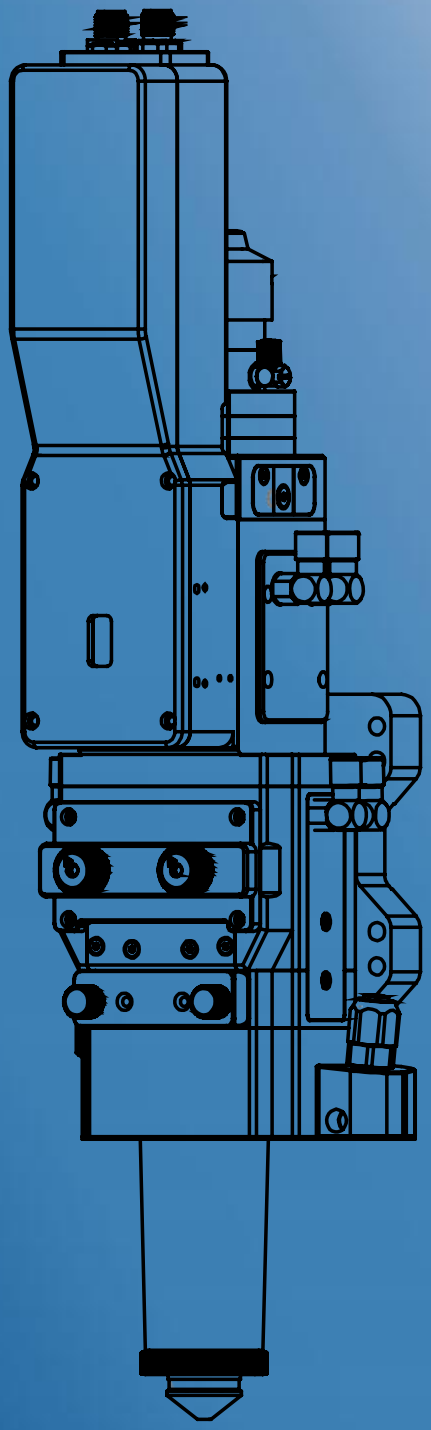
Fiber optic automatic focus cutting head

NC6 3 E



Product Operation User Manual

Shenzhen Worthing Technology Co., Ltd.

Version：V1. 1

Revision History of the Manual

NO.	Adjusted Timing	Version
01	2023-8-29	V1.0
02	2024-3-13	V1.1

Contents

1. Main technical parameters and structural description of the product

1 .1 Main technical parameters

Cutting head model:NC63E

Laser wavelength: 1030 ~ 1090nm
Laser power: ≤8000W
Fiber interface: QBH/QD/G5

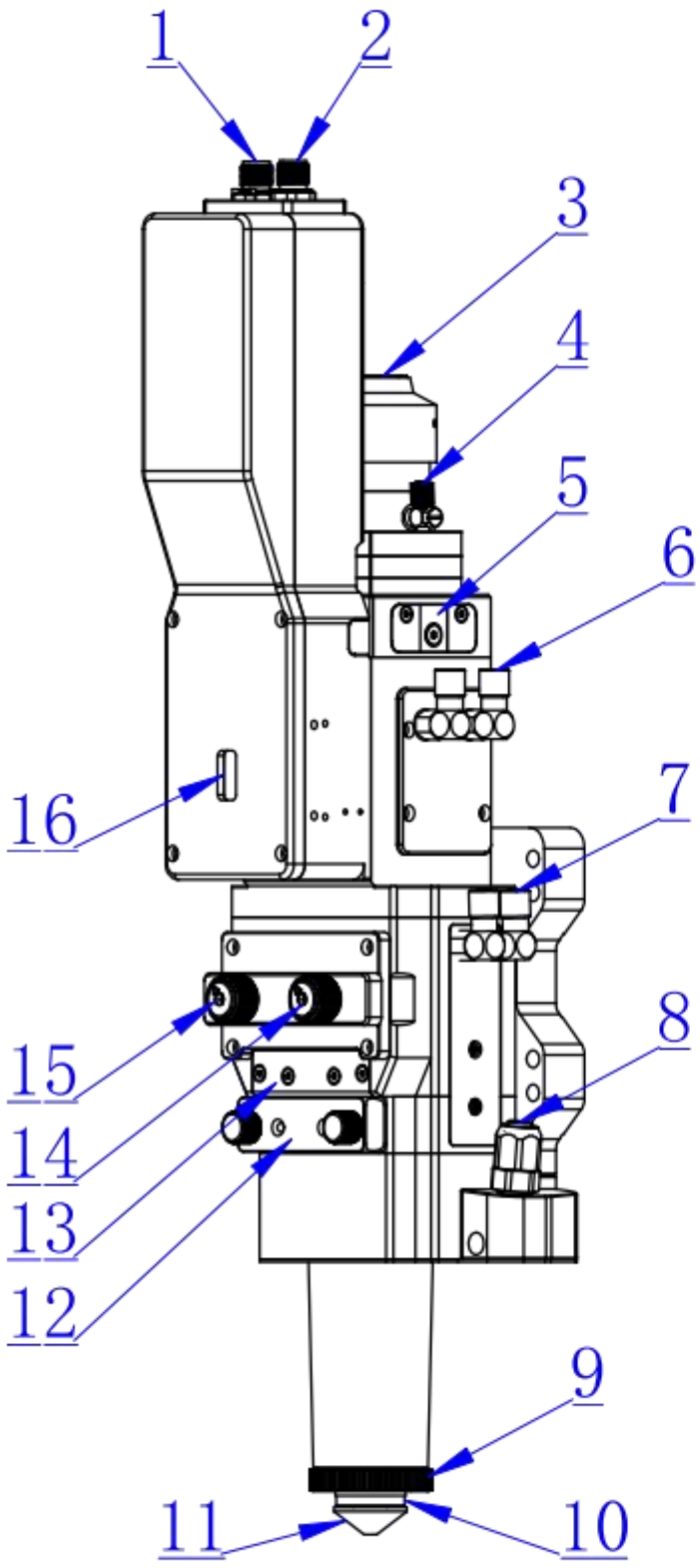
Lens configuration: Collimation F100,Focusing F150/F200

Focus range:
The focus range for a lens configuration of F100/F150 is ± 18mm.
The focus range for a lens configuration of F100/F200 is ±35mm.

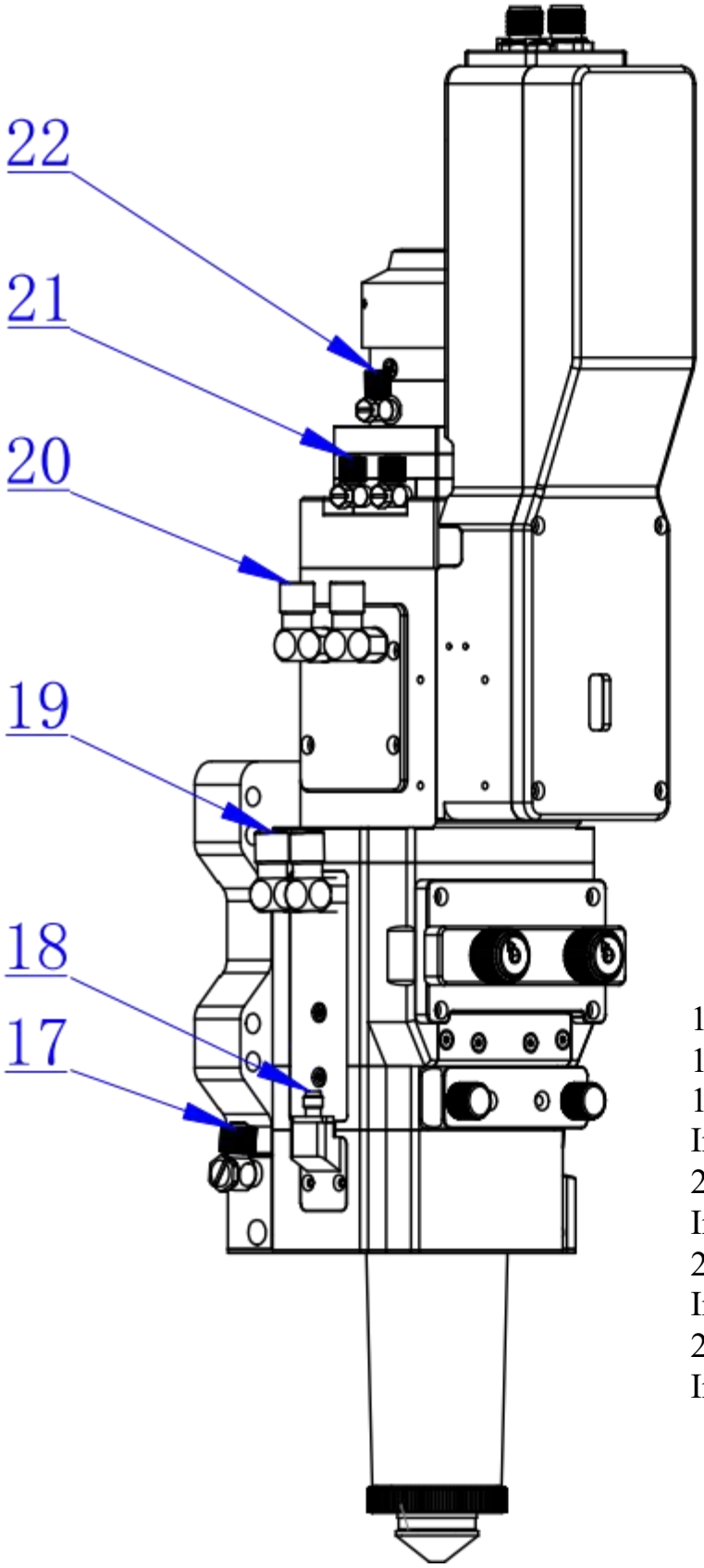
Alignment and focus range: ± 1.5mm

Cutting gas interface:
Standard ϕ10 (optional ϕ12), gas pressure ≤2.5 Mpa
Nozzle cooling gas interface: ϕ6, gas pressure ≤0.6 Mpa
Cooling water pipe interface: 4 6, cooling water pressure ≤0.5 Mpa
Weight: Approximately 7.8k

1.2 Interface Descriptions

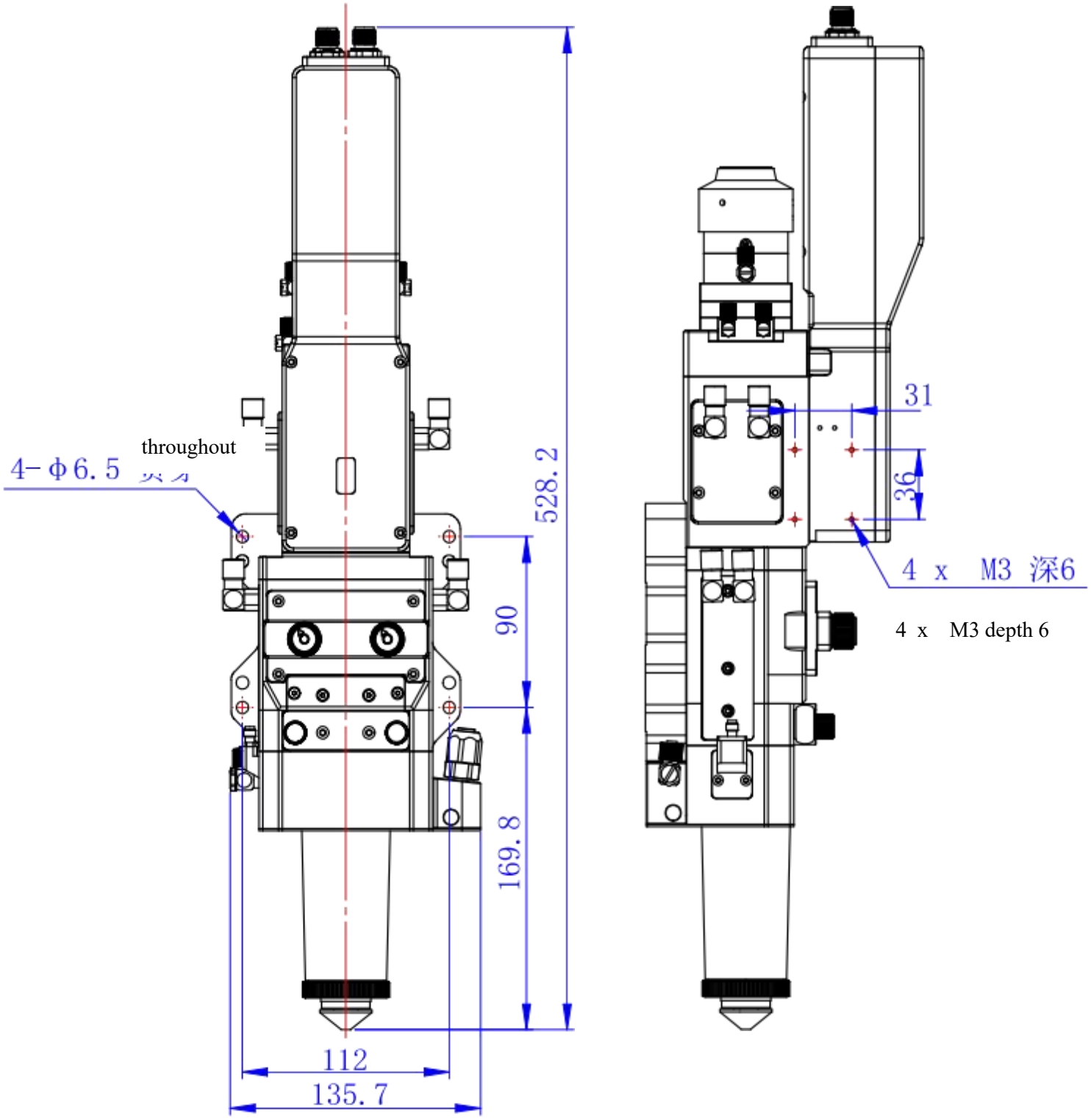


1. Power line interface
2. Encoder & limit signal line interface
3. Fiber optic interface
4. Fiber optic water cooling interface 1 (middle 6)
5. Collimator protection mirror drawer
6. Collimator inlet and outlet water cooling interface 1 (ϕ6)
7. Focusing inlet and outlet water cooling interface 1 (ϕ6)
8. Cutting gas interface (standard ϕ10, optional ϕ12)
9. Locking ring
10. Ceramic ring
11. Nozzle
12. Drawer protection mirror
13. Focusing protection mirror
14. Focusing mirror center adjustment (X, Y)
15. Focusing mirror center adjustment (x, Y)
16. Observation window

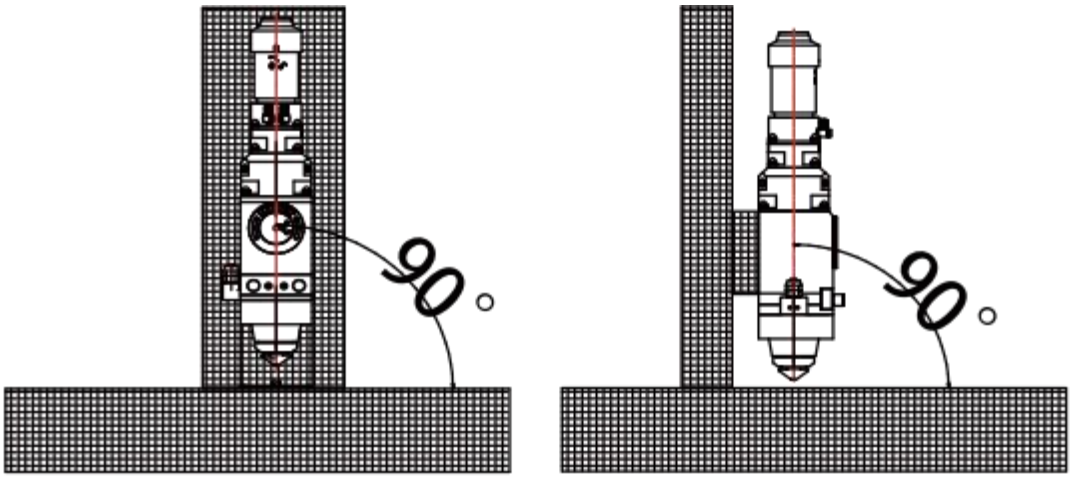


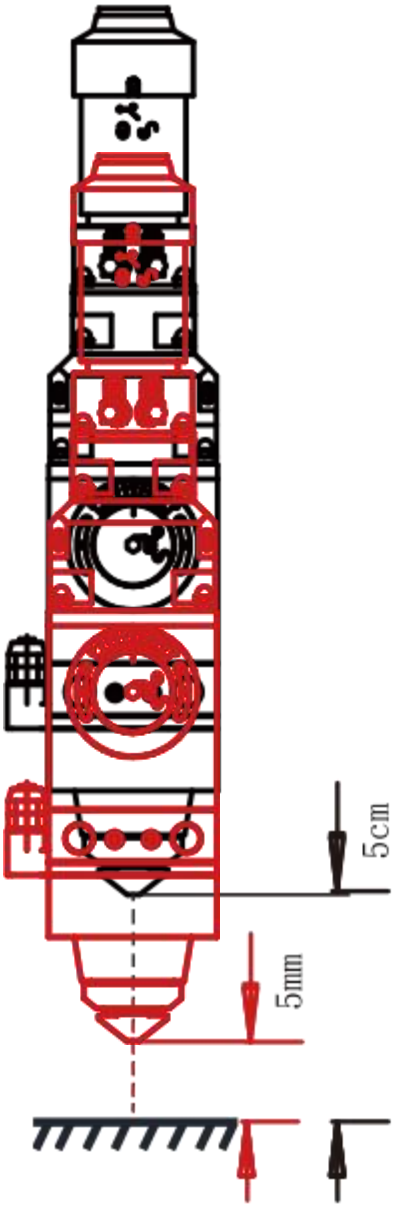
17. Cooling Gas Interface (ϕ6)
18. Follow-up Signal Interface
19. Focusing Water Cooling In/Out Interface 2 (ϕ6)
20. Collimation Water Cooling In/Out Interface 2 (ϕ6)
21. Collimation Protective Lens Water In/Out Interface (ϕ6)
22. Fiber Optic Water Cooling Interface 2 (ϕ6)

1.3 Installation Dimensions

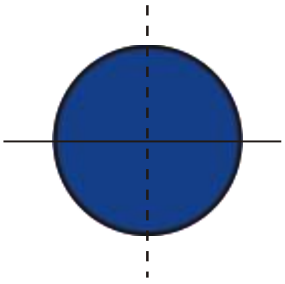


1.4 Installation and Debugging

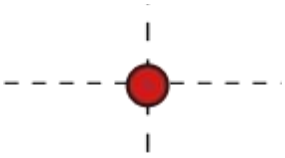




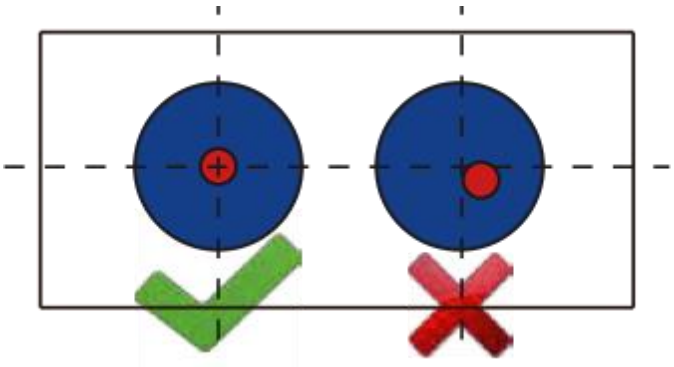
Step 1: At a height of 5 cm from the surface, fire the laser with a power of about 500W to create a circular burn mark on the surface.



Step 2: At a height of 1-5 mm from the surface, fire the laser with a power of about 100W to create a circular burn spot on the surface.

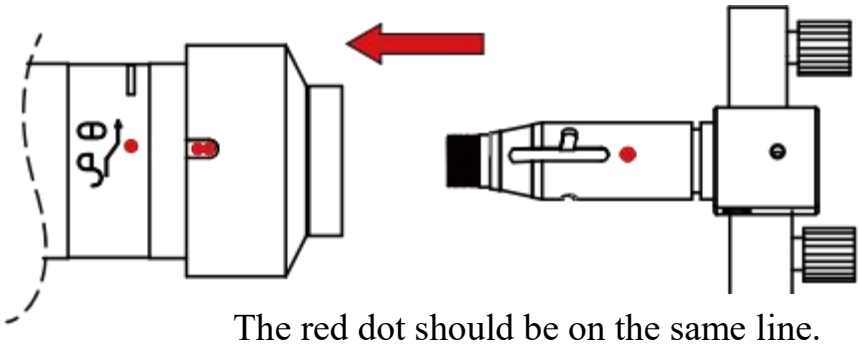


Step 3: Compare the concentricity.



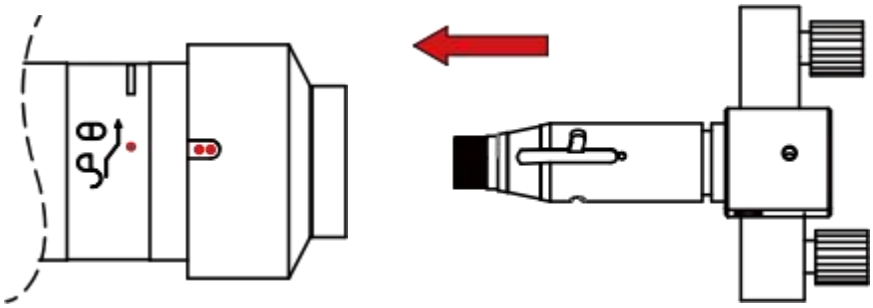
1.5 Optical Fiber Connection

(1) Place the optical fiber rod and optical fiber connector in a horizontal position.
(2) Clean the optical fiber rod and optical fiber connector with a lint-free cloth and anhydrous ethanol.



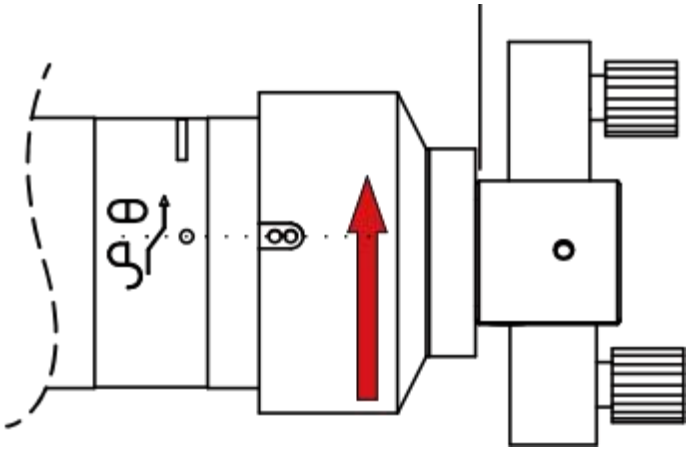
The red dot should be on the same line.

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



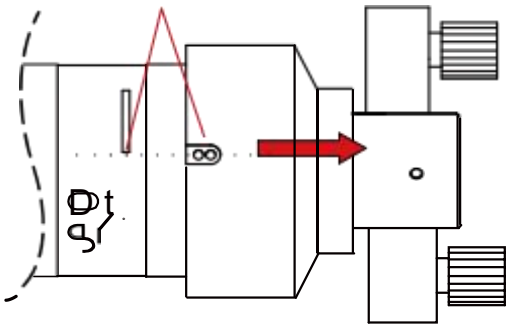
(4) After the optical fiber rod is fully inserted, rotate the red mark on the rotating sleeve to align it with the white reference line in the direction of the arrow.

Align first



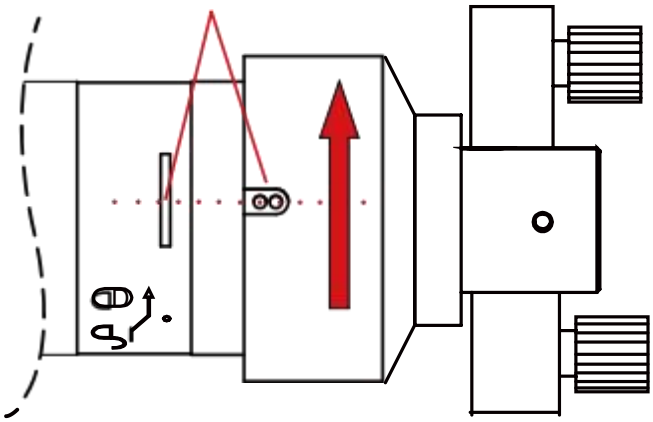
(5) Pull the rotating sleeve upward in the direction shown in the diagram

Align first, then lift.



(6) Gently rotate in the indicated direction once more, applying moderate force. Typically, you should feel a snug fit.(pinching with thumb and forefinger)

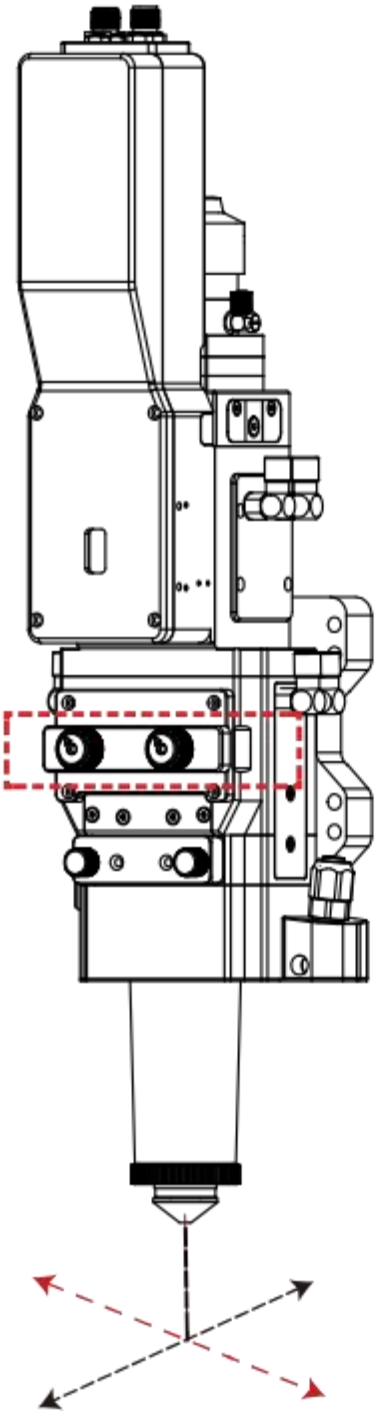
Alignment or surpassing the midpoint is acceptable, but be mindful not to overadjust once you're in place.



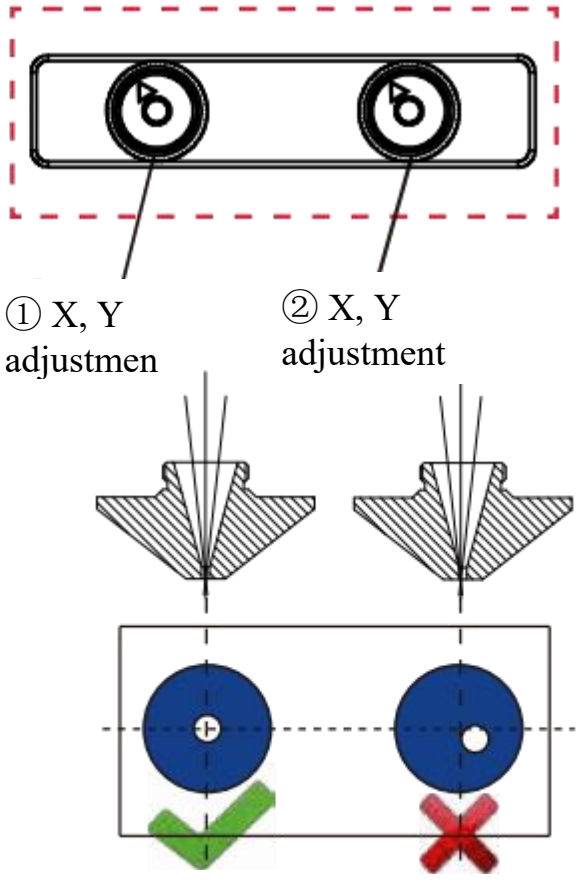
Note:Please do not twist forcefully, as it may cause damage to the precision mechanism!

To prevent dust or dirt from accidentally entering the optical fiber connector, first clean the fiber rod. Insert the fiber plug only after the laser head is in a horizontal position.

1.6 Adjusting the Light Center



1.Use an Allen wrench to adjust the X/Y leveling screws of 1 and 2 so that the beam passes through the center of the nozzle.
2.The best cutting effect is achieved 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, poor cutting effect, and other issues.



The beam passes through the center of the nozzle (correct).

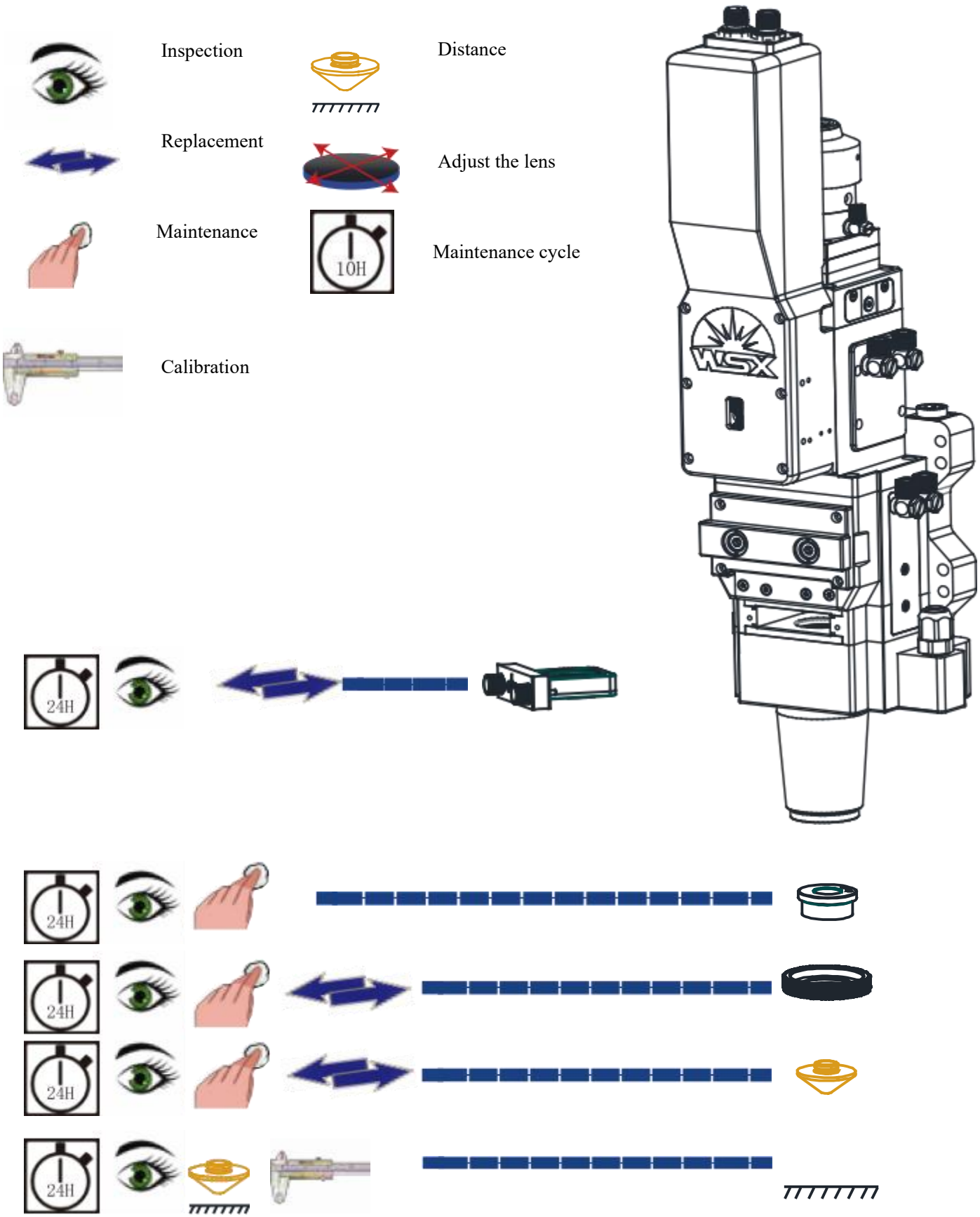
The beam passes through the center of the nozzle (correct).

Method to check if the beam passes through the center of the nozzle:

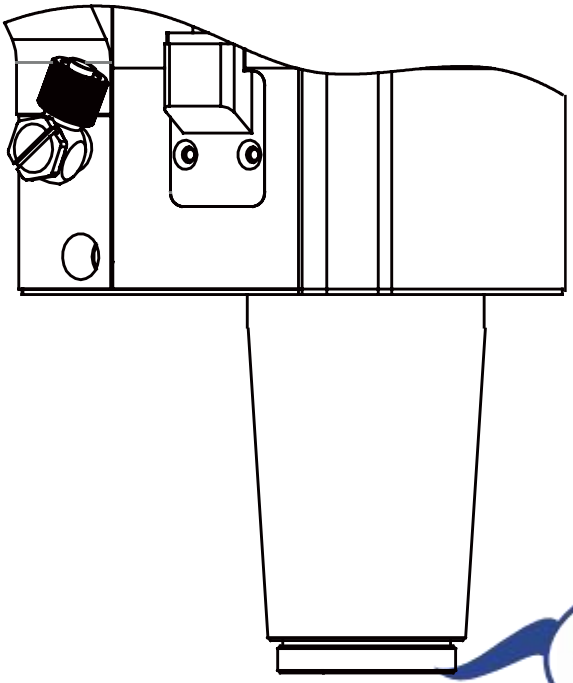
1. Stick transparent tape over the nozzle (preferably use a new or undistorted nozzle);
2. Adjust the laser power to around 50W (for a 500W laser, set the spot power to 10%);
3. Let the laser beam shine for 1-2 seconds, then remove the transparent tape;
4. Hold the transparent tape towards a light source and observe whether the circular mark on the tape from the nozzle is concentric with the burn spot made by the laser through the tape;
5. If they are concentric, the adjustment is correct; if not, continue to adjust until correct;
6. After the adjustment is correct, immediately tighten the center locking ring (red part).

2. Maintenance/Disassembly

2.1 Routine Inspection and Maintenance



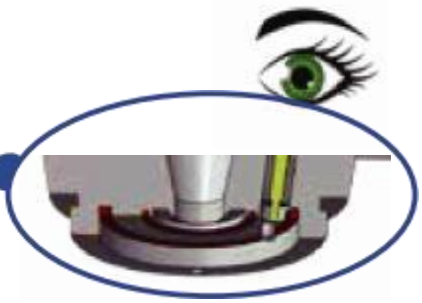
2.2 Replacement of Ceramic Rings and Nozzles

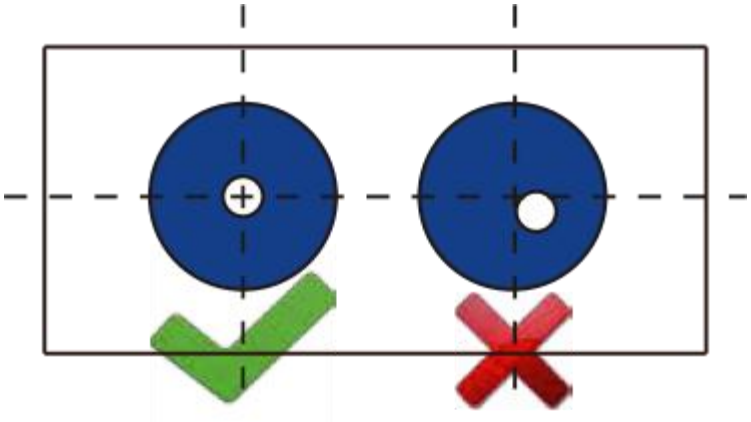


Power supply

Cooling gas

Cutting gas

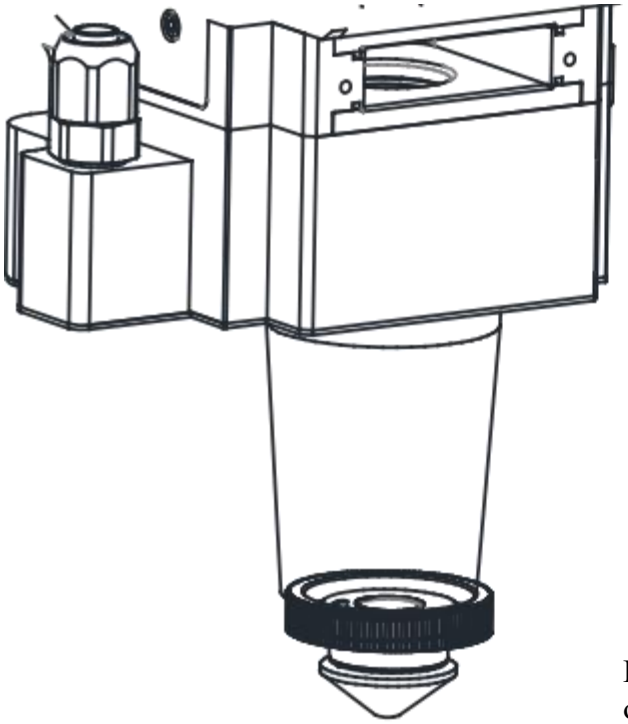


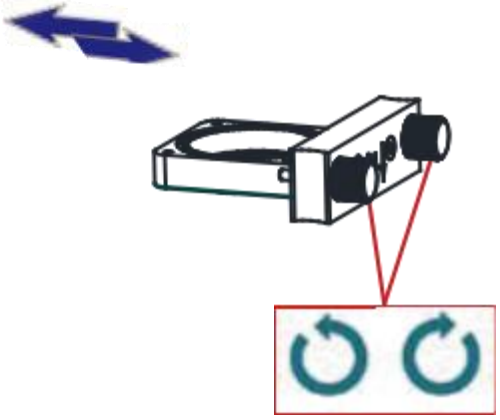


Proofreading Center

Please make sure to recognize the WSX brand.

2.3 Drawer Protection Mirror Replacement





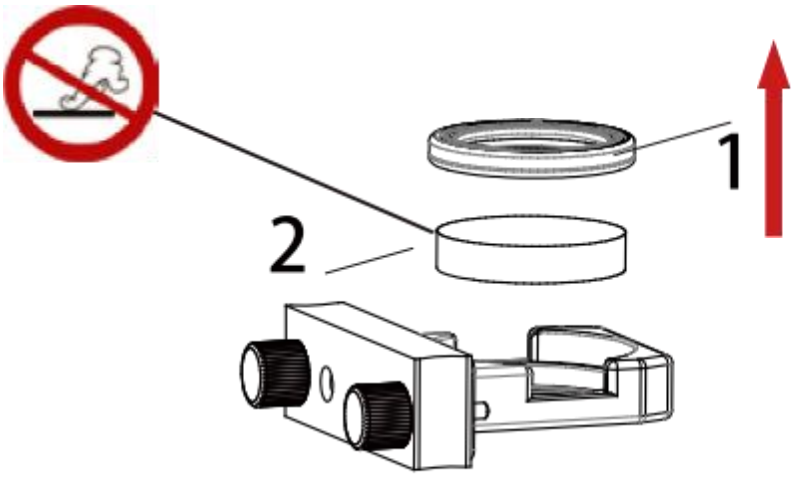
Power supply

Cooling gas

Cutting gas

Disassemble by unscrewing the screws and pulling out horizontally.

Note on dust prevention: Wear dust-proof gloves and finger cots when assembling or disassembling the mirror. This should be done in a clean environment. (When replacing lenses on-site, masking tape can be used to seal the window to prevent dust from entering and causing contamination.)

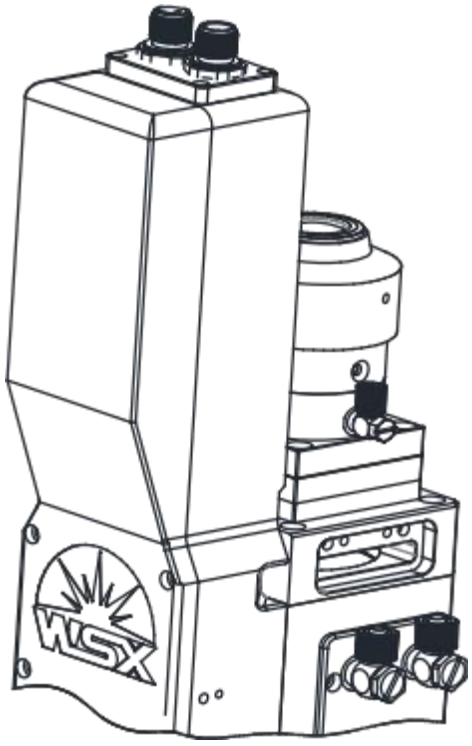


1. Pressure cover
2. Protective lens

Note: To open, pull upwards following the arrow sequence.

Do not use wrenches, pliers, or other tools, as this may damage the components.

2.4 Replacement of Collimator Protection Lens

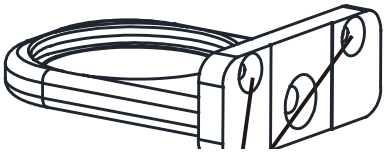


Beware of falling objects

Power supply

Cooling gas

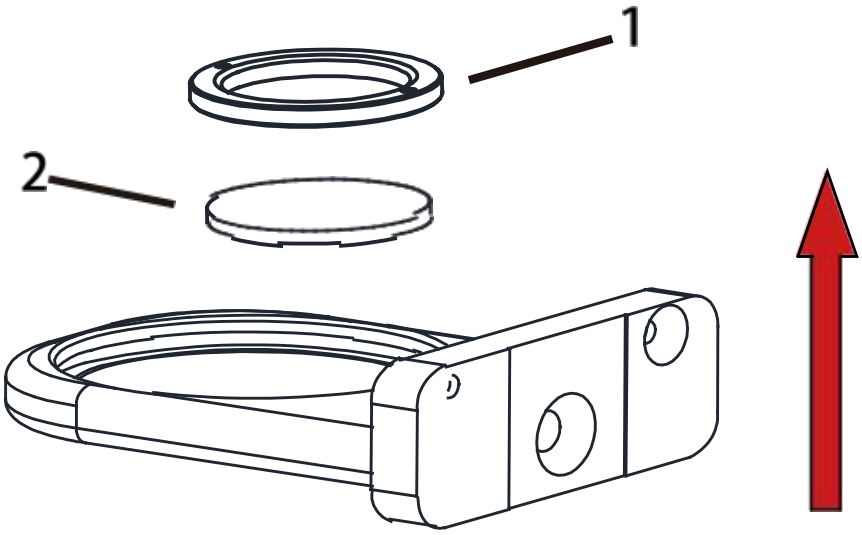
Cutting gas



Disassemble by unscrewing the screws and pulling out horizontally.

Note on Dust Prevention: When disassembling the mirror, wear dust-proof gloves and finger cots, and perform the task in a clean environment. (During on-site lens replacement, you can use masking tape to seal the window to prevent dust from entering and causing contamination.)

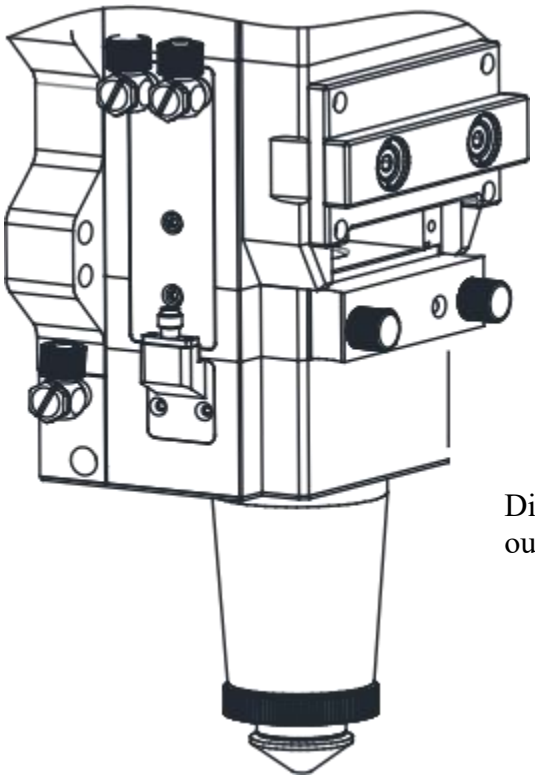
3

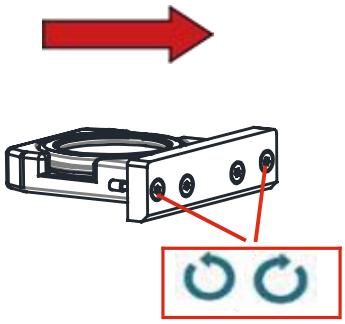


1. Pressure cap 2. Protective glass 3. Special fixture

Note: For disassembly, use the special tooling fixture to rotate and loosen the fixed pressure cap, then invert and remove it. Do not use wrenches, pliers, or other tools, as they may damage the parts.

2.5 Focusing Protective Lens Replacement





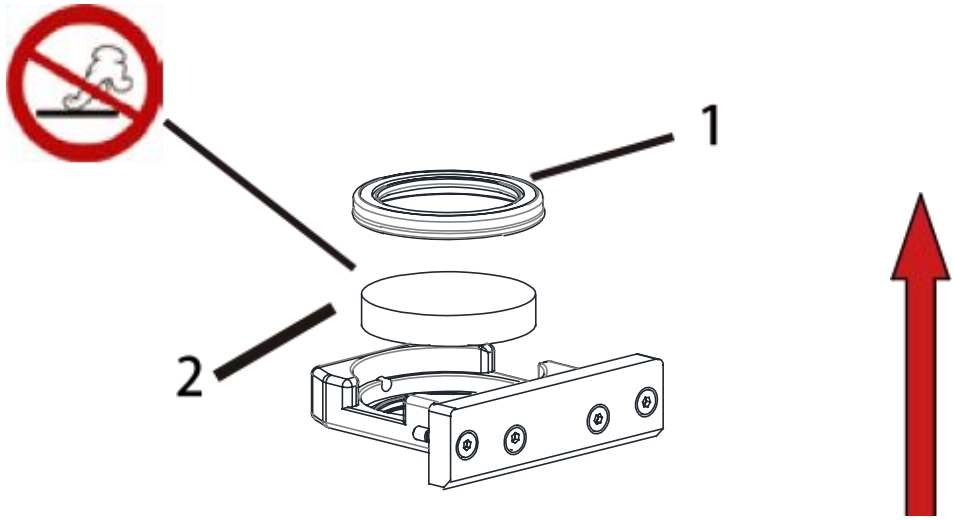
Power supply

Cooling gas

Cutting gas

Disassemble by unscrewing the screws and pulling out horizontally.

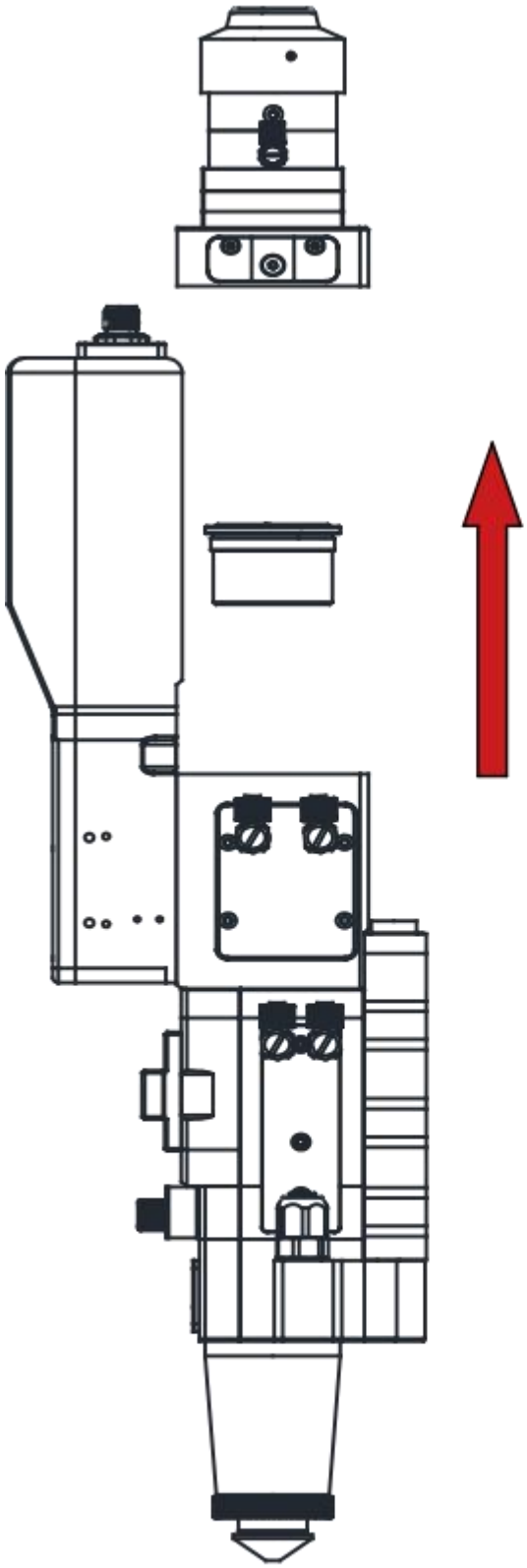
Beware of falling objects

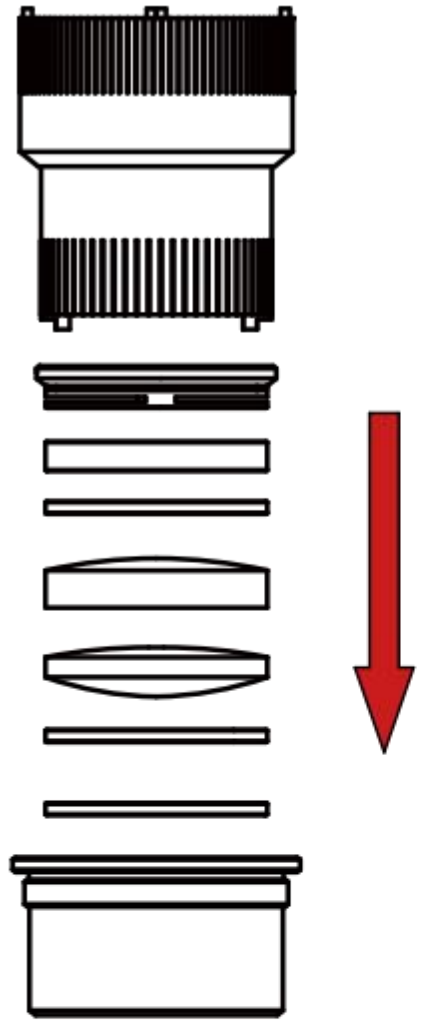


1. Cap 2. Protective cover

Note: To open, pull upwards according to the arrow sequence.
Do not use wrenches, pliers, or other tools, as this may damage the parts.

2.6 Replacing the Collimator

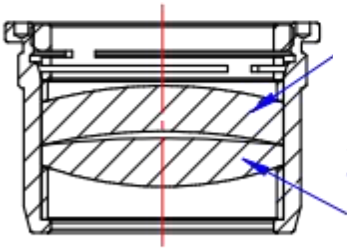




Power supply

Cooling gas

Cutting gas

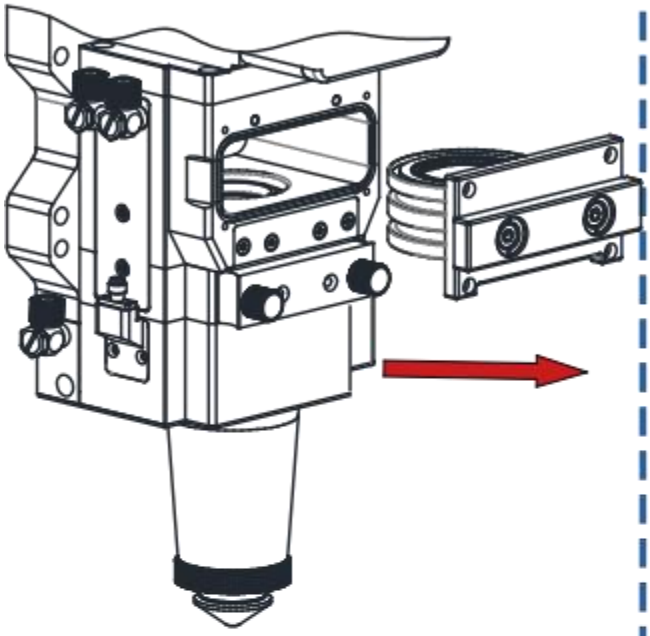


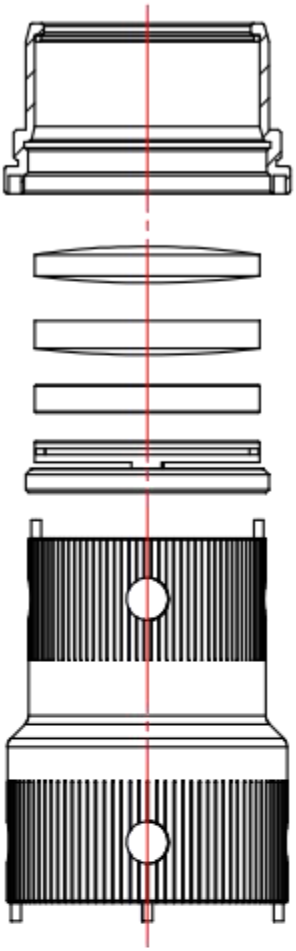
Concave-convex lens

Double convex lens (the flatter side facing the concave lens)

Note: Use specialized fixtures to loosen the fixed cover by rotating. After removing the lens, record the thickness and direction of the gasket. After replacing it, restore it to its original recorded state in the correct order.

2.7 Focusing Lens Replacement

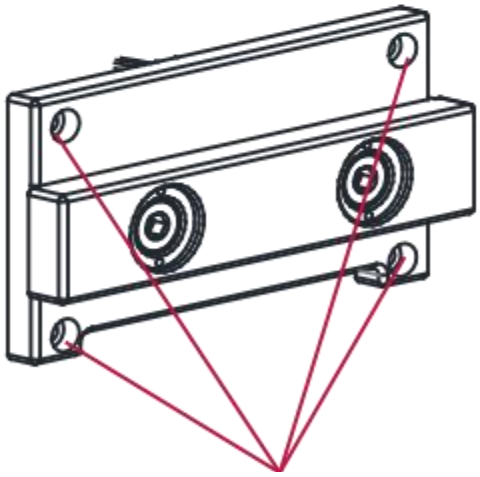




Power supply

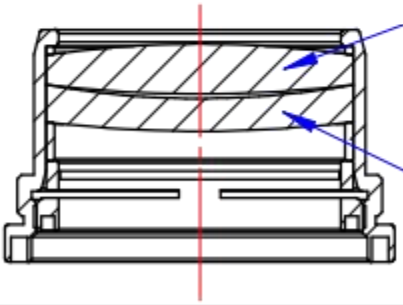
Cooling gas

Cutting gas



Loosen the 4 M4 hex screws and directly pull out the focusing lens group

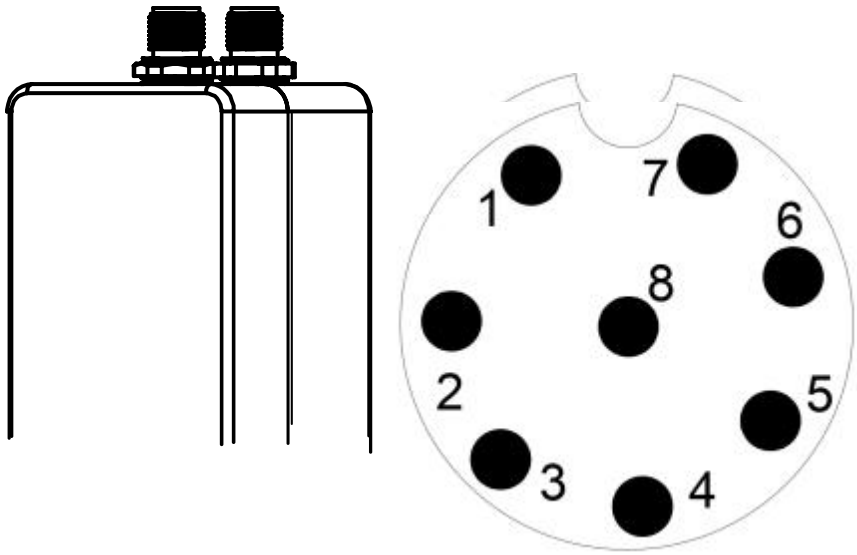
Double convex lens (the flatter side facing the concave lens)



Concave-convex lens

Note: For disassembly, use a specialized fixture to rotate and loosen the fixed pressure cover. After removing the lens, record the thickness and orientation of the washer. After replacement, restore the original recorded state in sequence.

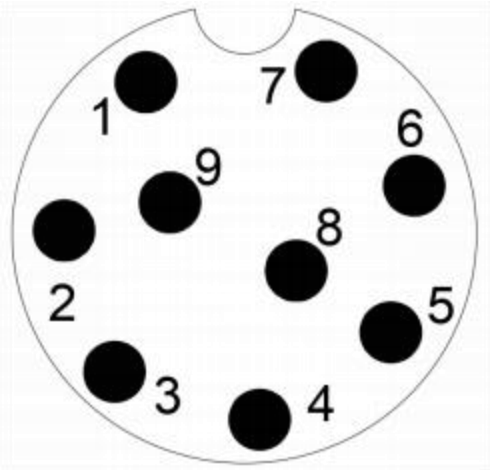
3. Electrical Interfaces and Definitions



Pin	Definition
1	--
2	VCC
3	EGND
4	EA+
5	EA-
6	EB+
7	EB-
8	--

Servo motor encoder port

□definitions

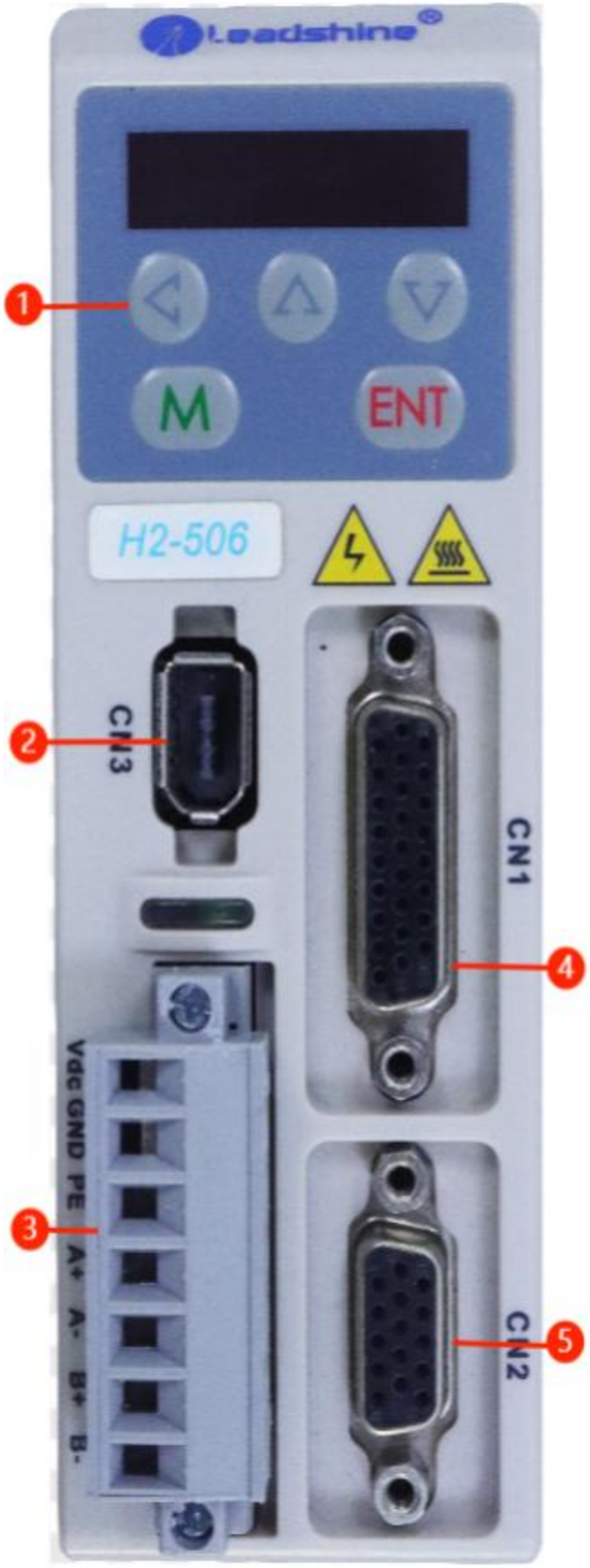


Pin	Definition
1	--
2	A+
3	A-
4	B+
5	B-
6	24V
7	0V
8	W+
9	W-

Servo motor control lines and photoelectric switch port

□definition

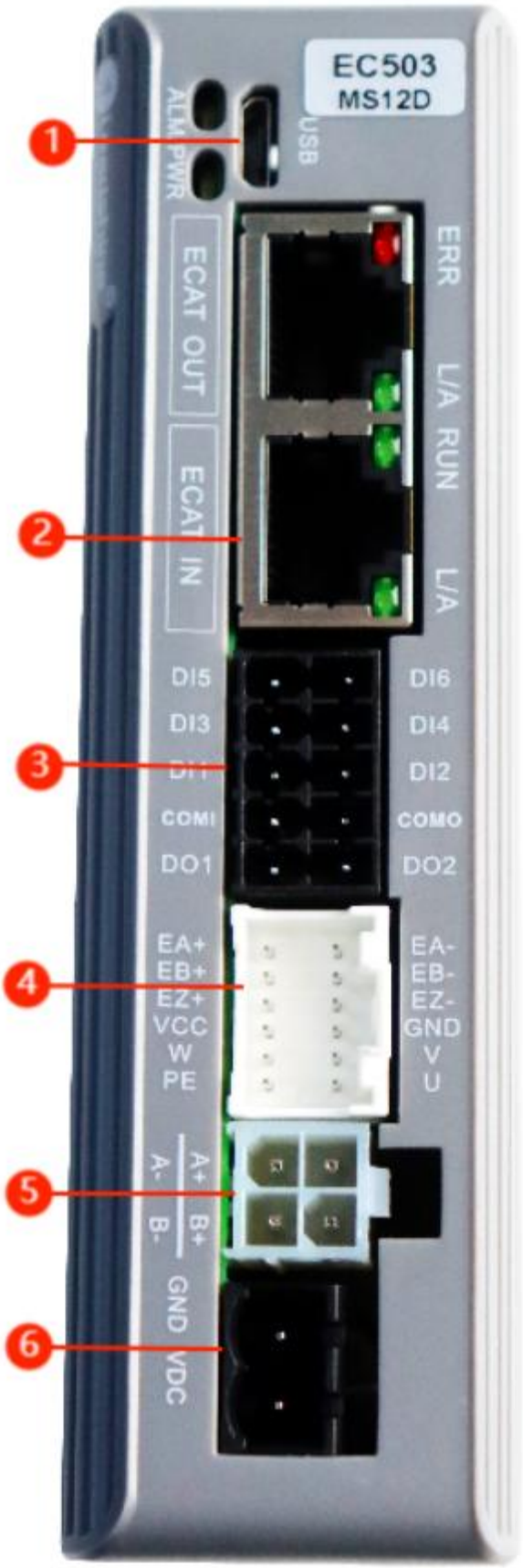
4. Wiring Instructions for Mixed Pulse Drive Type



NO.	Name	Description
1	Keypad	M ： Navigate through menus ▲ ： Up button ▼ ： Down button ◀ ： Shift key ENT ： Confirm/Save
2	Debugging Interface	Connect to a computer for driver debugging
3	Motor and Power Input Ports	1.Input power: DC 24V (Vdc to 24V, GND to 0V, PE to ground) 2.A+, A-, B+, B- to connect with the motor
4	Pulse IO Ports	IO control signal input and output
5	Encoder Port	Communication port with the motor encoder

Note: 1. The power supply input for this drive is DC 24V (Direct Current). 2. This drive is intended solely for position mode (open-loop mode). 3. The PE terminal of the drive's enclosure must be connected to the ground terminal.

5.Instructions for Wiring Mixed Bus-Type Drives



NO.	Name	Description
1	Debugging Interface and Alarm Indicator Light	Connect the computer for drive debugging
2	Ethere CAT Communication Port	Connect to the host or the preceding slave device
3	Pulse IO Port	IO control signal input and output (Connections to be made according to actual usage)
4	Encoder Port	Communication port with the motor encoder
5	Motor Phase Sequence	A+, A-, B+, B- connections for interfacing with the motor
6	Power Supply Port	Input power is DC24V (VDC connects to 24V, GND connects to 0V)

Note: 1. The power supply for this driver is DC 24V (direct current). 2. This driver is exclusively for bus use. 3. The driver's metal enclosure must be connected to the ground terminal.

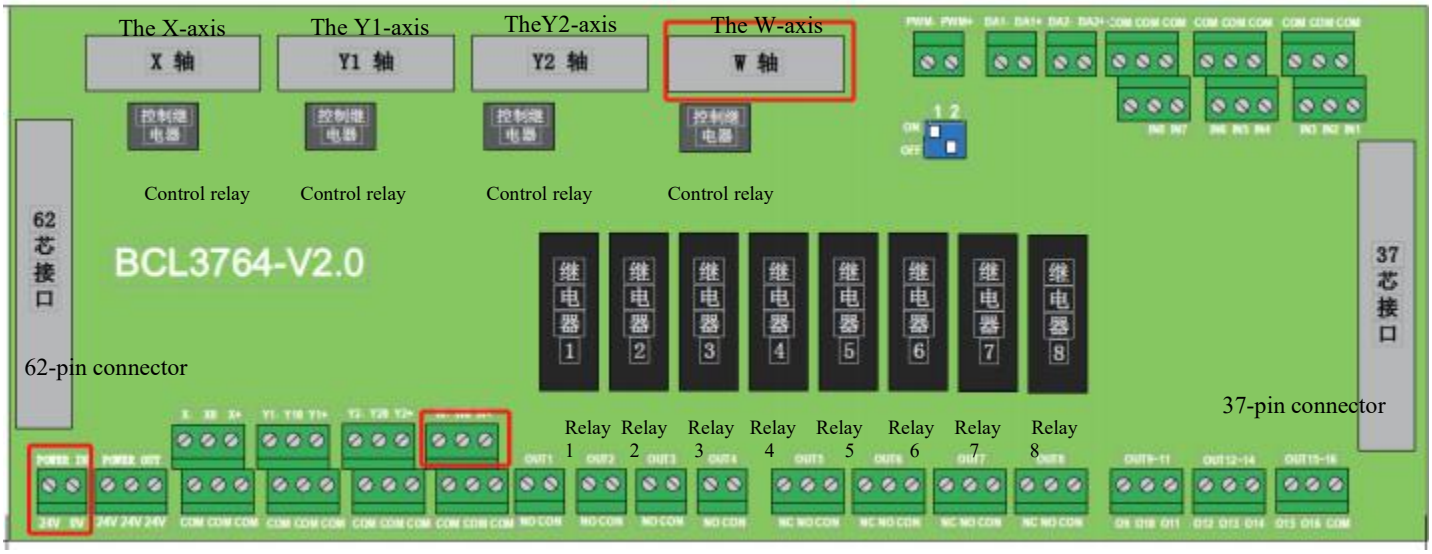
6.Measurement Instructions for Motors and Limit Switches

Motor Measurement Procedure:
1. Instrument: Multimeter.
2. Set the multimeter to the resistance mode of 200Ω or the continuity mode with a buzzer.
3. Measure the motor's U, V, W terminals, preferably by inserting one end into the cutting head connector.
4. The resistance between motor terminals U/V, U/W, V/W should be approximately 17-20 Ω. If the continuity mode emits a sound, the motor is functioning normally. If the resistance is 0Ω or infinite, the motor is faulty.
5. None of the motor terminals U, V, W should be conductive with PE or the casing. If conductivity is present, the motor is defective.

Limit Switch Measurement and Wiring Procedure:
1. Instrument: Multimeter.
2. Unless specified otherwise, the limit switch is an NPN type with a normally closed signal.
3. It is advisable to perform measurements when the focus is at the zero position.
4. Jog the servo motor to confirm it can rotate forwards and backwards.
5. Connect 24V and 0V to the DC24V power supply, leaving W+ and W- unconnected.
6. Measure 24V with the red probe and W+ or W- with the black probe on the multimeter. If the output voltage at either the positive or negative limit is 0V, the switch is functioning correctly.
7. Wiring instructions for the limit photoelectric sensor.

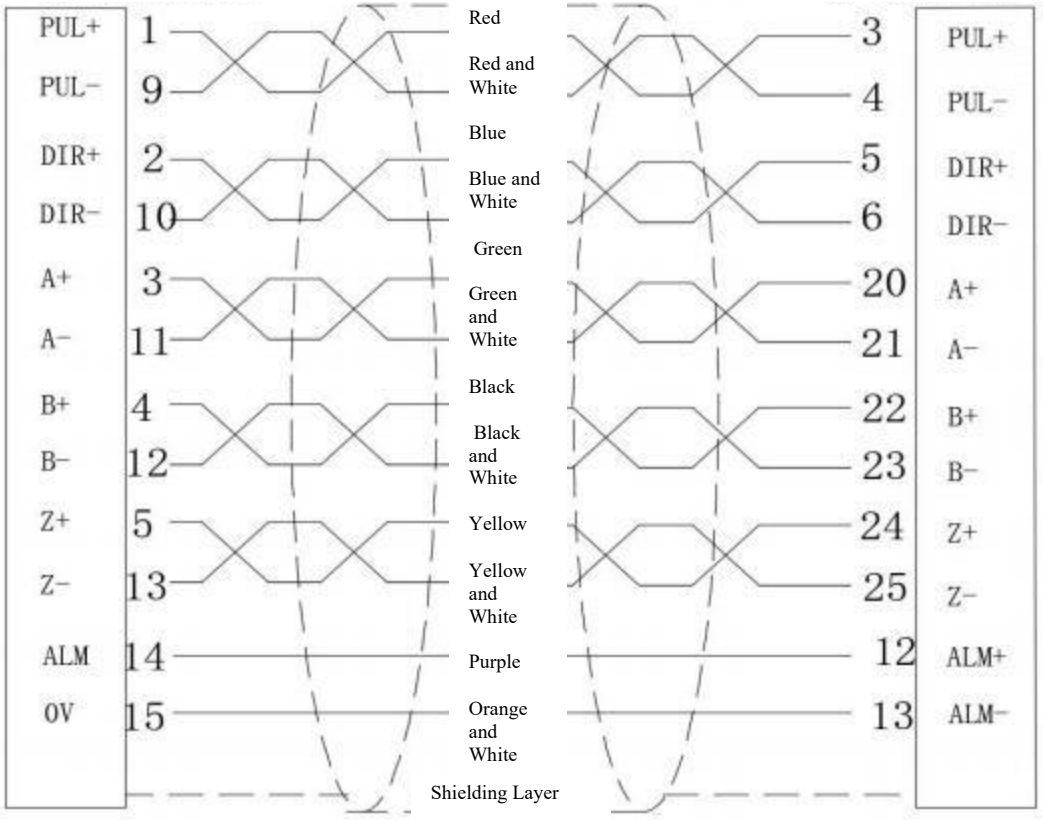
NO.	Name	Description
1	24V	Positive terminal of the DC24V switching power supply
2	0V	Negative terminal of the DC24V switching power supply
3	W+	Limit optical sensor signal (NPN type, normally closed)
4	W-	Limit optical sensor signal (NPN type, normally closed)

7. Instructions for Wiring the PCT Control Card

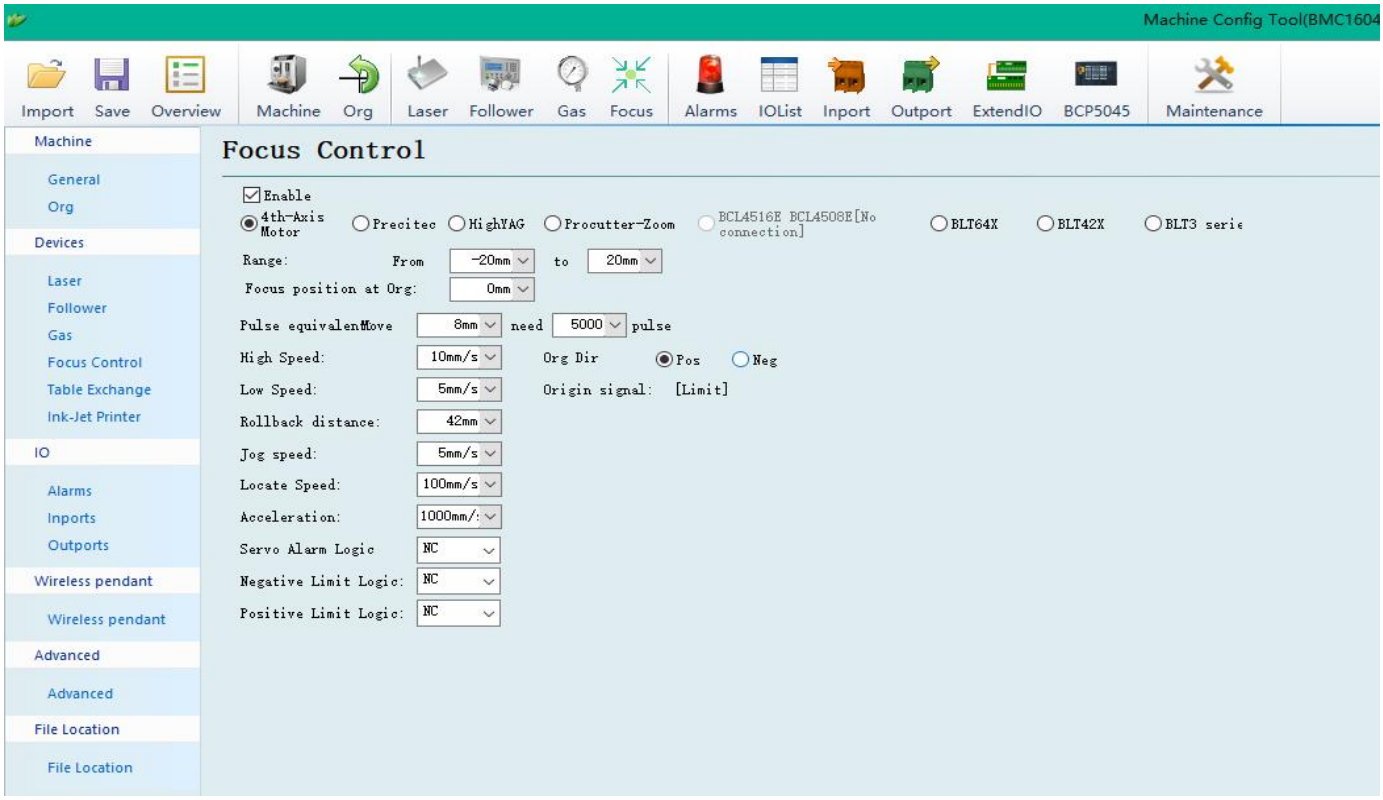


Note:1. The pulse control line connects to the W-axis port on the control card;2. 24V, 0V, W+, and W- connect to their corresponding ports on the control card.

7.1 Wiring Instructions for the Pulse Control Line of the Bechert System



8.Description of the Configuration Parameters for the Cypcut System Platform

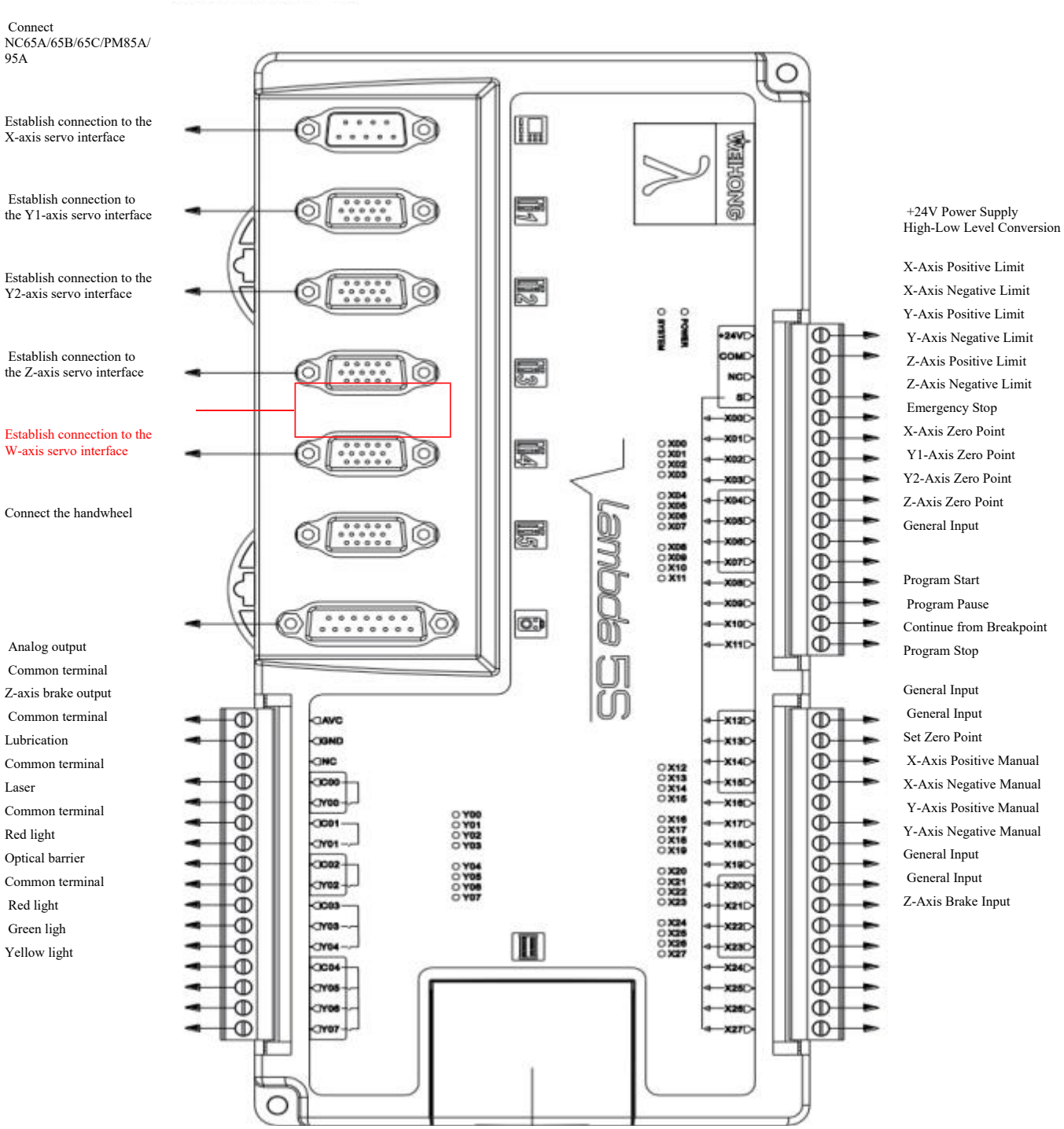


8.1 Description of the Configuration Parameters for the Cypcut Bus System Platform

Note: The setback distance should be adjusted based on the physical focus.

9. Wiring Instructions for the Weihong System Control Module

Terminal Wiring Diagram



Remove this cover.
Connect the extension terminal board EX30A5.

Figure 4-1 Wiring diagram for the Rhonda controller in the laser cutting system (Dual Y)

9.1 Instructions for Wiring the Expansion Module of the Weihong System

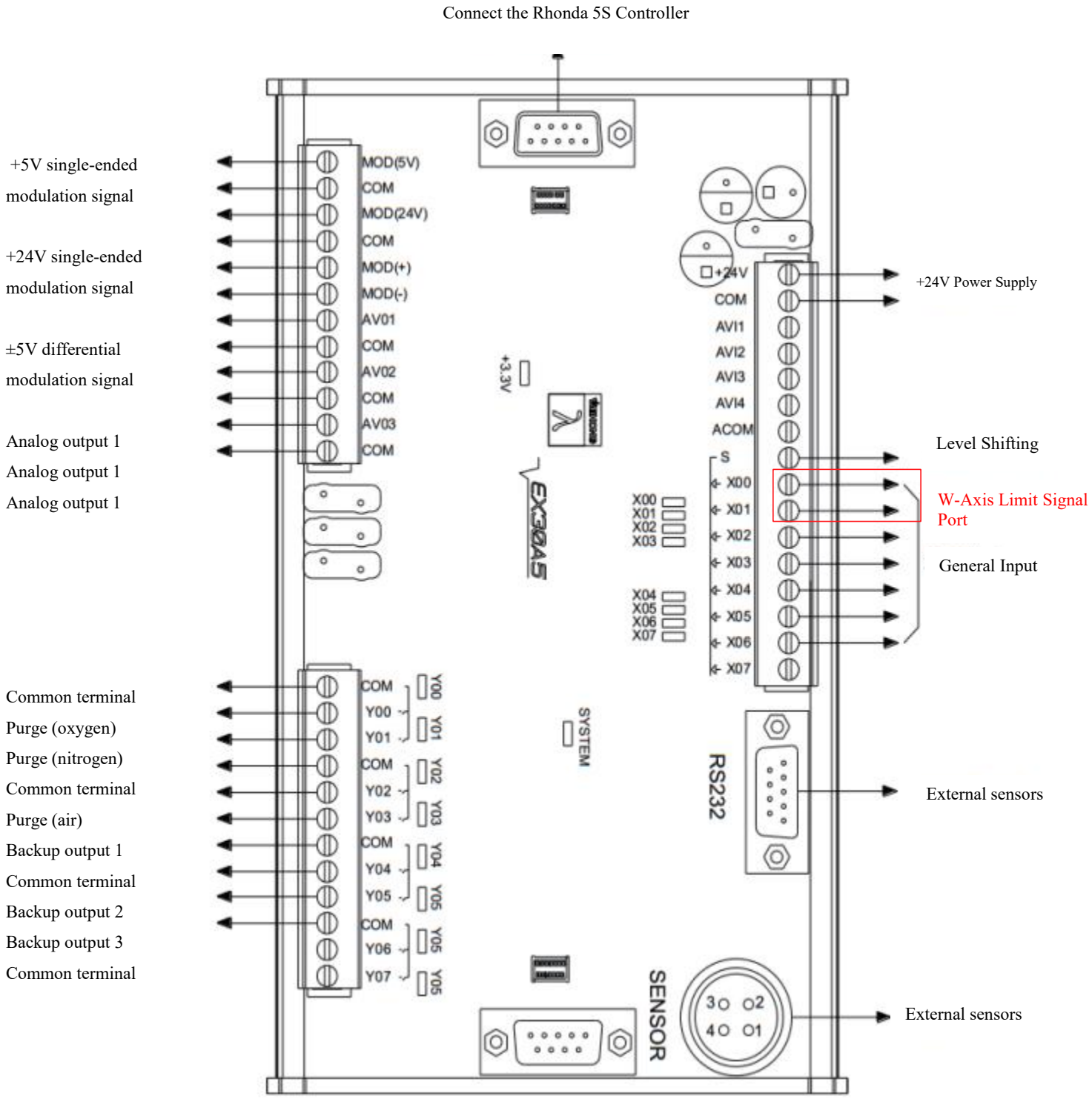
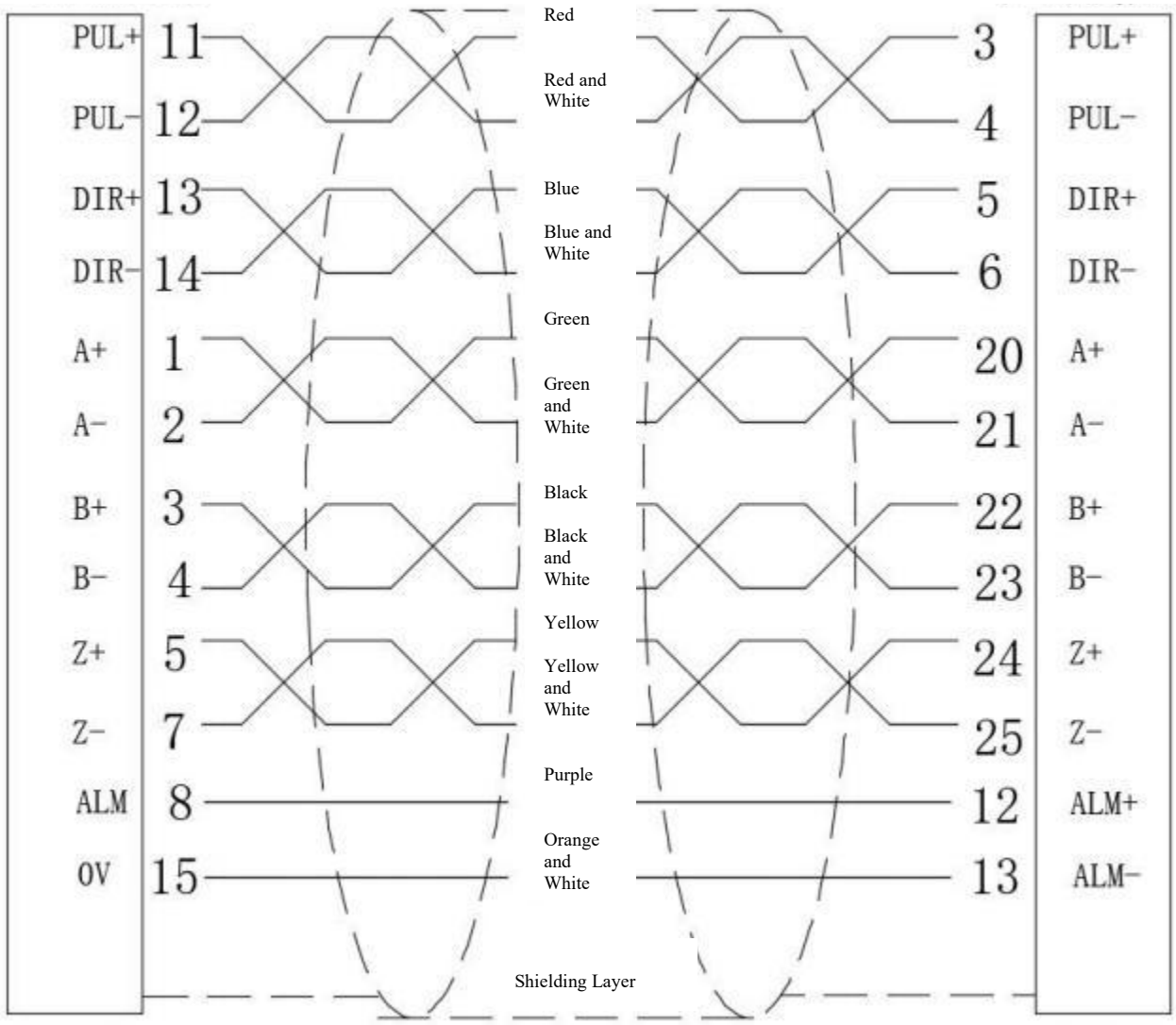
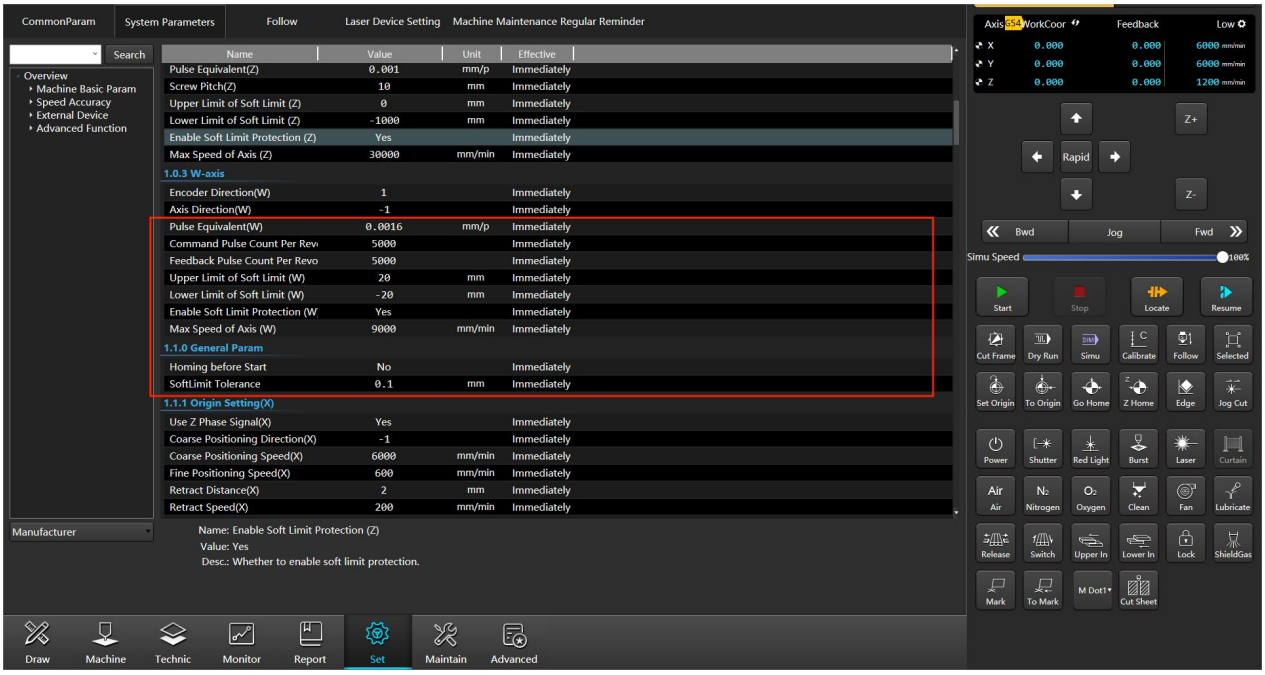


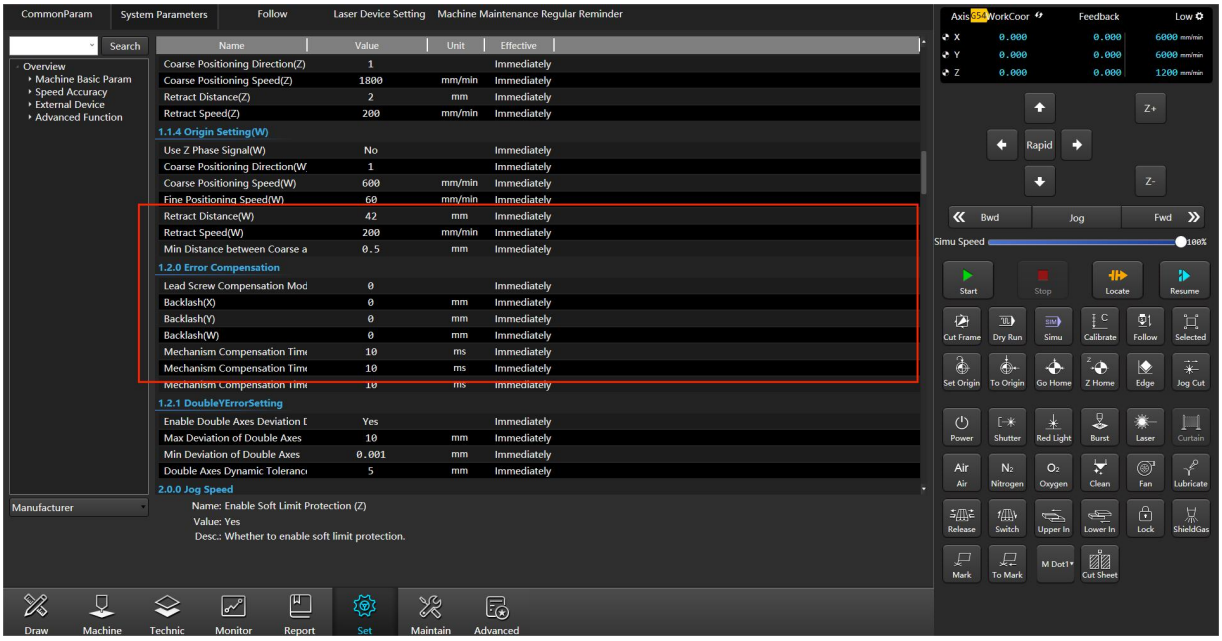
Figure 4-2: Wiring Diagram for the Extended Terminal Block EX30A5 in the Laser Cutting System

9.2 Wiring Instructions for the Pulse Control Line of the Weihong System



10. Description of Configuration Parameters for the Weihong System Platform





Note: The retreat distance is adjusted according to the physical focal point.

11. Fault Alarm Code Explanation

11.1 Pulse Fault Alarm Description

NO.	Name	Measures for Resolution
Er001	Overcurrent protection	1.Restart the driver. 2.If the restart driver alarm still exists, check if there is a short circuit in the motor power line. 3.Disconnect the motor power line, restart the driver, and if the alarm still exists, the driver is damaged.
Er002	Over-voltage protection	1.Restart the driver. 2.If the driver restart alarm persists, check if the power supply voltage is too high. .
Er020	Out of position tolerance	1. Check if the encoder resolution (PA08) is set incorrectly.2. Check the wiring between the motor and the driver to ensure that the phase sequence is correct (the motor A+/A-, B+/B- must strictly correspond to the driver A+/A-, B+/B-); check if there is any broken connection in the encoder wires. 3. Increase the acceleration time appropriately. 4. Check if the motor is jammed.
Er00d	Line disconnection protection	1. Check if the motor encoder cable and encoder extension cable are broken or have poor contact. 2. If the cable is confirmed to be in good condition but the alarm persists, check if the motor encoder is damaged. 3. If the cable was soldered by the customer, verify if the wiring definitions are correct.

11.2 Bus-type fault alarm description

ALM blinking frequency	N a m e	Measures for Resolution
1	Overcurrent protection	1. Ensure that the drive output wires are not short-circuited; make sure the motor is not damaged. 2. Adjust the wiring sequence of the motor. 3. Replace with a new drive.
2	Overvoltage protection	Reduce the supply voltage on the VDC/GND terminals. 2. Decrease acceleration and deceleration.
3	The instruction pulse increment is too large.	Please verify if the parameter segmentation is accurate.
4	Locking Axis Error	1. Ensure that the connections for the motor output terminals A+, A-, B+, and B- are correct. 2. Ensure that the motor wires are not broken. 3. Ensure that the encoder power supply voltage is normal; ensure that the encoder cables are intact, and ensure that the encoder ground connection is good.

6	Self-tuning error	Check if there is any jamming in the motor screw structure.
7	The location is very poor.	1. Restart the driver. 2. If the alarm still persists after restarting the driver, check if there is a short circuit in the motor power line. 3. Disconnect the motor power line, restart the driver, and if the alarm still persists, the driver is damaged.
8	Encoder Disconnection Detection	Ensure that the encoder lines are correctly connected, with no cold solder joints, misalignment, or short circuits.
10	Emergency stop alarm	Make sure the input signal wiring is correct.
11	Positive and negative limit alarms	Check if the input end positive and negative limit signal outputs are normal and if the hardware is damaged.
12	Over-speeding error	Check if the fault occurs after the zeroing is completed; check if the slave's zeroing mode is used.
13	Stall alarm	Check if there is any jamming in the motor screw rod structure.
14	Zero error alarm	1. The encoder resolution of the motor is incorrect, causing the motor to not operate. 2. The motor's power lines are connected incorrectly. 3. The motor output is insufficient; appropriately increase the driver current. 4. If increasing the current doesn't work, check if there is any blockage in the mechanical structure or if the motor is undersized.
15	Current overload alarm	Set bit 6 of the peak output current value Pr4.22 or 0x2056 to 0 to disable it.
Everbright	Hardware Interrupt Protection	Verify the network connection and the sequence of the ESM conversion at the main station.

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