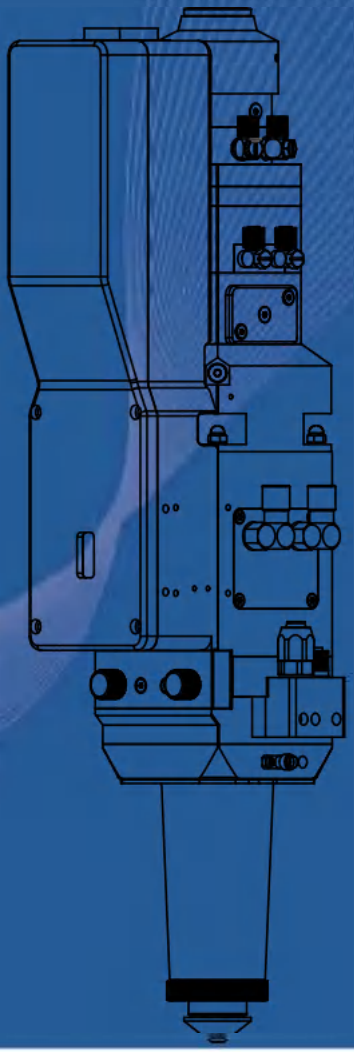
产品使用说明手册

PRODUCT
INSTRUCTION
MANUAL



NC40A (INOVANCE Bus Servo)

Fiber Optic Auto-Focus Cutting Head

CAUTION

Please ensure to read this manual thoroughly and understand its contents before operating this laser head.

Please keep this manual properly for future operational maintenance.

Due to the continuous updates of the product features, the product you received may differ in some aspects from the statements in this manual.
We apologize for any inconvenience this may cause.

Test Conditions

Correct wiring; Normal electrical status; Proper grounding; Equipped with filtering and voltage stabilization circuits.

Steps

1. Set the soft limit to -100~100.
2. Adjust the jog speed to 1mm/s.
3. Jog in the positive direction until the positive limit is found.
4. Jog in the negative direction until the negative limit is found.
5. After confirming that both positive and negative limits are effective, return to the home position.
6. Restore the soft limit and jog speed to their original settings.

Notes

1. Ensure that the manual jog can find the limit switch.
2. Reduce the manual speed to prevent structural damage in case of limit switch failure.
3. Confirm the correctness of the negative limit switch wiring and check if the signal is normal.
4. Only after confirming both positive and negative limits, proceed to automatically return to the home position.
5. Restore parameters to ensure the correct operation of the system.

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1. Main Technical Parameters and Installation/Debugging Methods

1.1 Main Technical Parameters

Technical Parameters:

Cutting Head Model: NC40A

Laser Wavelength: 1030~1090nm

Laser Power: ≤6000W

Fiber Optic Interface: QBH/G5

Lens Configuration: Collimation F100, Focusing F190

Focus Adjustment Range: ±9.5mm

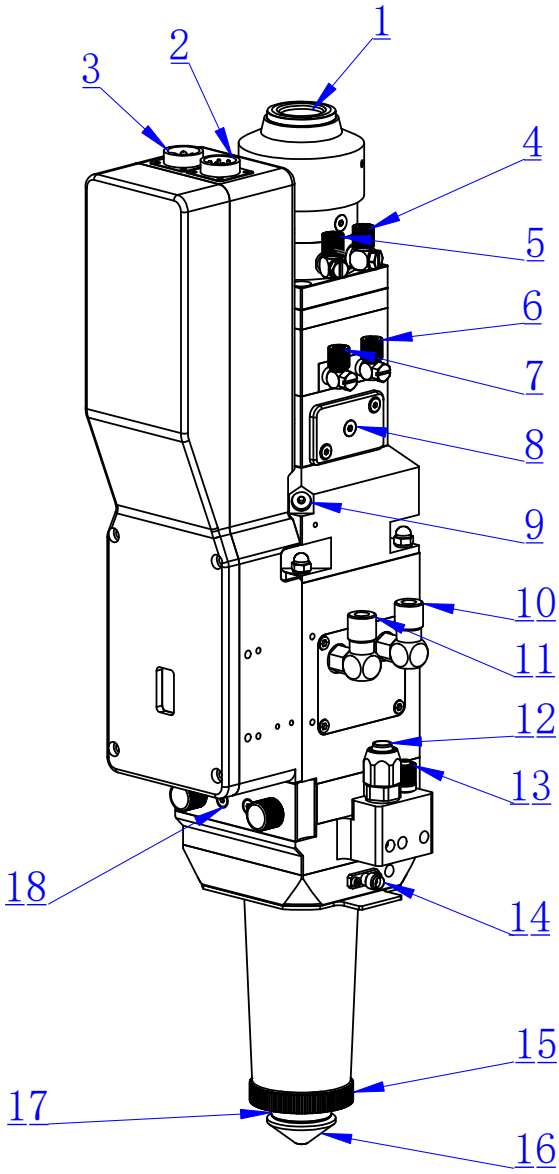
Centering Adjustment Range: ±1.5mm

Cutting Gas Interface: Standard φ10 (Optional φ12), Gas Pressure ≤2.5MPa
Nozzle Cooling Gas Interface: φ6, Gas Pressure ≤0.6MPa

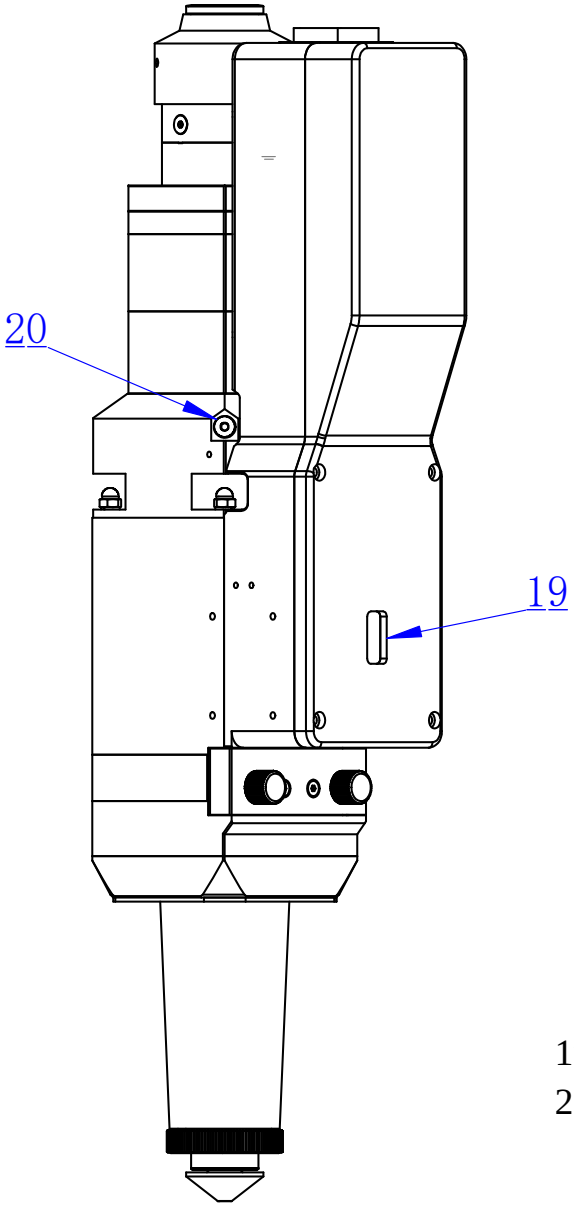
Cooling Water Pipe Interface: φ6, Cooling Water Pressure ≤0.5MPa

Weight: Approximately 6.0Kg

1.2 Description of Interfaces

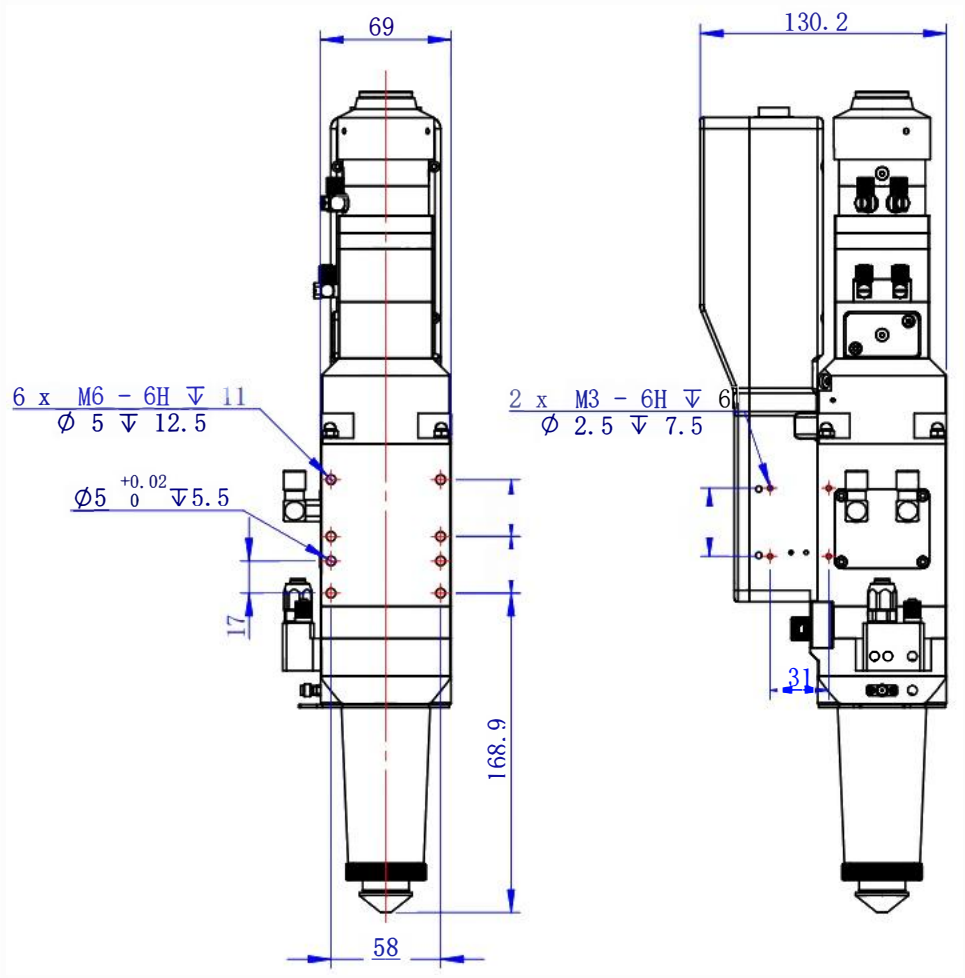


1. Fiber Optic Interface
2. Servo Motor Power Line Interface
3. Servo Motor Encoder Line Interface
4. QBH Water Cooling Interface 1
5. QBH Water Cooling Interface 2
6. Dust Shield Water Cooling Interface 1
7. Dust Shield Water Cooling Interface 2
8. Dust Shield Drawer Assembly
9. Center Adjustment (X)
10. Focusing Water Cooling Interface 1
11. Focusing Water Cooling Interface 2
12. Cutting Gas Interface
13. Cooling Gas Interface
14. Follow-up Signal Interface
15. Locking Ring
16. Nozzle
17. Ceramic Ring
18. Protective Lens Drawer Assembly

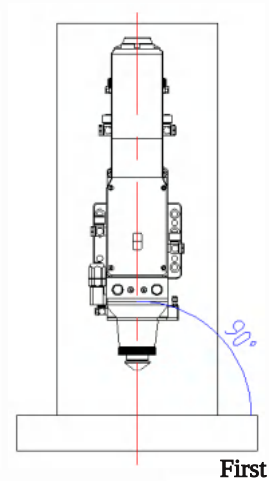


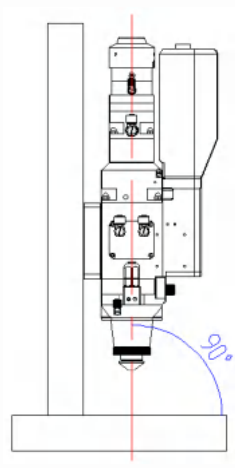
19.Observation Window
20.Center Adjustment (Y)

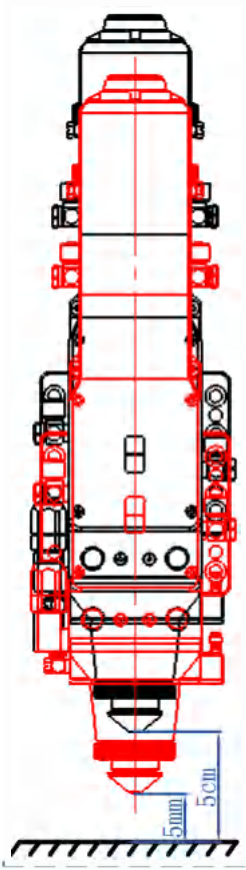
1.3 Installation Dimensions



1.4 Verticality Check

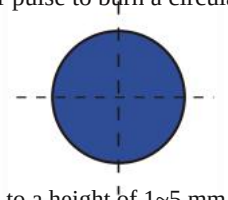






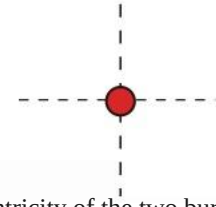
First Step:

Position the laser head at a height of 5 cm above the surface of the plate; Set the laser power to approximately 500W; Perform a short laser pulse to burn a circular mark on the plate surface.



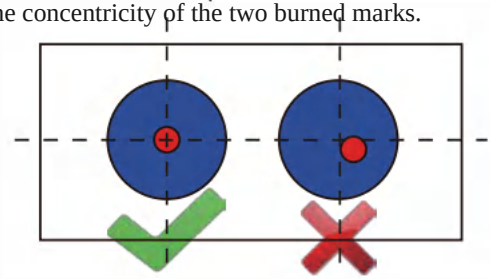
Second Step:

Lower the laser head to a height of 1~5 mm above the surface of the plate; Set the laser power to approximately 100W; Perform a short laser pulse to burn a smaller circular mark on the plate surface.



Third Step:

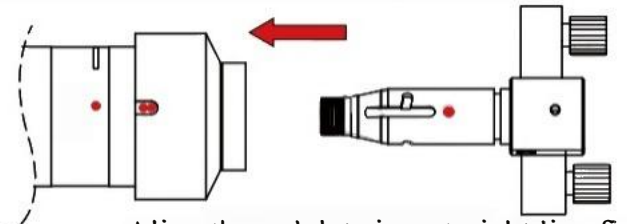
Compare the concentricity of the two burned marks.



1.5 Fiber Optic Connection

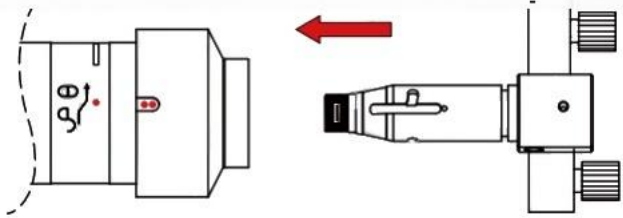
(1) Place the fiber rod and fiber connector in a horizontal position.

(2) Clean the fiber rod and fiber connector with a lint-free cloth and anhydrous ethanol.

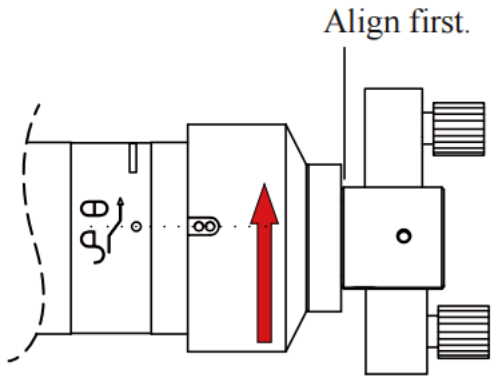


Align the red dots in a straight line first.

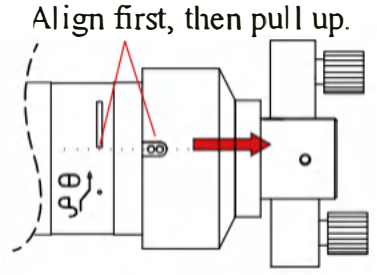
(3) Gently insert the fiber rod into the fiber connector.



(4) After the fiber rod is fully inserted, rotate the red mark on the rotating sleeve in the direction of the arrow until it aligns with the white mark.

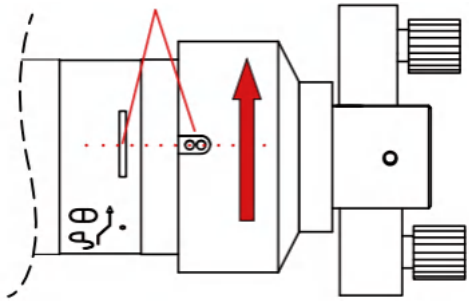


(5) Pull up the rotating sleeve in the direction shown in the diagram.



(6) Gently rotate again in the direction shown in the diagram with mod erate force until it feels locked (using your thumb and index finger).

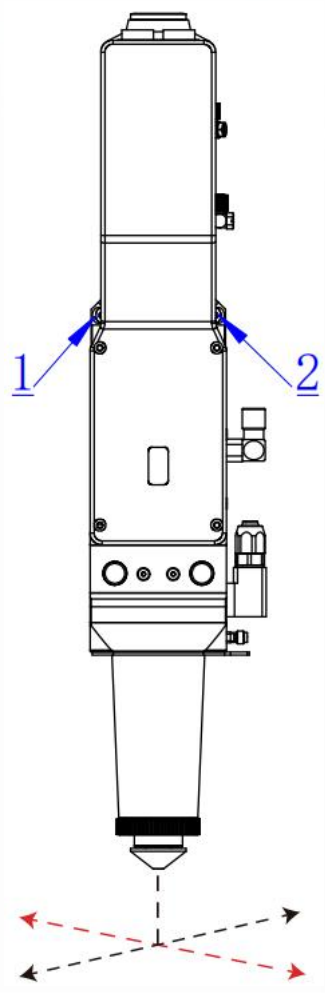
Align or exceed the middle, but be careful not to turn any further o nce in place.



Note: Do not apply excessive force as it may damage the precision nechanism!

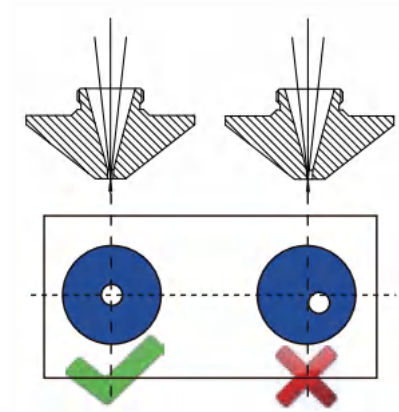
To avoid dust or dirt from accidentally entering the fiber connector, clean the fiber rod part first! Insert the fiber rod into the fiber conn ector while keeping the laser head in a horizontal position.

1.6 Adjustment of Light Centering



1. Y-direction horizontal adjustment screw
2. X-direction horizontal adjustment screw

1.Use an Allen wrench to adjust the X/Y horizontal adjustment screws 1 and 2, so that the beam passes through the center of the nozzle.
2.The cutting effect is best when the beam passes through the center of the nozzle.
3.If the beam does not pass through the center of the nozzle, it may result in no light output or poor cutting performance.



The beam passes through the center of the nozzle (Correct)

The beam does not pass through t he center of the nozzle (Incorrect)

Method to Check if the Beam Passes through the Center of the Nozzle:

1.Stick transparent adhesive tape on the nozzle opening (preferably use a new or non-deformed nozzle).
2.Adjust the laser power to around 50W; (for example, with a 500W laser, adjust the pulse power to 10%).
3.Emit light for 1-2 seconds, then remove the transparent adhesive tape.
4.Face the adhesive tape towards a light source and observe whether the circular mark imprinted by the nozzle on the tape is concentric with the burn mark made by the laser.
5.If they are concentric, the adjustment is qualified; if not, continue adjusting until it is qualified.

Kerf Method for Zero Focus and Focusing

Objective:

To correct the "return to origin retreat distance," ensuring that the actual physical focal point coincides with the software zero focus, and to serve as a benchmark for subsequent process adjustments.

Method:

1.Use the kerf method to determine the focal point by observing the size of the cut kerf. The smallest kerf indicates the focal point.2.Correct the "return to origin retreat distance," ensuring that the actual physical focal point coincides with the software zero focus, and use this as a benchmark for subsequent process adjustments.

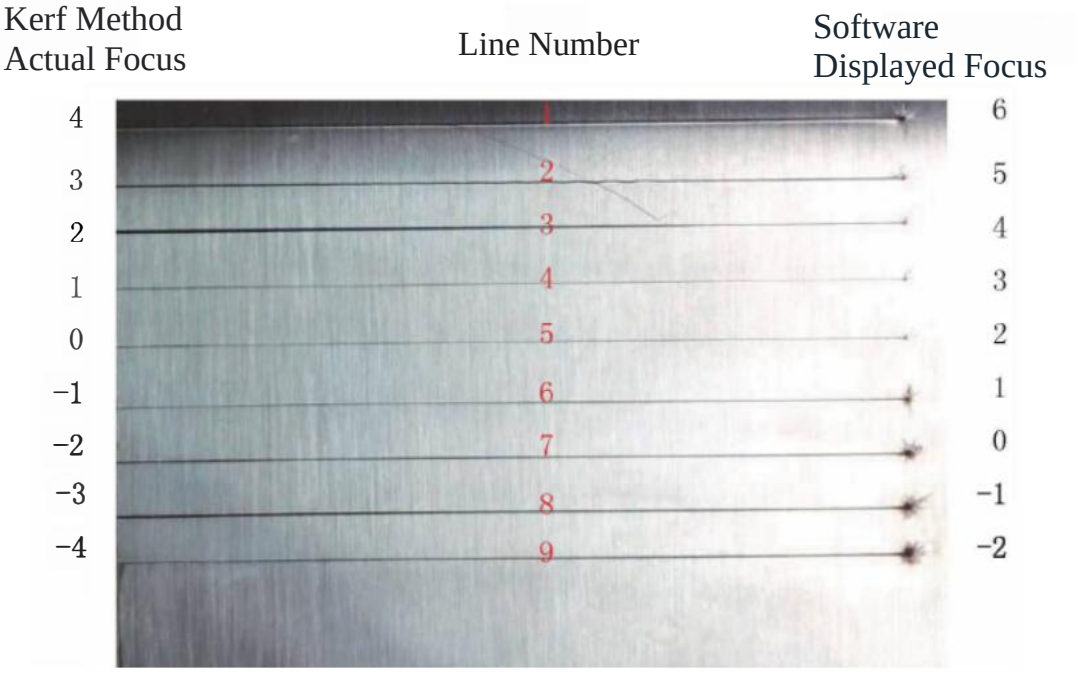
Example:1.Platform Setup:

2.Start cutting from software focus +6, with intervals of 1mm, until the focus is -2. Observe and find that the 5th line is the thinnest, meaning the actual focus 0 is at the software-displayed focus +2 position.

3.Correction: If the actual focus determined by the kerf method is higher than the software-displayed focus, then:

Return to origin retreat distance = return to origin retreat distance - difference value.

For example, return to origin retreat distance = 9 - 2 = 7. The same principle applies in the opposite case.



2.Maintenance/Disassembly and Assembly

2.1 Regular Inspection and Maintenance


Inspection


Distance

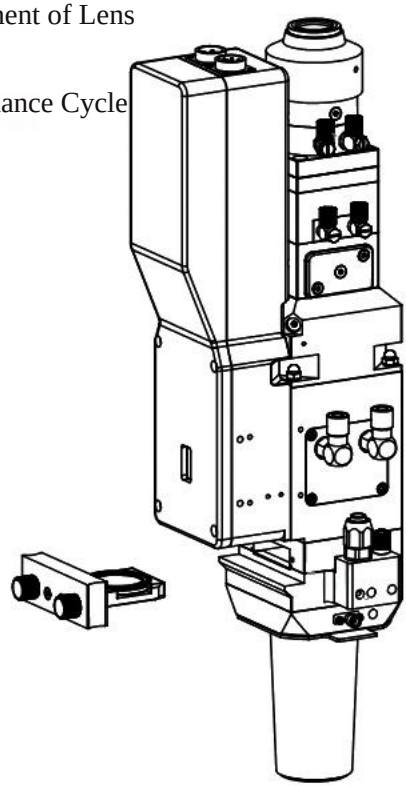

Replacement


Adjustment of Lens


Maintenance

Maintenance Cycle


Calibration

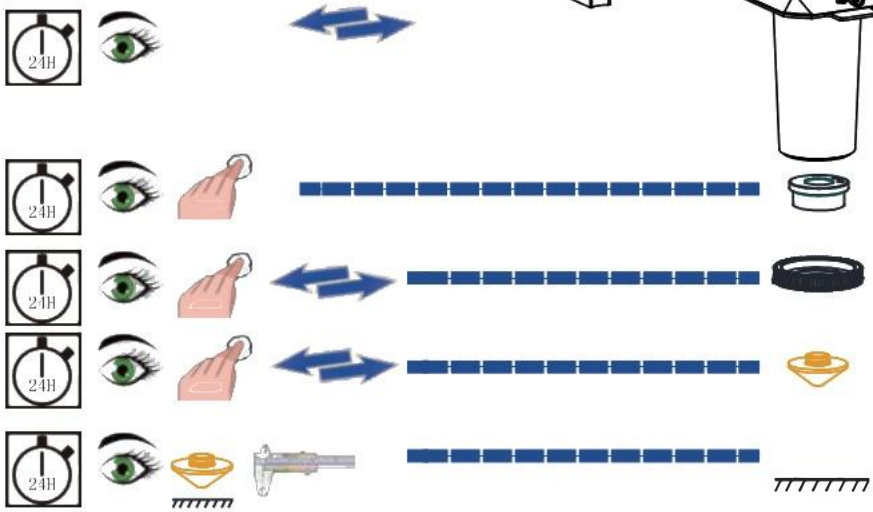


Note:

Before maintenance, please use compressed air to blow off the dust on the surface of the cutting head, then clean the corresponding parts with a clean cloth and alcohol.

Note:

After each maintenance of the ceramic ring and nozzle, it is necessary to recalibrate.

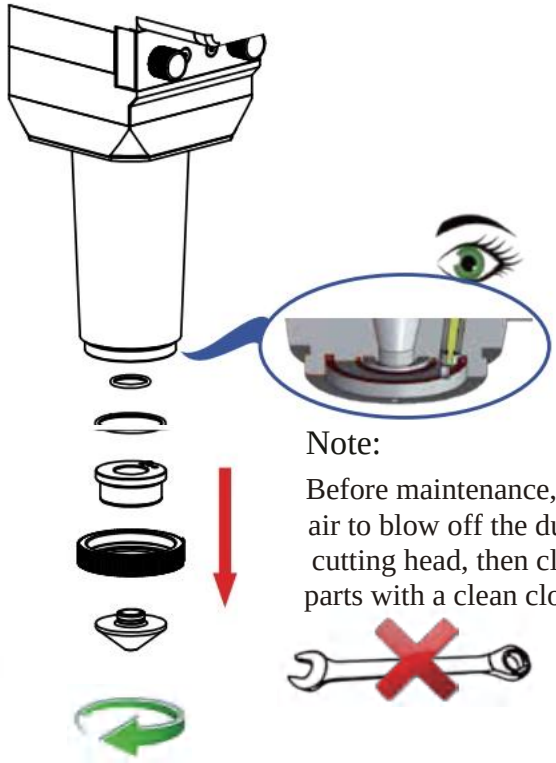


2.2 Ceramic Ring/Nozzle Replacement

Power Supply

Cooling Gas

Cutting Gas

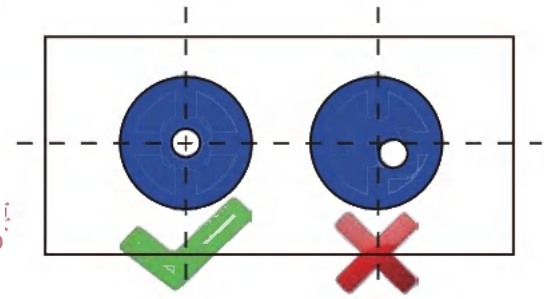


Note:

Before maintenance, please use compressed air to blow off the dust on the surface of the cutting head, then clean the corresponding parts with a clean cloth and alcohol.

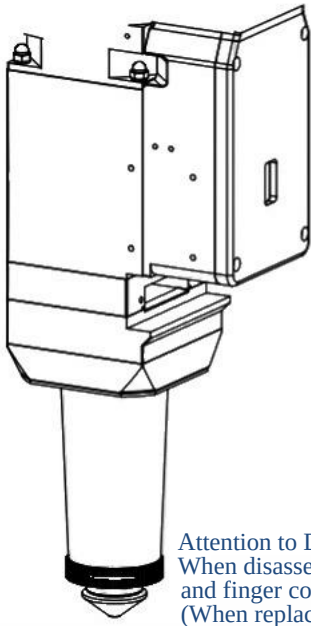
Pin Position

Note:
After each maintenance of the ceramic ring and nozzle, it is necessary to recalibrate and test whether the light is centered.



Center Alignment

2.3 Drawer Protective Lens Replacement



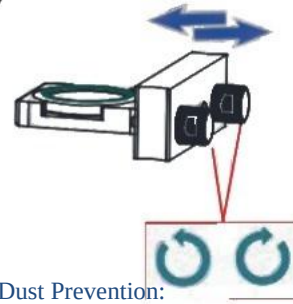
Note

Before maintenance, please use compressed air to blow off the dust on the surface of the cutting head, then clean the corresponding parts with a clean cloth and alcohol.

Power Supply

Cooling Gas

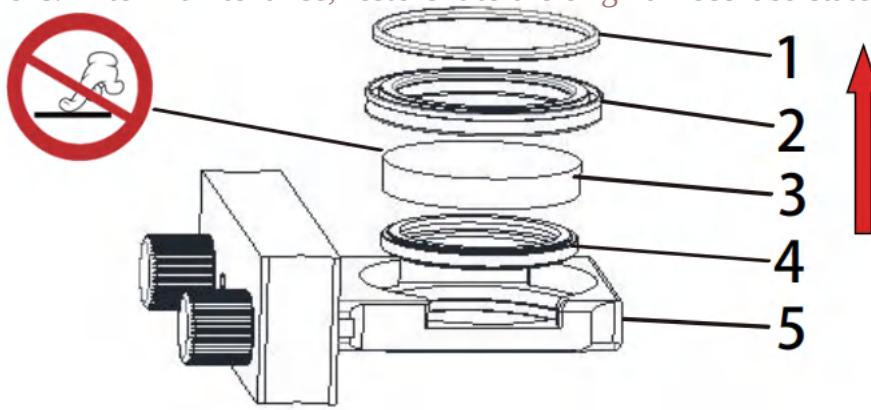
Cutting Gas



Disassembly Method:
Loosen the screws and pull out the drawer horizontally.

Attention to Dust Prevention:
When disassembling and assembling the lens, wear dust-proof gloves and finger cots, and complete the operation in a clean environment. (When replacing the lens on-site, you can use masking tape to seal the window to prevent dust from entering and causing contamination.)

Before maintenance, record the padding method and direction of the lens. After maintenance, restore it to the original recorded state.

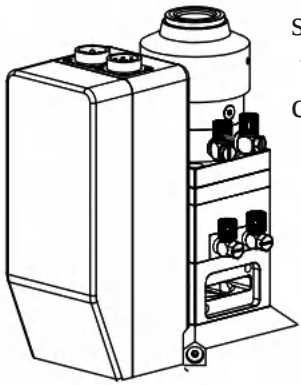


1. Washer 2. Pressure Cap 3. Protective Lens 4. Elastic Seal Ring
5. Protective Lens Holder

Note: Remove parts 1 to 4 in the direction of the arrows to avoid damaging the components. Do not use wrenches, pliers, or other tools for this operation. The elastic seal ring should be replaced every 2 to 3 months.

2.4 Collimating Protective Lens Replacement

Note:
Before maintenance, please use comp
-ressed air to blow off the dust on the surface of the cutting head, then clean the corresponding parts with a clean cloth and alcohol.



Disassembly Method:
Loosen the screws and pull out the drawer horizontally.

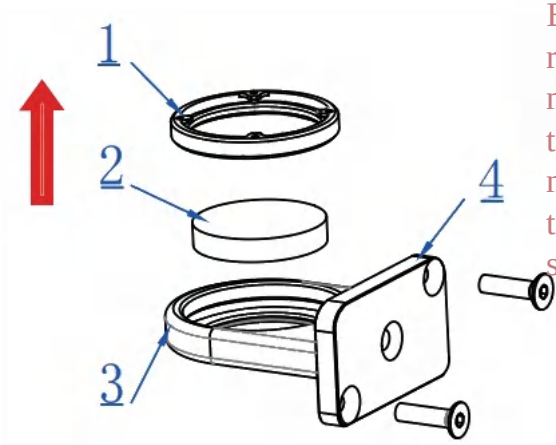
Power Supply

Cooling Gas

Attention to Dropping

Cutting Gas

Attention to Dust Prevention:
When disassembling and assembling the lens, wear dust-pro of gloves and finger cots, and complete the operation in a cle an environment. (When replacing the lens on-site, you can u se masking tape to seal the window to prevent dust from ente ring and causing contamination.)



Before maintenance, record the padding method and direction of the lens. After maintenance, restore it to the original recorded state.

1. Pressure Cap 2. Protective Lens 3. Dust Protection Tray
4. Dust Protection Panel

Note: Remove parts 1 to 3 in the direction of the arrows to av oid damaging the components.

3. Control Section

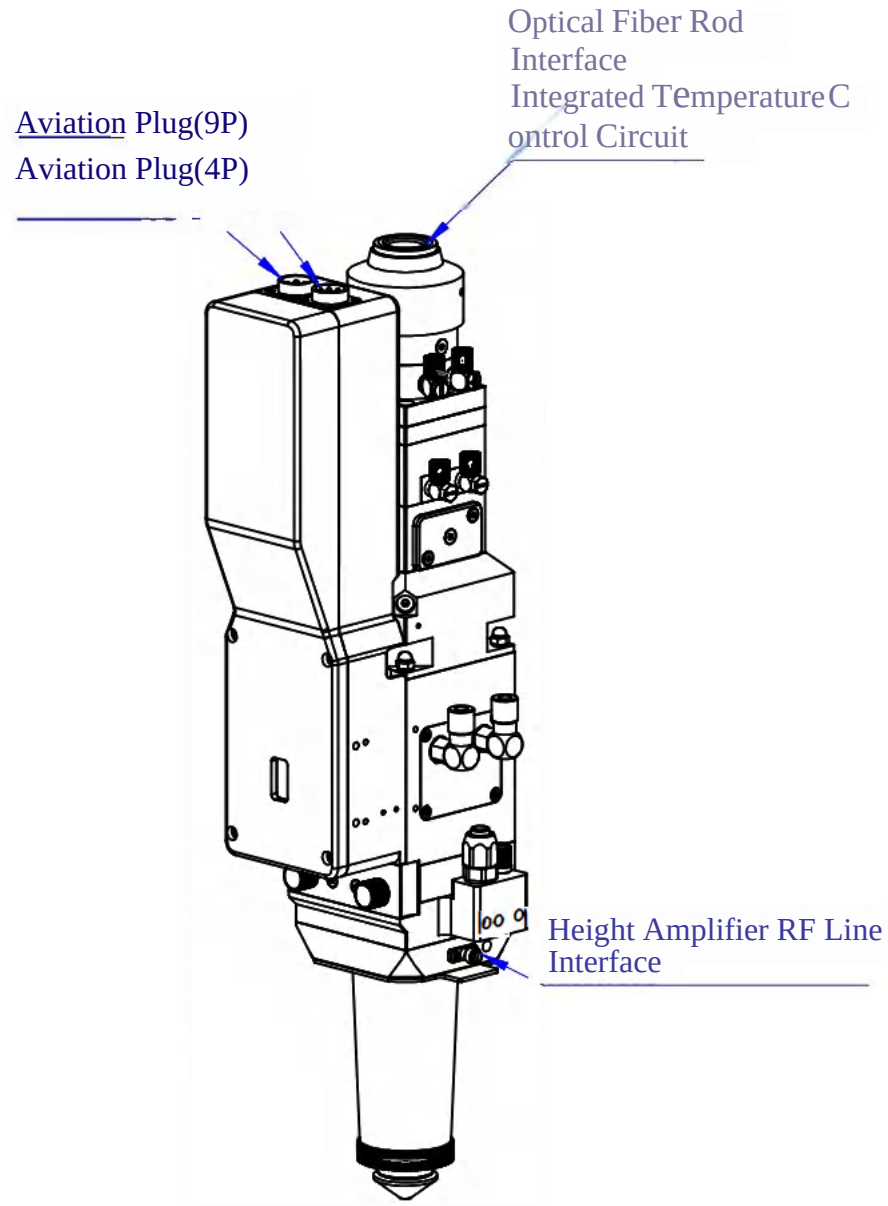
Test Conditions:

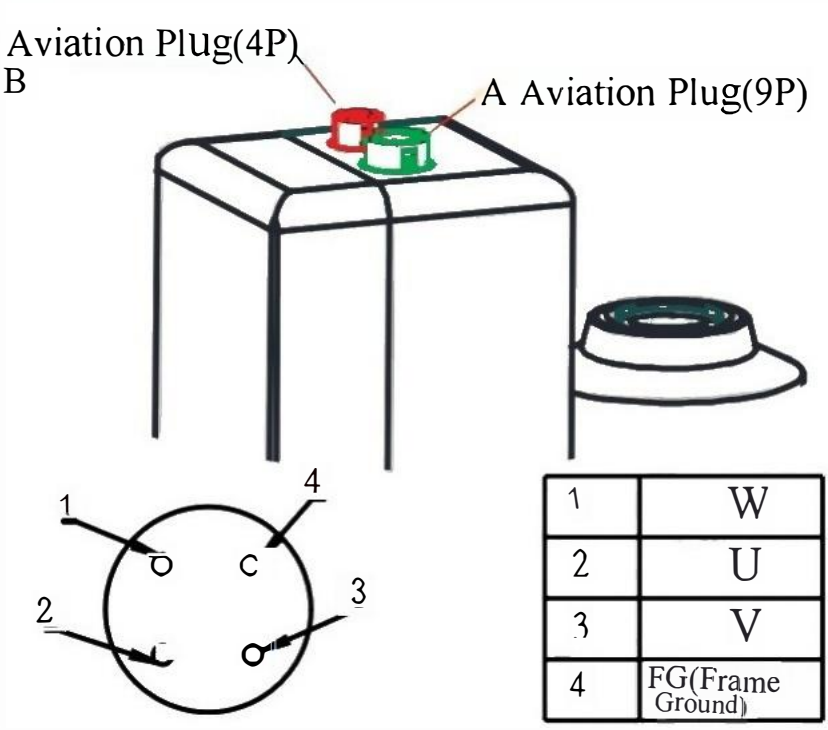
1.Carefully read this manual.
2.Ensure electrical wiring is correct.
3.Install filtering and voltage stabilization cir
cuits.
4.Ensure proper grounding.
5.Set software parameters correctly.

Steps:

1. Modify the soft limit to -100~100.
2. Set the jog speed to 1 mm/s.
3. Jog in the positive direction until the positive limit is found.
4. Jog in the negative direction until the negative limit is found.
5. After confirming that both positive and negative limits are effective, return to the origin.
6. Restore the soft limit and manual jog speed parameters to their original settings.

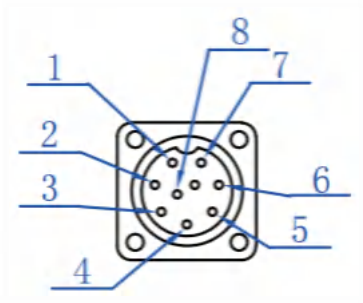
3.1 Electrical Ports and Definitions





1	W
2	U
3	V
4	FG(Frame Ground)

Servo Motor Power Line Port Definition
(Aviation Male Plug M16-4AH-M)



	FG	Shielded Wire
1	-D	Encoder Signal Data(-)
2	+D	Encoder Signal Data (+)
3	SG	Signal Ground
4	VCC(Encoder Power Supply +5V)	
5	+24V (Proximity Switch Power Supply)	
6	0V	Praximiy Switch Power Supdly
7	W+	Proximity Switch Signal
8	V- Proximity Switch Signal	

Servo Motor Encoder and Photoelectric Switch Port Definition
(Aviation Male Plug M16-9A2H-M)

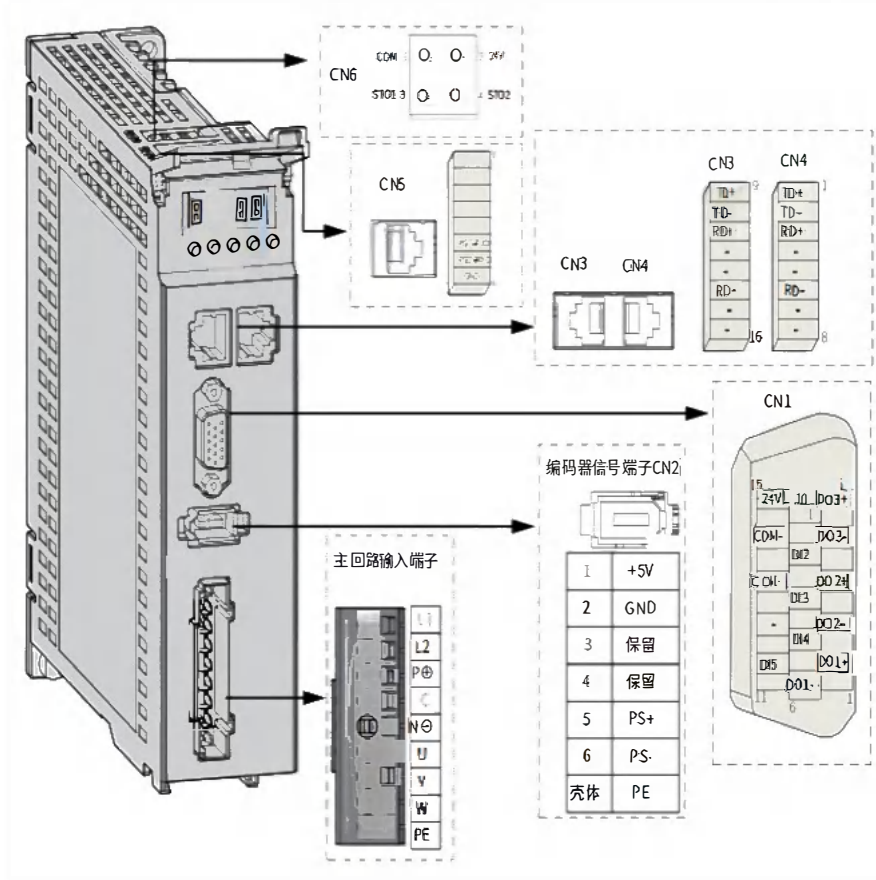
3.2 Aviation Plug Connection Steps

First step: Use an air gun to clean the inside of the aviation plug, removing moisture, oil, and dust.

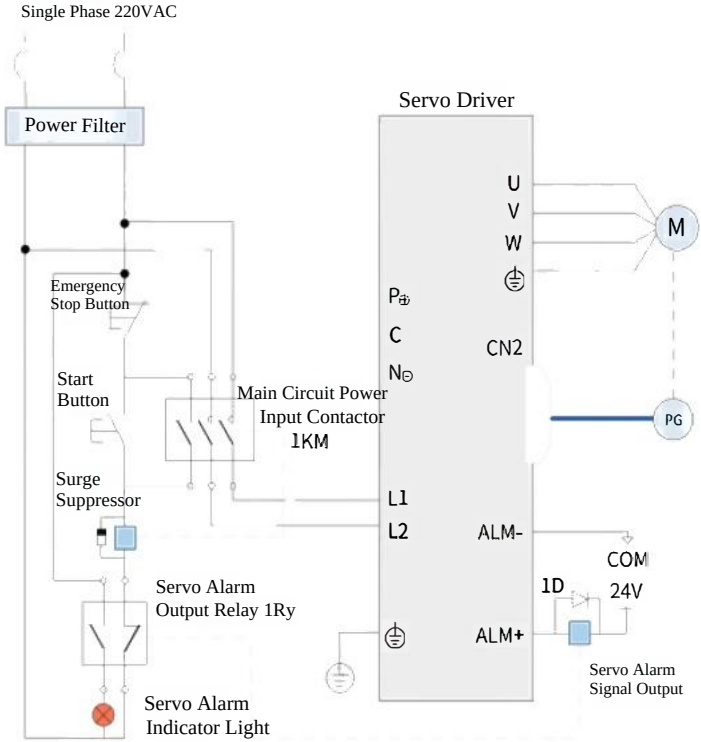
Second step: Secure tightly.

Third step: Wrap the male and female parts of the aviation plug with vinyl tape or electrical tape to p revent the entry of moisture, oil, or dust.

3.3 Servo Port Definition and Wiring



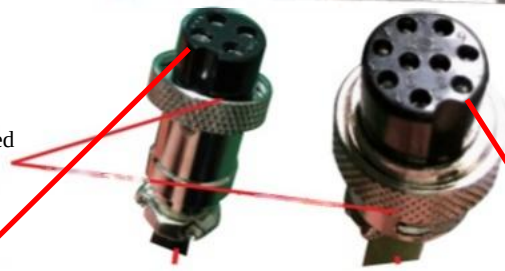
Note:
This driver is connected to a single-phase 220V power supply, L1 - live wire, L2 - neutral wire.
Please refer to the Hui SV660N series driver manual f or driver debugging.



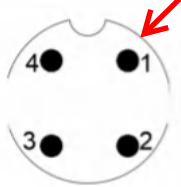
Use single-phase 220V main circuit wiring

Description

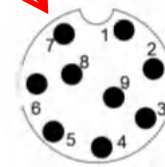
· 1KM: Electromagnetic Contactor; 1Ry: Relay; 1D: Free Wheeling Diode.
· DO is set for alarm output function (ALM+/-), when the servo driver gives an alarm, it can automatically cut off the power supply, at the same time, SV660NS1R6I and SV660NS2R8I do not have built-in braking resistors. If needed, connect an external braking resistor between P⊕ and C.



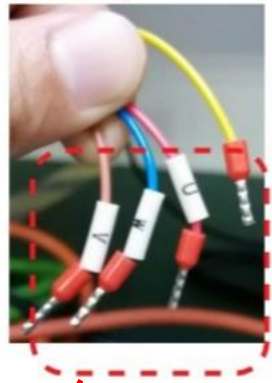
Ensure it is securely tightened to prevent loosening.



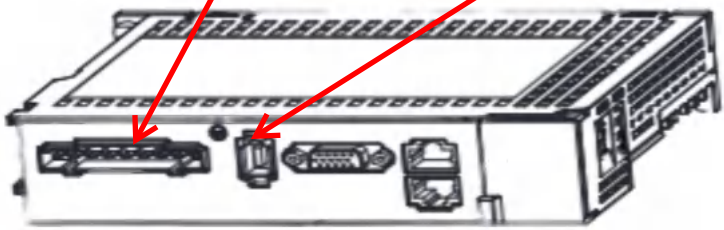
Wire end aviation female connector M16-4AH-F



Wire end aviation female connector M16-9A2H-F



The sequence of U V W must not be reversed; it needs to match accordingly.



3.4 Laser Head and Driver Connection Check Method

(1) Check the UVW wires' labeling; they must correspond one-to-one with UVW on the plug.

(2) UVW should not conduct with the ground wire or the casing; resistance with the casing should be greater than 5MΩ.

Test condition: One end connected to the cutting head, one end of the driver not connected.

(3) The resistance between UVW poles is approximately 20Ω. If the resistance is 0 (short circuit) or the multimeter displays infinity (open circuit), it is considered abnormal.

Test condition: One end connected to the cutting head, one end of the driver not connected.

(4) Grounding (※ very important).

(5) When connecting the aviation plug, please follow the following steps:

First step: Use an air gun to clean the water, oil, and dust from inside the aviation plug hole.

Second step: Tighten the male and female parts of the aviation plug.

Third step: Wrap the aviation plug with masking tape or electrical tape to prevent water, oil, and dust from entering.

Limit Signal Detection Method

Test Conditions

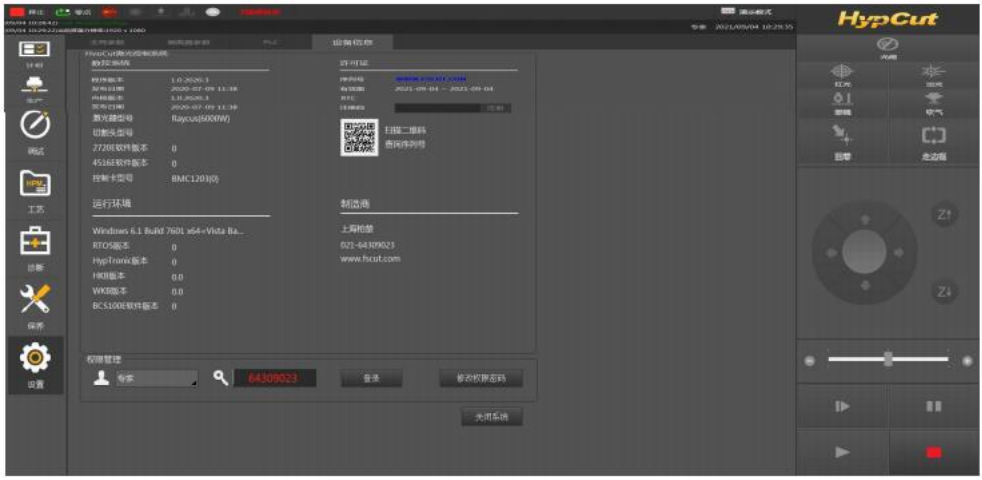
1. Connect the DC24 power supply.
2. The laser head scale 0 is in the middle of the window.
3. W+W- is an NPN type u-shaped photoelectric, which is a nor mally closed signal. Do not connect it before the test.

Steps

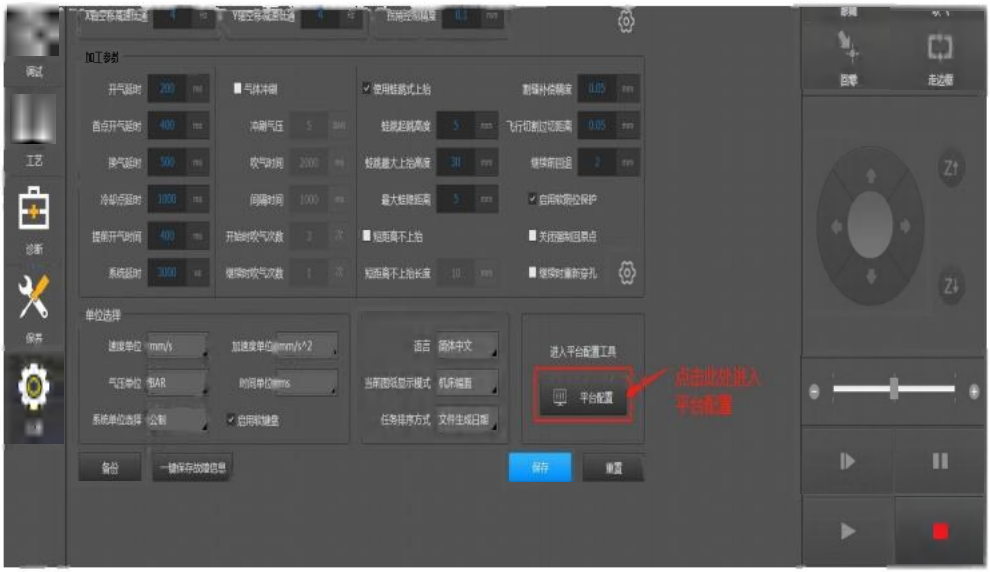
1. Set the multimeter to "DC Voltage" mode, 200V or higher.
2. Connect the red probe to the DC24V terminal and the black probe to the W+ terminal (side of the laser head wire).
3. A displayed voltage value greater than 18V is normal (theoretical value 24V), less than 14V is abnormal (theoretical value 0V).
4. Incrementally move in the positive direction, observe the changing voltage, and a voltage difference greater than 12V is normal.
5. Connect the red probe to the DC24V terminal and the black probe to the W- terminal (side of the laser head wire).
6. A displayed voltage value greater than 18V is normal (theoretical value 24V), less than 14V is abnormal (theoretical value 0V).
7. Sequentially incrementally move in both positive and negative directions, observe the changing voltage, and a voltage difference greater than 12V is normal.
8. Connect W+W- to the corresponding port of the system expansion card.
9. Open the control software, limit logic high for normally closed. Incrementally move to positive and negative limits, observe whether the system can detect the limit.
10. The above is the detection method for a normally closed limit switch. For a normally open type, it is the opposite.
11. Special reminder: Before using, incrementally move the servo motor to confirm that the positive and negative limits are effective, then enable the automatic mode. Before enabling automatic mode, return the servo motor to its origin point.

4. BOCHU Bus System Operations and Settings

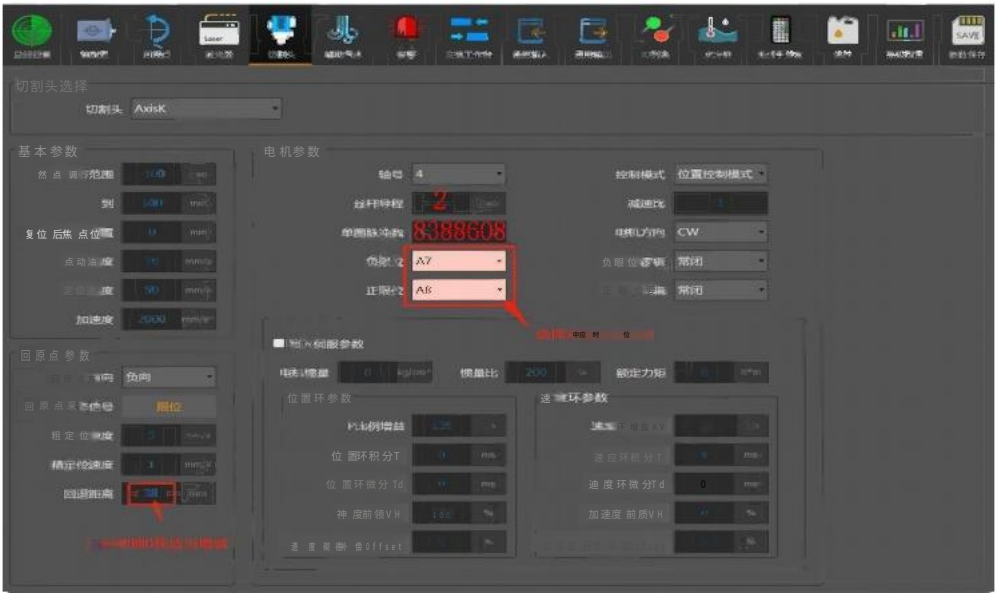
4.1 Settings > Device Information Interface > Enter Password 64309023 > Enter Expert Mode



4.2 Settings > Global Parameters > Click on Platform Configuration >



Axis Configuration



Common Issues and Problems

EtherCAT Communication Interference

Please follow the remediation steps described in the table below:

Serial Number	Steps
1	The communication network cable meets the shielding requirements of Category 5e or above.
2	There are no issues with loose connections or poor contact in the communication ports.
3	The communication cable is kept at least 30cm away from power cables.
4	For multi-node communication, add equipotential grounding between nodes.
5	The maximum allowed cable length between two nodes is 100 meters.
6	Add magnetic cores to both ends of the communication cable and wind it 1-2 turns.
7	For driver outputs UVW, add a ferrite core and wind it 2-4 turns.
8	Use shielded power cables with a well-grounded shield.

Common Electrical Faults and Solutions

Nuisance Tripping of Residual Current Breakers

If the equipment is to use a Residual Current Device (RCD), please select the type under the following conditions:

·As drive equipment can generate DC leakage currents in the protective conductor, it is essential to use a Type B Residual Current Device (RCD).

·Drives can produce certain high-frequency leakage currents when operating, to avoid nuisance tripping of the RCD, choose an RCD for each drive with a tripping current not less than 100mA.

·When multiple drives are paralleled and share one RCD, select an RCD with a tripping current not less than 300mA.

- It is recommended to use RCDs from brands like Chint, Schneider Electric, etc.

If the equipment uses a breaker with leakage protection and experiences nuisance tripping faults, pl ease solve the issue by following these steps.

Leakage Current Response Strategy

Leakage Protection Trip	Factors	Measures
Immediate Trip Upon Energization	Poor RCD (Residual Current Device) anti-interference performance	Use a recommended brand's leakage circuit breaker. It is recommended to replace it with a leakage circuit breaker that has a higher operating current.
	RCD tripping current is excessive	
	Unbalanced loads connected after the RCD	Move the unbalanced loads to the front of the leakage protection.
	Large capacitance to ground at the drive front-end	
Trip During Operation	RCD has poor anti-interference performance	Use a recommended brand's leakage circuit breaker. It is recommended to replace it with a leakage circuit breaker that has a higher operating current.
	RCD tripping current is too low	
	Unbalanced loads connected after the RCD	• Install a simple filter on the input side of this product and wind a magnetic ring on the LN, RST lines near the leakage protection device;
	The distributed capacitance to ground of motor cables, motors, etc., is too large	• Appropriately reduce the carrier frequency if it ensures performance requirements. • Shorten the length of the motor cables.

Troubleshooting Cutting Anomalies

I. Causes of excessive nozzle temperature during processing:

1. Misalignment.
2. Contamination of the protective lens.
3. Contamination of the focusing lens or collimating lens.
4. Contamination of the fiber rod.
5. Heat transfer from the plate.
6. The inner core hole and the outer hole are not concentric.
7. Excessive defocusing amount.

Troubleshooting Plan:

1. Check for misalignment; if there is any, make adjustments.

2. Remove the protective lens to inspect it. Be sure to seal the cutting head's open space with crepe paper after removing the protective lens holder (protective window, nozzle mouth). Do not blow air after removing the protective lens holder. If the protective lens is contaminated, it needs to be cleaned.

3. Inspect the cutting head's internal optical lenses. Lift the cutting head to the highest position, turn on the red light, unscrew the nozzle, and place a piece of white paper at a range of 0 – 40mm below the ceramic body. Move it up and down to observe the uniformity of the red light distribution. When observing the red light, try to shield the surrounding light to ensure sufficient contrast for clearer observation. If obvious black spots are observed, it might indicate internal contamination of the focusing or collimating lenses or the fiber end face. In such cases, contact after-sales service engineers for guidance. Do not attempt to disassemble the laser head on your own or continue using it to avoid further damage.

4. If everything checks out fine but the cutting nozzle is still hot, inspect without cutting or blowing air at full power output. When emitting light, place a bucket of water about 1 meter below the nozzle with an iron plate inside the bucket to prevent the bucket from burning. Check if the nozzle heats up during full power output for 1 to 10 minutes. If the nozzle does not heat up, it indicates that the heating of the nozzle is caused by heat transfer from the plate during cutting. If the nozzle still heats up, disassemble the laser head's focusing lens, collimating lens, and laser head.

5. Inspect the nozzle; nozzles with surface damage are not shiny and tend to absorb heat, w hereas new nozzles with shiny surfaces do not easily absorb heat.

II. Abnormal Capacitance Value Alarm Causes:

1. Damage or loosening of the ceramic body.
2. Damage or loosening of the nozzle.
3. The probe inside the sensor is damaged and lacks elasticity.
4. The copper contact of the ceramic body and the stainless steel tooth ring are not conducting.
5. The resistance value of the ceramic body is not large enough.
6. Issue with the signal line.

Troubleshooting Plan:

1. Check the ceramic body and nozzle for any damage or looseness; if any issues are found, replace and reinforce them.
2. After removing the ceramic body and nozzle, inspect whether the cutting head sensor probe contacts are damaged or if they still have elasticity. If damaged or lacking elasticity, contact the supplier for replacement.
3. Check if the signal line is disconnected and if the copper contact of the ceramic body and the stainless steel tooth ring are conducting.
4. If the above three points show no problem, clean the ceramic body with alcohol and dry it with a hairdryer or oven.

Because when the surface of the ceramic body is not dry, and the resistance value is less than 1 megaohm, the capacitance value will also cause an abnormal alarm.

III. Fiber Interlock Alarm Causes:

1. The fiber is not properly installed.
2. The QBH (Quick Beam Handler) temperature is too high.
3. Internal contact issues within the QBH.
4. Issues with the laser fiber connector.

Troubleshooting Plan:

1.Following the cutting head's instructions, re-tighten the fiber.
2.Check the water temperature and water circuit.
4.Contact the cutting head manufacturer for assistance.
5.Contact the laser manufacturer.

IV. Causes of Abnormal Cutting Performance:

1. Are the cutting parameters correct?
2. Is the cutting focus correct?
3. Is the cutting gas correct?
4. Is there an issue with the cutting head lenses?

Troubleshooting Plan:

1. Check the cutting parameters and the position of the cutting focus.
2. Check whether the gas is sufficient and its purity. Observe the pressure gauge on the gas cylinder according to the selected cutting gas; if using oxygen, ensure it is around 10 kg. Check whether the cutting system's output gas voltage value corresponds to the value displayed by the gas proportioning valve, which is typically 10V corresponding to 10 kg. Nitrogen pressure should be adjusted according to the thickness of the sheet being cut. Purity can be confirmed by ensuring the label on the gas cylinder indicates a purity of 99.9% or higher. If cutting with nitrogen, you can also test by cutting the end of a stainless steel piece – if the end turns yellow, the purity is low, and you should immediately switch to a higher-purity gas.
3. Remove and inspect the protective lens for contamination. If contaminated, the lens must be cleaned.
4. Check whether the internal lenses of the cutting head and fiber end face are normal.

V. Causes of Misalignment During Processing:

1. The fiber is loose.
2. Issue with the centering module.
3. Loosening of focusing and collimating.
3. Loosening of the ceramic body.
4. Loosening of the nozzle.

Troubleshooting Plan:

1. Check whether the fiber is securely locked and if there is any sway.
2. Contact the cutting head manufacturer.
3. Check whether the ceramic body and nozzle are tightly locked; if loose, they need to be re-secured.
4. If no issues are found in the above checks, inspect the focusing lens tube and collimating lens tube for any looseness.

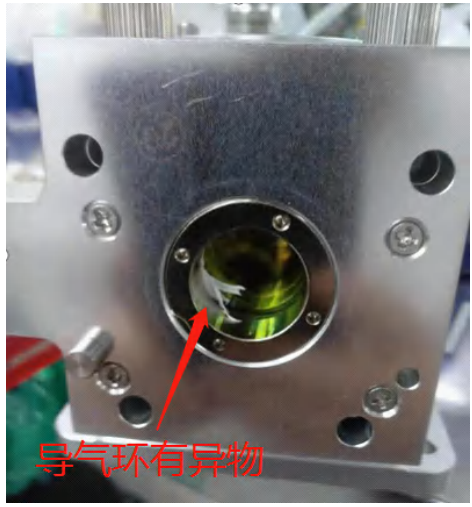
VI.Analysis of the Causes of Slag Burning Below the Protective Lens:

1. Related to cutting process parameters, especially thick plate piercing parameters.
2. Associated with air path blockage.
3. For the BoChu system PLC process settings, it is advised to place blowing before foll owing.
4. Related to electronic valves, check valves, and proportional valves.
5. Associated with the cutting plate, especially when cutting with a film.
6. Dust from worn check valves being blown onto the protective lens, affecting the lens.

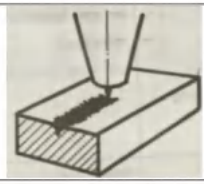
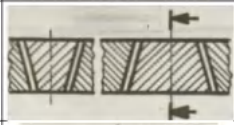
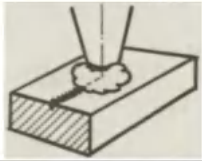
Dust is prone to accumulate here.

VII. Checking for Poor Cutting:

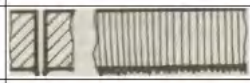
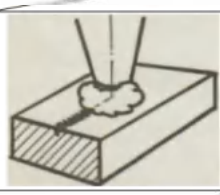
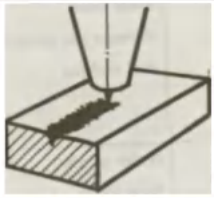
If the cutting effect does not meet the requirements during the cutting process, especially when using nitrogen or air results in poor cutting quality, the first step is to check whether the cutting head's air path is blocked and if there are any foreign objects in the air path, as shown in the following diagram.



Analysis of Common Defects and Solutions for Oxygen Cutting of Carbon Steel

Serial Number	Defect Type	Defect Image	Possible Causes	Solutions
1	The bottom traction line has a significant offset, and the bottom cut is wider.		The feed rate is too high. The laser power is too low. The air pressure is too low. The focus is too high.	Decrease the feed rate. Increase the laser power. Increase the air pressure. Lower the focus.
2	The burrs on the bottom surface are similar to slag, in a drip shape and easy to remove.		The feed rate is too high. The air pressure is too low. The focus is too high.	Decrease the feed rate and increase the air pressure. Lower the focus.
3	The metal burrs connected together can be removed as a whole.		The focus is too high.	Lower the focus.
4	The metal burrs on the bottom surface are difficult to remove.		The feed rate is too high. The air pressure is too low. The gas is impure. The focus is too high.	Reduce feed rate Increase air pressure Use purer gas to lower focus
5	Burrs only on one side		Nozzle misalignment Nozzle defect	Align the nozzle Replace the nozzle
6	Material discharges from the top		Power too low Feed rate too high	If this occurs, immediately press the pause button to prevent slag from splashing onto the focusing lens. Then, increase the power and reduce the feed rate.
7	Inclined surface cutting Two sides good, two sides bad		Total reflection mirror inappropriate, installed incorrectly or defective Total reflection mirror installed in the position of the deflection mirror	Check the total reflection mirror Check the deflection mirror
8	Blue plasma, workpiece not cut through		Incorrect processing gas (N2), feed rate too high Power too low	If this occurs, immediately press the pause button to prevent slag from splashing onto the focusing lens. Use oxygen as the processing gas, reduce the feed rate, and increase the power.
9	Cutting surface not precise		Air pressure too high Nozzle damaged Nozzle diameter too large Material quality poor	Reduce air pressure Replace the nozzle Install an appropriate nozzle Use materials with a smooth and even surface
10	No burrs, trailing line inclined, cut becomes narrower at the bottom		Feed rate too high	Reduce feed rate
11	Crater formation		Air pressure too high Feed rate too low Focus too high Rust on the surface of the sheet Processed workpiece overheated	Reduce air pressure Increase feed rate Lower the focus Use higher quality materials
12	Very rough cutting surface		Focus too high Air pressure too high Feed rate too low, material too hot	Lower the focus Reduce air pressure Increase feed rate, cool the material

Analysis of Common Issues and Solutions for Cutting Stainless Steel with Nitrogen

Serial Number	Defect Type	Defect Image	Possible Cause	Solution
1	Formation of small, regular droplet-like burrs		Focus too low Feed rate too high	Raise the focus Reduce the feed rate
2	Long, irregular filament-like burrs on both sides, surface discoloration of large sheets		Feed rate too low Focus too high Air pressure too low Material too hot	Increase feed rate Lower the focus Increase air pressure Cool the material
3	Long, irregular burrs only on one side of the cutting edge		Nozzle misalignment Focus too high Air pressure too low Speed too low	Align the nozzle Lower the focus Increase air pressure Increase speed
4	Yellowing of the cutting edge		Oxygen impurities in the nitrogen	Use high-purity nitrogen
5	Plasma formation on the straight section		Feed rate too high Power too low Focus too low	If this occurs, immediately press the pause button to prevent slag from splashing onto the focusing lens Reduce the feed rate Increase the power Raise the focus
6	Beam dispersion		Feed rate too high Power too low Focus too low	Reduce the feed rate Increase the power Raise the focus
7	Plasma formation at the corners		Angle tolerance too high Modulation too high Acceleration too high	Reduce angle tolerance Reduce modulation or acceleration
8	Beam dispersion at the start		Acceleration too high Focus too low Melted material not expelled	Reduce acceleration Raise the focus Pierce a round hole
9	Rough cut		Nozzle damaged Lens dirty	Replace the nozzle, clean the lens, and replace if necessary
10	Material discharges from the top		Power too low Feed rate too high Air pressure too high	If this occurs, immediately press the pause button to prevent slag from splashing onto the focusing lens. Increase the power, reduce the feed rate, and reduce the air pressure.