

# RAYTOOLS

## BW101-GS SERIES (3kW)

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### 4-in-One Handheld Laser Processing Head- User Manual



### Document History

Edit date	Version	Topic, revision, action taken
2021/11/16	V1.0	First edition
2022/1/11	V1.1	1. Modify controller version 2. Add wire feeder info
2022/4/19	V1.2	Add wiring info
2022/10/24	V1.3	Modify wire feeder
2023/7/3	V1.5	Product iteration
2024/3/29	V2.0	Product iteration

Thank you for choosing our product!

This manual describes the installation and commissioning of laser processing head in details so that you can use this product quickly. You can consult us directly for more details.

Due to the continuous updating of product functions, the product you receive may differ from the introduction in this manual in some aspects.

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If you find any errors in this document, please inform us as soon as possible. The data contained in this manual is only used to describe the product and shall not be regarded as a statement of security interest.

For the benefit of our customers, we will constantly try to ensure that the products we develop comply with the latest technology.

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## Disclaimer

- We reserve the right to change the design in order to improve the quality or expand the application or comply to manufacturing workmanship.
- We will not bear any responsibility for losses and accidents caused by wrong operation or improper handling of our products.
- Dismantling of product will lose all warranty claims excluding the normal replacement of worn parts and components required for maintenance or commissioning operations.
- Unauthorized modification of products or use of non-original spare parts will directly lead to the invalidation of warranty and liability exemption.
- It is recommended to only use the spare parts provided by us or submit them to us or the designated professional team for installation.

## Use Regulations

- Ensure that the product is used in a dry environment.
- Ensure that the product is used in the environment required by EMC standards.
- The product is only allowed to run within the parameters specified in the technical data.

## Personnel Responsibilities

- Be familiar with the basic provisions of work safety & accident prevention and have received equipment operation guidance.
- Read and understand basic safety instructions and operations.
- You must have studied the relevant regulations and safety instructions and understand the possible hazards.
- Comply with relevant regulations and implement corresponding protective measures.

## Safety Instructions

### Prevent Electric Shock

-  Parts of the laser head such as nozzle, sensor, sensor interface and attached fasteners may not be fully protected by the ground wire due to function fault. These parts may have low voltage. When installing electrical equipment, please pay attention to taking anti electric shock measures for relevant personnel.
-  Note that the equipment shall be grounded as specified.

### Guard against Danger

- Never put your hands or other body under the laser head.
- Repair and maintenance work can only be carried out after the power is turned off.
- Do not exceed the specified maximum pressure.
- It must be ensured that the laser head is in normal condition at all times.
- All fasteners such as bolts and nuts must be tightened.



### Laser Caution

- Avoid direct laser radiation or scattering to the skin.
- Do not stare at the laser beam even when wearing optical equipment.
- Use special laser protective eyeglasses that meet the requirements of safety standards IEC 60825-1.

### Prevent Waterway Corrosion

- In order to avoid corrosion, use the specified coolant and comply with relevant requirements and specified maintenance intervals.

### Noise Prevention

- The corresponding measures shall be specified or explained and observed in order to prevent personnel from being harmed by noise when the cutting air pressure is high.

### Storage and Transportation

- Observe the storage temperature range allowed by the technical data.
- Take reasonable measures to prevent fire, vibration or impact.
- Do not store in or near the magnetic field.

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## 1 Safety Instructions & Precaution

### 1.1 Summary

This chapter summarizes information to operate laser equipment safely. Laser radiation will heat objects and cause hazard to eyes and skin. Therefore, to avoid potential risks, please operate this equipment correctly as required and take protections.

Please place this manual near laser equipment.

### 1.2 Operation Standard

Operation standard for laser head:

GB 7247.1-2012 Safety of laser products-Part 1: Equipment classification and requirements

### 1.3 Warning Sign and Description

Warning signs including:

Information about the name and hazard source;

Information about the possible consequences if the danger has already occurred;

Information about signs to avoid damage.

Serious consequences may be caused by violating signs as below:

- "Danger": Serious danger with death or severe injury possibly;
- "Warning": Moderate disability and permanent injury possibly;
- "Caution": Mild disability but not permanent injury possibly;
- "Note": Material damage possibly;
- "Remark": Explanation and description of operation.

Warning eg.:

	Warning
<p>If the laser radiation doesn't deviate from the human body, eyes and skin may be exposed. Laser radiation will burn the skin, and direct and scattered laser beams will cause permanent eye damage.</p>	

## 1.4 Damage Source

Laser products are manufactured in accordance with the newest standard and accepted safety rules. However, there are risks to people and materials in operating, which will cause possible hazard and loss if failed to observe these rules.

This section explains the possible danger caused by laser products and response measure including:

How to reduce risks through measures Raytools provides;

How to ensure the safety of users when operating laser equipment through effective measures.

### 1.4.1 Laser Beam

Laser beams may hurt eyes and skin. This product is classified as the Class 4 according to different damage definition. Therefore, please wear protective eyeglasses when beaming out. Otherwise, we will not bear any responsibility for loss caused by violating rules.

Laser products is classified by safety standards EN 60825-1 and IEC 60825.

Class 4: By definition, a Class 4 laser can burn the skin, or cause devastating and permanent eye damage as a result of direct, diffuse or indirect beam viewing. These lasers may ignite combustible materials, and thus may represent an explosion risk.

Please wear laser protective eyeglasses when operating, and avoid direct laser radiation or scattering to the skin.

### 1.4.2 Gas & Smoke & Dust

Harmful gases, smoke and dust may be produced when processing workpiece. These materials may enter the respiratory tract and cause injury to nose or eyes, if contacting with the skin and mucous membranes in the mouth.

Dust particle: Solid matter less than 1 micron in diameter

Smoke: Gas containing solid and liquid particles less than 1 micron in diameter.

Workpiece materials and divergent substances may lead to cancer.

Carcinogens: Beryllium and zinc chromate, etc.

Relevant factors: Material type, producing speed, laser energy and protective gas pressure.

### 1.4.3 Thermal Energy

Fire & Explosion: A Class 3B or Class 4 laser beam may ignite combustible materials, and thus may cause fire.

Although laser beam does not directly irradiate solid materials with high energy, it's possible to cause fire by explosive gases or smoke in the air (such as hydrogen-oxygen mixture, sawdust and carbon chips).

- Workpiece temperature: The laser beam will lead to a rising temperature of workpiece in operating, which depends on the workpiece material and laser beam energy.

 <span style="font-weight: bold; margin-left: 10px;">Warning</span>
Touching hot workpieces may cause burning.

**Solution:**

Use appropriate tools and wear protective gloves to move hot workpieces, and don't touch the surface directly.

- hot surface of handheld laser head: The laser beam is reflected on the workpiece, which may rise the temperature of the extending tube and nozzle of laser head, thus causing burning.

 <span style="font-weight: bold; margin-left: 10px;">Caution</span>
Hot surface of laser head may burn human skin.

**Solution:**

Don't touch hot surface of laser head; maintain and repair the head after it's cooling.

### 1.4.4 Noise

Noise will be generated when using handheld laser head to beam out and blow protective gas.

These noise may come from material gasification due to exposure to laser beam, but the max noise source is from blowing compressed protective gas [ $>60\text{dB(A)}$ ], which are applied to protect cover glasses through annular air knife when processing workpiece.

 <span style="font-weight: bold; margin-left: 10px;">Warning</span>
Noise will be produced when using handheld laser head. Noise may cause permanent hearing damage and other health problems, especially for a long-time exposure.

**Solution:**

Mount protective cover for effective noise reduction; Earmuff is available at high noise level.

## 1.5 User Guideline

### 1.5.1 Using Rule

Handheld laser heads are mainly used to weld solid metal or metal alloy.

#### Using rules including:

1. Follow the instructions in this manual.
2. Follow laser usage rule, connecting fiber interface and laser head safely and scientifically.
3. Follow the electromagnetic coordination rule, wiring to the handheld laser head.
4. Inspect and maintain laser head.

#### Not allowable operations:

1. Operate laser with unspecified wavelength, or with laser power  $> 3\text{kW}$ .
2. Weld flammable and explosive materials with metal or metal alloy (including combustible gas, petrol and explosive).
3. Operate in a gas environment with explosive risk.

Laser manufactures will not bear any responsibility for loss caused by violating using rules.

### 1.5.2 Technical Guideline

#### ■ Laser product status

Laser products can only be used in good condition. Any damage should be repaired timely, especially those affecting safety facilities.

#### ■ Modify

Don't modify any parts without the permission of Raytools, to avoid unsafe usage of laser product.

#### ■ Spare parts

Spare parts must meet technical requirements of Raytools.

#### ■ Software

Don't modify software.

#### ■ Connecting cable

Fiber and circuit cables should be placed well, following the minimum bending radius of fiber. And the connecting cables should be away from transportation channels and machine parts with frequent and severe vibration.

### 1.5.3 Usage Standard and Rule

Please strictly comply with the following important rules when operating laser (for reference).

International Standard:

IEC60825	Radiation of laser product
EN60825	Safety of laser product
EN207	Personal eye-protection equipment—Filters and eye-protectors against laser radiation.
EN60204	Electrical equipment of machines

### Maintenance

1. Close all water/gas/ electrical circuit before maintenance and repairing in the clean environment.
2. Debug and maintain laser products regularly according to the manual. Please refer to the following rules to maintain and replace parts as required.
3. Check whether devices testing laser product are in good working regularly.

### 1.5.4 Emergency & Safety Measure

#### Emergency including:

1. Laser leakage.
2. Movement caused by uncontrolled system components.
3. Fire or explosion.
4. Leakage of harmful substance.

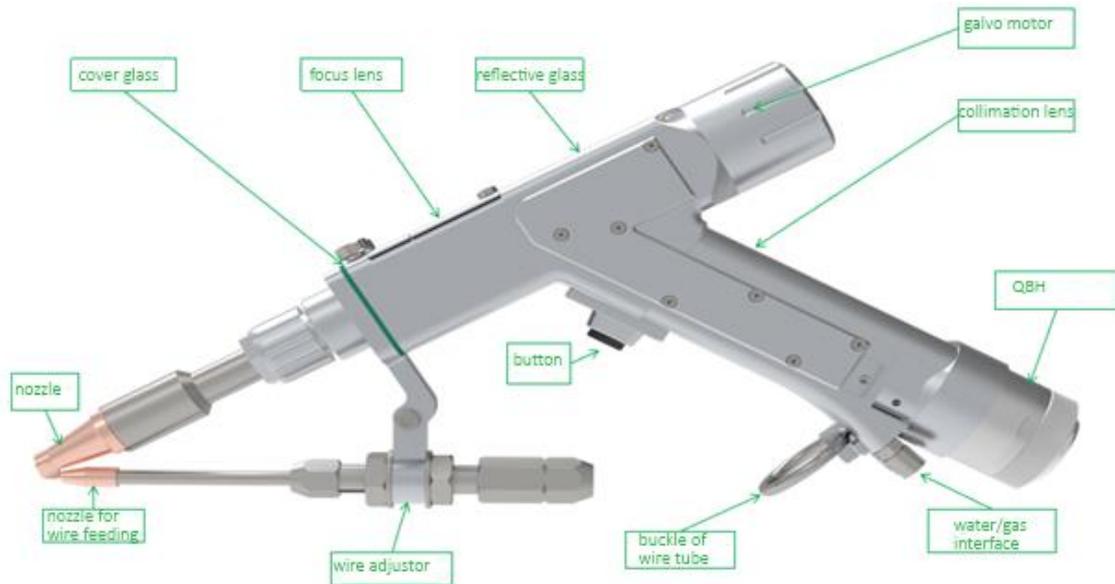
#### Emergency safety measure:

1. If there are any other situations affecting human health or damage materials, please solve them timely.
2. If the danger is caused by laser products, press the emergency “Stop” button to stop radiating laser and running machine.
3. Other specific measures should be taken for different situation.
4. We recommend that users of laser products should identify potential risks through assessment and then take corresponding measures, to minimize losses or give emergency treatment to the injured.

Please prepare emergency signs in visible places where there are potential risks.

## 2 Laser Welding Head

### 2.1 Structure



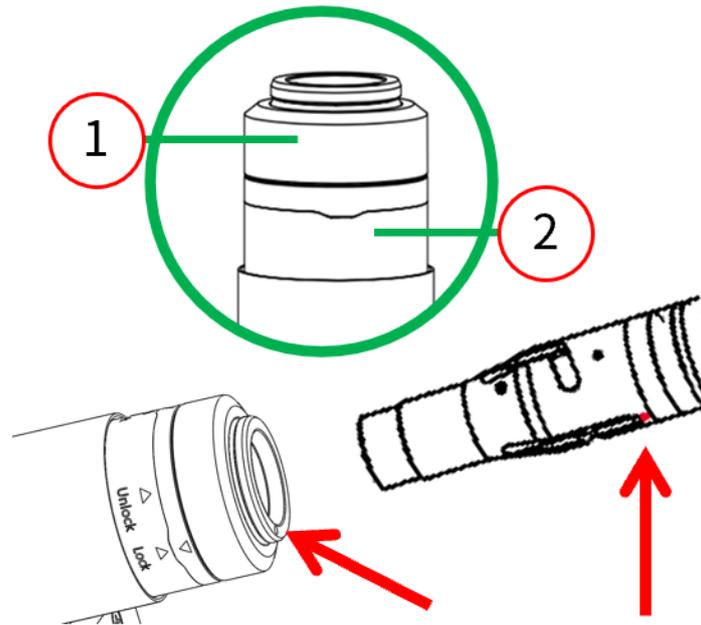
### 2.2 Technical Datasheet

Model	BW101-GS
Operating Temperature	5 ~ 50 ° C
Humidity	< 70 ° C
Wavelength	1064 ± 10
Max. Laser Power	3000W
Optical Configuration	60: 150
Wobbling Width	0-5mm
Specification of Cover Glass	D 18 × 2
Weight	About 0.9 kg

## 2.3 QBH Fiber Insertion



**WARNING:** The optical components must be dust free and all dusts must be cleaned before use. The fiber shall be horizontally inserted into fiber interface to prevent dust from entering the interface and falling on the surface of the lens. Upper limit in the fiber before fixing the laser head.



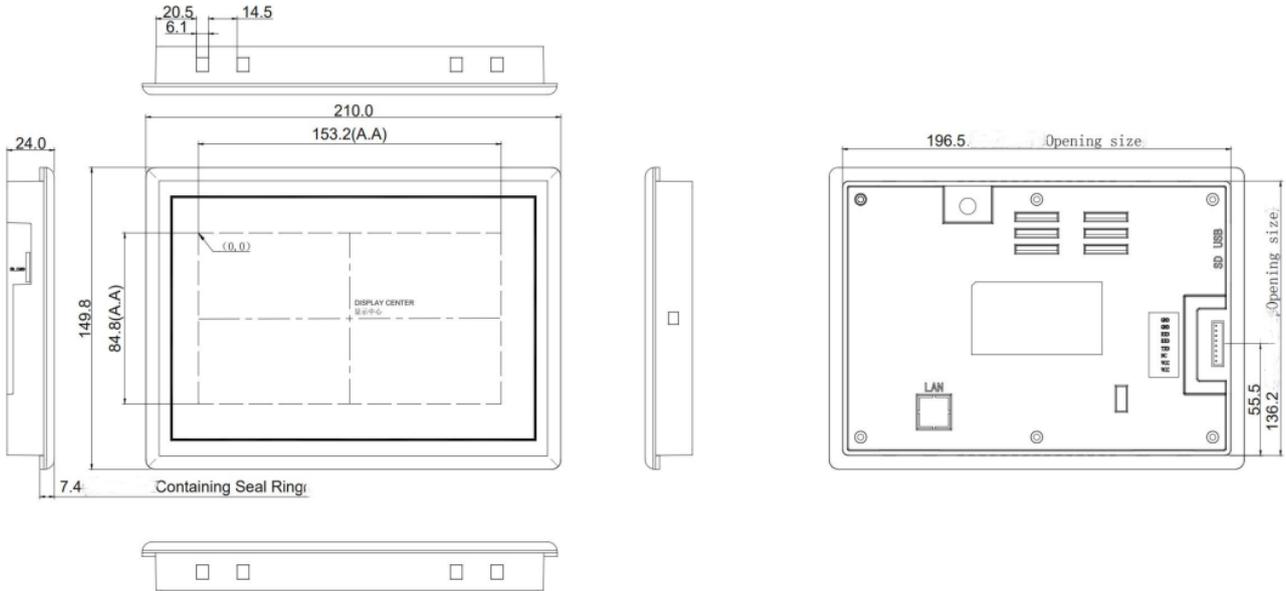
- Place the laser head horizontally and loosen QBH steel sleeve ① counterclockwise.
- Align the red point at the end of the QBH interface to the red point of the handwheel.
- Remove QBH dustproof cover.
- Align the red mark of male fiber end to red mark on female QBH of welding head when you insert the fiber end straightly to bottom of QBH interface of welding head.
- Turn the QBH handwheel clockwise. It is in place when you hear the "Da" voice, then pull the handwheel up and turn clockwise to end.
- Shake the fiber gently to confirm it is tightened prior to use.



It is recommended to use textured tape to seal the connection of female and male fiber interface after the installation is finished in order to prevent from dust as much as possible in critical dusty environment.

## 2.4 Mechanical Size

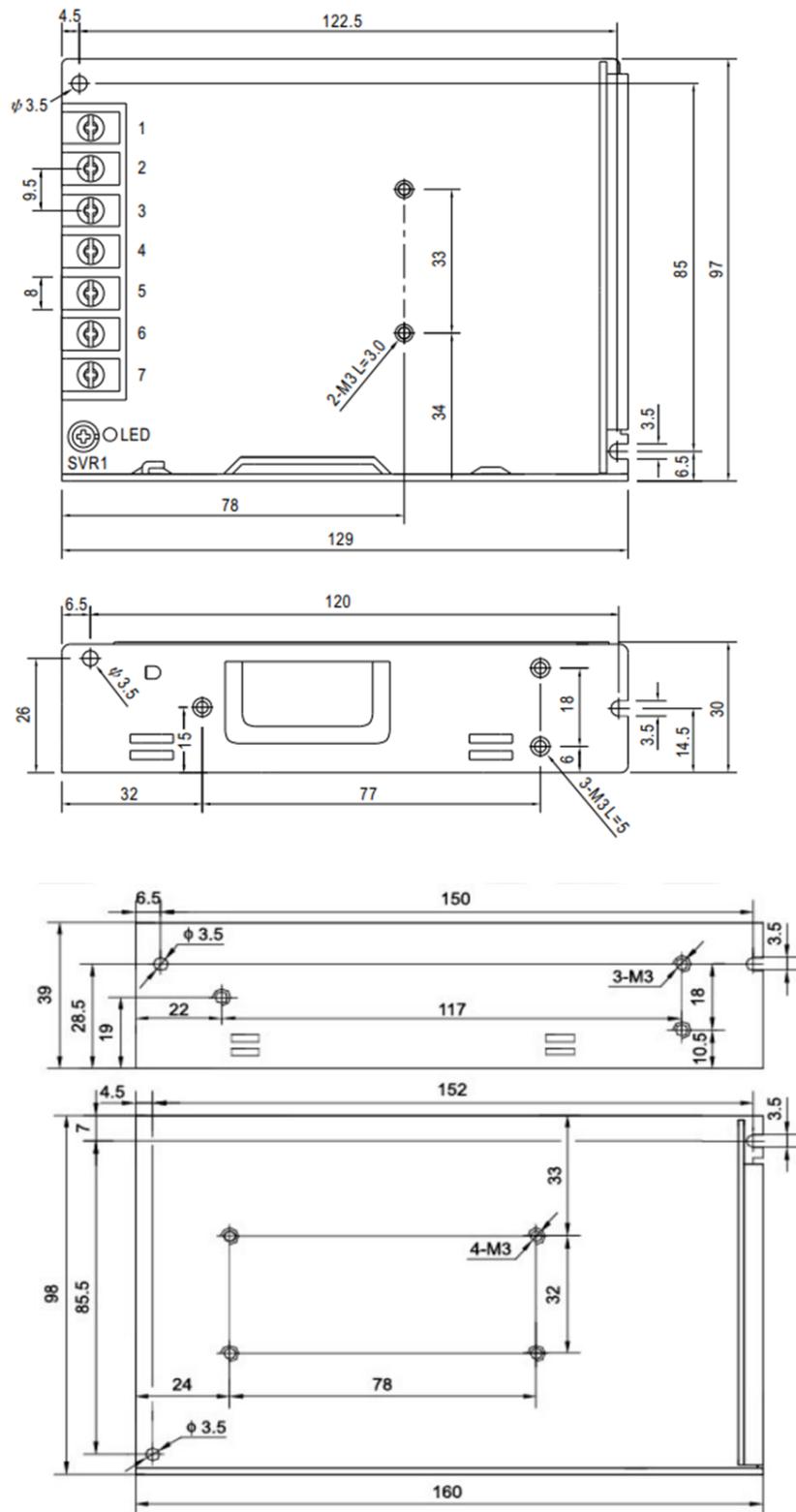
### 2.4.1 Mounting of Human Machine Interface



### 2.4.2 Mounting of Motion Control System

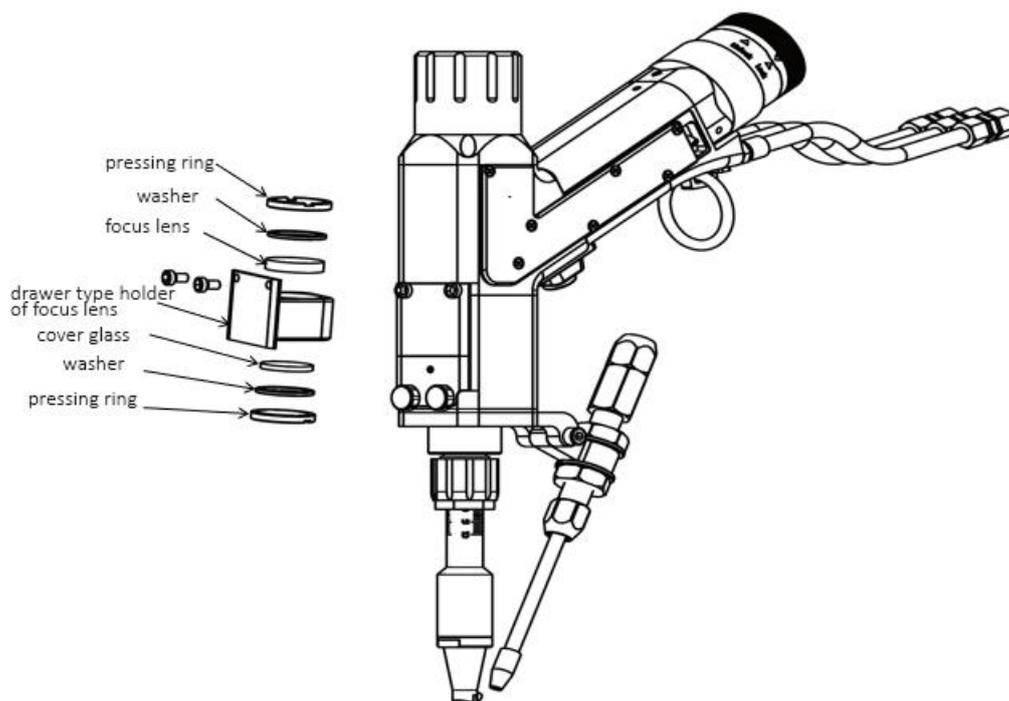


## 2.4.3 Mounting of Switch Mode Power Supply



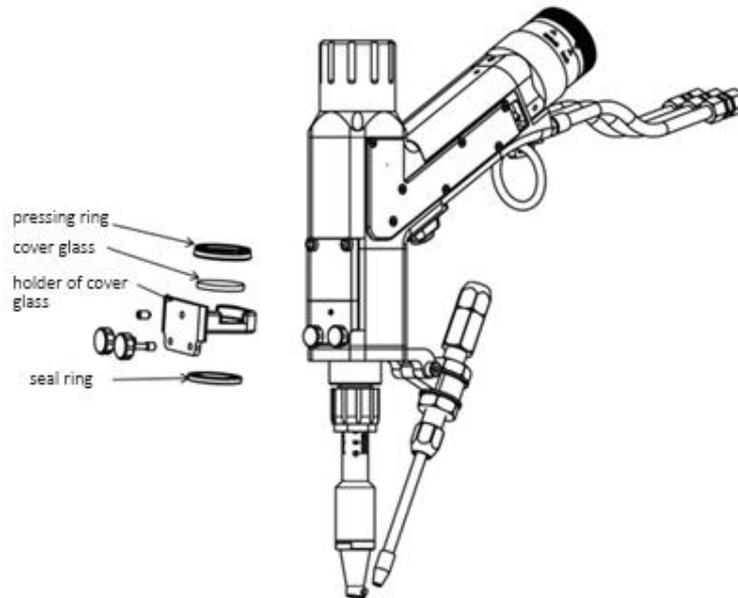
## 2.5 Removal and Installation of Cover Glass

### 2.5.1 Removal and Installation of Inner Cover Glass



- Clean all dusts on the laser head surface.
- Loosen bolts to pull out the drawer type holder of the focus lens.
- Remove the pressing ring, seal ring, and cover glass from the bottom of the holder.
- Replace or clean the cover glass.

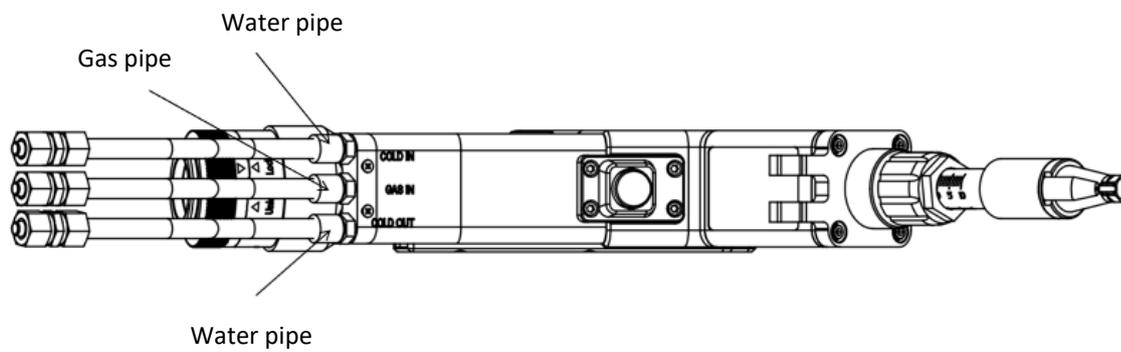
## 2.5.2 Outer Cover Glass



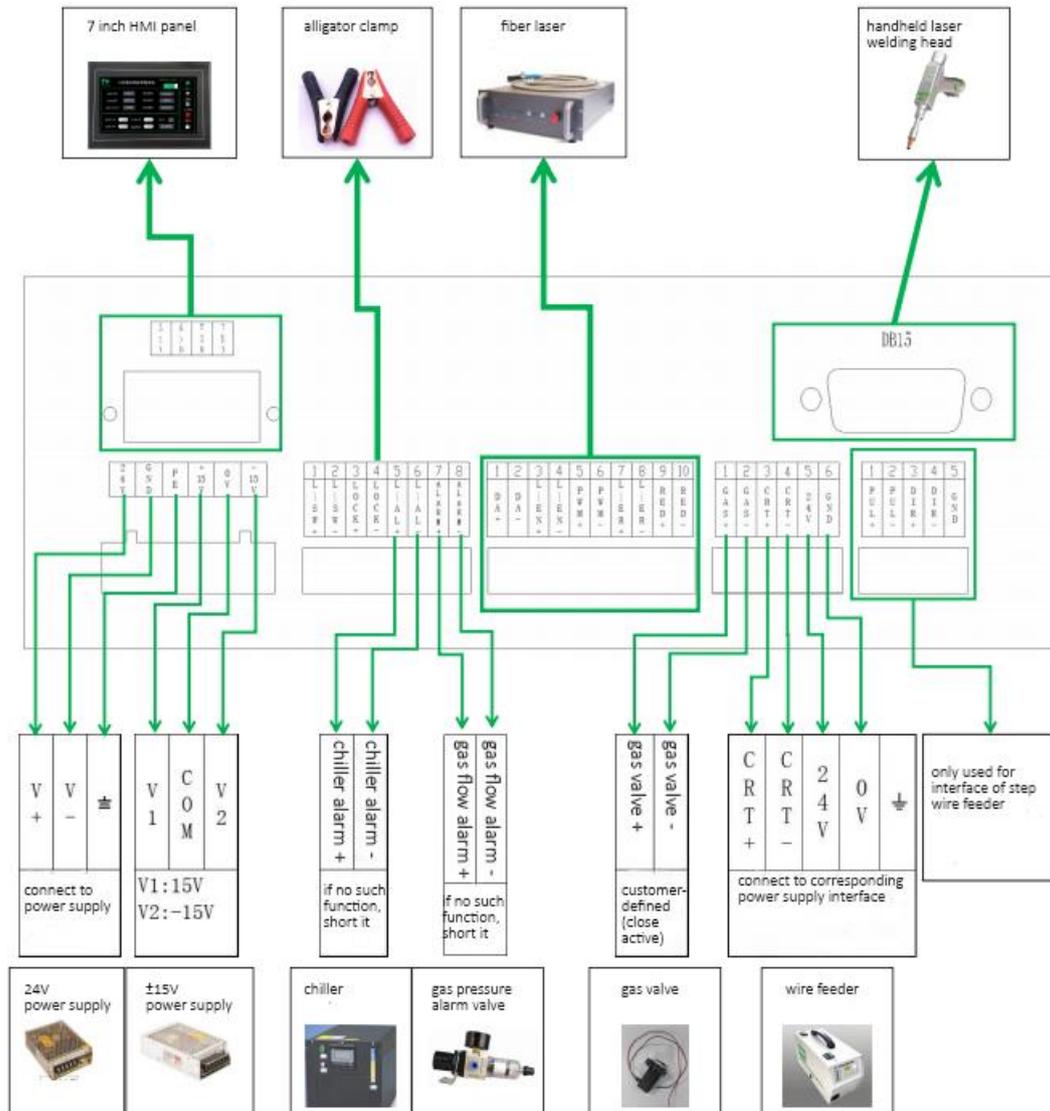
- Clean all dusts on the laser head surface.
- Loosen bolts to pull out the cover glass holder by pinching the 2 edges of the drawer-type holder.
- Seal the mounting openings with textured tape immediately.
- Remove the pressing ring and cover glass after wearing fingertips.
- Clean the cover glass holder and seal ring. The elastic seal ring should be replaced if it is damaged.
- Install the cleaned or new cover glass (regardless of the front or back surface) into the holder of cover glass.
- Install the pressing ring.
- Insert the cover glass holder back to the laser head and tighten the bolts.

## 2.6 Maintenance

1. Check whether cover glasses are contaminated before daily use. If so, replace them.
2. Check whether the QBH interface is loose before daily use. If so, tighten it.
3. Check if nozzle is blocked, and whether nozzle is conducted with safety lock normally. For the former, clear welding slag or replace nozzles. For the later, replace nozzle.
4. Check whether connecting cable contains water before daily use; If so, clean and check if there is water seepage.
5. Ensure that water and gas interfaces are connected correctly (assist gas in middle, water in/out on both sides).  
Gas/water cooling interface:  $\phi$  6mm



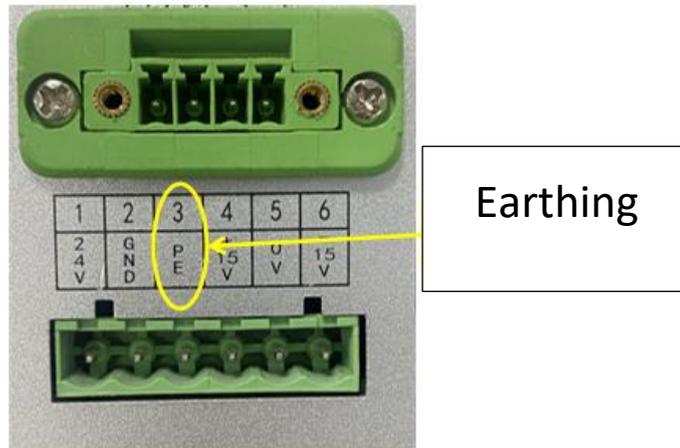
## 3 Controller



Wiring

### 3.1 Controller Power

24V and  $\pm 15V$  power supply are included in the standard kit and shall be connected to control box:



### 3.2 Connection of HMI Panel and Controller



Power communication cable of HMI panel

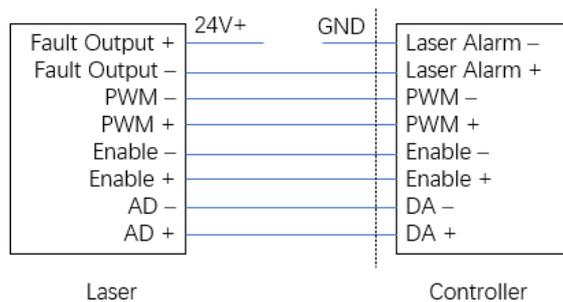


Controller Interface

### 3.3 Connection of Laser and Controller

Connect control box with Enable ±, PWM ± and DA ± of the laser (Fault signals are not required).

Different lasers require different wiring methods, and some lasers need to be interlocked before beaming out. For details, please refer to Table 6: Wiring of Controller and Fiber Laser (only for reference). If there is any discrepancy, please operate base on the instructions provided by manufacturers.

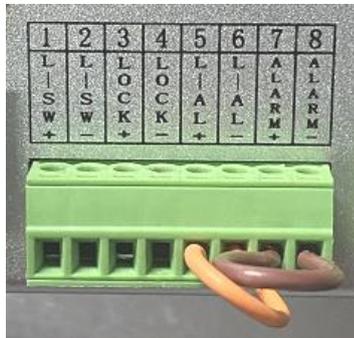


- Enable +: external Enable input signal + (generally PNP active)
- Enable -: external Enable input signal GND (generally PNP active)
- PWM +: external modulation input signal + (control laser modulation beaming)
- PWM -: external modulation input signal GND (control laser modulation beaming)
- DA+: analog input + (control laser beaming power)
- DA -: analog input GND (control laser beaming power)
- Fault +: fault signal output + (Controller receives alarm signal from laser)
- Fault -: fault signal output - (Controller receives alarm signal from laser)

### 3.4 Connection of Laser Head and Controller



DB15 connector



safety lock



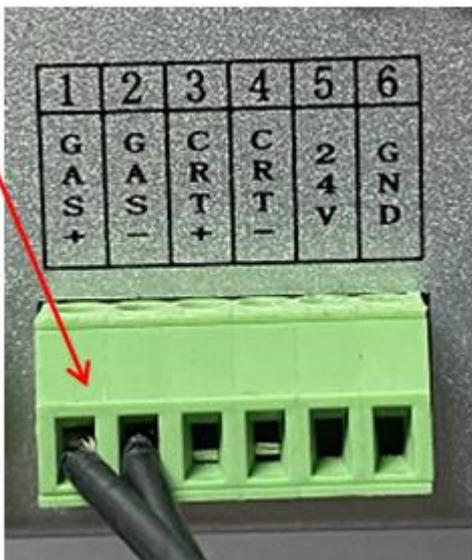
alligator clamp

Connect DB15 connector of laser head to control box.

Connect a cable of safety lock to alligator clamp, to ensuring laser beaming in processing.

### 3.5 Connection of Gas Valve & Wire Feeder & Controller

Gas Valve

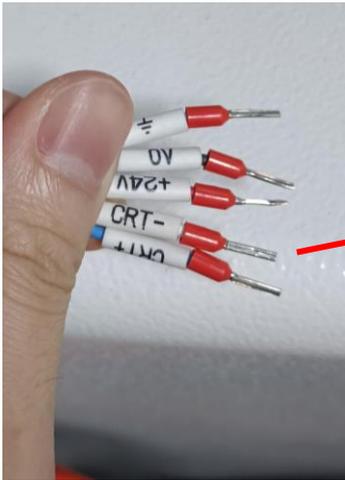


Gas-in

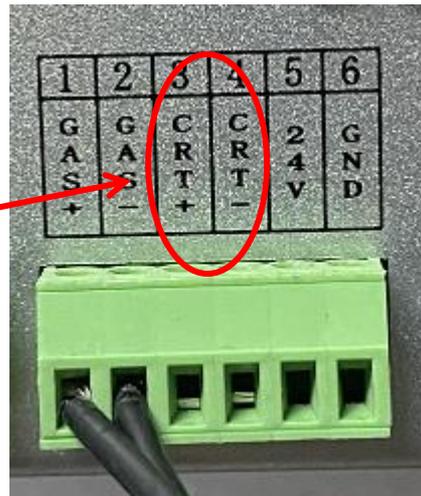


**Gas valve ±:** control switch of protective gas.

- **Valve +:** 24V + relay output, without additional relay to control;
- **Valve -:** 0V relay output, and customized solenoid valves have different inlet and outlet. Please connect correctly.



Control cable of wire feeder



Feeding wiring

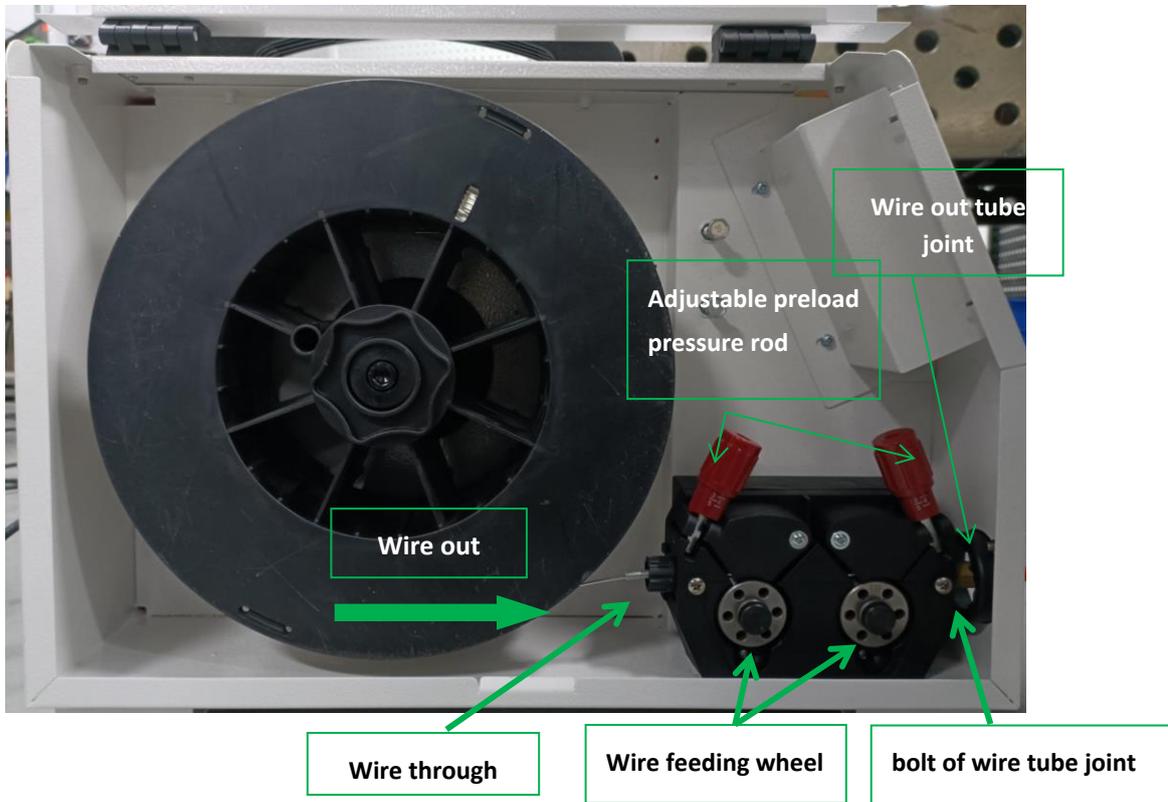
- **24V/0V:** Power supply of wire feeder, connect 24V and 0V power cables to 24V power supply.
- **CRT+/CRT-:** Feeding signal of wire feeder, connecting CRT+ and CRT- to wire contacts in controller. (connecting CRT+ and CRT- to start feeding and disconnecting to stop feeding.)

### 3.6 Connection of Alarm Signal



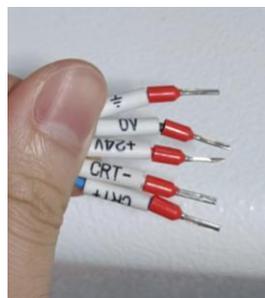
- **Chiller Alarm ±:** connect to chiller alarm interface, or short it if it's unnecessary.
- **Gas flow alarm ±:** connect to gas alarm device, or short it if it's unnecessary.

## 4 Wire Feeder

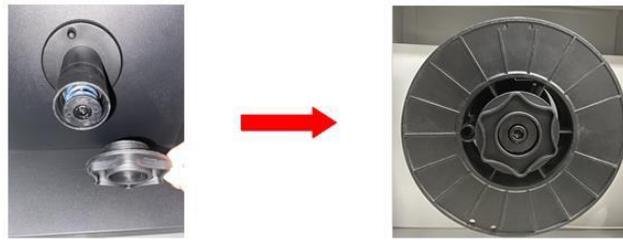


### 4.1 Installation of Wire Feeder

1. Two 24V input cables of wire feeder shall be connected to the 24V power supply or switch mode power supply of handheld laser head (power  $\geq$  80W). And signal cables CRT+ and CRT- shall be connected to control box.



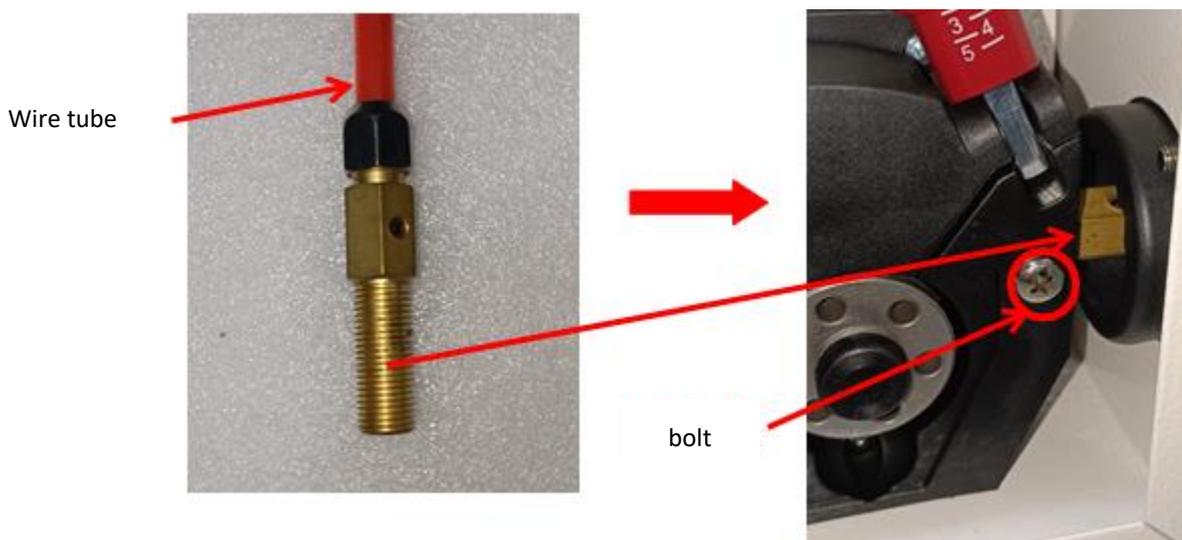
2. Hang the wire reel on the reel shaft of the wire feeder.



3. Confirm the groove diameter of the wire feeding wheel. Loosen the tension regulator of wire feeder; pass the wire through the wire leading nozzle and align it with the groove; tighten the tension regulator.



4. Connect the interface of wire tube; Press Manual Feeding in the panel to feed wire to the tube in the interface; Fix the wire feeding inlet onto the wire feeding mechanism; Tighten it by bolt.

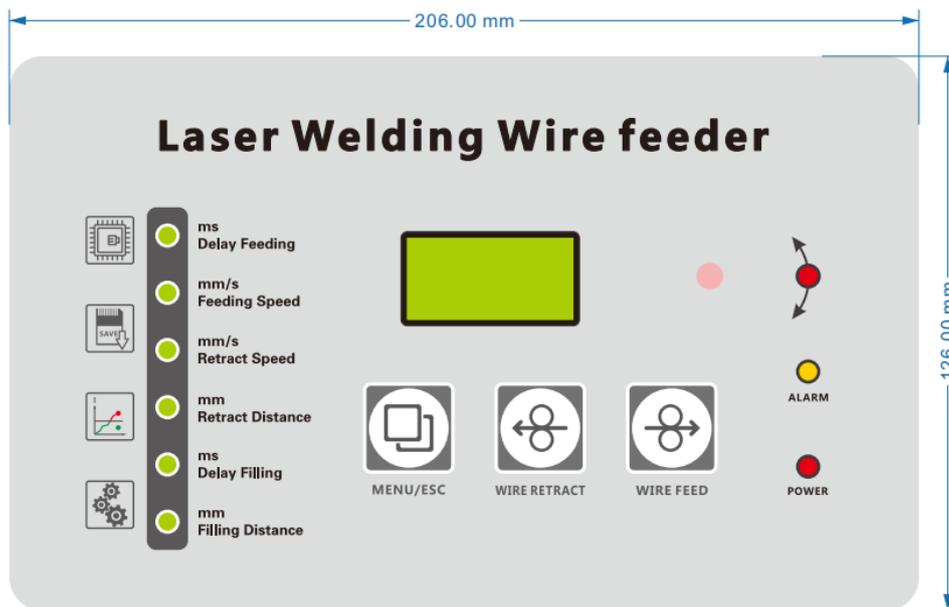




**Internal structure of wire feeder**

- Adjust the tension of tension regulator to enable stable wire feeding. Deliver the wire to wire feeding nozzle in manual feeding mode.

### 4.2 Software Operation of Wire Feeder



## 4.2.1 Button and Indicator



switch functions. Relevant parameters could be modified by rotating stepless knob, which can also change feeding speed in feeding status.



rotate to modify parameters when relevant indicator lights up.



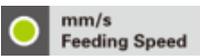
press to start wire feeding and release to stop wire feeding. (running with feeding speed)



press to start wire retracting and release to stop wire retracting. (running with retract speed)



lights up when it is selected and can be adjusted by rotating stepless knob.



lights up when it is selected and can be adjusted by rotating stepless knob.



lights up when it is selected and can be adjusted by rotating stepless knob.



lights up when it is selected and can be adjusted by rotating stepless knob.



lights up when it is selected and can be adjusted by rotating stepless knob.



lights up when it is selected and can be adjusted by rotating stepless knob.



lights up when power on.



lights up when the wire feeder fails.



switch function button to display relevant parameters. (display feeding speed in working status)

## 4.2.2 Parameter Setting

Item	Range	Unit	Recommended Value
Delay Feeding	0-500	ms	002
Feeding Speed	5-100	mm/s	015
Retract Speed	100	mm/s	100
Retract Distance	0-100	mm	010
Delay Filling	0-500	ms	005
Filling Distance	0- 100	mm	010

Technical Parameter	
Model	RT-HWS-YB80A
Voltage	DC24V
Power	80W
Motor	PMDC motor
Speed Adjusting	PWM open-loop adjusting
Wire Size	0.6/0.8/1.0/1.2/1.6/2.0 (mm)
Feeding Speed	5-100(mm/s)
Size	580*310*460mm
Weight	15kg

## 4.3 Troubleshooting of Wire Feeder

S/N	Fault	Reason	Solution
1	Power LED doesn't work.	24V DC power supply is poor.	Check aviation plug and test whether there is 24V DC on the 1 and 2 holes.
		Poor contact from the aviation plug to the circuit board socket in chassis	Open side-plate of chassis and check socket connection.
2	Wire feeding fails by operating welding head.	Poor welding / disconnection of internal cables of switch plug of welding head	Replace the plug and check the connecting cables.
		Wire feeding motor fails	Replace wire feeding motor
		Out of wire	Replace wire reel
		Motor plug loose on drive card	Replug
		Welding wire knotted	Loosen the tension regulator and rewind the wire
		Wire feeding tube knotted	Straighten out the wire feeding tube
		The welding wire is blocked at the outlet of wire feeder	Adjust wire tube to align with the outlet of wire feeder
		Wire feeding tube blocked	Replace wire tube
		Insufficient tension	Loosen the brake of wire reel
		Control board fails	Replace the control board
3	Unstable wire feeding speed and poor wire feeding.	The welding wire is knotted in the wire reel	Remove the knotted part and rewind the wire
		Mismatch or wear of wire tube	Replace wire tube
		Improper wire wheel	Replace wire wheel
		Incorrect tension by tension regulator	Modify the tension
		Wire feeding motor fails	Replace wire feeding motor
		Drive card fails	Replace drive card
		Wire tube blocked	Replace or clean the wire tube
		The bending angle of wire tube is less than 30 degrees	Put the wire feeding tube straight
		Deformation of wire tube after extrusion	Replace wire tube

S/N	Fault	Reason	Solution
4	HMI panel display fails.	HMI panel doesn't work	Replace circuit board
5	Can't adjust feeding speed and it always keeps the highest speed.	Speed feedback loop doesn't work	Replace encoder cable behind wire feeder/ replace main board/ replace wire feeder.
6	Other faults	Difficult to describe	Send the manufacturer for repair.

## 4.4 Maintenance of Wire Feeder

### 4.4.1 Normal Maintenance

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

### 4.4.2 Remark

#### Operation Environment

- The wire feeder is for indoor use with IP2X protection grade. Do not use it near water.
- Working Temperature: - 10°C– 40°C.
- Don't place it on the table with strong vibration or great impact.

#### Use Attention

- When installing the wire reel or inserting wire into the wire tube, don't wear gloves to avoid winding caused by the rotation of rotating parts.
- Ensure the weight of wire reel is no more than 20kg, otherwise the wire reel may fall off.
- Close the right-side plate of wire reel when welding, otherwise electric shock or winding may occur caused by the rotation of rotating parts.
- Before welding, please ensure the real shaft end cover is tightened, otherwise the wire reel may fall off.

## 4.5 Auto Feeding Speed Adjustment

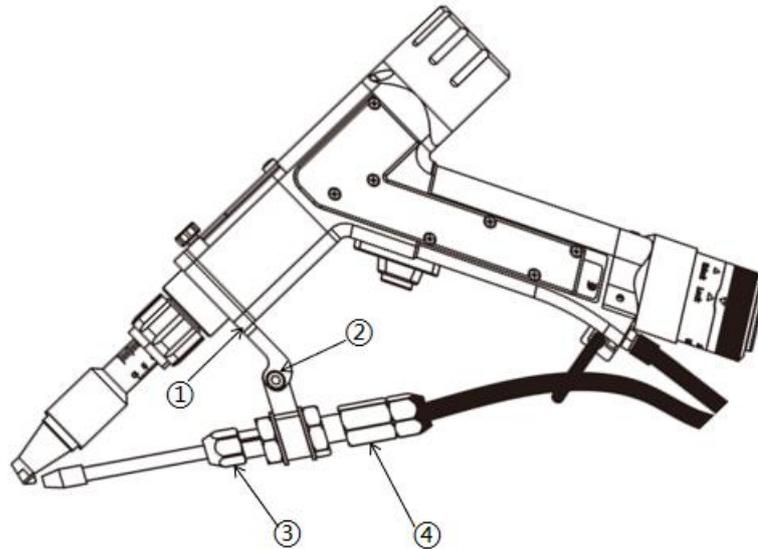
### Pre-adjust:

1. Press wire feeding button on HMI panel.
2. Adjust the power to 0W.
3. Press and hold the control button of head, adjust feeding speed at low level (015-025).
4. Knob the two adjustable rotation sleeves of tension regulator until wire reel rotates uniformly (Ensure that the wire tube is smooth without bending).

### Real-time Adjust:

Adjust feeding speed and other parameters manually according to actual processing effect.

## 5 Connection of Wire Feeding Mechanism and Laser Head



- ①: Fix the wire feeding connecting part onto laser head by M2.5\*5 screws.
- ②: Tighten the connecting part by M4\*12 screws, and adjust it to control feeding angle.
- ③: Adjust feeding distance by extending wire tube and fix with bolts.
- ④: Tighten wire tube with M5\* 4 jacking screw.

- Remove the nozzle for wire feeding.



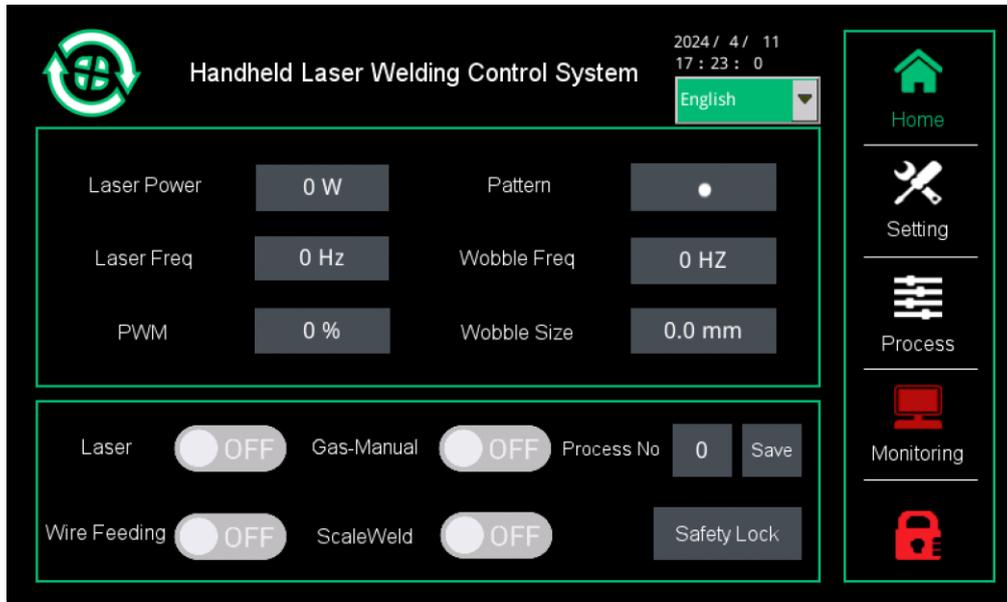
- Press  on the panel to feed wire out.
- Install the nozzle on the wire feeding assembly after wire passes through the nozzle.
- Fix the wire feeding assembly on the laser head.
- Adjust the wire feeding angle to align laser beam with wire.
- Tighten all bolts.



**Ensure wire reel is smooth without knots.**

## 6 HMI Panel

### 6.1 Main Interface



### 6.2 Home Description



multifunction button.

**Laser Power**

laser output power(range: 0 to 3kW).

**Pattern**

click to switch between SpotWeld or Line Wobble Weld.

**Laser Freq**

number of laser pulses emitted by the laser per second.

**Wobble Freq**

range: 0-200Hz.

**PWM**

ratio of pulse duration to pulse cycle (range: 0-100%).

**Wobble Size**

adjust wobble line length when welding.

**Laser**



open/close laser



open/close wire feeding



open when spot-welding is required.

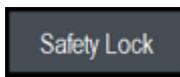


open to blow continuously when testing.

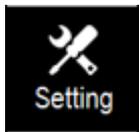


16 types (1-16) with relevant parameters. Process No. can be selected on Process

Interface.



show status of safety lock. Green: conductive; Grey: non-conductive.



support to modify parameters in basic setting and galvo setting interfaces.



contain process reference parameters, which can be modified or selected to use.



display red if alarms occur. Please check I/O status and fault signals.



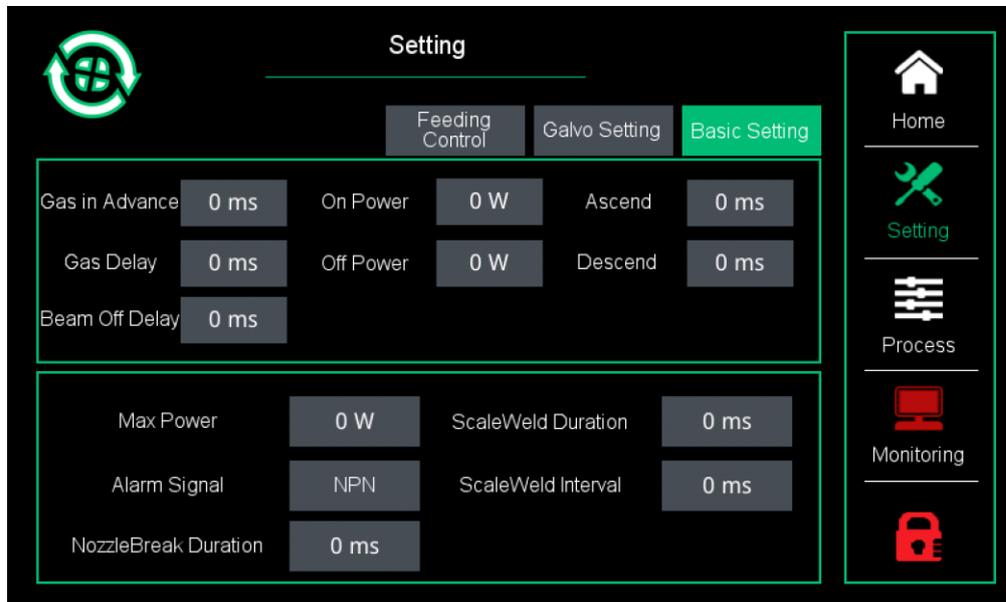
lock HMI in order to prevent other people from touching the screen by mistake when the operator is welding or debugging. It is used to secure the safety of the operator. Click it to switch locking and unlocking status.



select different languages.

## 6.3 Setting

### 6.3.1 Basic Setting



**Gas in Advance** gas blow duration from laser on to beaming.

**Gas Delay** gas blow duration after laser off.

**Beam Off Delay** beaming duration after laser off. It is used to weld melt welding wire.

**On Power** starting power of power ascending process, adjusted with ascent duration.

**Off Power** ending power of power descending process, adjusted with descent duration.

**Ascend** duration from the lowest power to set power after starting beaming.

**Descend** duration from set power to 0 after stopping beaming.

**Max Power** set according to actual laser (power range:0- 3000W).

**Alarm Signal** select PNP/NPN active (24V - PNP active).

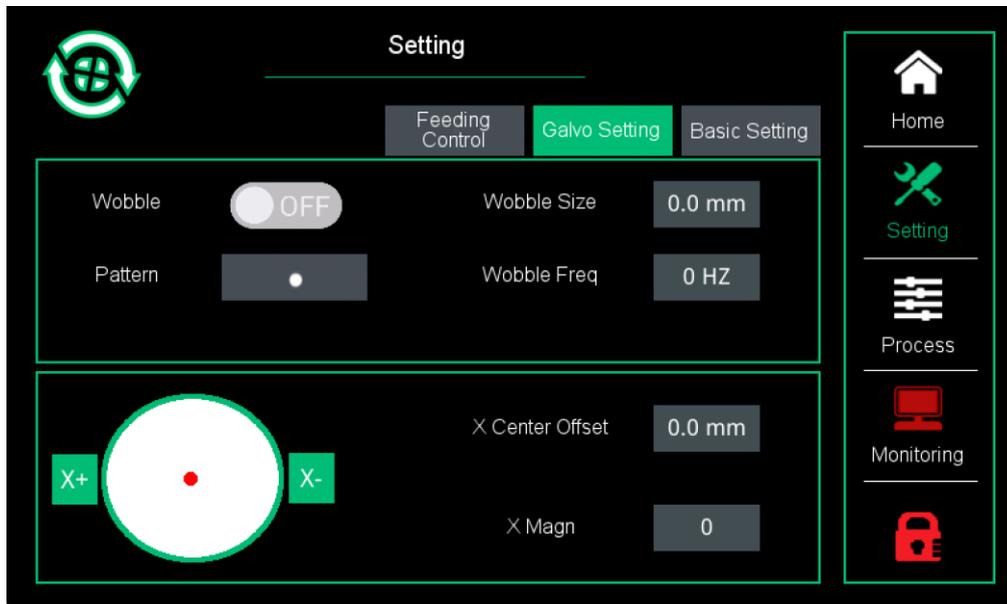
**NozzleBreak Duration** beaming duration when the nozzle temporarily separates from workpiece.

Beaming will stop if the non-contact duration is longer than this parameter.

**ScaleWeld Duration** adjust beaming duration of scale welding according to the reality.

**ScaleWeld Interval** beaming stopping interval of scale welding.

## 6.3.2 Galvo Setting



**Wobble**  OFF open/close red wobble function, only used for commissioning of red light.

**Pattern** wobble graphic: line or spot.

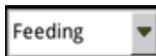
**Wobble Size** wobble line length (range: 0-5mm).

**Wobble Freq** range: 0-200Hz.

**X Center Offset** galvo center correction, finished before selling, but allowing fine adjustment in actual usage.

**X Magn** finished before selling, but allowing fine adjustment in actual usage.

## 6.4 Process



switch parameters of feeding and no-feeding.



current process No., valid after saving modified parameters.



click to apply selected process No.

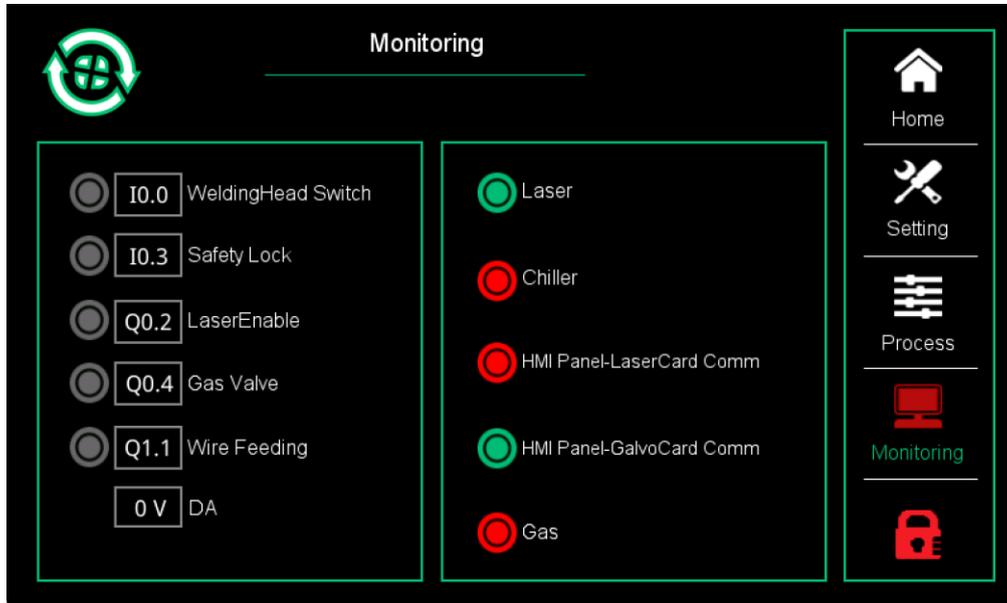


click to edit parameters.



click to restore defaulted parameters.

## 6.5 Monitoring



### output/input status:



display laser head status (open/close).



display if laser head is in contact with workpiece, and only with IO.3 contact beaming is allowed for safety operation.



display output status of laser enable signal.



display output status of gas valve.



display feeding signal of wire feeder.

### Alarm status:



green-normal, red-abnormal.



green-normal, red-abnormal.



green-normal, red-abnormal.

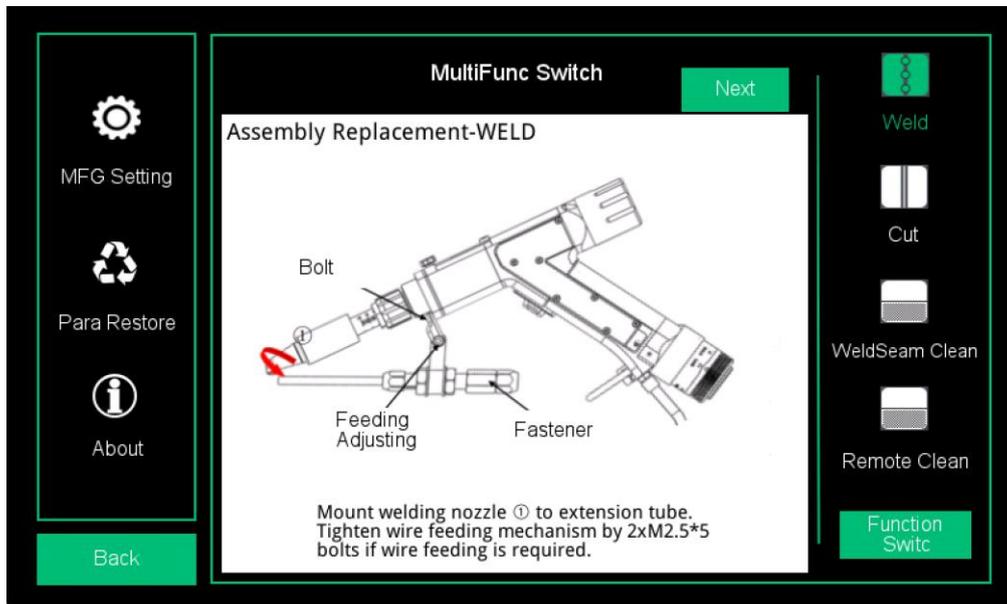


green-normal, red-abnormal.



green-normal, red-abnormal.

## 6.6 Function Switch



Click  to switch different function interface:

 **Weld** display the interface of welding assembly replacement, and click  for nozzle selection.

 **Cut** display the interface of cutting assembly replacement.

 **WeldSeam Clean** display the interface of weldseam cleaning assembly replacement.

 **Remote Clean** display the interface of remote cutting assembly replacement.

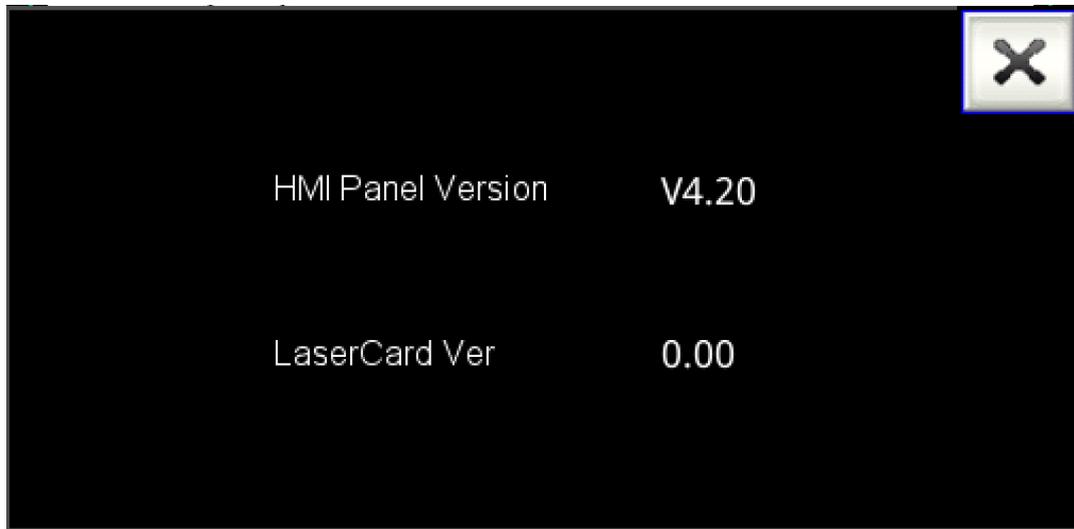
 **Function Switch** select required function and click it to switch function interface.

 **MFG Setting** manufacturer setting, requiring permission to operate. Please contact the seller if it's necessary.

 **Para Restore** click to restore default factory setting. This operation will clean all modified parameters.

 **About** display hardware version like HMI panel, laser control card.

## 6.7 About

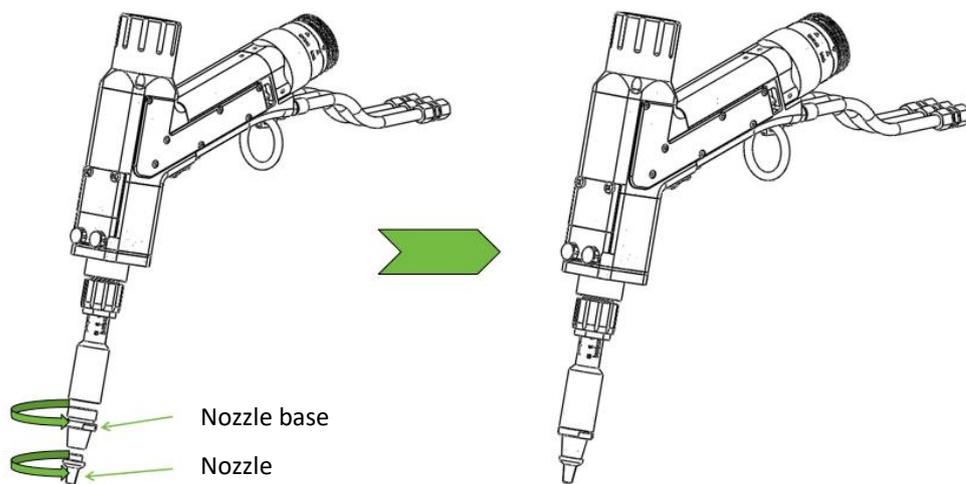


Each version product match corresponding device, including HMI pane version and laser card version. For following version upgrade, please contact the manufacturer.

## 7 Multi-Function

### 7.1 Cut

#### 7.1.1 Config.



#### **BW101-GS SERIES supports cutting.**

- Remove wire feeding assembly and nozzle.
- Install the nozzle base on the extending tube and install the nozzle on the base as above.
- Select Cut function in App.
- Adjust parameters according to actual processing requirements.

#### **Working principle:**

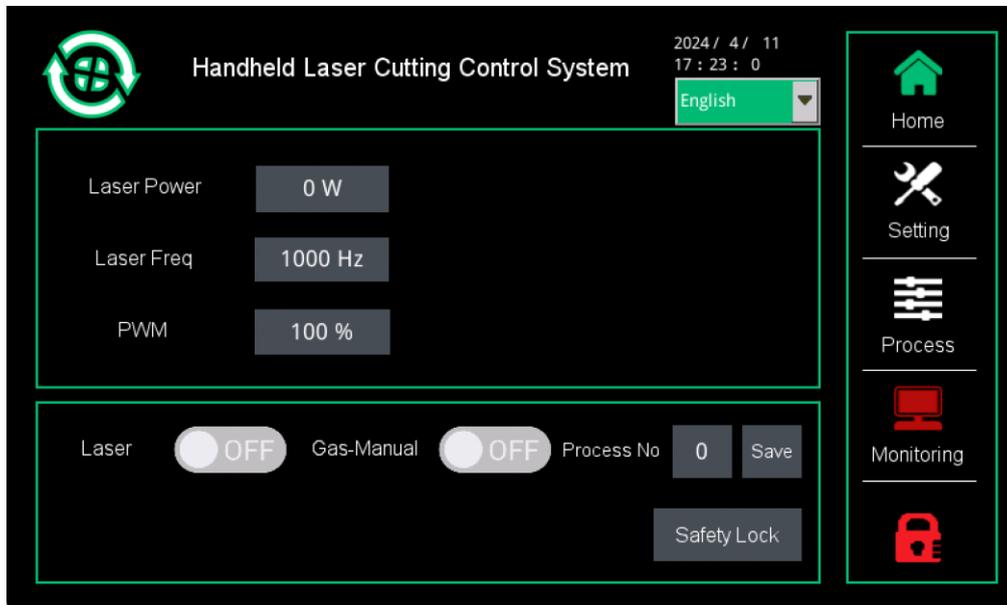
Laser beam strikes the workpiece to reach its melting point and boiling point. And high-pressure gas with beam blows molten or vaporized metal. With movement of laser beam and workpiece, material will display cutting seam and achieve cutting effect. Handheld cutting function is mainly used for sheet metal in metal appliances, sheet metal manufacturing and other industries.

#### **Feature:**

Convenient to operate; flexible and fast

## 7.1.2 Software Setting

Home page:



### Laser Power

laser output power (range: 0 to 3kW).

### Laser Freq

number of laser pulses emitted by the laser per second.

### PWM

ratio of pulse duration to pulse cycle (range: 0-100%).

### Laser



open/close laser

### Gas-Manual



open to blow continuously when testing.

### Process No

0

16 types (1-16) with relevant parameters. Process No. can be selected on Process Interface.

### Safety Lock

show status of safety lock. Green: conductive; Red: non-conductive.



### Setting

support to modify parameters in basic setting and galvo setting interfaces.



### Process

contain process reference parameters, which can be modified or selected to use.

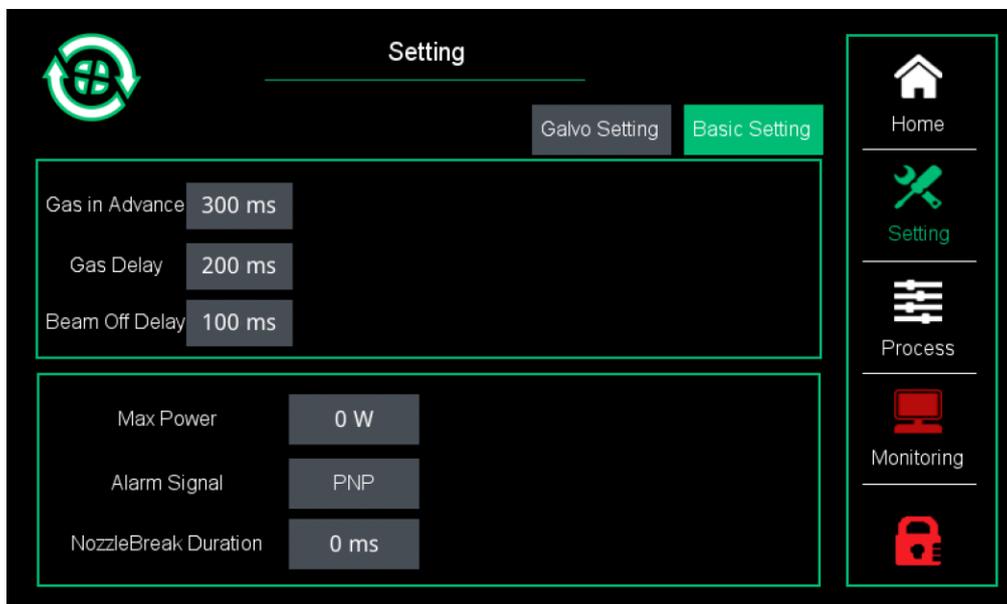


display red if alarms occur. Please check I/O status and fault signals.



lock HMI in order to prevent other people from touching the screen by mistake when the operator is welding or debugging. It is used to secure the safety of the operator. Click it to switch locking and unlocking status.

### Basic Setting:



**Gas in Advance** gas blow duration from laser on to beaming.

**Gas Delay** gas blow duration after laser off.

**Beam Off Delay** beaming duration after laser off. It is used to weld melt welding wire.

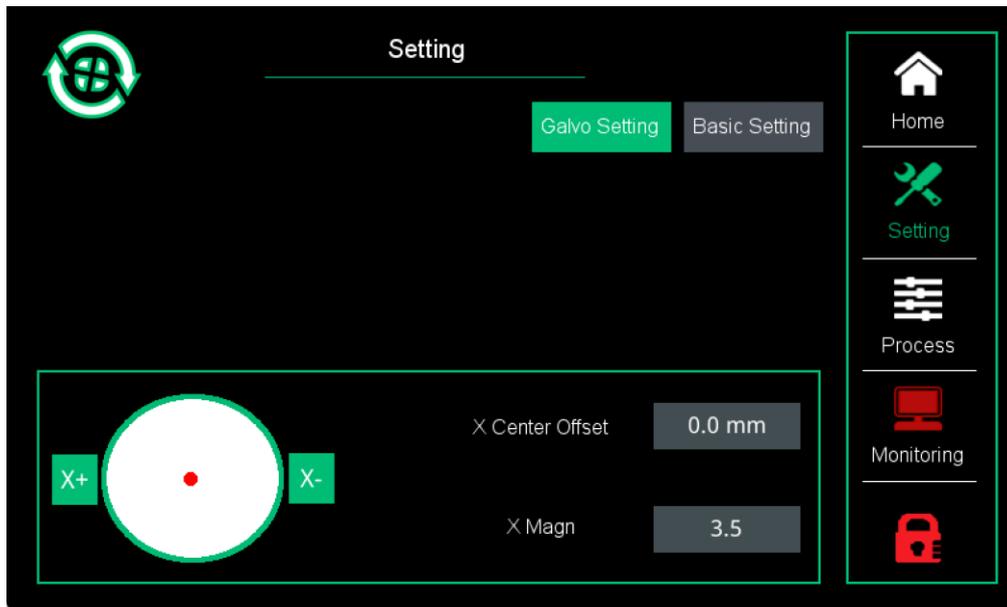
**Max Power** set according to actual laser (power range:0- 3000W).

**Alarm Signal** select PNP/NPN active (24V - PNP active).

**NozzleBreak Duration** beaming duration when the nozzle temporarily separates from workpiece.

Beaming will stop if the non-contact duration is longer than this parameter.

## Galvo Setting:



**X Center Offset**

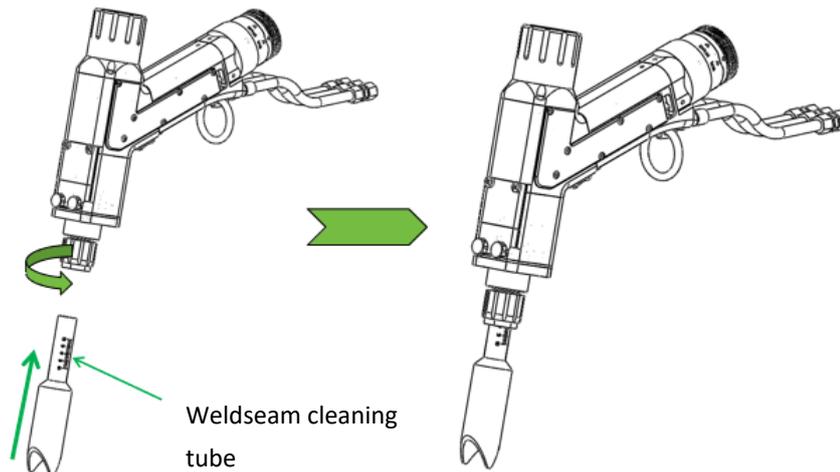
galvo center correction, finished before selling, but allowing fine adjustment in actual usage.

**X Magn**

finished before selling, but allowing fine adjustment in actual usage.

## 7.2 WeldSeam Clean

### 7.2.1 Config.



#### **BW101-GS SERIES supports weld seam cleaning.**

- Remove extending tube and wire feeding assembly.
- Install weldseam cleaning tube and tighten it as above.
- Adjust focus point and select WeldSeam Clean function in App.
- Adjust parameters according to actual processing requirements.

#### **Function:**

Paint removal, rust removal, oil removal before welding.

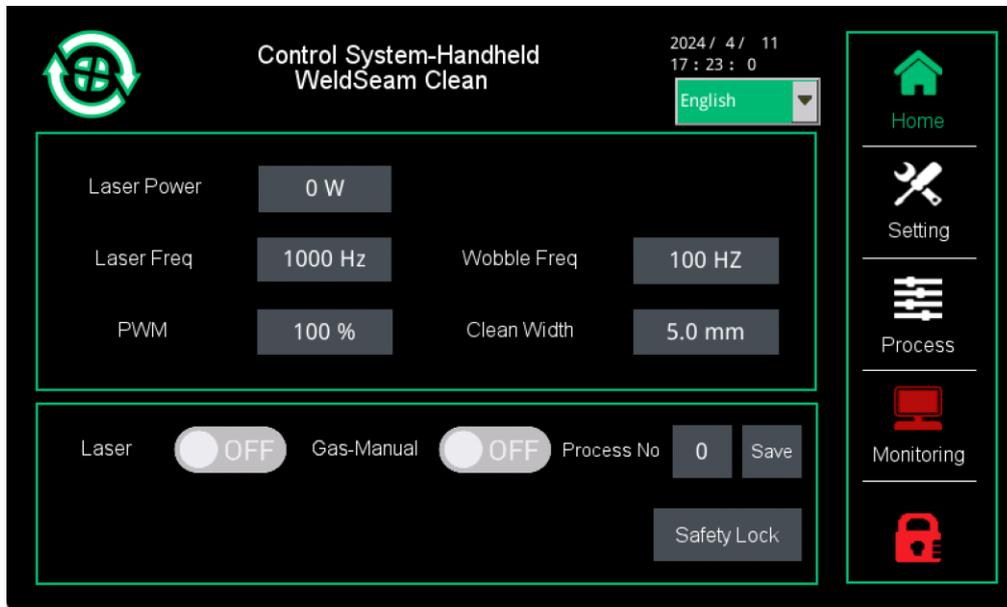
Oxide and residue treatment after welding.

#### **Feature:**

Low power; small processing field; convenient to operate.

## 7.2.2 Software Setting

Home Page:



### Laser Power

laser output power (range: 0 to 3kW).

### Laser Freq

number of laser pulses emitted by the laser per second.

### Wobble Freq

range: 0-150Hz.

### PWM

ratio of pulse duration to pulse cycle (range: 0-100%).

### Clean Width

wobble line length when wobble cleaning

### Laser



open/close laser

### Gas-Manual



open to blow continuously when testing.

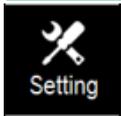
### Process No

0

16 types (1-16) with relevant parameters. Process No. can be selected on Process Interface.

### Safety Lock

show status of safety lock. Green: conductive; Red: non-conductive.



Setting

support to modify parameters in basic setting and galvo setting interfaces.



Process

contain process reference parameters, which can be modified or selected to use.



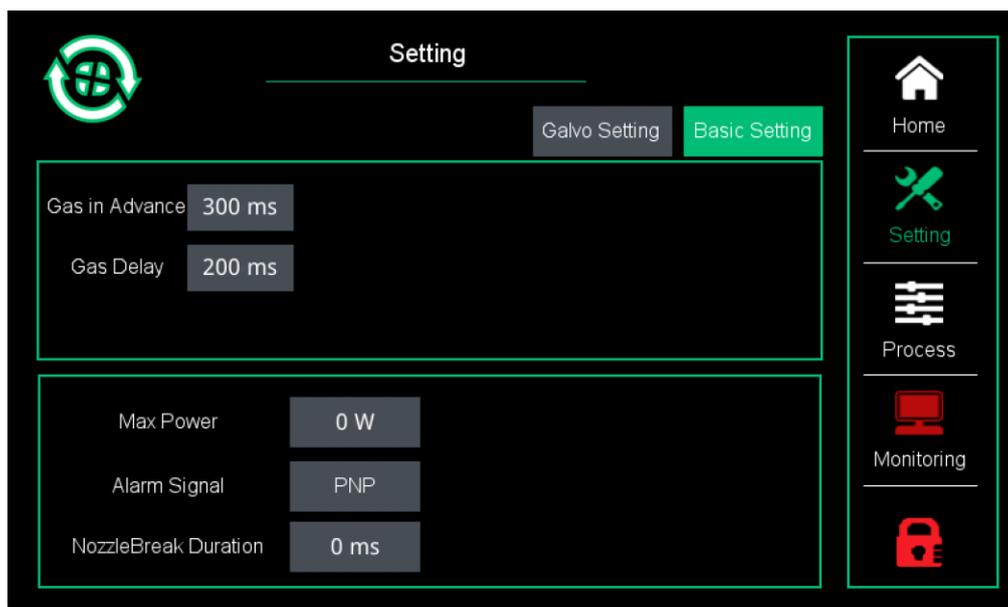
Monitoring

display red if alarms occur. Please check I/O status and fault signals.



lock HMI in order to prevent other people from touching the screen by mistake when the operator is welding or debugging. It is used to secure the safety of the operator. Click it to switch locking and unlocking status.

## Basic Setting



Gas in Advance

gas blow duration from laser on to beaming.

Gas Delay

gas blow duration after laser off.

Max Power

set according to actual laser (power range:0- 3000W).

Alarm Signal

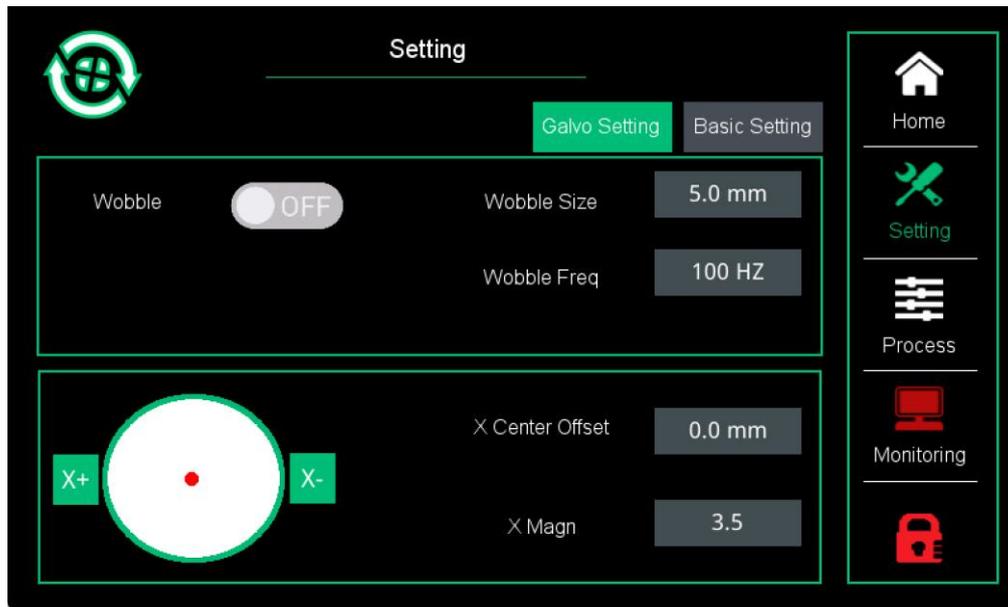
select PNP/NPN active (24V - PNP active).

NozzleBreak Duration

beaming duration when the nozzle temporarily separates from workpiece.

Beaming will stop if the non-contact duration is longer than this parameter.

## Galvo Setting



open/close red wobble function, only used for commissioning of red light.



wobble line length (range: 0-5mm).



range: 0-200Hz.



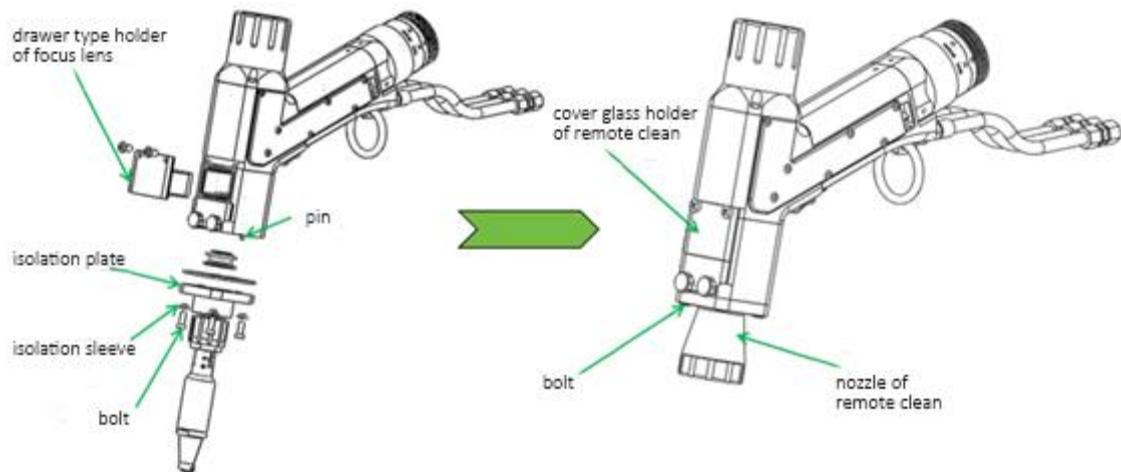
galvo center correction, finished before selling, but allowing fine adjustment in actual usage.



finished before selling, but allowing fine adjustment in actual usage.

## 7.3 Remote Clean (Optional)

### 7.3.1 Config.



#### **BW101-GS SERIES supports remote cleaning.**

- Remove two circle head screws of drawer type holder of focus lens by hex wrench.
- Remove the holder and install a lens holder of remote clean.
- Remove nozzle assembly and install a cleaning tube.
- Tighten the cleaning tube.
- Adjust focus point and select Remote Clean function in App.
- Adjust parameters according to actual processing requirements.

#### **Function:**

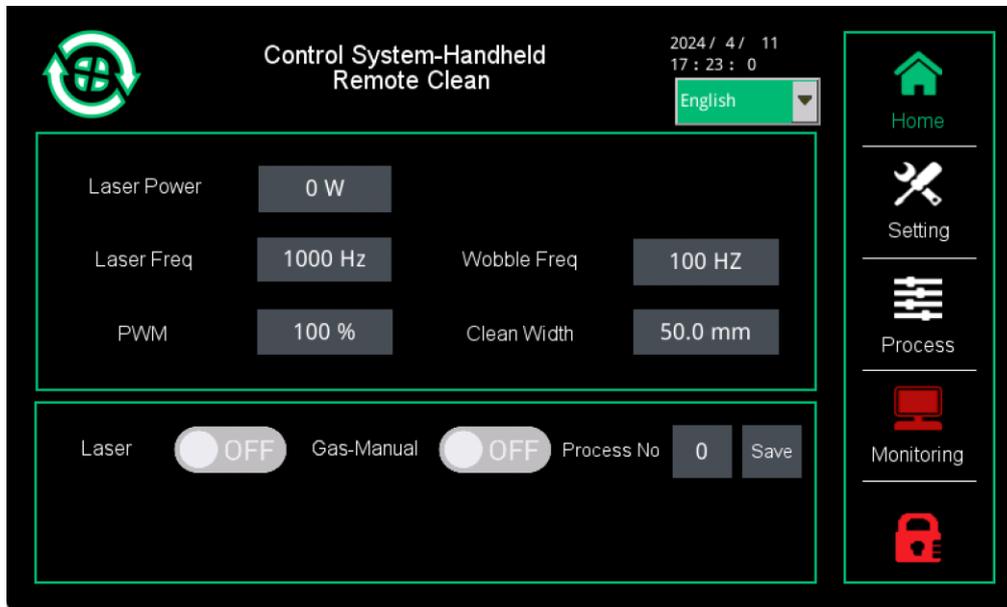
Remove metal surface coating, paint, metal oxide.

#### **Feature:**

Low power; middle processing field; without direct contact with workpiece; convenient to operate.

## 7.3.2 Software Setting

Home Page:



**Laser Power**

laser output power (range: 0 to 3kW).

**Laser Freq**

number of laser pulses emitted by the laser per second.

**Wobble Freq**

range: 0-150Hz.

**PWM**

ratio of pulse duration to pulse cycle (range: 0-100%).

**Clean Width**

adjust cleaning width (0-80mm)

**Laser**



open/close laser

**Gas-Manual**



open to blow continuously when testing.

**Process No**

0

16 types (1-16) with relevant parameters. Process No. can be selected on Process Interface.



support to modify parameters in basic setting and galvo setting interfaces.



contain process reference parameters, which can be modified or selected to use.

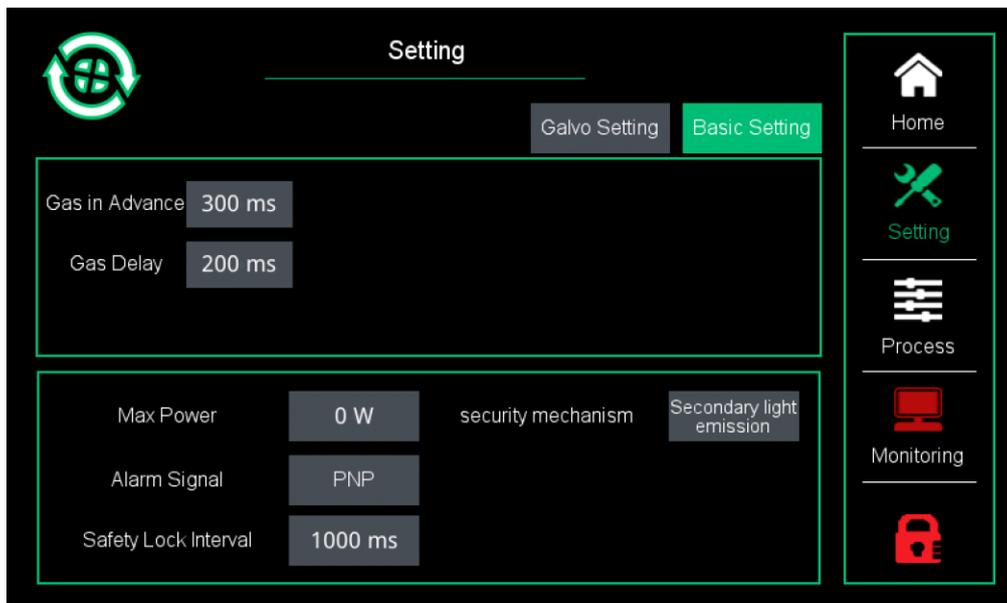


display red if alarms occur. Please check I/O status and fault signals.



lock HMI in order to prevent other people from touching the screen by mistake when the operator is welding or debugging. It is used to secure the safety of the operator. Click it to switch locking and unlocking status.

## Basic Setting



**Gas in Advance** gas blow duration from laser on to beaming.

**Gas Delay** gas blow duration after laser off.

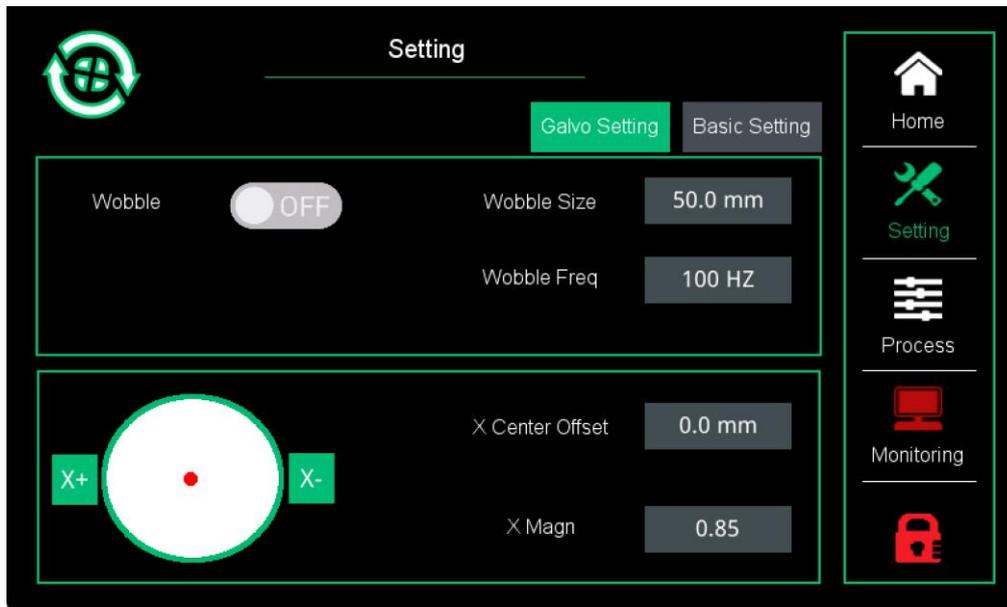
**Max Power** set according to actual laser (power range:0- 3000W).

**Alarm Signal** select PNP/NPN active (24V - PNP active).

**NozzleBreak Duration** beaming duration when the nozzle temporarily separates from workpiece.

Beaming will stop if the non-contact duration is longer than this parameter.

## Galvo Setting



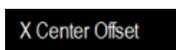
open/close red wobble function, only used for commissioning of red light.



wobble line length: 0-5mm.



range: 0-200Hz.

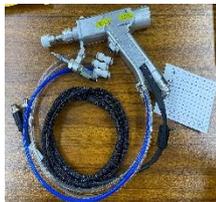


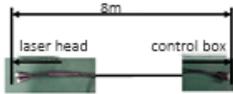
galvo center correction, finished before selling, but allowing fine adjustment in actual usage.



finished before selling, but allowing fine adjustment in actual usage.

**Table 1: Bill of Material**

Item	Description	Parts	Qty	Image for reference
Processing head	Handheld laser processing head (3kW)		1pcs	
Control box kit	control box kit (RT-ZY300)		1pcs	
HMI panel kit	HMI panel kit-standard version	Panel	1pcs	
		Power communication cable	1pcs	
Power supply	24V-100W		1pcs	
	± 15V-55W		1pcs	
Motor cable (select 1 of 2)	Motor cable (8m)	10m (cable: 8m+head: 2m)	1pcs	

	Motor cable (13m)	15m (cable:13m+head: 2m)		 
Accessories package	Accessories package- standard version	Nozzle box kit	1pcs	
		Cover glass D18*2	5pcs	
		alligator clamp & cable	1pcs	
		Open end wrench	1pcs	
		Open end wrench	1pcs	

## Consumables:

Item	Specification	Image for reference
Cover glass	D18*2-1064nm-3kW	
Seal ring	For cover glass	

**Table 2: Optional Material Bill**

Item	Description	Qty	Image for reference
Wire feeder for welding	Including wire feeder, power signal cable, wire tube, wire wheel (0.8-1.0 V-type *2, 1.2-1.6 V-type *2), caster (swivel caster *2, rigid caster *2)	1pcs	
AI wire feeding kit	Including graphene wire tube (3m), wire wheel (0.8-1.0 U-type *2, 1.2-1.6 U-type *2)	1pcs	
Remote clean package	Including focus lens module and other remote clean accessories	1pcs	
Dual wire feeding assembly	F150 dual wire feeding, compatible with 1.2/1.6/2.0 wire, including 3 types of nozzles, welding nozzle and main body module	1pcs	
Laser protective glass	OD4+, 1064nm	1pcs	
Power supply cable kit	Including 220V power input cable*2, ±15V power output cable*1 and 24V power output cable*1	1pcs	

**Table 3: Nozzle Selection**

Product ID	Type	Image	In-corner	Out-corner	Butt	Wire Dia.	Qty
120W50513E	In-corner					/	1
120W50514E	Wire 1.2mm					0.8-1.2	2
120W50515E	Wire 1.6mm					1.2-1.6	1
120W50524B	Out-corner					/	1
120W50517E	Out-corner wire 1.2mm					0.8-1.2	1
120W50518E	Out-corner wire 1.6mm					1.2-1.6	1

**Table 4: Troubleshooting**

Faults	Description	Solution
Communication alarm of HMI panel	Poor wiring	Check wiring and restart after 2 mins.
No beaming of laser	Laser alarm	1. Restart.
		2. Check wiring.
		3. Check if laser is encrypted.
		4. Check QBH for firm lock status if fiber interface interlock is under alarm.
		5. Replace QBH if alarm stays intermittently or continuously.
	NO laser alarm	1. If the red beam indication is normal, wobble in red beam to observe whether it is centered.
		2. If wobble function is normal, check the process parameter setting.
		3. Check whether the beam is locked or the focus is wrong.
		4. Check if optics contamination occurs in head or laser can work independently.
Unfamiliar to select nozzle	/	Refer to Table 3: Nozzle Selection
Wire feeder not working	Wiring	Check wiring as chapter 5. Independent power supply is suggested.
	Installation	Check installation from wire feeder to wire feeding mechanism. (refer to user manual or installation video)

**Table 5: Process Parameter**

 <b>Handheld Laser Head-Process Parameter (Wire Feeding)</b>									
Laser	CW		Power	3000W		Handheld laser head : collimation/focus length: F60//F150			
Core dia.	50 μ M		Protective gas	Nitrogen /argon		Gas flow	20L/min	Gas purity	≥99.99
Material	Thickness (MM)	Power (W)	PWM (%)	Freq. (HZ)	Focus	Wobble size	Wobble freq.	Wire feeding dia./velocity	Fusion depth
SS	1.0MM	600W	100%	1000 HZ	-1.5	2.0MM	80HZ	14mm/s 0.8mm	1.0MM
	1.5MM	800W	100%	1000 HZ	-2	2.0MM	80HZ	14mm/s 1.0mm	1.5MM
	2.0MM	1000W	100%	1000 HZ	-2	2.0MM	70HZ	12mm/s 1.0mm	2.0MM
	3.0MM	1500W	100%	1000 HZ	-2	2.5MM	60HZ	10mm/s 1.2mm	2.5MM
	4.0MM	2000W	100%	1000 HZ	-3	3.0MM	50HZ	6mm/s 1.6mm	3.0MM
	5.0MM	2500W	100%	1000 HZ	-3	3.5MM	50HZ	5mm/s 2.0mm	3.5MM
	6.0MM	3000W	100%	1000 HZ	-3	4.0MM	40HZ	5mm/s 2.0mm	4.0MM
Al Alloy (Al-Mg)	1.0MM	600W	100%	1000 HZ	0	2.0MM	70HZ	14mm/s 1.0mm	1.0MM
	2.0MM	1000W	100%	1000 HZ	0	2.5MM	70HZ	12mm/s 1.2mm	2.0MM
	3.0MM	1500W	100%	1000 HZ	-1	2.5MM	60HZ	10mm/s 1.2mm	2.5MM
	4.0MM	2000W	100%	1000 HZ	-2	3.0MM	60HZ	10mm/s 1.6mm	3.0MM
	5.0MM	2500W	100%	1000 HZ	-3	3.5MM	60HZ	8mm/s 2.0mm	3.5MM
MS	1.0MM	600W	100%	1000 HZ	+2	2.0MM	80HZ	14mm/s 0.8mm	1.0MM
	2.0MM	1000W	100%	1000 HZ	+2	2.0MM	80HZ	14mm/s 1.0mm	2.0MM
	3.0MM	1500W	100%	1000 HZ	+2	2.5MM	60HZ	10mm/s 1.2mm	2.5MM
	4.0MM	2000W	100%	1000 HZ	+2	3.0MM	50HZ	10mm/s 1.6mm	3.0MM
	5.0MM	2500W	100%	1000 HZ	+4	3.0MM	50HZ	8mm/s 2.0mm	3.5MM
	6.0MM	3000W	100%	1000 HZ	+4	3.0MM	50HZ	8mm/s 2.0mm	4.0MM

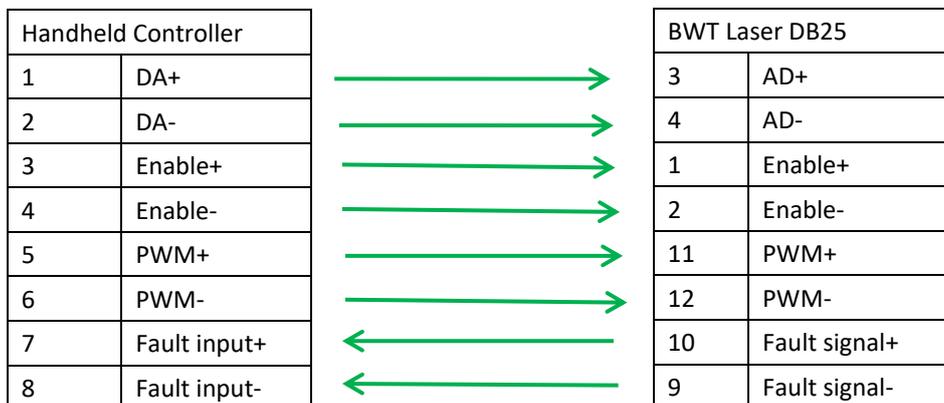
 <b>Handheld Laser Head-Process Parameter (NO Wire Feeding)</b>									
Laser		CW		Power		3000W		Handheld laser head: collimation/focus length: F60//F150	
Core dia.		50 μ M		Protective gas		Nitrogen/argon		Gas flow 20L/min Gas purity ≥99.99	
Material	Thickness (MM)	Power (W)	PWM (%)	Freq. (HZ)	Focus	Wobble size	Wobble freq.	Wire feeding dia./velocity	Fusion depth
SS	1.0MM	500W	100%	1000HZ	0	1.5MM	100HZ	16mm/s	1.0MM
	1.5MM	700W	100%	1000HZ	0	1.8MM	100HZ	16mm/s	1.5MM
	2.0MM	1000W	100%	1000HZ	0	2.0MM	100HZ	14mm/s	2.0MM
	2.5MM	1200W	100%	1000HZ	0	2.0MM	80HZ	14mm/s	2.5MM
	3.0MM	1500W	100%	1000HZ	-1.5	2.5MM	60HZ	14mm/s	3.0MM
	4.0MM	2000W	100%	1000HZ	-2	3.0MM	60HZ	10mm/s	3.5MM
	5.0MM	2500W	100%	1000HZ	-2.5	3.5MM	60HZ	8mm/s	4.0MM
Al Alloy (Al-Mg)	1.0MM	500W	100%	1000HZ	0	1.5MM	100HZ	16mm/s	1.0MM
	2.0MM	1000W	100%	1000HZ	0	1.8MM	100HZ	16mm/s	2.0MM
	3.0MM	1500W	100%	1000HZ	-1	2.0MM	70HZ	14mm/s	2.5MM
	4.0MM	2000W	100%	1000HZ	-2	2.0MM	70HZ	14mm/s	3.0MM
	5.0MM	2500W	100%	1000HZ	-3	2.5MM	60HZ	10mm/s	3.5MM
MS	1.0MM	500W	100%	1000HZ	0	1.5MM	100HZ	16mm/s	1.0MM
	2.0MM	1000W	100%	1000HZ	0	2.0MM	100HZ	16mm/s	2.0MM
	3.0MM	1500W	100%	1000HZ	+1.5	2.0MM	80HZ	14mm/s	2.5MM
	4.0MM	2000W	100%	1000HZ	+2	2.0MM	50HZ	12mm/s	3.0MM
	5.0MM	2500W	100%	1000HZ	+4	3.0MM	50HZ	10mm/s	3.5MM
	6.0MM	3000W	100%	1000HZ	+4	3.0MM	50HZ	8mm/s	4.0MM

Note: Above parameters are only for reference (Lasers of different brands have different energy density), for detailed parameters, please set according to actual laser and customer requirements.

## Table 6: Wiring of Controller and Fiber Laser

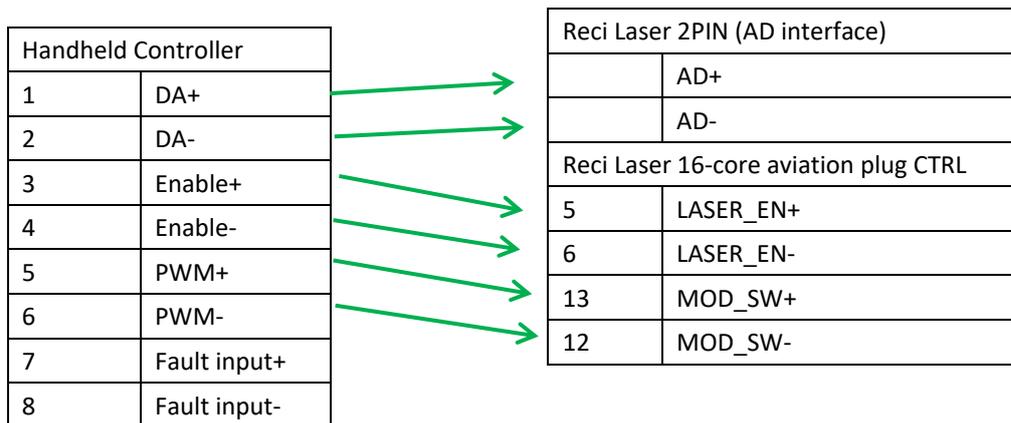
### 1、BWT Laser DB25

No.	Definition	Function	Description
1	Enable+	External enable input signal +	5V-24V, PNP active.
2	Enable-	External enable input signal GND	
3	AD+	Analog input +	0V-10V, control laser output power (10V corresponds to 100% output power).
4	AD-	Analog input GND	
5	Bias+	Bias Current +	Max. bias voltage: 1V.
6	Bias-	Bias Current GND	
7	External input 24V+	External input power supply 24V +	If with laser fault, output external 24V signal from 7/8 ports by 9/10 ports.
8	External input 24V-	External input power supply GND	
9	Fault signal+	Fault signal output +	If with laser fault, output 24V signal from 7/8 ports.
10	Fault signal-	Fault signal output GND	
11	PWM+	External modulation input signal +	Control laser modulation beaming, 10-24V, PNP active.
12	PWM-	External modulation input signal GND	



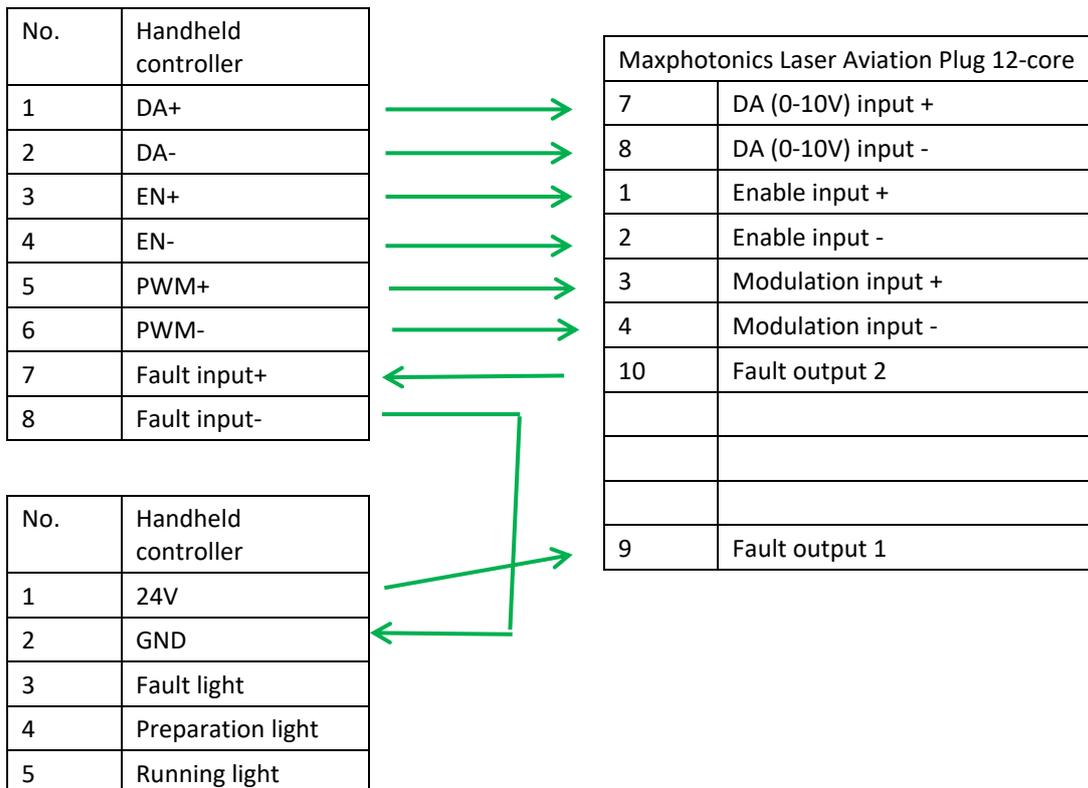
## 2、Reci Laser

Pin	Definition	Remark
1	RS485-A	485 Interface for parameter setting, fault checking and program upgrading.
2	RS485-B	
3	REM_START-	24V PNP active, for starting device remotely (with same functions as Power button).
4	REM_START+	
5	LASER_EN+	24V PNP active, for beaming enable in AD mode.
6	LASER_EN-	
7	KEY_LOCK	Short circuit for normal status and displaying KEY_LOCK alarm for disconnecting. (it's required to set EN by background software.)
8	KEY_LOCK	
9	EX_ALARM_OUT+	Fault signal output +
10	EX_ALARM_OUT+	Fault signal output +
11	EX_ALARM_OUT-	Fault signal output -
12	MOD_SW-	24V PNP active.
13	MOD_SW+	
14	ERROR_OUT (high value for error)	PNP depends on Pin 15 PULL.
15	ERROR_OUT_PULL (available for 5V, 12V and 24V)	
16	EX_ALARM_OUT-	Fault signal output -



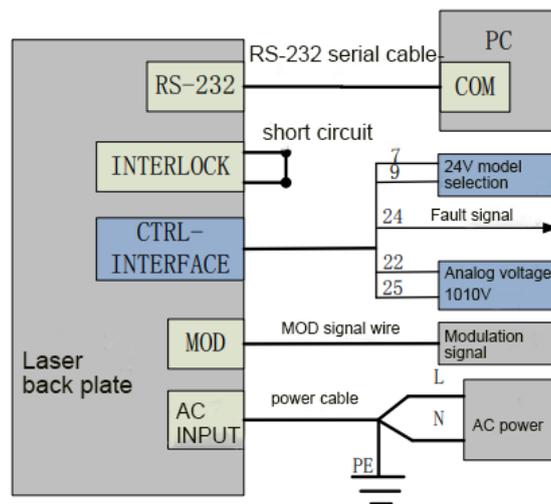
### 3、Maxphotonics Laser Aviation Plug- 12PIN Interface

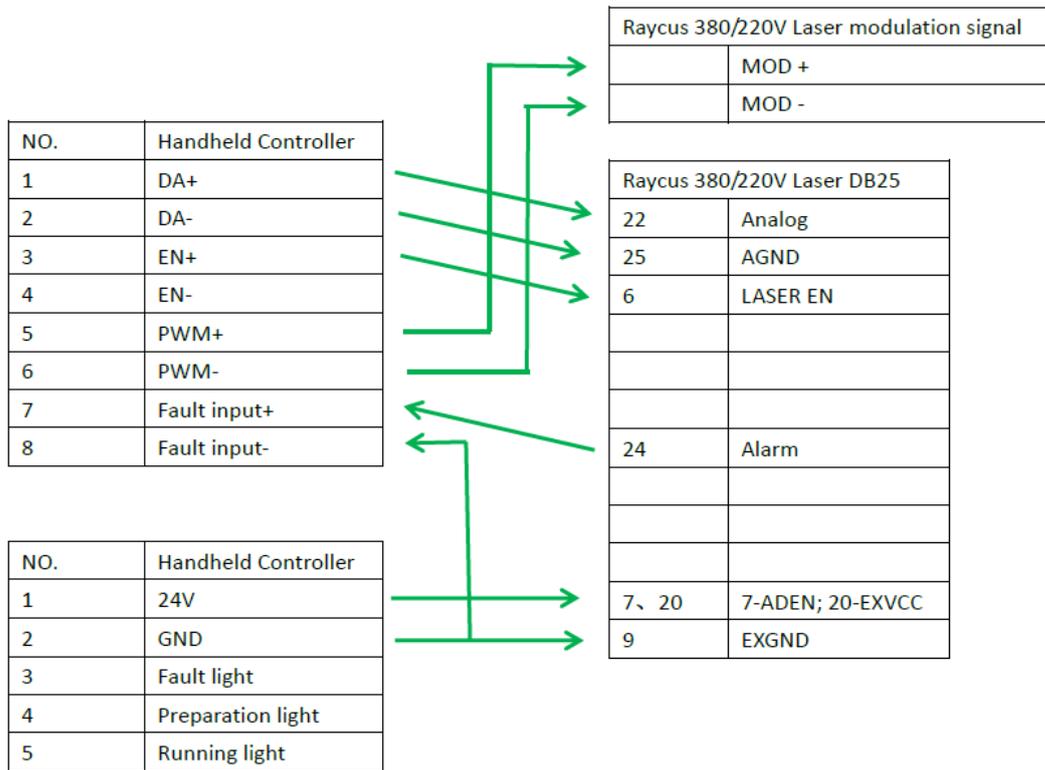
CTRL interface No.	Wiring color	Function	Description
1	Red	Enable input +	24V DC PNP active.
2	Red & white	Enable input -	
3	Black	Modulation input +	24V DC PNP active.
4	Black & white	Modulation input -	
5	Yellow	Beaming +	24V DC PNP active (the same function as START function in starting switch).
6	Black & yellow	Beaming -	
7	Green	DA(0-10V) input +	0-10V analog signal, control output power.
8	Green & white	DA(0-10V) input -	
9	Brown	Fault output 1	NC with alarm fault; NO without alarm fault.
10	Brown & white	Fault output 2	
11	Blue	NC	
12	Blue & white	NC	



## 4. Raycus 380/220V DB25 PIN

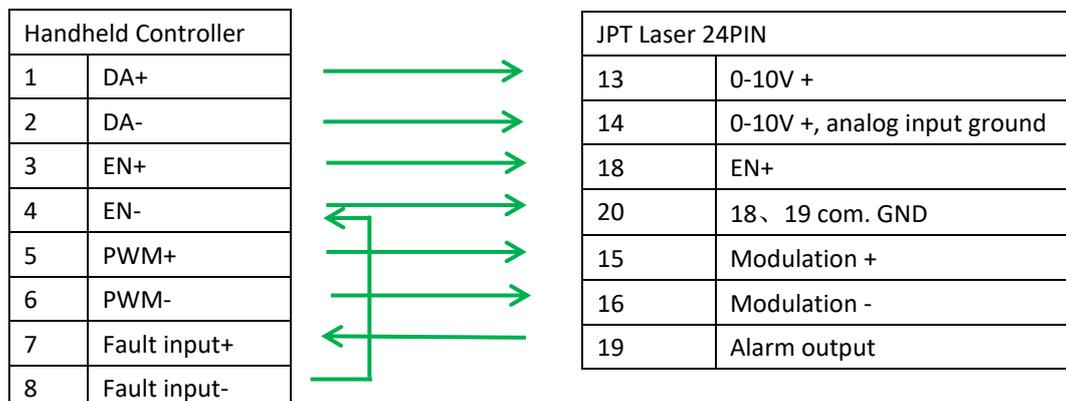
PIN	Item	Input/Output	Function	Typical value	Min.	Max.	Current	
6	LASER EN	Input	Laser beaming EN signal	EN	24V	15V	28V	<8mA
				No	0V	0V	3V	
7	ADEN	Input	External EN in AD mode	EN	24V	15V	28V	<8mA
				No	0V	0V	3V	
8	Laser Ready	Output	Laser is ready	Ready	24V			<100mA
				Not ready	0V			
9	EXGND		6,7,8,20,24 reference GND					
20	EXVCC		24V (power supply for PIN8 & PIN24 output)	24V	20V	28V	<500mA	
22	Analog	Input	External power gives analog		0V	10V	<10mA	
23	Laser power	Output	Laser power sign		0V	5V	<20mA	
24	Alarm	Output	Laser abnormality	Abnormal	24V			<100mA
				Normal	0V			
25	AGND		22 & 23 reference GND					
Other	NC		No connection					





## 5、 JPT Fiber Laser 24PIN

PIN	Item	Type	Level	Description
1				
2				
3	Interlock channel +	Close contact input		Reserve
4	Interlock channel +			
5				
6				
7				
8				
9				
10	Remote starting button +	24VDC		Available to replace START button
11	Remote starting button -			
12				
13	0-10V +	Analog input	1-10VDC	Power control input: 1-10V=10-100% power
14	0-10V analog input GND			12、 13 com. GND
15	Modulation +	24VDC		PWM modulation
16	Modulation -			
17				
18	EN +	24VDC		
19	Alarm output	24VDC		PNP with alarm
20	EN-/ alarm output			18、 19 com. GND
21				
22				
23				
24				
PE	Earth cable			Earthing



## 6、IPG YLR-Y14

### YLR-Y14 interface definition\_Han24

PIN	Item	Type	Level	Drive capacity	Typical response	Description
1	Safety interlock channel 1A	Closed contact input	Internal 24V DC	<1A	<500ms	passive contact and no external voltage or earthing (following EN 954-1/ ISO 13849-1 Cat. 3 PLd)
2	Safety interlock channel 2A					
3	Safety interlock channel 2B					
4	Safety interlock channel 1B					
5	RS232 Tx				120 ms	Digital sending
6	RS232 Rx					Digital receiving
7	RS232 Com	Back port				RS-232 back port
8	Remote key switch	Closed contact input	Internal 5 V DC or 24 V DC		20s	Starting internal main control board for power supply in REMOTE mode
9						
10	Remote START button	Closed contact input	24V DC		1s	Starting laser pump power in REMOTE mode
11						
12	Current control (power) input	Analog input	1-10V DC	1 mA (sink)	100μs	Current setting analog input: 1-10 VDX = 10-100% current
13	Laser power sign output	Analog output	0-5V DC	11 mA (source)	20μs	Analog input 0-4 VDC = 0-P <sub>nom</sub>
14	Analog com. ground	Back port				PIN 12、13 com. ground
15	Modulation +	Digital input	5-24V DC	6 mA (sink)	20μs	5-24 VDC PWM signal input
16	Modulation -	Back port				Back port of 15PIN
17	Leading red control	Digital input	5-24V DC	6 mA (sink)	120 ms	Rising edge in REMOTE mode
18	Laser EN	Digital input	5-24V DC	6 mA (sink)	120 ms	Rising edge in REMOTE mode
19	Error / RDY	Digital output	24V DC	100 mA (source)	120 ms	NPN=alarm, PNP= RDY
20	System com. ground	Back port				PIN 17/18/19/21/22/23/24 com. ground
21	Reset fault	Digital input	5-24V DC	6 mA (sink)	120 ms	Rising edge reset (resettable alarm)
22	System power on	Digital output	24V DC	100 mA (source)	120 ms	PNP = System power on
23	Main power starting	Digital output	24V DC	100 mA (source)	120 ms	PNP = Main power starts
24	Laser emitted	Digital output	24V DC	100 mA (source)	120 ms	PNP = laser EN

## 7、Feibo Laser

PIN	Signal	Description
1	INTLK1A	Interlocking switch 1A, 1A1B close active
2	INTLK2A	Interlocking switch 2A, 2A2B close active
3	INTLK2B	Interlocking switch 2B, 2A2B close active
4	INTLK1B	Interlocking switch 1B, 1A1B close active
5	RS232 RX	RS232 receiving, don't use with DB9-RS232
6	RS232 TX	RS232 sending, don't use with DB9-RS232
7	CASE	RS232、RS485 signal GND
8	RS485_D+	Spare communication interface (RS485)
9	RS485_D-	Spare communication interface (RS485)
10	NC	No contact for this internal testing signal
11	NC	No contact for this internal testing signal
12	IFWD_SET	Power setting input (0-10V) 1-10V analog voltage = 10-100% output power 0-1V: 0V; > 10V: 10V
13	IFWD_FB	Reserve
14	CASE	Analog voltage (Pin 12) signal GND
15	CASE	External contact signal input, 16-24V active
16	GND_IO	External interface signal GND (Pin15-Pin24)
17	RED_EN	Signal light EN input 24V: ON / 0V: OFF
18	EX_EN	External EN input 24V: control EN / 0V: control stop
19	FAULT	Fault signal output signal 24V: YES / 0V: NO
20	GND_IO	External interface signal GND (Pin15-Pin24)
21	WARNING	Alarm sign output signal 24V: YES / 0V: NO
22	PWR	Power on sign output signal 24V: Normal / 0V: Abnormal
23	EN_ON	EN sign output signal 24V: YES / 0V: NO
24	EN_ON	Beaming sign output signal 24V: YES / 0V: NO
25	NC	

