y ratio coefficient: This is used to set the ratio between the scanning length of the Y-direction galvanometer and the actual light emission length. It is related to the focal length and the galvanometer. The smaller the ratio coefficient value, the longer the actual scanned length will be.

Camera model	X coefficient	Y coefficient
F160	145	159
F210	193.5	212.5
F254	227.5	251
F330	272	297

Gas release delay: During the start-up of the processing, a gas release delay can be set. When the external start button is pressed, the gas will be released for a certain period of time first, and then the laser will start to be emitted.

Gas shutdown delay: When stopping the processing, a gas shutdown delay can be set. When the processing is stopped, the laser output is first stopped, and then after a certain delay period, the gas blowing is also stopped.

Corner delay: Sets the delay time for the scanning graphics of the linear type when they swing in the opposite direction. The default setting is 0.

End delay: Set a certain amount of extra time for the laser to be on at the end of the scan. The default setting is 0.

Power setting: This is used to set the initial power of the laser, expressed as a percentage of the output power.

Power-up progressive time: The time it takes for the laser output to gradually increase to the set power level.

Shutdown optical power: This is used to set the shutdown optical power of the laser,

which is the percentage of the output power.

Fade-out time: The duration during which the laser power is gradually reduced to zero.

X-axis offset: Used for fine-tuning the center offset.

Y-axis offset: Used for fine-tuning the center offset.

【Advanced Parameters】:

Field lens range: The field lens range for the head head. Ensure correct settings are made when it comes to the aspects related to the head head.

Rated Power: This is used to set the rated power of the laser. After the rated power is correctly set, the laser power displayed on the main interface will be the actual value.

Maximum laser frequency: This is used to set the maximum frequency of the laser.

Minimum laser frequency: This setting is used to determine the minimum frequency of the laser.

Maximum laser pulse width: This is used to set the maximum pulse width value of the laser.

Minimum laser pulse width: This setting is used to determine the minimum pulse width value for the laser.

Maximum scanning speed: This setting is used to determine the maximum scanning speed of the galvanometer.

Minimum scanning speed: This setting is used to determine the minimum scanning speed of the galvanometer.

Maximum length: This is used to set the maximum scanning length of the galvanometer.

Minimum Length: This setting is used to determine the minimum scanning length of the mirror.

Maximum Width: This setting is used to determine the maximum scanning width of the galvanometer.

Minimum Width: This setting is used to determine the minimum scanning width of the mirror.

Correction Enable: This function is used for correcting the distortion and deformation of the graphic texture when dealing with large graphics. Once enabled, the correction parameters cannot be modified. The correction has been performed at the factory.

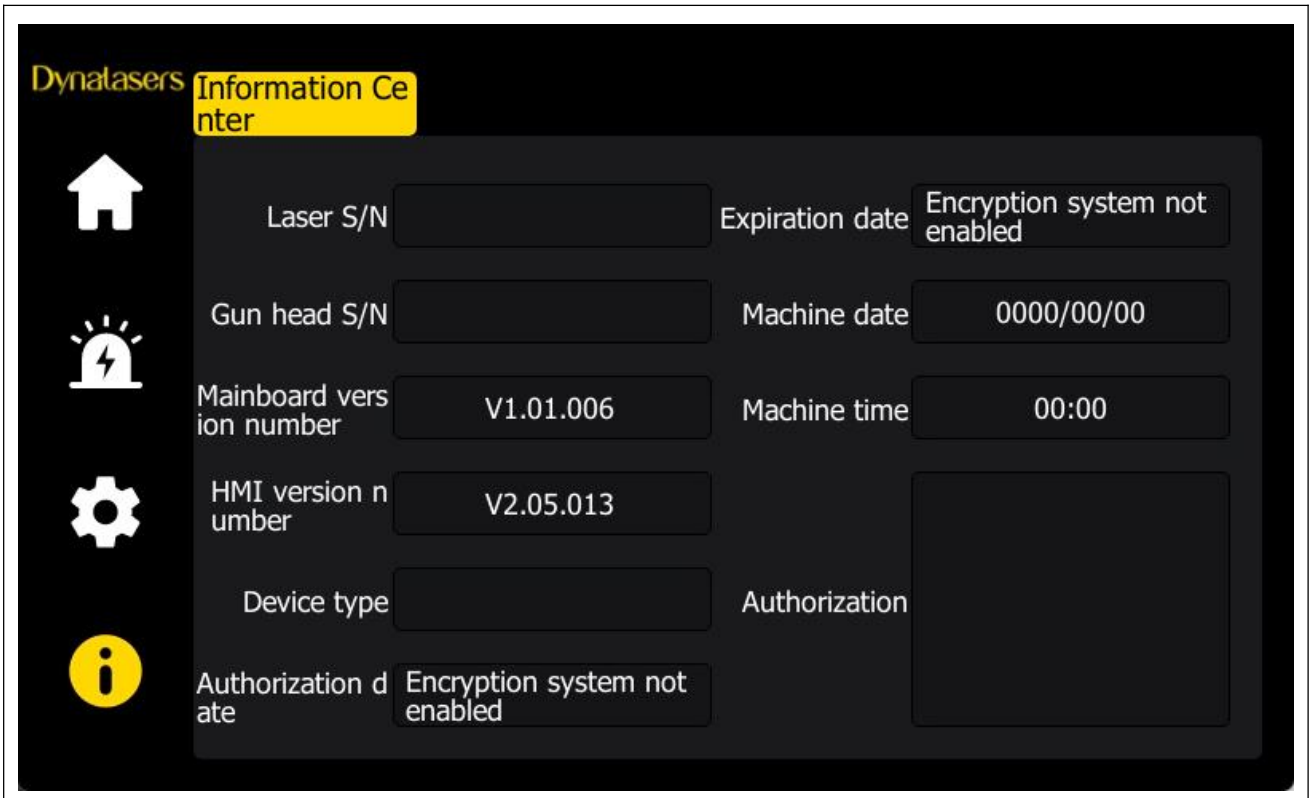
Vertex Length X2: The measured value of the distorted-corrected vertex length.

Vertex width Y2: The measured value of the vertex width after distortion correction.

Centerline length X1: The measured value of the centerline length after distortion correction.

Centerline width Y1: The measured value of the centerline width after distortion correction.

7.5 Information Center

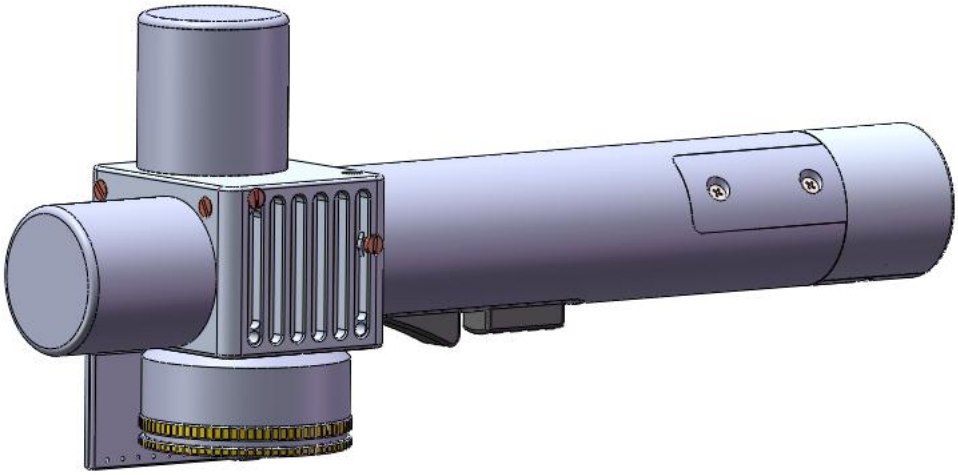


Display the information of the device, including the laser S/N code, head head S/N code, motherboard version number, panel version number, device model, machine time and authorization function information. If you need to modify the authorization code, please press and hold the right area of the authorization code for 3 seconds and then enter the complete authorization code.

Among them, the S/N code of the head head, the equipment model, the machine date, and the machine time need to be manually modified and entered. The modification method is as follows: press and hold the parameter name area for 3 seconds to pop up a password input box. Enter the password 260666 and then a keyboard will pop up for you to input. For example, to modify the machine date, you need to press and hold the parameter box on the right side of the machine date (0000/00/00), and then enter the password 260666 on the password page, click Enter, and then modify the date on the popped-up keyboard. It should be a complete year, month, and day (such as modifying to 2026-02-02, then input

20260202). When modifying the machine time, enter the complete time (such as modifying to 09:00, then input 0900).

8-Cleaning Instructions for the Cleaning Head



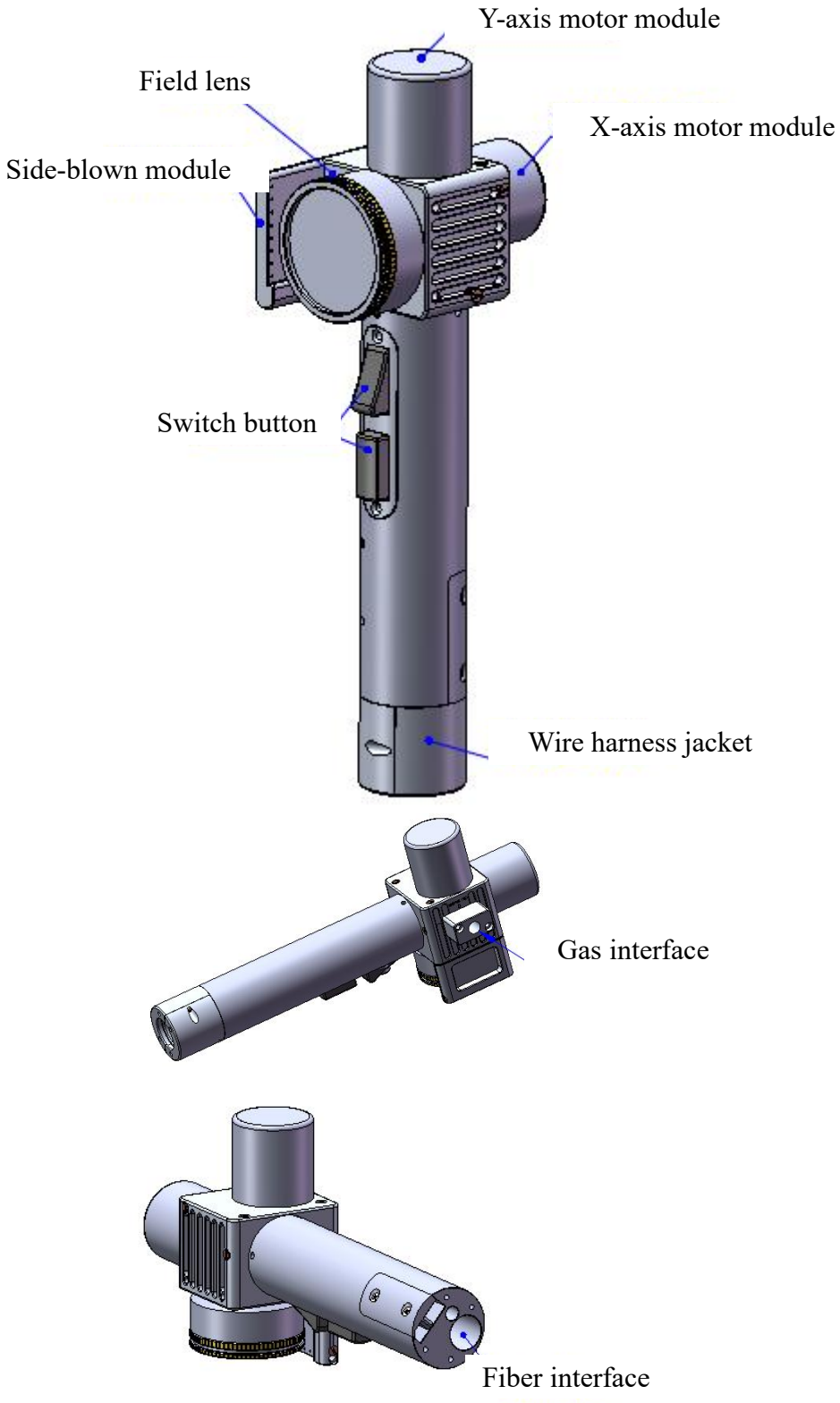
1. Product Specifications

Name	Pulsed Water Jet Handheld
Optical fiber interface	QCS Ø17 (without isolator)
Wavelength	1070±20nm
Power rating	200W-500/pulse
Field lens specifications	F254mm
Scanning scope	145 mm long * 145 mm wide
Scanning speed	≦30000mm/s
Auxiliary air pressure	≤1Mpa
Effective aperture	Ø25
Cleaning type	

Weight	0.76Kg/0.9kg

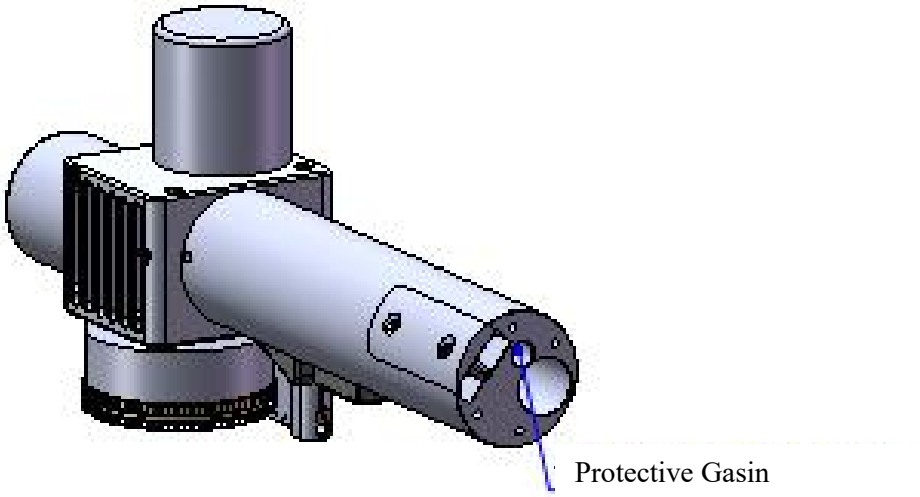
2. Product

Structure



3. Pipe Connection

(1) Protective Gas Connection



Connection of cooling water and shielding gas and usage requirements:

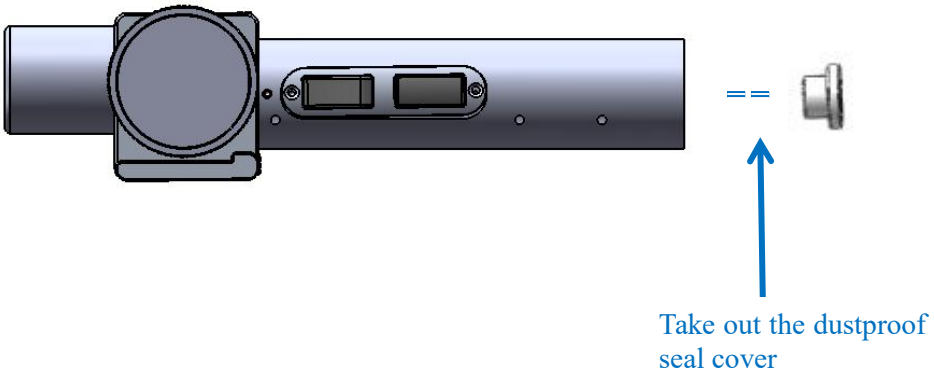
Note: Gas for regular use: Compressed air (oil-water filtration required)

Gas for regular use: argon, nitrogen and compressed air (oil-water filtration required).

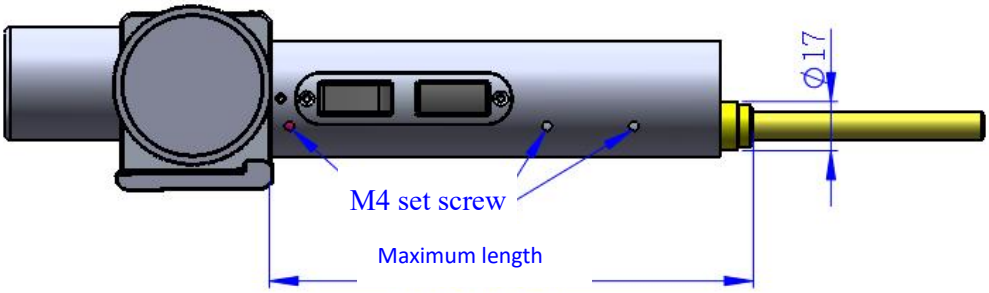
3.1.1 Cooling water: The 6mm air tube is connected. The main function is that the excess heat is taken away by cooling through the internal structural member water route when the heat is produced by the light path in the cavity to ensure the cleaning performance.

4. Installation of optical fiber input

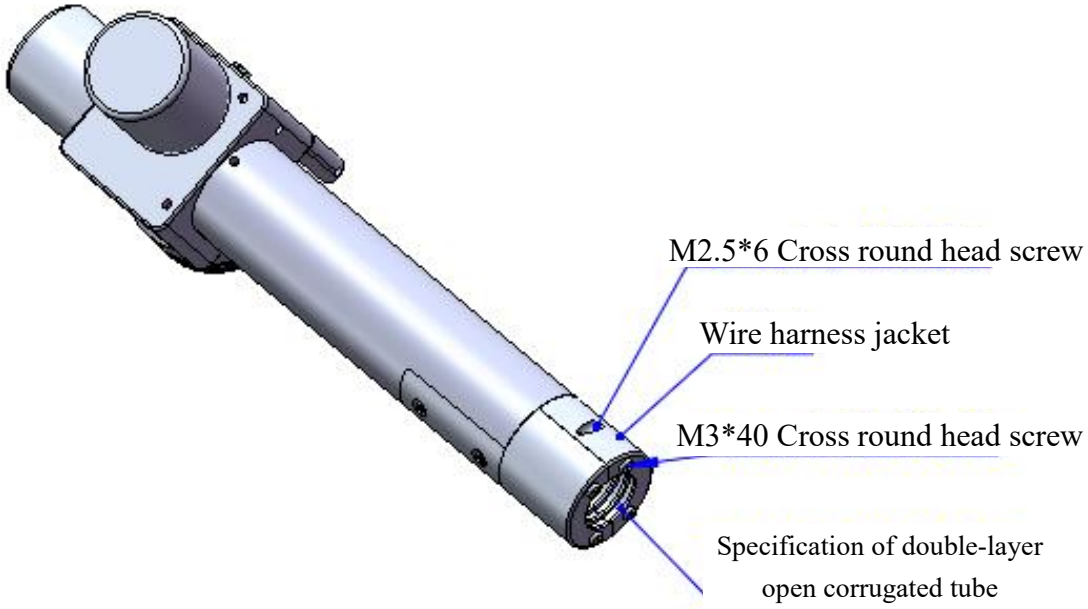
※ Arrange horizontally, and take out the dustproof seal cover.



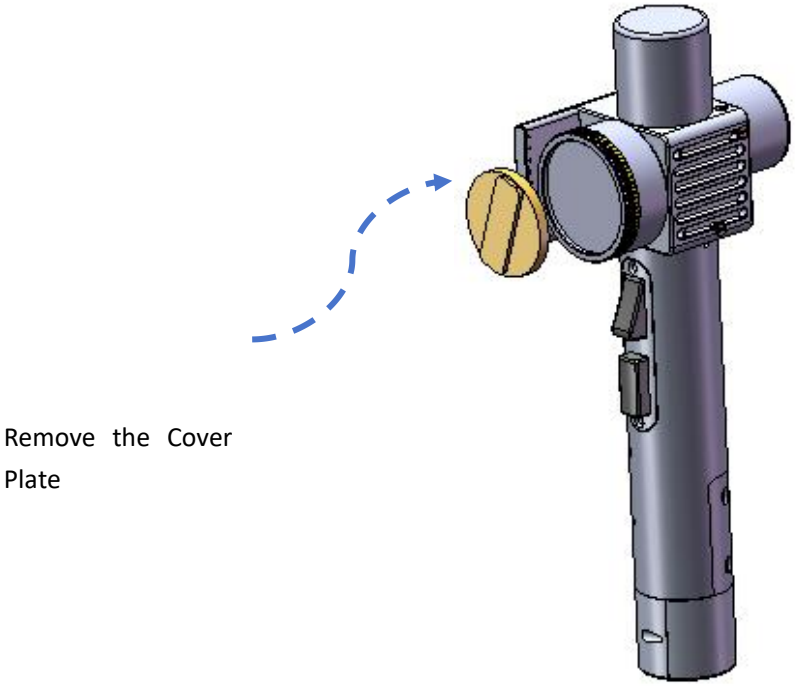
Insert the head of optical fiber into the bottom slowly, and tighten the optical fiber with the M4 set screw.



※ Use a protective cover to protect the end of the optical fiber from bending, and collect the cable and water pipe.

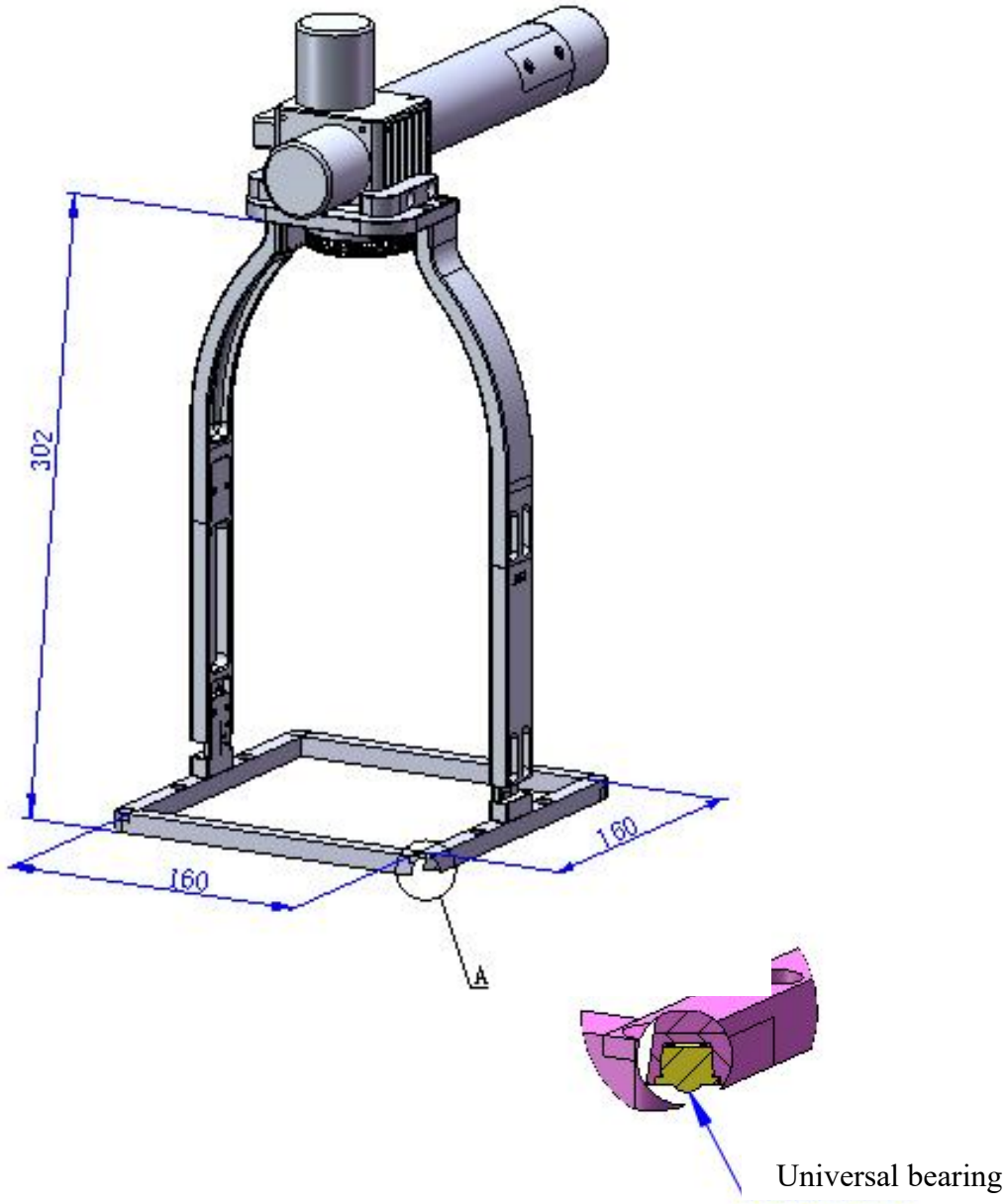


Before the laser presents, remove the front end clamshell dust blocking plate! !



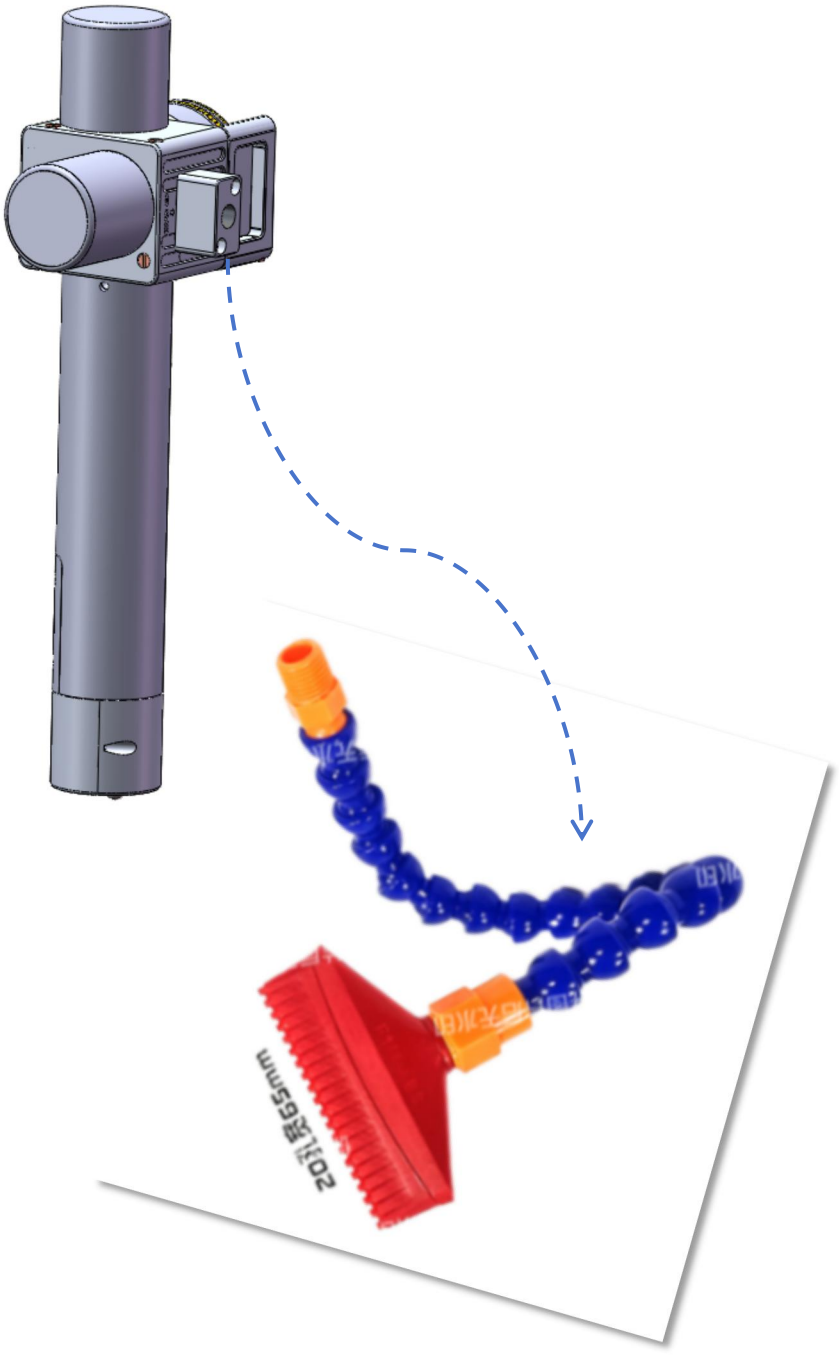
5. **Fixed-focus support module**

1. It can accurately position the object for scanning and cleaning. The lower part can be fixed by screws. It can also be scanned and cleaned by universal movement.



6. **Side-blown module**

Blow off the residual dust on the surface of the object cleaned.



Chapter 4 Detailed Specifications

1- Optical Characteristic Parameters Table

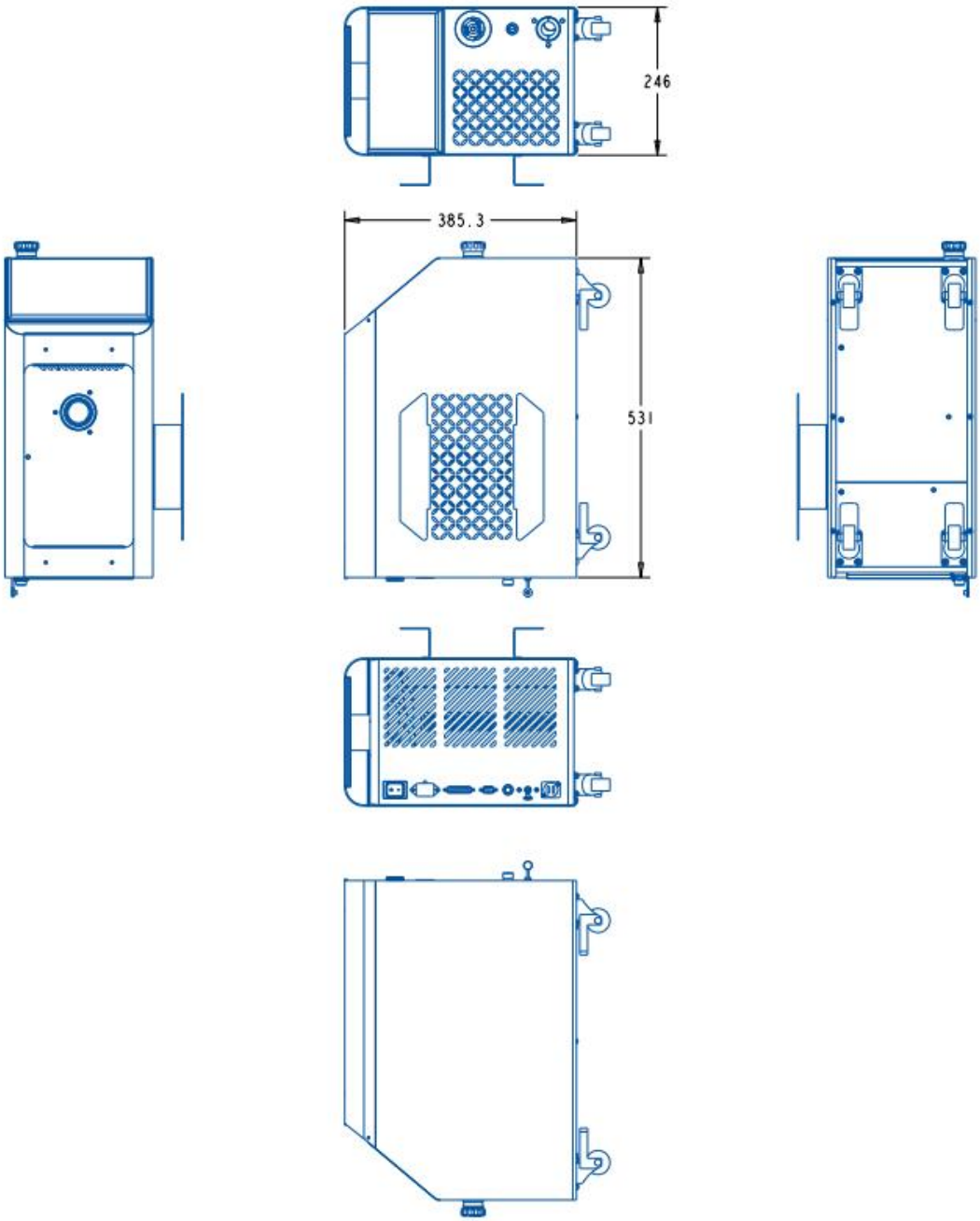
Type		YDFLP-CL2-200-1	YDFLP-CL2- 300-1	YDFLP-CL-500-1- A
M² Typical		1.5		< 1.7
Cable Length	m	5		5
Average Output Power	W	>200	>300	>500
Max. Pulse Enegy	mJ	2		1.5
Freq. Adjust Range	kHz	1-3000		1-4000
Pulse Width	ns	13-500		30-500
Output Power Instability	%	<5		
Cool Method		Air Cooling		
Supply Voltage	V	48V		
Max. Power Consumption	W	<700	<1000	>2000
Power Supply	A	>14.6	>20.8	>42
Wavelength	nm	1064		
Spectral Width@3dB	nm	<15		<20
Polarization Direction		Any		
Resistant to High Reflectivity		Yes		
Laser Output Head Type		QCS	QCS	QBH/QCS
Power Adjust Range	%	0 ~ 100		
Working Temp.	℃	0 ~ 40		
Storage Temp.	℃	-10 ~ 60		
Laser Source size	mm	340*265*100		392*288*135
Laser Source Weight	Kg	Net：8.9 Gross：10.3		Net：11.3 Gross：12.35
Machine Size	mm	570*304*450		
Machine Weight	Kg	<30		<33

2- General Characteristic Parameters Table

Pulse Width Setting (ns)	Reduce Power Freq. (kHz)		Max. Freq. (kHz)	Reduce Power Freq. (kHz)	Max. Freq. (kHz)
	YDFLP-CL2-200-1	YDFLP-CL2-300-1		YDFLP-CL-500-1-A	
1(CW)	-			-	
13	1200	1800	3000	-	-
20	900	1350		-	-
30	650	975		2700	4000
45	400	600	2000	1900	4000
60	360	540		1500	4000
80	280	420		1400	3000
100	260	390	1000	1300	2000
150	180	270		700	2000
200	150	225		550	1800
250	130	195	900	430	1200
350	110	165	600	330	1000
500	100	150	500	330	650

3-Structural Layout

Machine three-view (unit: mm)



Chapter 5: Disassembly Guide

1-Instructions for unpacking shipping boxes

If the packaging shows any signs of external damage, inspect the device for damage and notify the freight forwarder immediately. When removing the device from the packaging,

handle it with extreme care to ensure the fiber optic cable remains intact.

The device consists of a foam-insulated wooden box, a foam impact shock absorber, and an impact indicator to ensure secure handling during transportation. Special care should be taken when unpacking and transporting the package. To minimize the risk of equipment damage, Dynalasers recommends reading this manual in detail.

2-Delivery and Transportation

The transport packaging bears the carriers information. However, these labels may not be accurate. Please check the outer surface of the crates for any visible damage during transit.

• Labeling – The packaging label is affixed to the top panel of the wooden box to identify the manufacturers name, address, and telephone number; it provides general product information such as model, model code, and serial number; and it specifies the shipping date (month/day/year).

• Impact indicators – labels and indicator panels are affixed to the side or the end of wooden crates to help provide correct guidance.

Warnings：

◎ Do not use the products cable accessories to lift or position the equipment.

3-Accessories List

name of material	dosage	unit
Goggles	1	pcs
Side brush	1	pcs
Positioning fixture	1	pcs
Protective Lens	3	pcs

Chapter 6: User Guide

1-Precautions

Cautions：

◎ Refer to Chapter 4, "Detailed Specifications," to select the appropriate power supply.

Refer to Chapter 2 Safety Information to verify whether the lasers peripheral operating environment meets the requirements.

◎ Wear the supplied soundproof earplugs before performing laser welding.

2-Power connection

1. The laser power supply must be connected to a single-phase AC (220VAC) source, using a power cable with a copper core of at least 1.5 mm² and a current capacity of no less than 10A.

3. Connect the power cord to the specified voltage and phase: L=220VAC, N=0VAC, PE=ground. Ensure correct wiring before powering on. Do not connect PE to ground.

If you have any further questions about power connections, refer to Chapter 4 "Detailed Specifications" for product electrical specifications. Electrical connections must comply with electrical safety standards and proper wiring procedures, and all wiring must meet national and local regulatory requirements.

3-Electrostatic grounding connection

The grounding nut of the laser housing must be reliably connected to the ground with a grounding wire to prevent potential damage to the laser caused by static electricity.

The wiring is shown in the figure:

One end of the grounding wire is locked on the grounding screw.

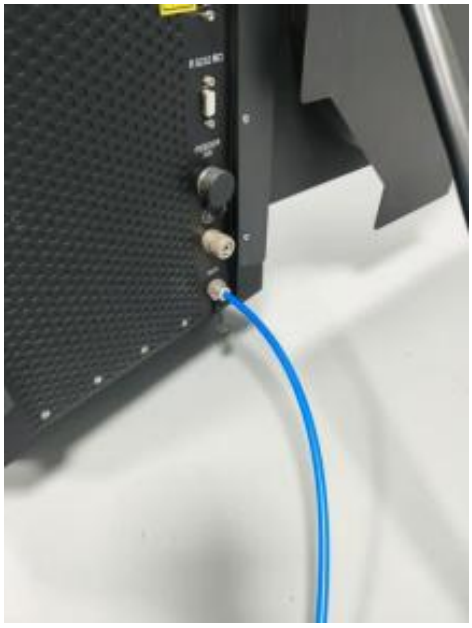
The other end of the grounding wire is connected to a reliable outdoor grounding post.

4-Gas Connection

The welding joint requires compressed air for cooling and protective gas, necessitating degreasing and treatment. The input gas pressure must be maintained between 80KPa and 500KPa. To ensure optimal welding performance, a flow meter-equipped pressure reducing valve (nominal flow rate 25L/min) is required to precisely regulate the gas flow.

Connect the 6mm outer diameter air pipe to the Gasin port and adjust the gas flow rate to 15-20L/min. Select the gas valve mode to normally open (in the advanced settings interface) for adjusting the gas flow rate.

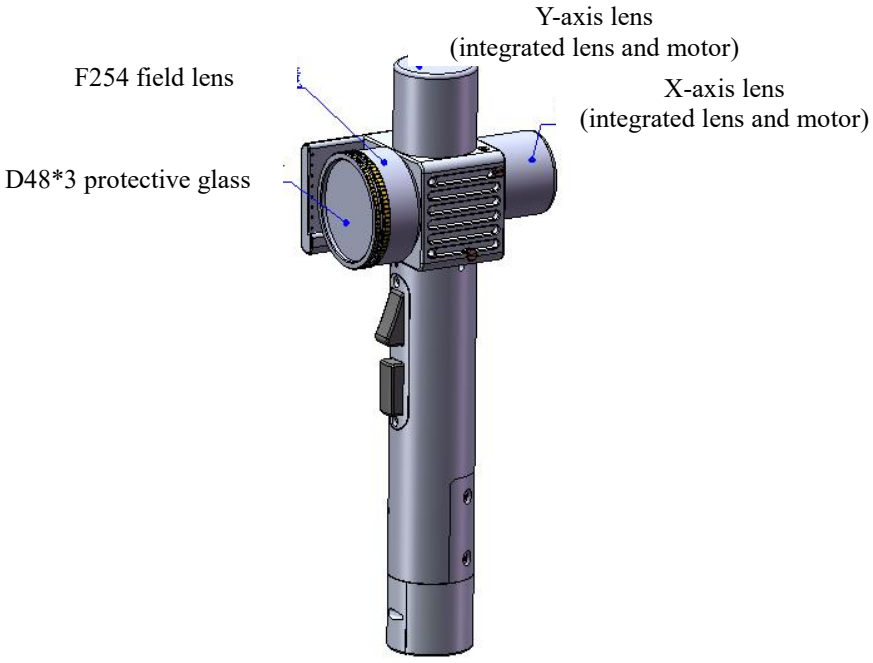
Device connection diagram:



5-Product Accessories Inspection and Cleaning Guide

1. Structure of optics lens

※ The assembly is completed in the dust-free plant at the time of replacement of parts. In principle, except for the front-end first protective glass can be disassembled and assembled, other modules are forbidden to be dismounted. If it is necessary to check the collimating lens, focus lens and galvanometer lens, the product shall be put into a clean environment for disassembly.

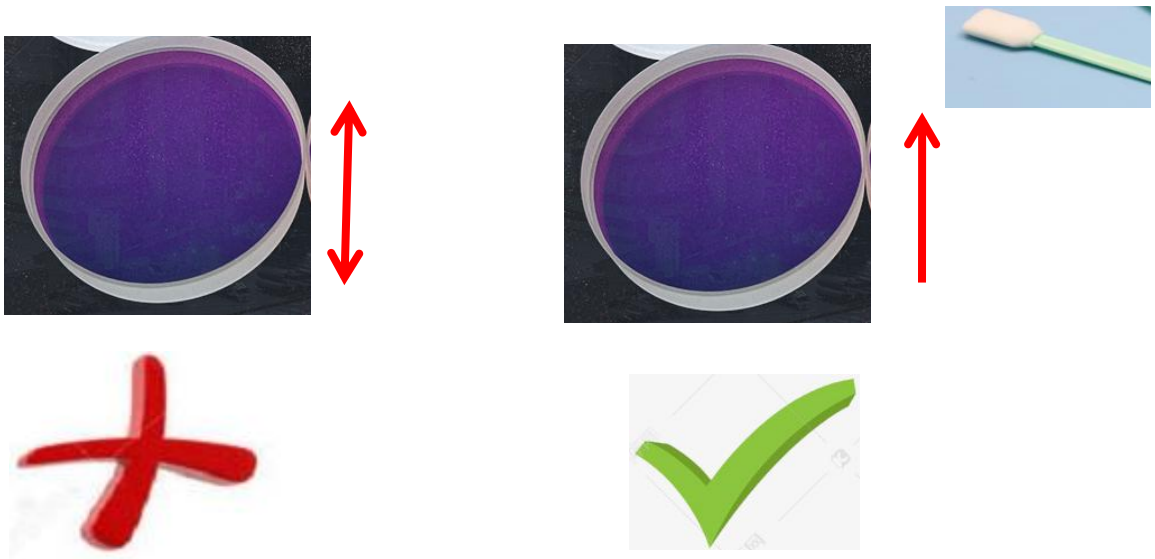


2. Optical Lens Cleaning

※ When the optics lens are cleaned, the operation method and attention points are as follows:

※ Tools: Dust-free gloves or dust-free fingerstall, dust-free wiping cotton swab, isopropyl alcohol, and caned dry and pure compressed air.

※ Spray the isopropyl alcohol onto the dust-free cotton swab, align the lens to eyes, gently pinch the side edge of the lens with left thumb and index finger and hold the dust-free cotton swab with right hand to gently wipe the front and back of the lens in a single direction from bottom to top or from left to right (avoid wiping back and forth to avert the secondary contamination of lens), blow the surface of the lens with filling dry and pure compressed air and confirm the surface of lens is free from foreign matters after cleaning.



3. Optical Lens Assembly and Disassembly

1. Disassembly and assembly of protective glass

Tools: Dust-free cotton swab, alcohol.

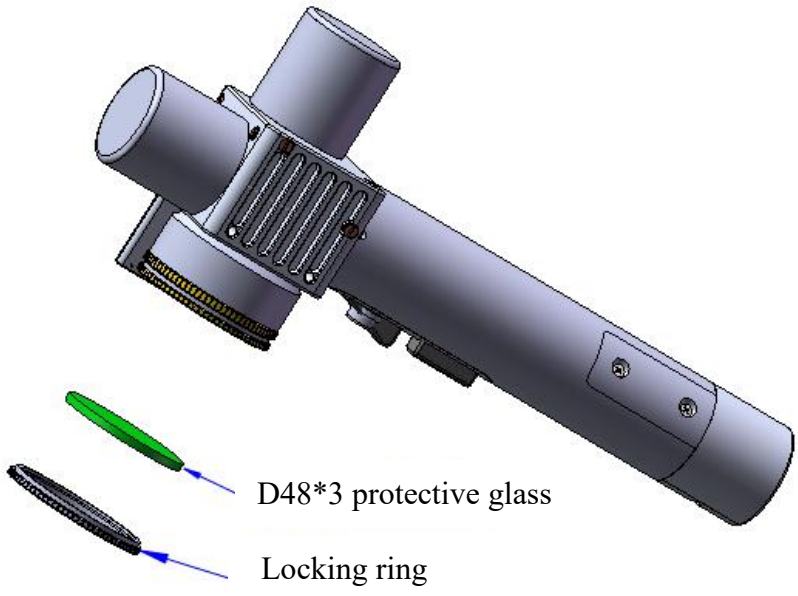
※ The disassembly and assembly shall be completed in a clean place. When the lens are dismounted, the dust-free gloves or dust-free fingerstall.

※ Disassembly and assembly steps:

Disassembly steps:

Step 1: Clean up all the dust on the surface of the laser head firstly.

Step 2: Rotate it counterclockwise and take out the locking ring to replace the protective lens.



Chapter 7 Service and Maintenance

1 - Maintenance Instructions

Notes:

◎ This product has no user serviceable parts, components or assemblies. All maintenance work must be completed by Dynalasers personnel.

◎ To protect your rights, please be sure to contact Dynalasers or the local representative as soon as possible after discovering the fault and apply for product repair or replacement service. After authorization by Dynalasers, please send the warranty products in matching packages back to Dynalasers.

◎ If any damage is found after receiving the products, you must keep the certification documents so that you can claim your rights from the carrier. Important:

◎ Do not send any product back to Dynalasers without communication and confirmation.

◎ If the product is not within the warranty period or warranty coverage, please be responsible for the product repair costs.

Changes:

Dynalasers reserves the right to make changes to any design or structure of the product without prior notice.

2 - Service Statement

For problems related to safety, setting, operation or maintenance of Dynalasers products, please read this manual carefully and strictly follow the operating instructions to solve them.

If you have any questions, please call Dynalasers Customer Service Department: 400 - 000 - 3207

After the problem you reported is confirmed by Dynalasers Customer Service Department, it will be followed up by the technical support team. If your problem cannot be solved after communicating with the technical support team, you may need to send the product back to Dynalasers for further investigation.

Chapter 8 Warranty Statement

1 - General Terms

Shenzhen Dynalasers Technology Co., Ltd provides warranty services for products with defects caused by materials or production processes during the contract warranty period, and guarantees that the products meet the relevant quality and specification requirements mentioned in the document under normal use.

Shenzhen Dynalasers Technology Co., Ltd provides repair or replacement services for products that fail due to materials or production processes during the contract warranty period. The repair or replacement of products within the warranty scope shall still be guaranteed according to the remaining warranty period of the original product.

2 - Warranty Limitation

Products, components (including fiber connectors) or equipment is not covered by the warranty in the following cases:

(1) Tampered, opened, disassembled or modified by personnel other than Dynalasers;

(2) Damaged due to improper use, negligence or accident;

(3) Used beyond the scope of product specifications and technical requirements;

(4) Indirect damage to the laser caused by failure of user software or interface;

(5) Used under improper installation, maintenance or other abnormal operating conditions not included in this manual;

(6) Accessories and fiber connectors are not covered by the warranty.

The customer is responsible for understanding the above information and operating in accordance with the user manual, or the product failure caused thereby will not be covered by the warranty.

Important:

◎ Within the warranty scope, the customer must provide feedback within one month of discovering the failure.

◎ Dynalasers does not grant any third party or individual the authority to repair or replace our products.

Chapter 9: Disposal Instructions

1 – Machine Scrap

The main methods for handling waste laser equipment include selecting professional recycling, following environmental principles and taking preventive measures.

The best way to dispose of discarded laser tubes is to choose a professional electronic waste recycling service. These services usually have the qualifications and technology to handle hazardous substances, ensuring that laser tubes are safely and environmentally treated. Recycling companies will classify, dismantle, and refine waste laser tubes, and

recycle useful materials to reduce the pressure on natural resource extraction.