GS03C-H01

Product Manual

Shenzhen Ospri Intelligent Technology Co., LTD

Foreword

Dear Users:

Welcome to use GS03C fiber laser autofocus cutting head produced by Shenzhen Ospri Intelligent Technology Co., LTD. We are honored to have your confidence in our products.

In order to make you have an overall view of the product, convenient for your use, we specifically provide the user manual for you, including product characteristics, structural feature, technical feature, direction for use, maintenance, etc. It's an essential guide when you use this product.

Please read the user manual carefully before use. I'm sure it will be helpful for you to use this product. In addition, if you have any questions during use, please contact us, and we will serve you wholeheartedly.

Declaration:

In order to ensure your safety and the product works normally, please read the guide book carefully before using.

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Chapter 4 Product Debugging

Chapter 5 Product Maintenance

Chapter 1 Overview

1.1 Product Parameter

Name	Fiber Laser Cutting Head
Model	GS03C-H01
Interface Type	QBH
Wavelength	1080±10nm
Rated Power	≤3KW
Focus Length	125mm/150mm/200mm
Collimation Length	100mm
Nozzle	Flat-head FSN02 series; Pointed-head FSN07 series
Focusing range	-18mm~+15mm (150mm)
Centering range	±1.5mm
Focusing speed	100mm/s
Gas Pressure	≤3Mpa
Weight	3.2KG

1.2 Cautions

① Please wear specialized laser safety goggles to ensure human safety when the cutting head is used in coordination with laser cutting machine

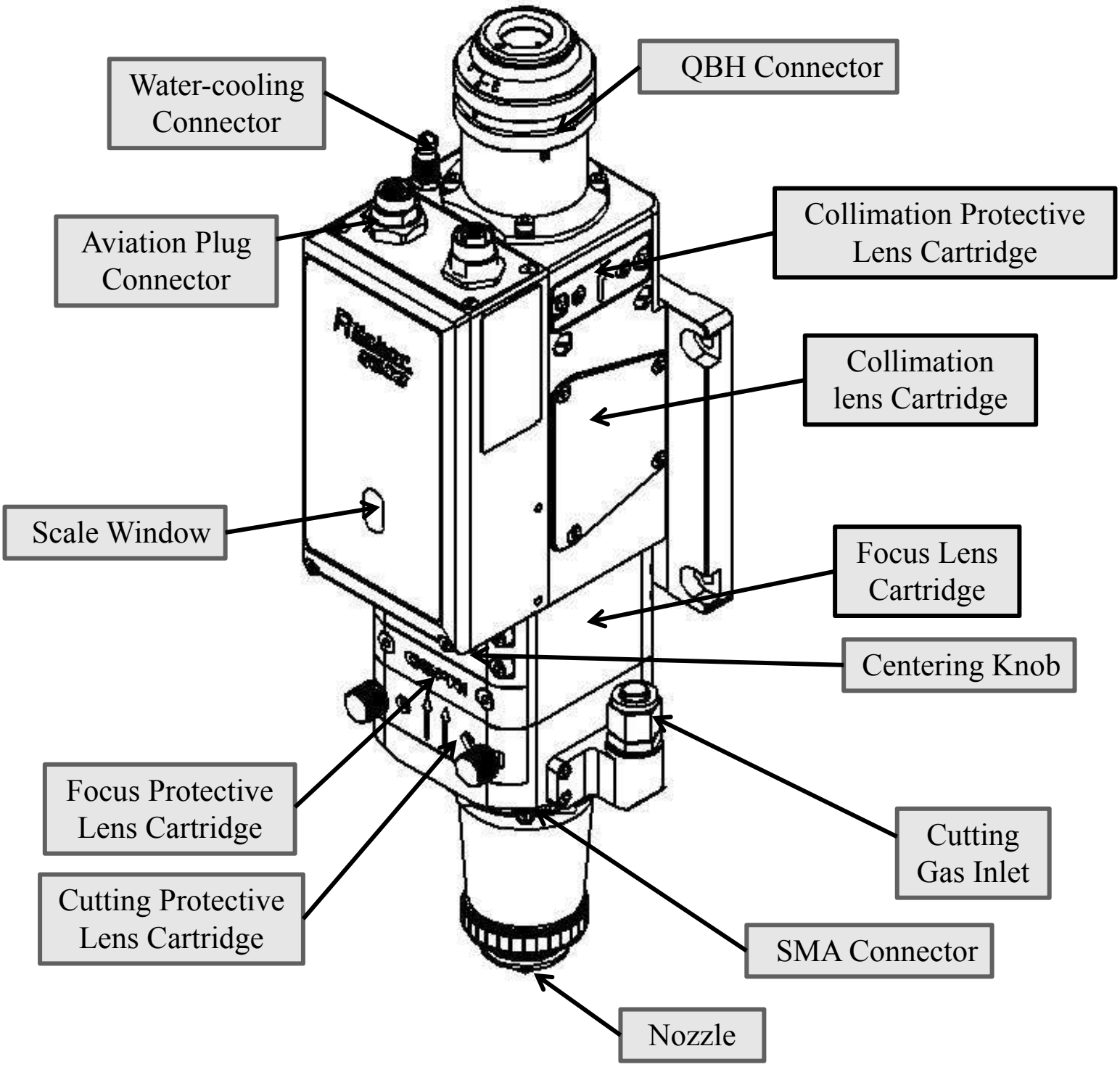
② Precautions and standard operations should be taken to prevent burning of cutting head and laser nozzle due to the deviation of laser beam from central axis.

③ Keep the cutting head clean to prevent coolant, condensate or other foreign matter from entering sensor parts; otherwise, it may cause sensor failure.

④ When processing products with laser, use protective devices to prevent the laser beam from causing injury to human body

Chapter 2 Structural Features

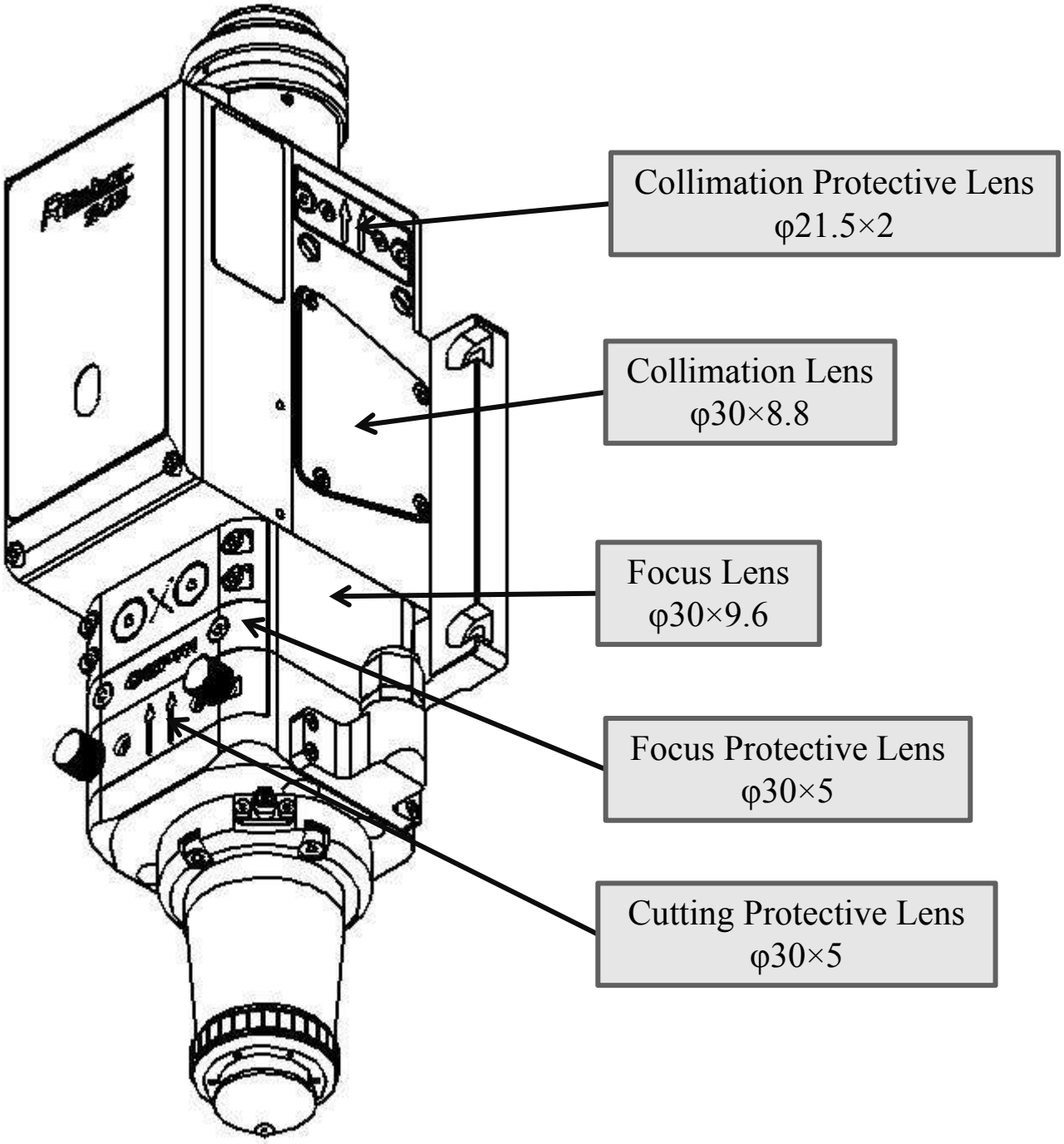
2.1 Brief Description of Product Structure



2.2 Brief Description of Product Parts

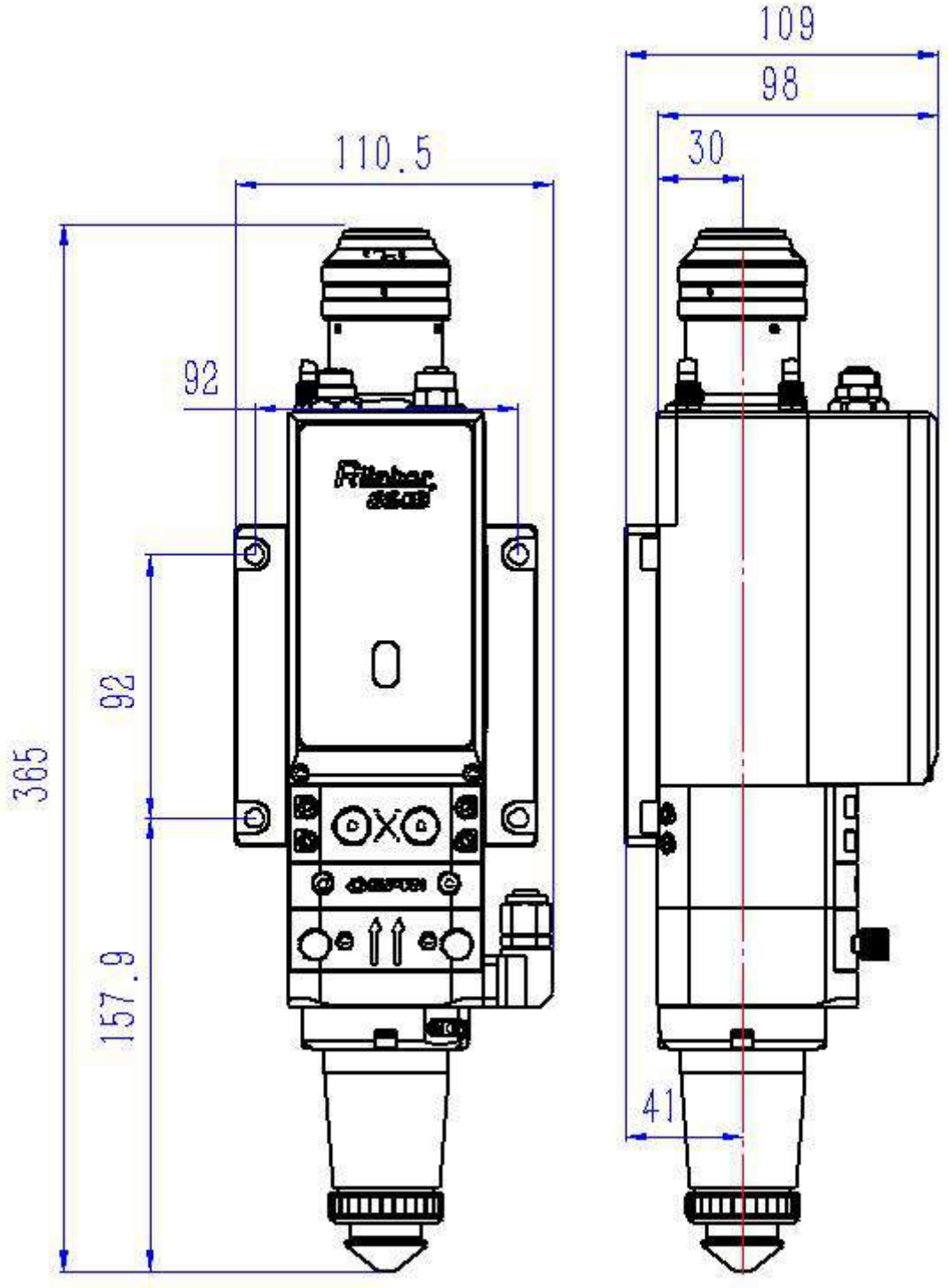
1. Water cooling connector: Mainly cool QBH and cutting head.
2. Aviation plug connector: Power lines for motors, encoder lines, and outputs for limit signals.
2. Collimation protective lens module: When inserting and removing the fiber head, prevent dust from entering the cutting head to protect the collimator fiber laser tip.
4. Scale window: Observation window for the cutting focus, for reference.
5. Focusing protective lens cartridge: Protect the focus lens to avoid contamination during the replacement of cutting protective lens.
6. Cutting protective lens cartridge: Seal the cutting gas and prevent external contaminants from polluting the focus protective lens.
7. Cutting gas inlet: φ10mm gas connector for inputting cutting gas.
8. Centering knob: Adjust the center of the light path so that the light beam passes through the center of the nozzle.
9. SMA connector: Connect to amplifier.

2.2.1 Brief Description of Product Parts (Lens Size)



Chapter 3 Product Installation

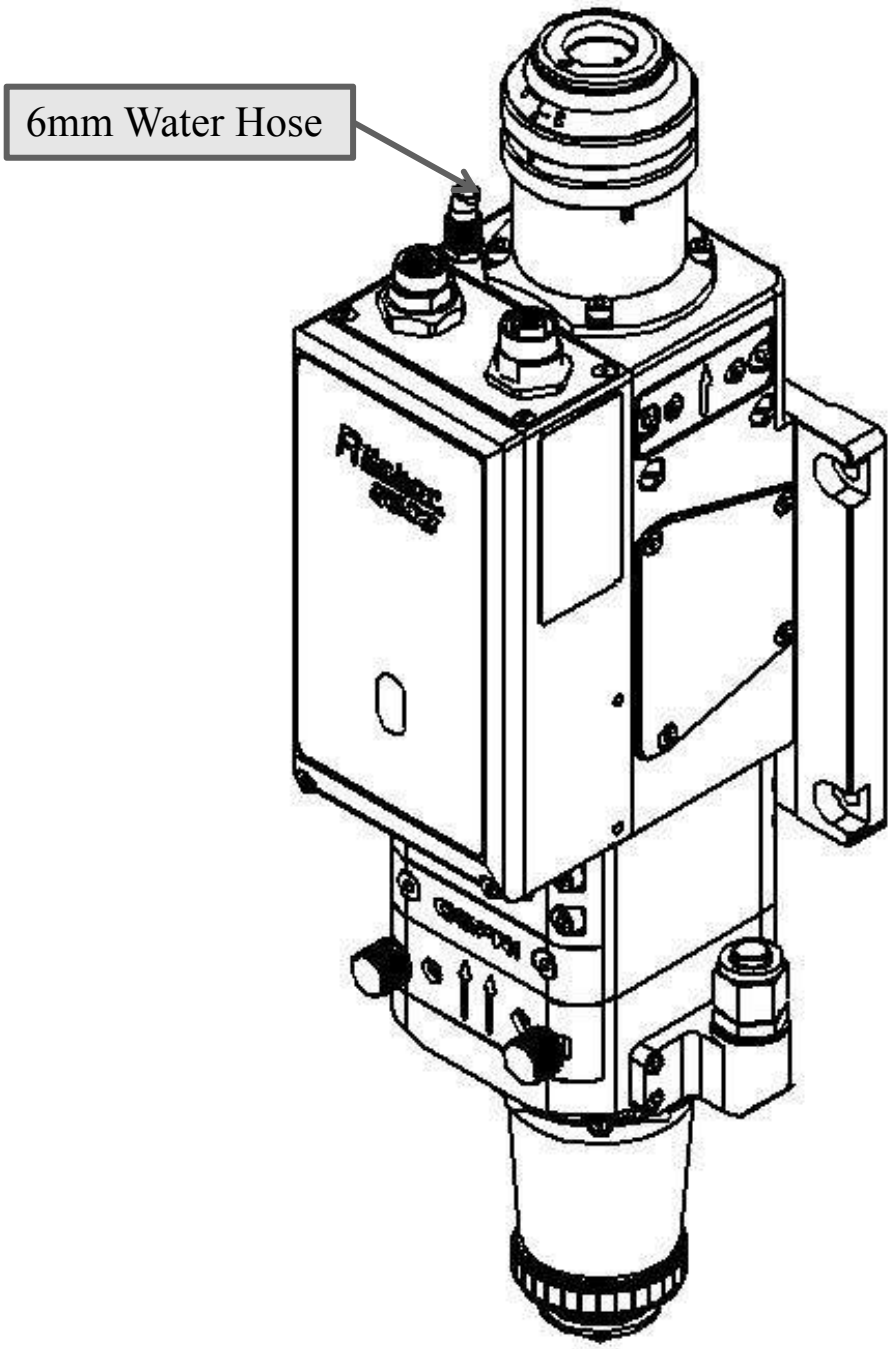
3.1 Cutting Head Installation



Dimension drawing of cutting head (collimation F100/focus F150)

3.2 Cutting Head Connection

3.2.1 Cooling Pipeline



It is used to cool down the cutting head with 1-inlet and 1-outlet cooling connection

3.2.2 Cutting Gas Pipeline

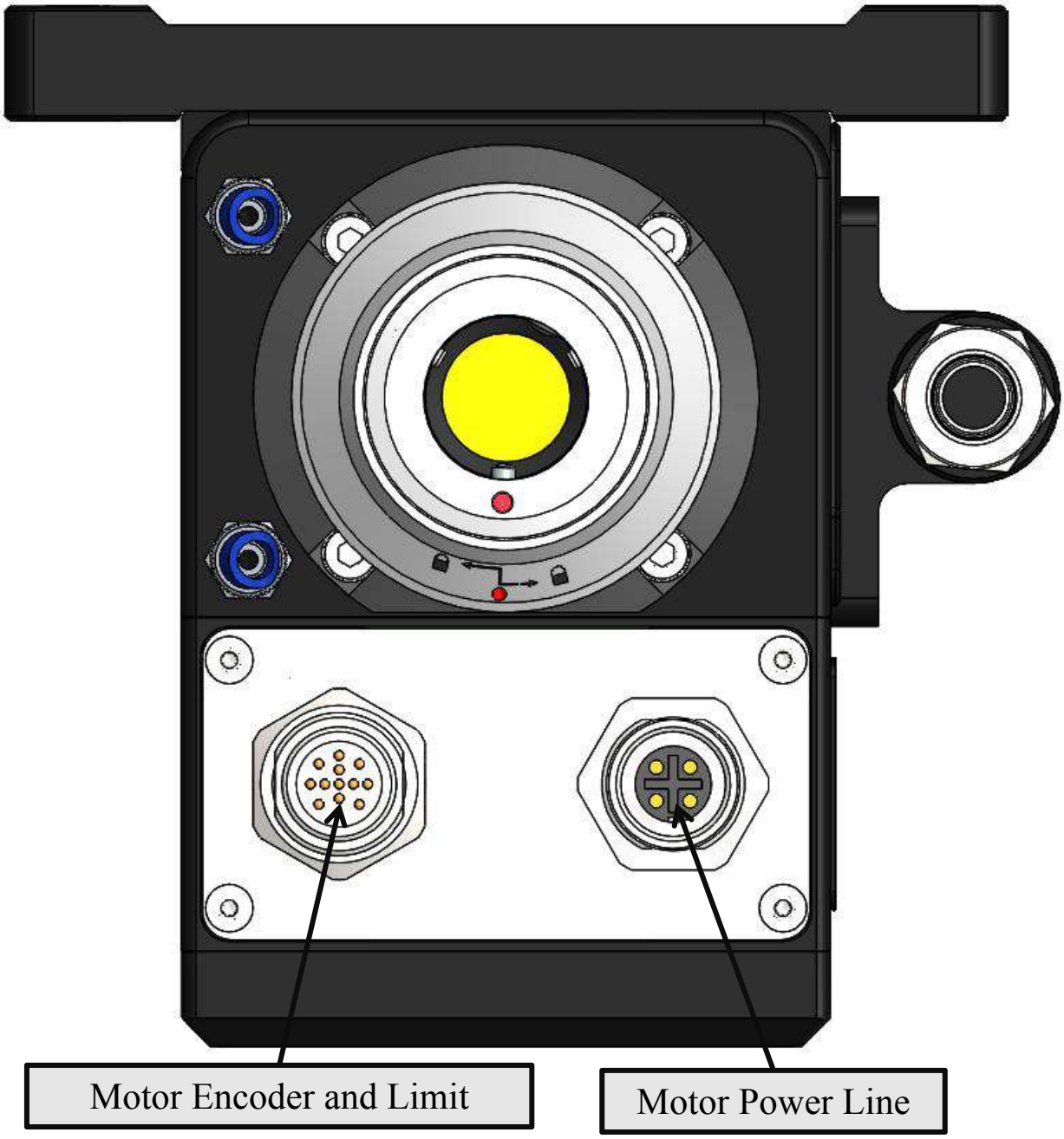
The inlet is connected to 10 mm gas hose, used to connect with the cutting had, with the input pressure <3.0 Mpa.

Common gas: Oxygen, nitrogen and compressed air.

Note: The gas entering the cutting pipeline must be filtered and dried to prevent contamination of the protective lenses, which could lead to damage.

3.3 Wiring Definitions and Requirements

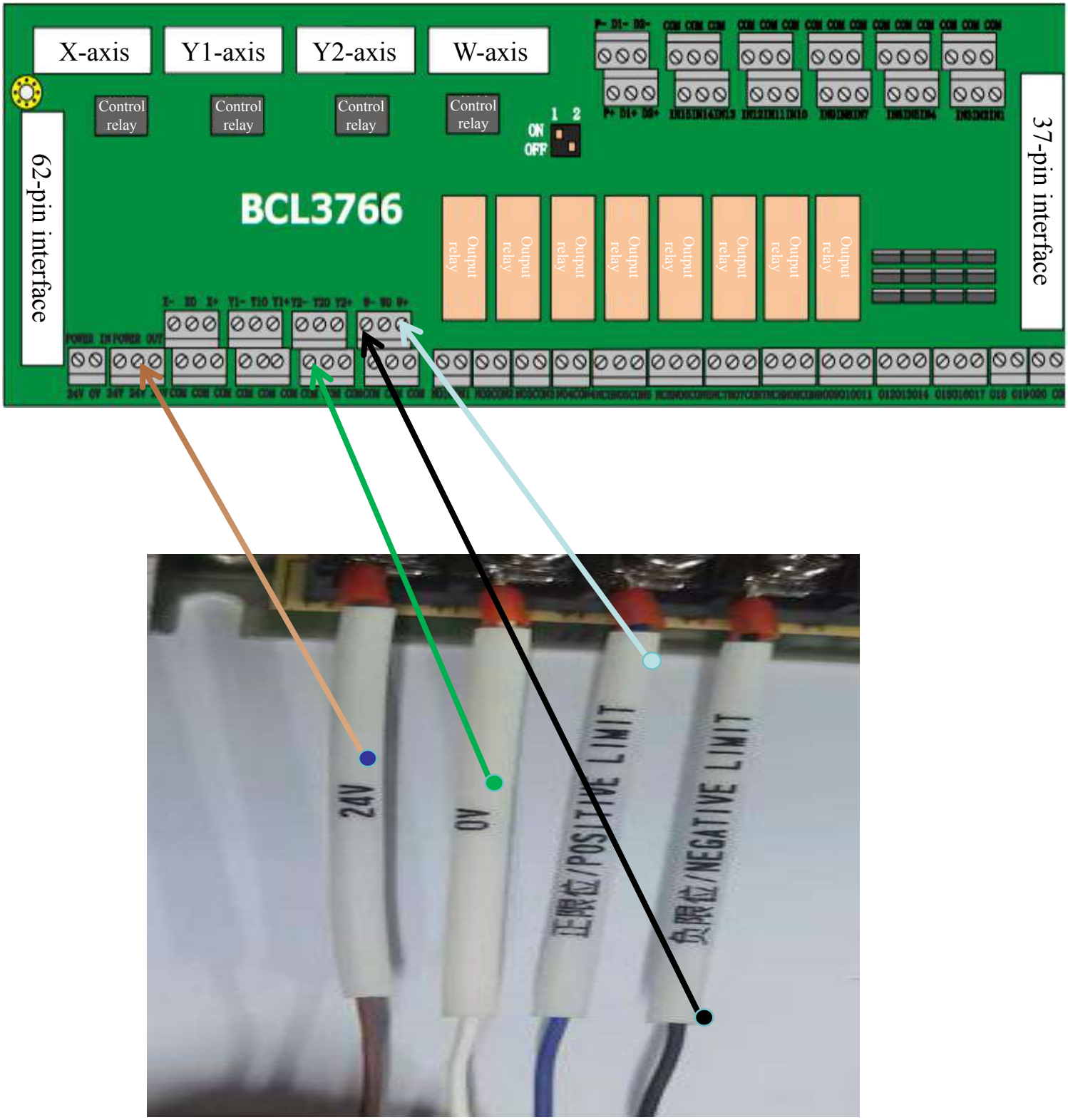
3.3.1 Aviation Plug Connector



Note: Power off when plugging or unplugging the aviation plugs, otherwise the servo motor will be burned inside.

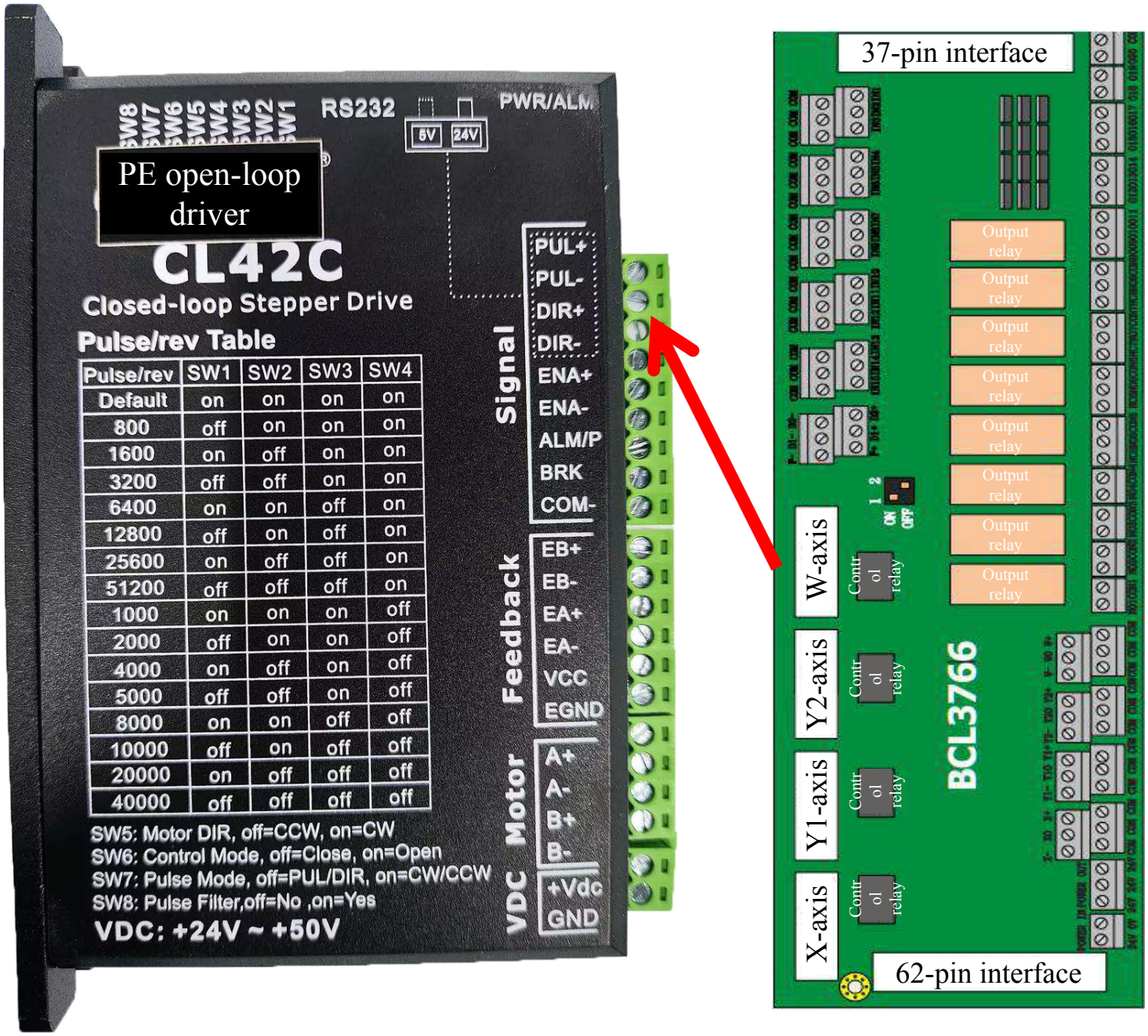
3.3.2: FSCUT2000C System Wiring (Example: BCL3766)

3.3.2.1: Board IO Wiring



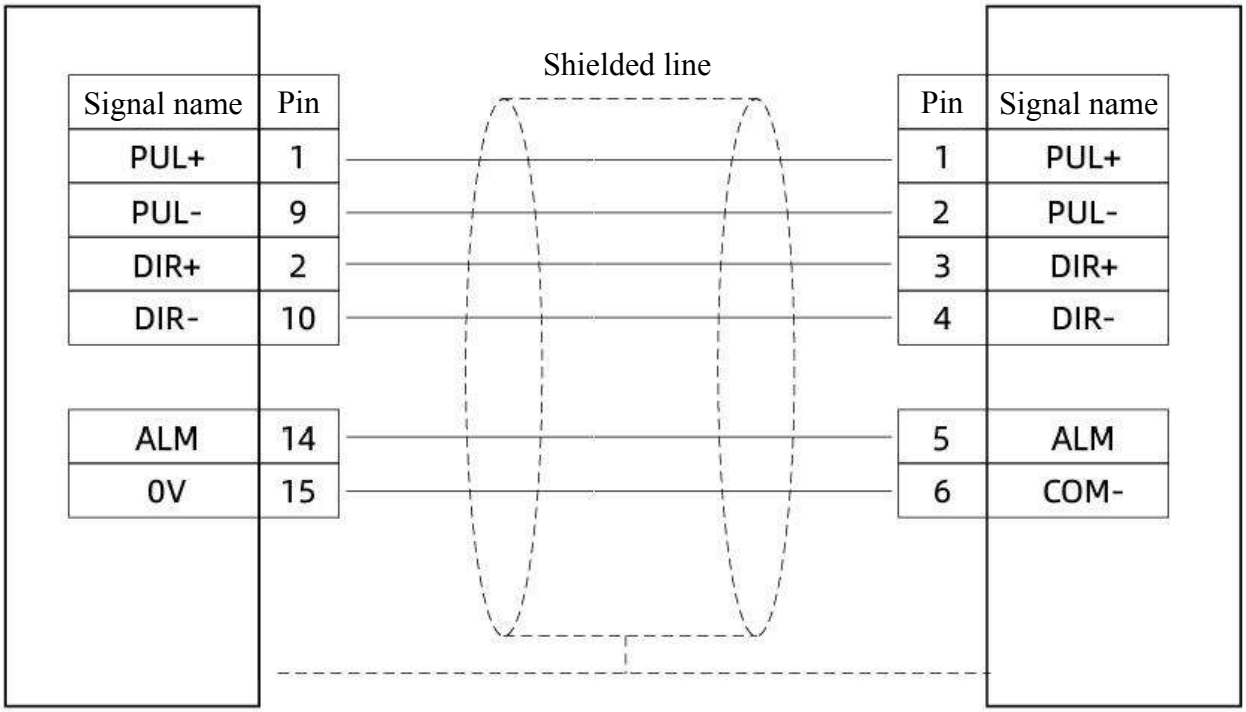
Limit switches and alarm signals are both NPN outputs; the alarm signal must be connected to the system. If damage to the cutting head occurs due to an unconnected alarm signal, the customer is fully responsible.

3.3.2.2: Board and Driver Wiring (Example: BCL3766)



3.3.2.3: Board Axis Port Definition Wiring

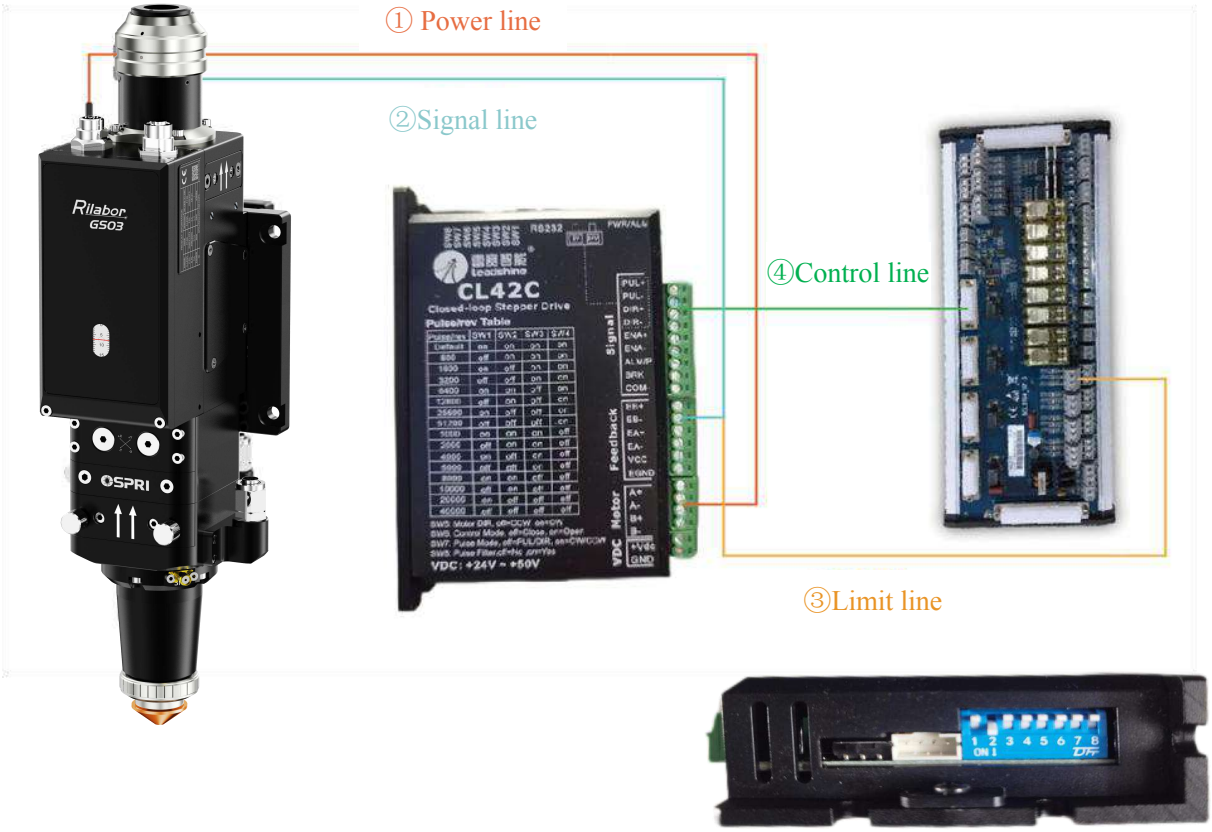
Cypcut DB15 Male Control Interface — Driver end



3.3.2.4: Drive Parameters

Parameter Index	Parameter Value	Parameter Content
PR0.00	10000	Pulses per command revolution
PR0.01	2	Open/Closed loop mode selection
PR0.03	1	Motor direction
PR0.42	6	Motor type
PR4.31	0	Fault output level
PR5.00	10	Motor peak current
PR7.01	4000	Encoder resolution

3.3.2.5: Cutting Head and Pulse System Wiring

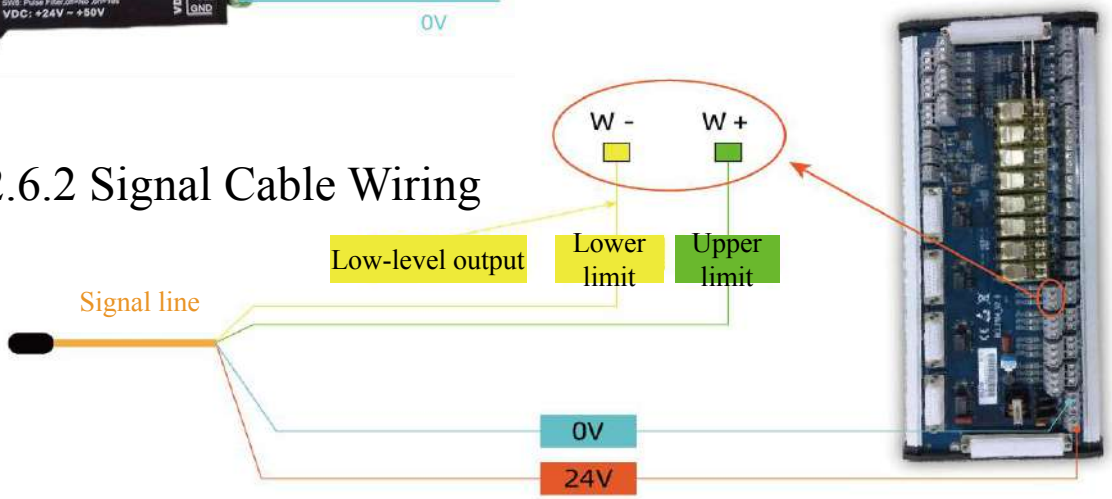


3.3.2.6: Cutting Head and System Wiring

Toggle switch position

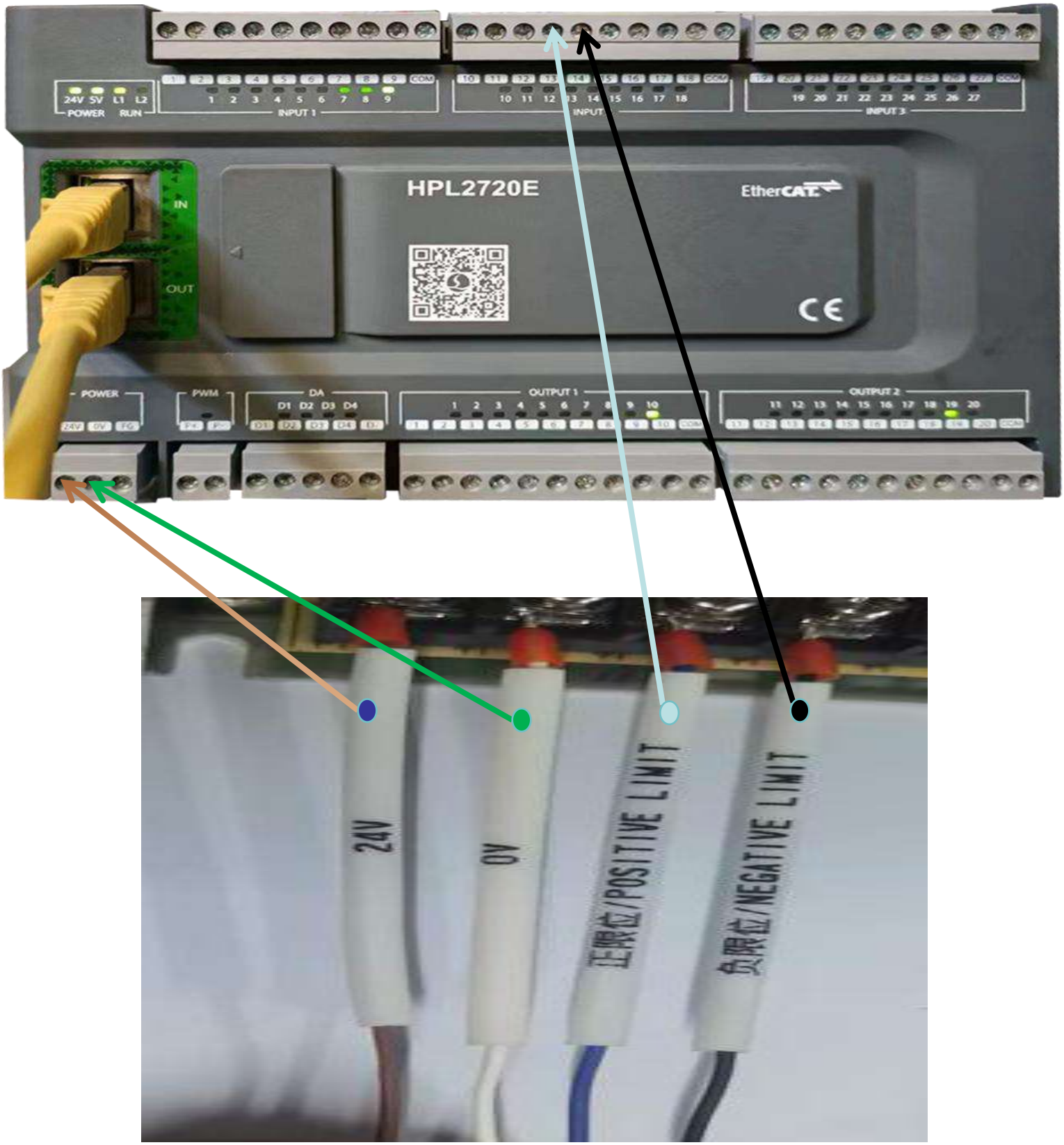
3.3.2.6.1: Servo Driver Power Wiring (DC24V)

3.3.2.6.2 Signal Cable Wiring



3.3.3: FSCUT8000 System Wiring (Example: HPL2720E)

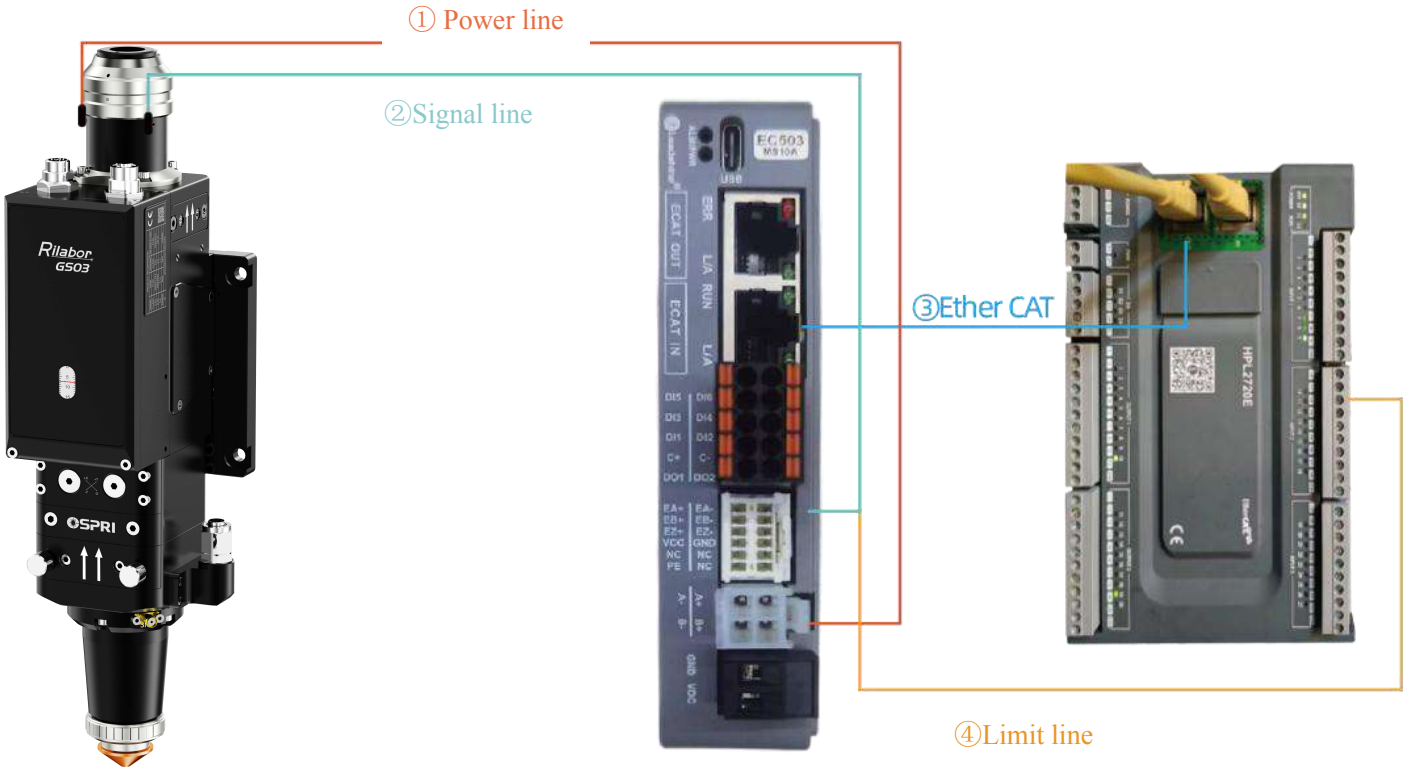
3.3.3.1: Board IO Wiring (Example: HPL2720E)



Limit switch with NPN output

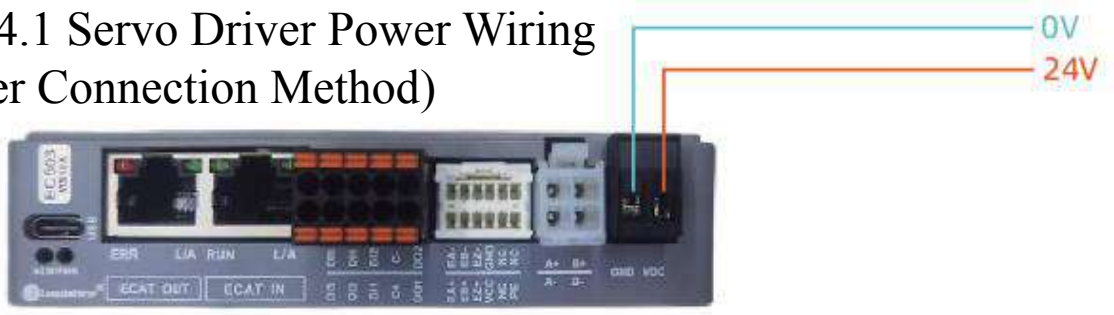
3.3.3.2: Board and Driver Wiring (Example: HPL2720E)

3.3.3.3 Cutting Head and Bus System Wiring



3.3.3.4 Cutting Head and System Wiring

3.3.3.4.1 Servo Driver Power Wiring (Power Connection Method)

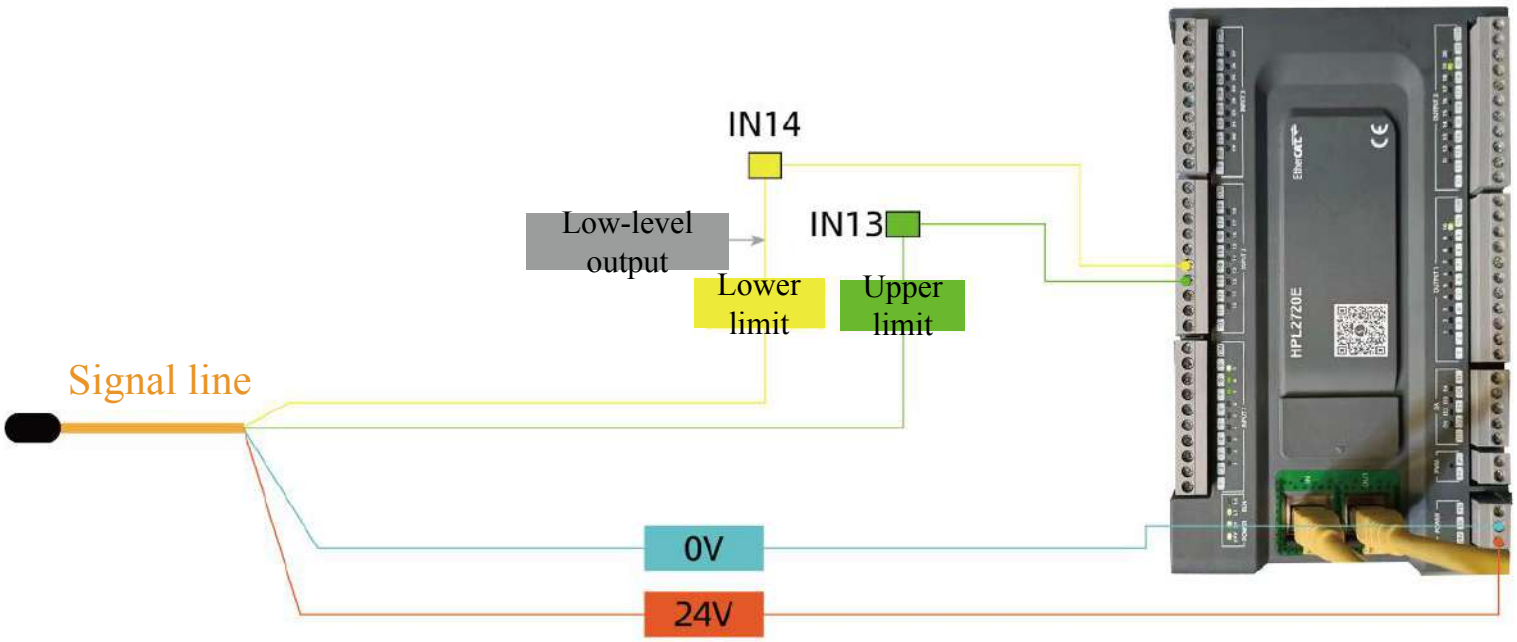


3.3.3.4.2 Driver Parameters

Parameter Index	Parameter Value	Parameter Content
PA000	10000	Pulses per revolution
PA003	0	Rotation direction
PA411	81	Servo alarm logic (normally closed)
PR438	0	Slave source

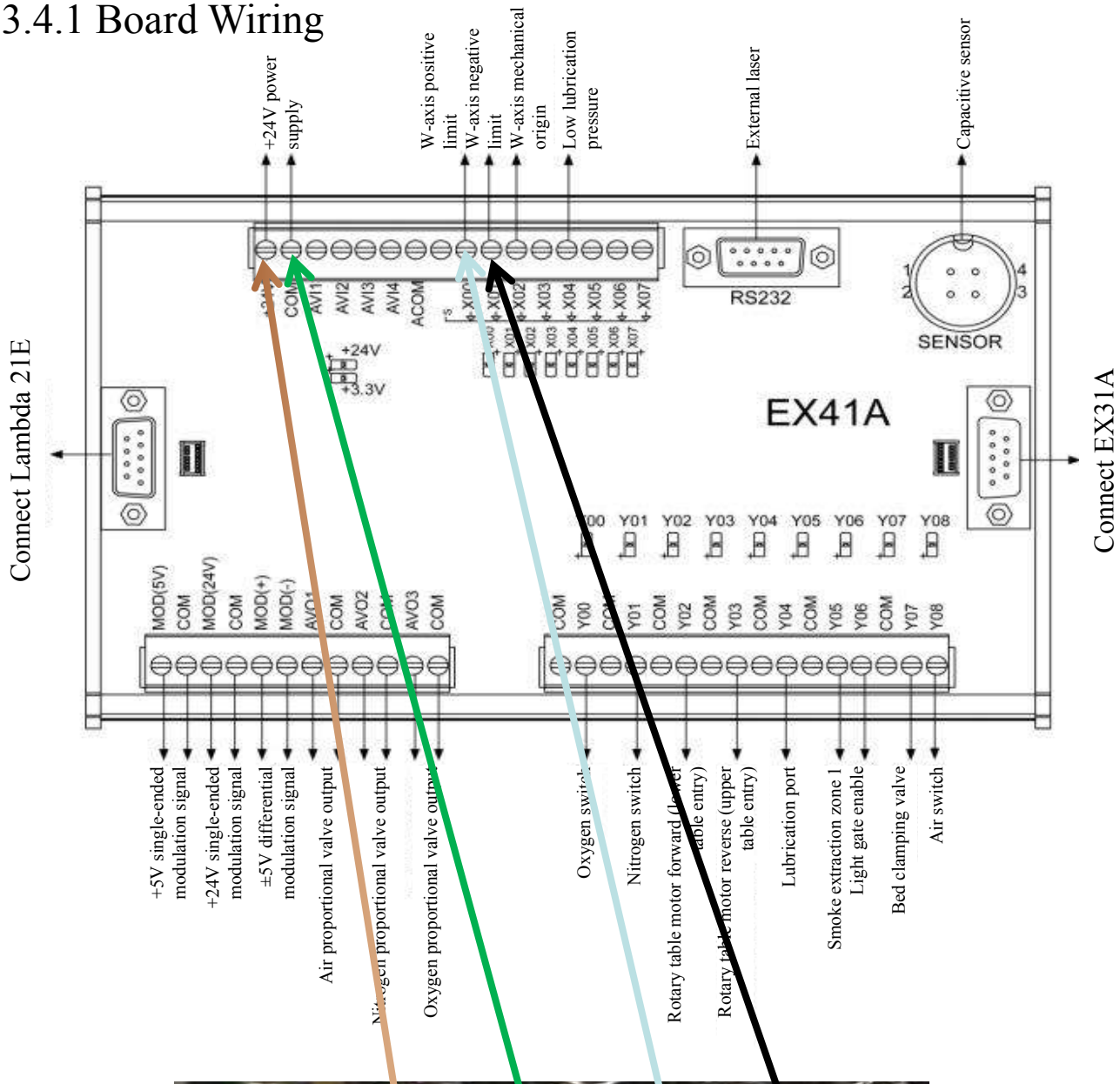
Note: Electronic gear ratio numerator: 8192;
Electronic gear ratio denominator: 10000;
Encoder resolution: 13 bits;

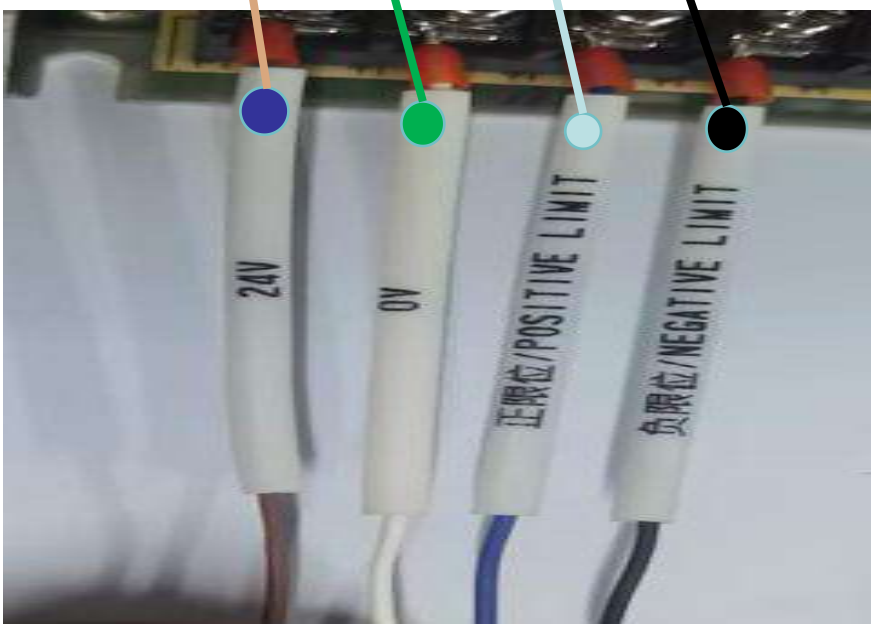
3.3.3.4.3 Signal Cable Wiring



3.3.4: LS6000M Non-Bus System Wiring (Example: EX41A)

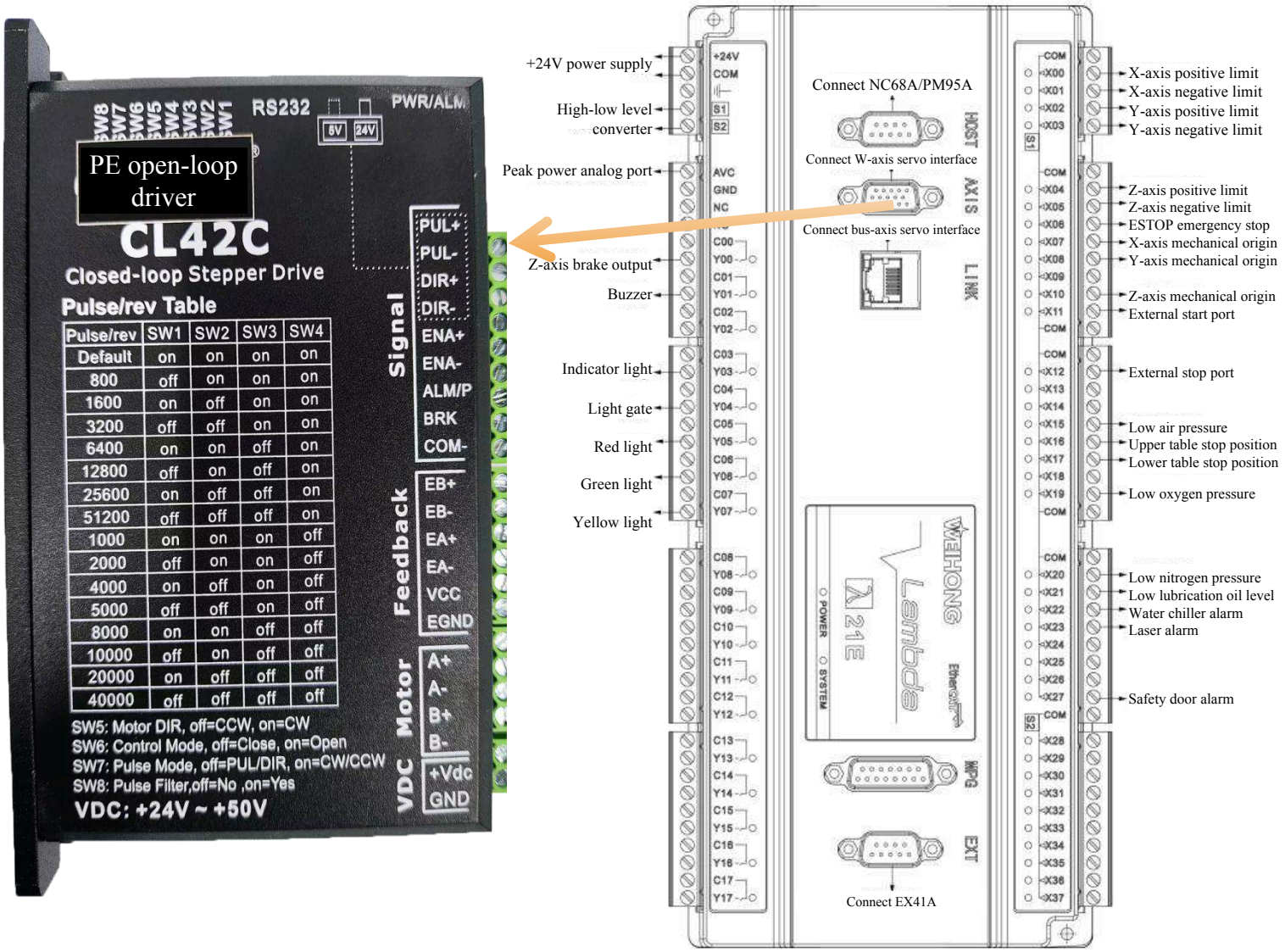
3.3.4.1 Board Wiring





Limit switch with NPN output

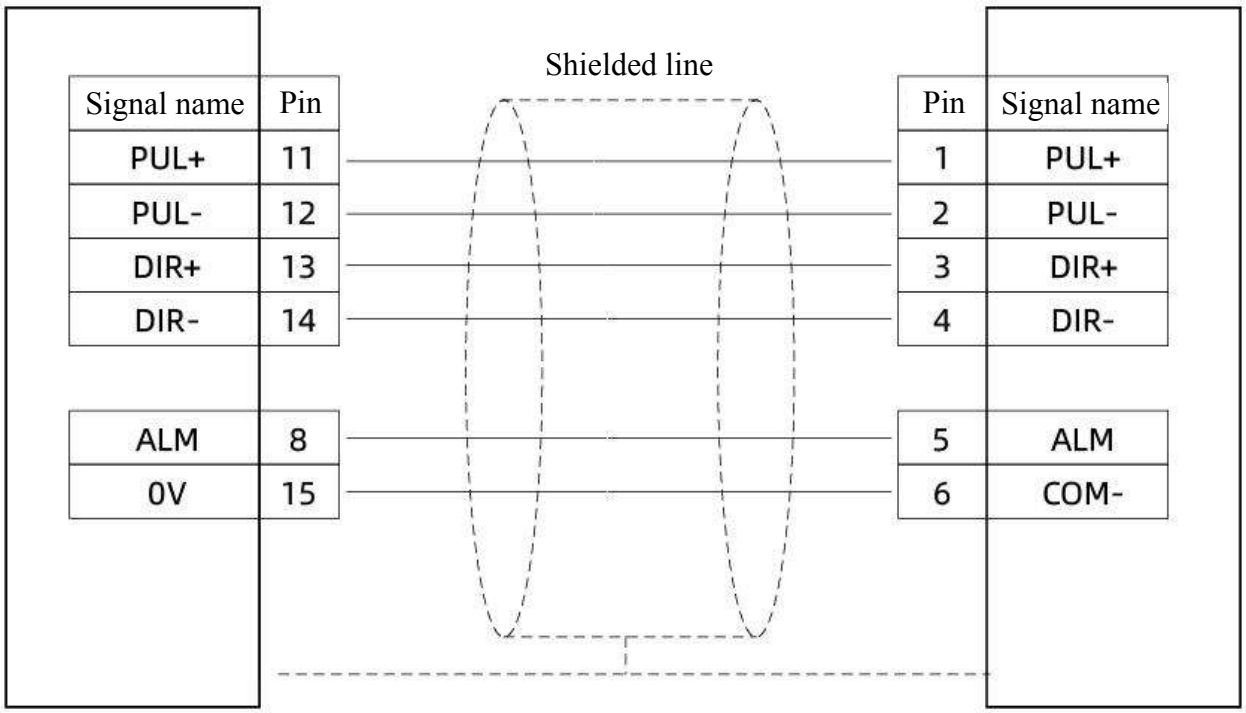
3.3.4.2: LS6000M Board and Driver Wiring (Example: 21E)



3.3.4.3: Board Axis Port Definition Wiring

Weihong three-row DB15 (dense) male connector

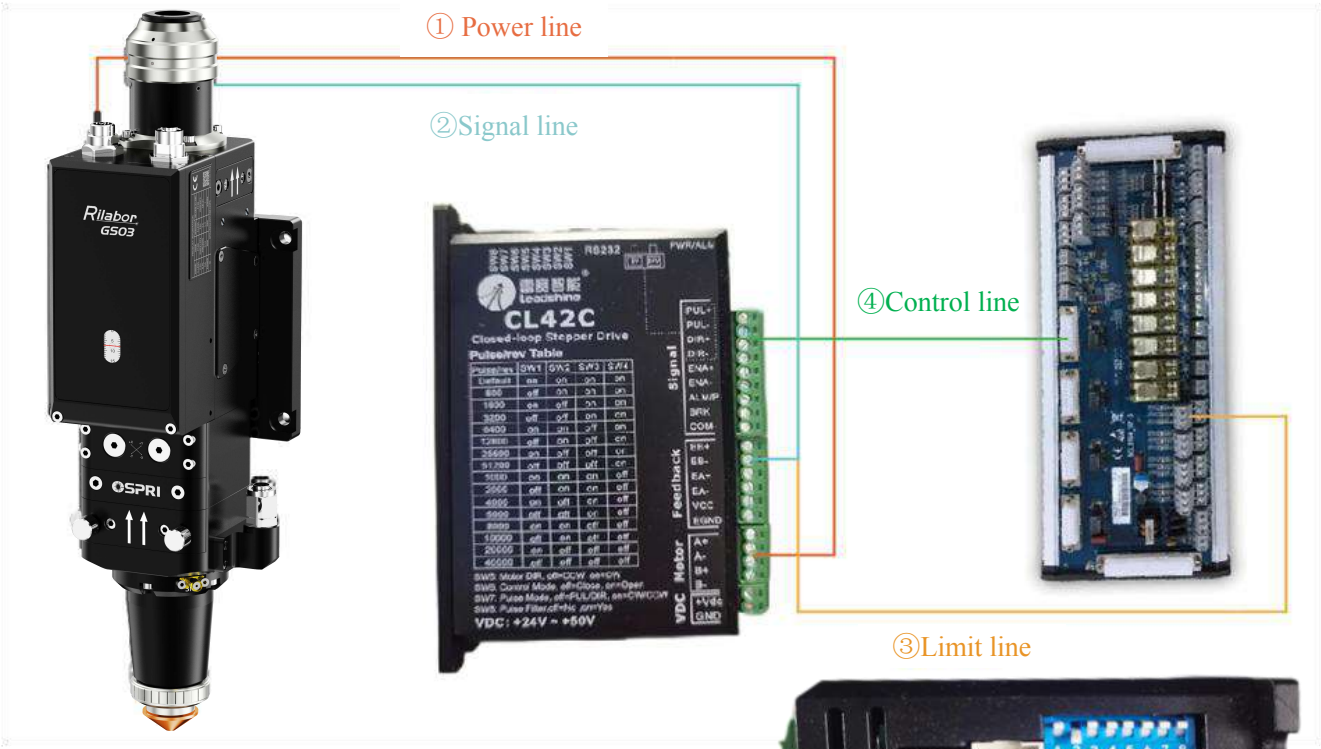
Driver end



3.3.4.4: Driver Parameters

Parameter Index	Parameter Value	Parameter Content
PR0.00	10000	Pulses per command revolution
PR0.01	2	Open/Closed loop mode selection
PR0.03	1	Motor direction
PR0.42	6	Motor type
PR4.31	0	Fault output level
PR5.00	10	Motor peak current
PR7.01	4000	Encoder resolution

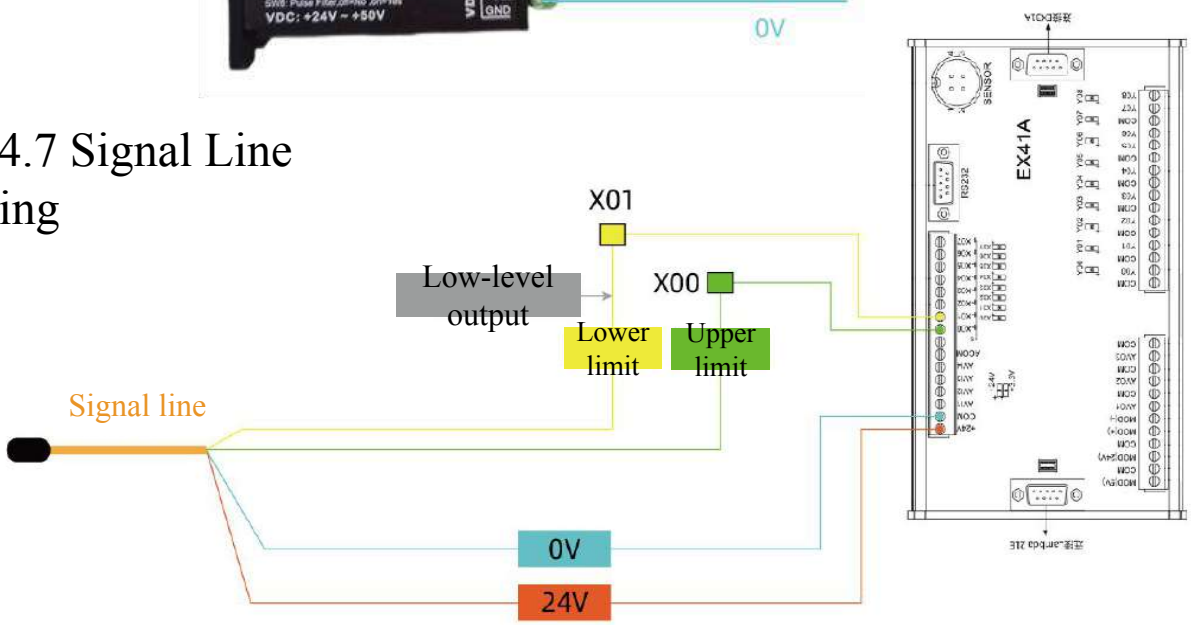
3.3.4.5 Cutting Head and Non-Bus System Wiring



3.3.4.6 Servo Driver Power Wiring (DC24V)

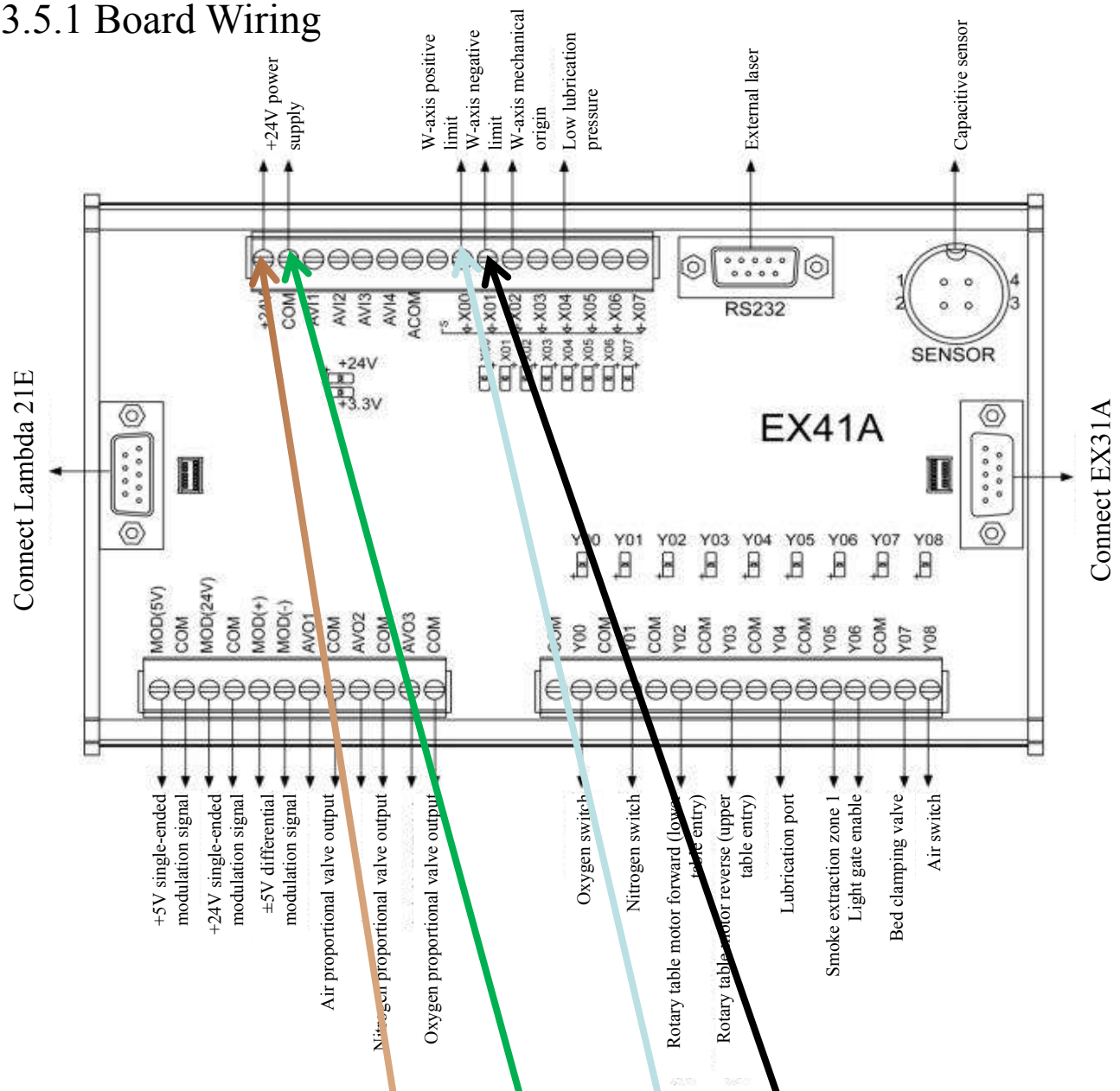
Toggle switch position

3.3.4.7 Signal Line Wiring



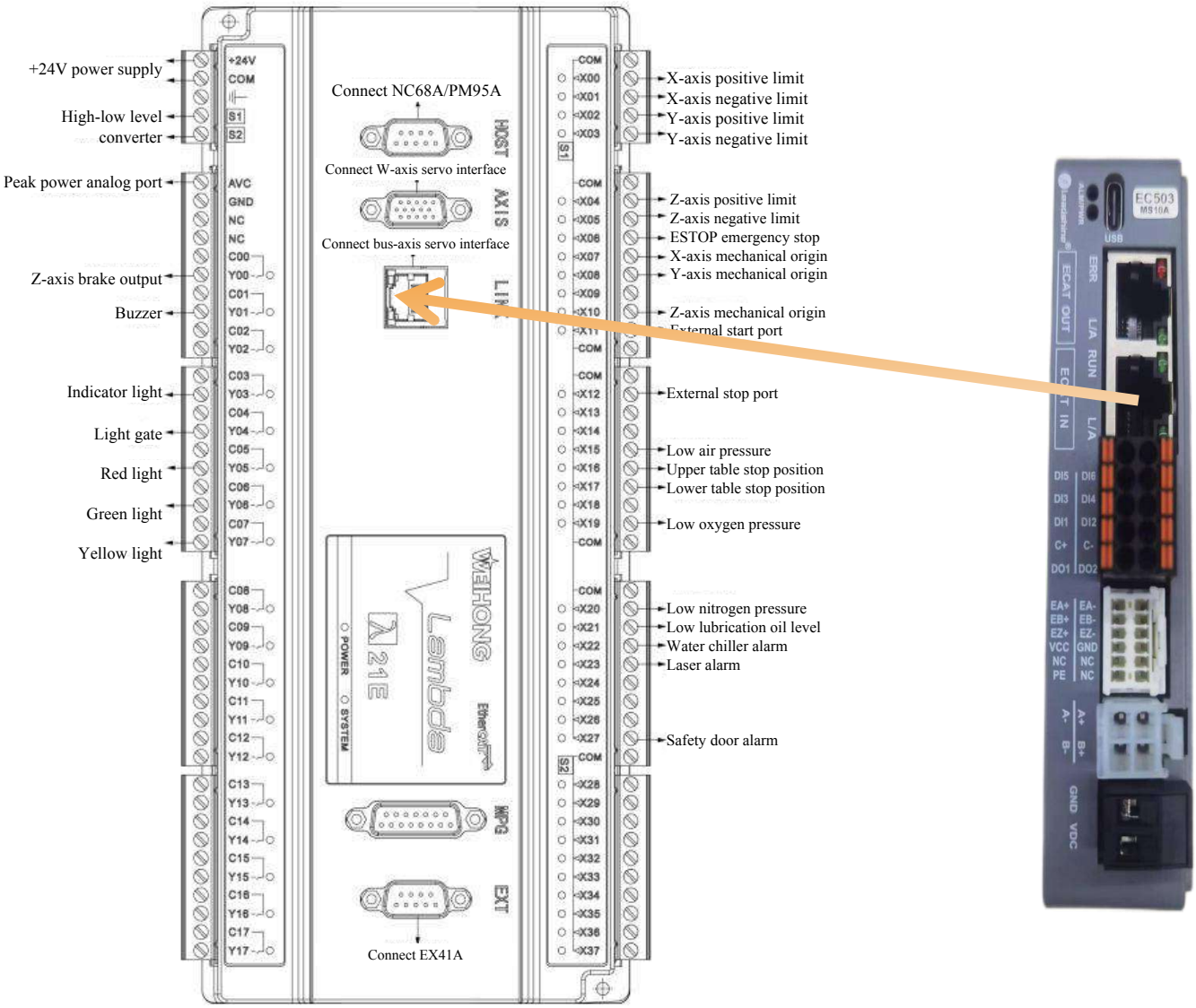
3.3.5: LS6000M Bus System Wiring (Example: EX41A)

3.3.5.1 Board Wiring

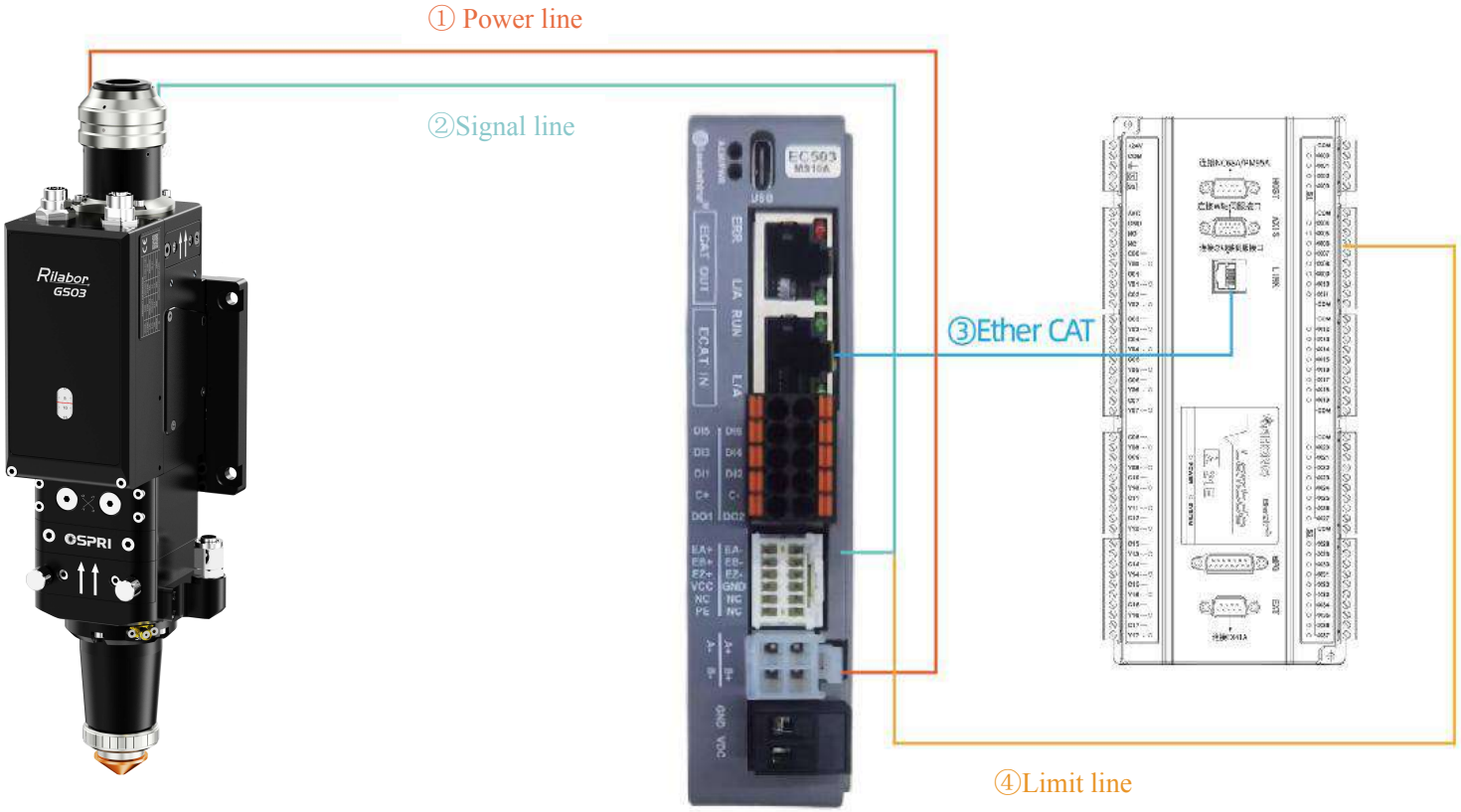


Limit switch with NPN output

3.3.5.2: LS6000M Board and Driver Wiring (Example: 21E)



3.3.5.3 Cutting Head and Bus System Wiring



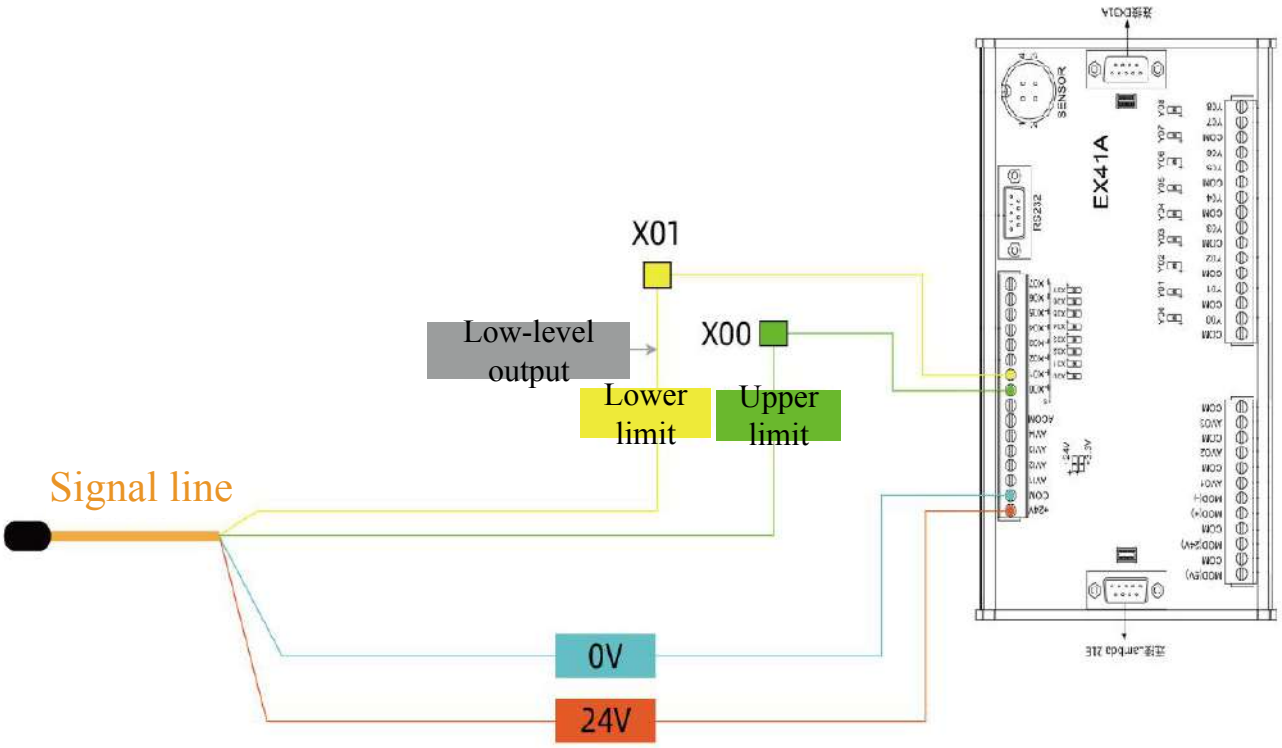
3.3.5.4 Servo Driver Power Wiring (DC24V)

3.3.5.5 Driver Parameters

Parameter Index	Parameter Value	Parameter Content
PA000	10000	Pulses per revolution
PA003	0	Rotation direction
PA411	81	Servo alarm logic (normally closed)
PR438	0	Slave source

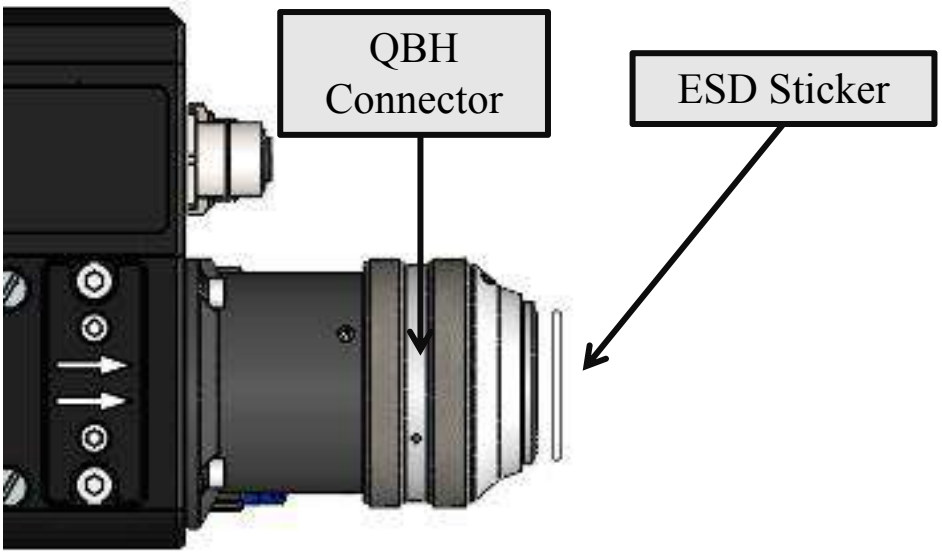
Note: Electronic gear ratio numerator: 8192;
Electronic gear ratio denominator: 10000;
Encoder resolution: 13 bits;

3.3.5.6 Signal Line Wiring

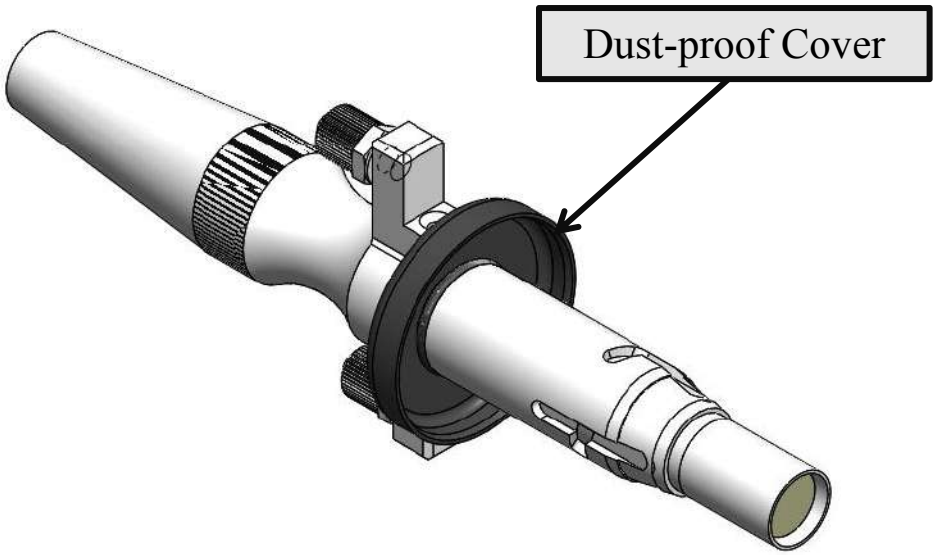


3.4 Installation of QBH Fiber Laser Head

3.4.1 Put the cutting head horizontally, remove the white cover and static sticker:



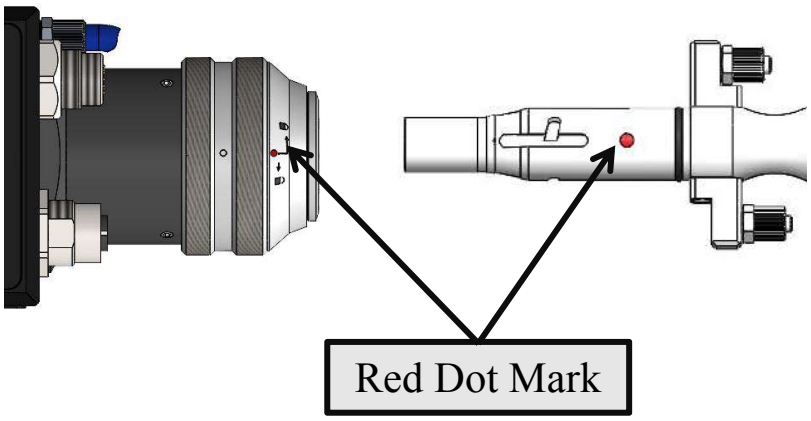
3.4.2 Cover the dust-proof cover which is in the white accessory box, onto the fiber laser tip. as shown in the figure below:



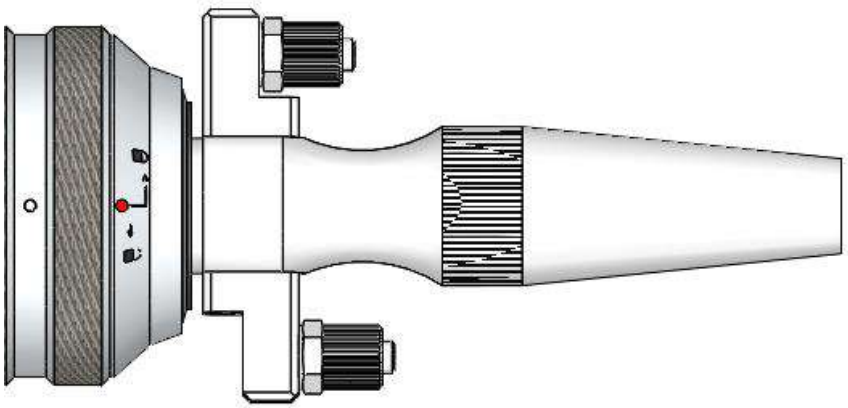
Attention: In case the fiber head is with original dust-proof gasket, users can choose whether install dust-proof cover or not according to the actual condition.

3.4.3 Turn the QBH connector into the open state, that is, screw it to the limit position counterclockwise (a "thud" sound can be heard). Do not twist with great force, otherwise the internal structure of the QBH may be damaged.

3.4.4 Align the red dot on the fiber head with the red dot on the QBH connector, and slowly insert the fiber head into the QBH connector, as shown in the figure below:



3.4.5 Turn the QBH connector to the locked state, that is, screw it toward the limit position clockwise (a "thud" sound can be heard). Then lift the swivel nut up and screw the nut clockwise again until the fiber tip is compressed tightly. (Do not twist with great force, otherwise the internal structure of the QBH internal structure)



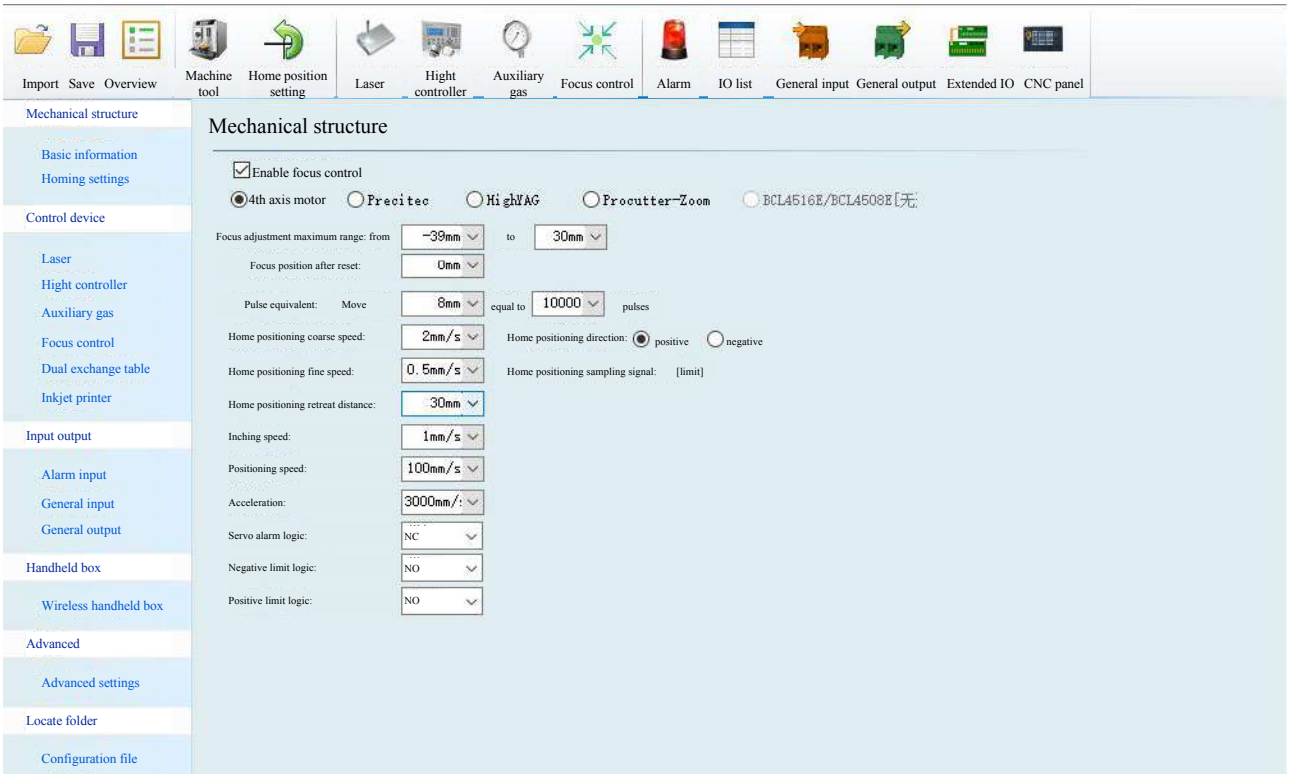
Attention: Wrap with masking tape after plugging fiber tip.

Chapter 4 Product Debugging

4.1: System Configuration

4.1.1: FSCUT2000C System Configuration (Pulse System)

4.1.1.1: Focus Control Configuration



LCS03 Platform Configuration

100 collimation, 200 focus:

Focus maximum adjustment range: -32mm to 26mm;

Pulse equivalent: every 8mm movement corresponds to 10,000 pulses;

Return to home direction: Forward;

Retraction distance: 26mm;

Limit logic: Normally open;

100 collimation 125 focus, 100 collimation 150 focus:

Focus maximum adjustment range: -18mm to 15mm;

Pulse equivalent: 10,000 pulses per 4.5mm of movement;

Return to home direction: Forward;

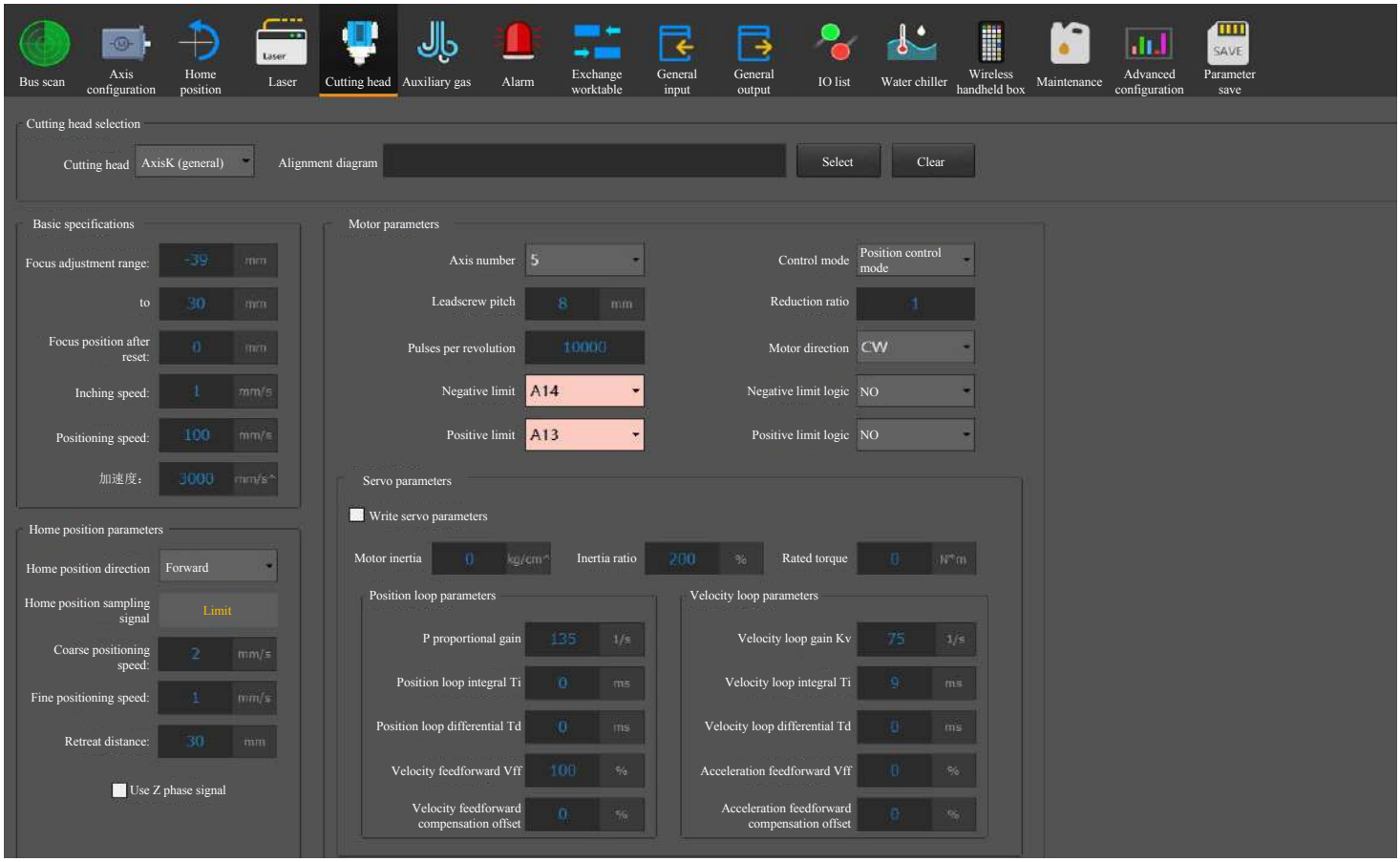
Retraction distance: 15mm;

Limit logic: Normally open;

Attention: The retraction distance can be slightly adjusted according to the actual cutting focus.

4.1.2: FSCUT8000 System Configuration (Bus System)

4.1.2.1: Focus Control Configuration and Limit Configuration



LCS03 Platform Configuration

100 collimation, 200 focus:

Focus maximum adjustment range: -32mm to 26mm;

Pulse equivalent: every 8mm movement corresponds to 10,000 pulses;

Return to home direction: Forward;

Retraction distance: 26mm;

Limit logic: Normally open;

100 collimation 125 focus, 100 collimation 150 focus:

Focus maximum adjustment range: -18mm to 15mm;

Pulse equivalent: 10,000 pulses per 4.5mm of movement;

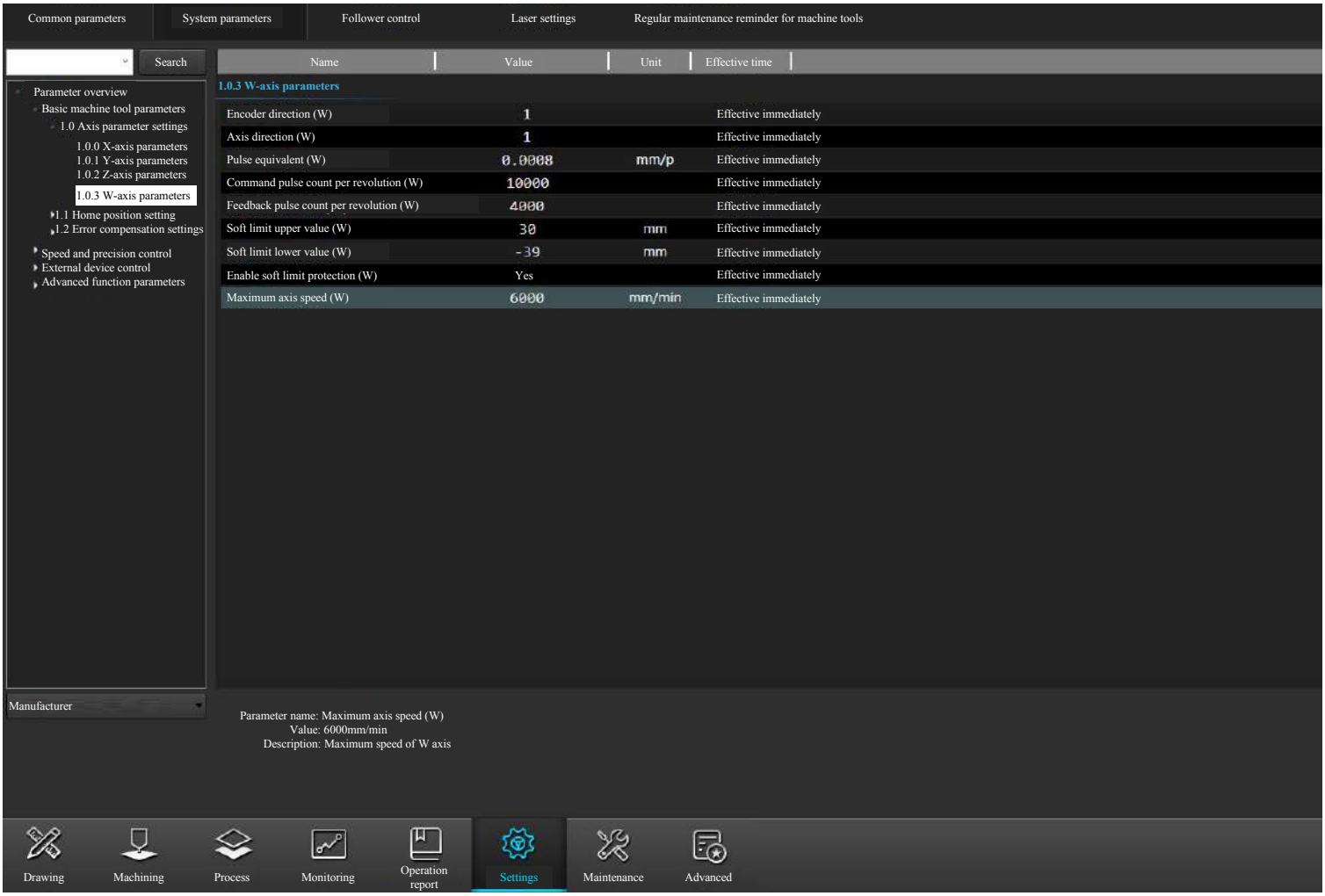
Return to home direction: Forward;

Retraction distance: 15mm;

Limit logic: Normally open;

4.1.3: LS6000M Non-Bus System Configuration

4.1.3.1: W Axis Parameter Configuration



LCS03 Platform Configuration

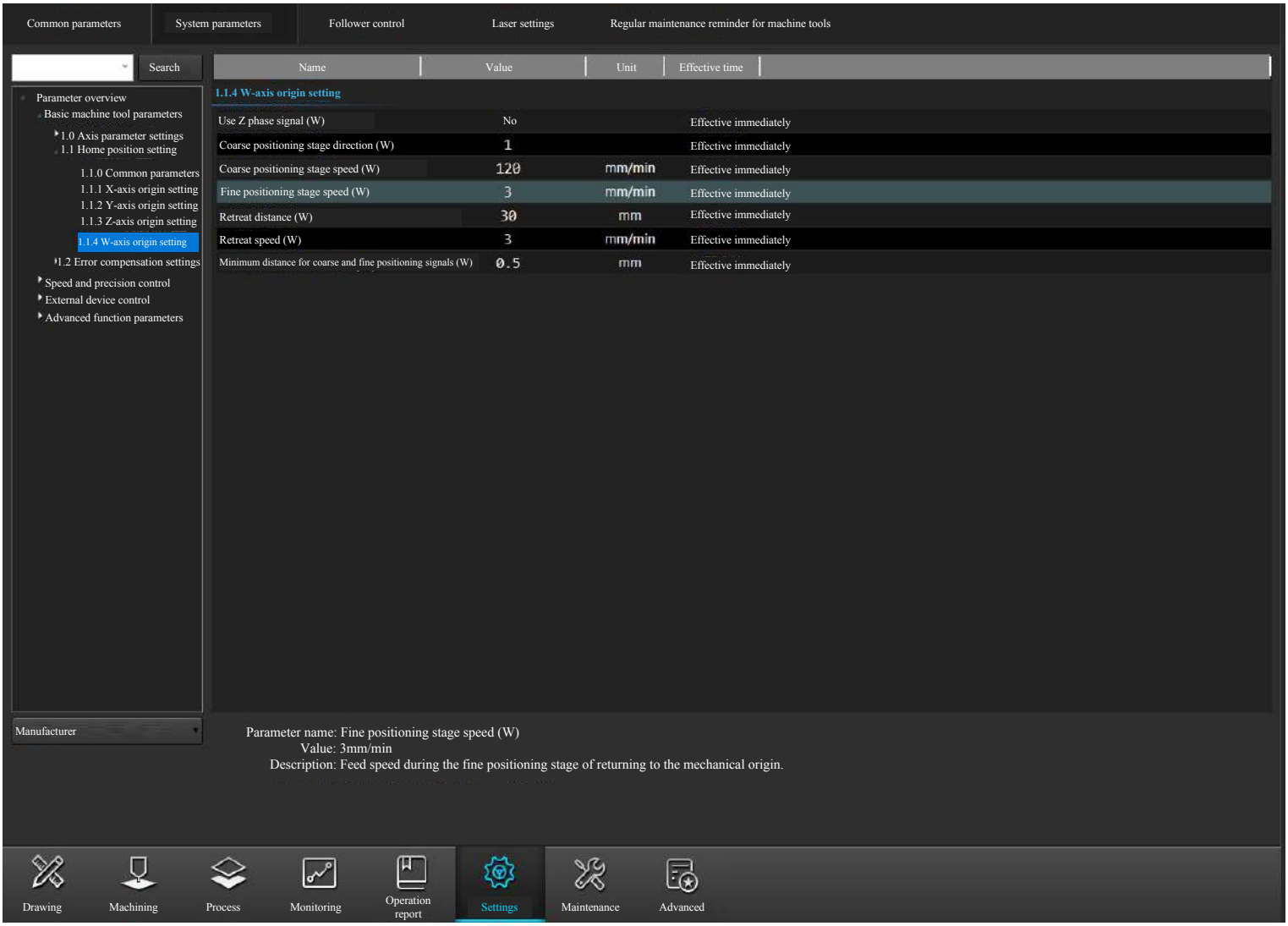
100 collimation, 200 focus:

Encoder direction: 1; axis direction: 1;
Pulse equivalent: 0.0008; pulses per revolution: 10,000;
Feedback pulses per revolution: 4,000; upper soft limit: 26;
Lower soft limit: -32; soft limit protection enabled: Yes;
Maximum axis speed: 6000 mm/s;

100 collimation 125 focus, 100 collimation 150 focus:

Encoder direction: 1; axis direction: 1;
Pulse equivalent: 0.00045; pulses per revolution: 10,000;
Feedback pulses per revolution: 4,000; upper soft limit: 15;
Lower soft limit: -18; soft limit protection enabled: Yes;
Maximum axis speed: 6000 mm/s;

4.1.3.2: W Axis Home Position Configuration



LCS03 Platform Configuration

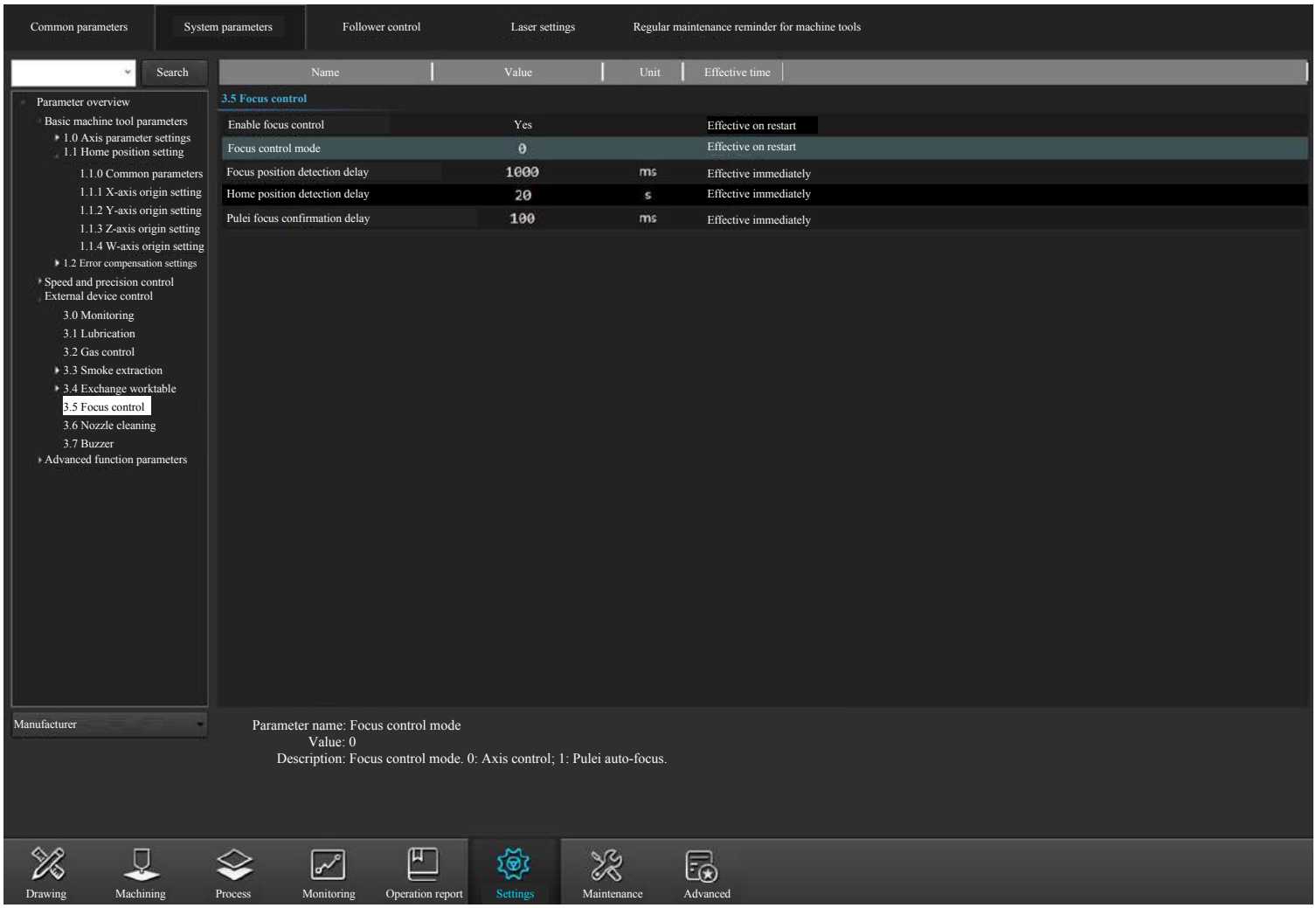
100 collimation, 200 focus:

Use Z-phase signal: No; coarse positioning direction: 1;
Coarse positioning speed: 120mm/min; fine positioning speed: 3mm/s;
Coarse positioning direction: 1; retraction distance: 26;
Retraction speed: 1mm/min;

100 collimation 125 focus, 100 collimation 150 focus:

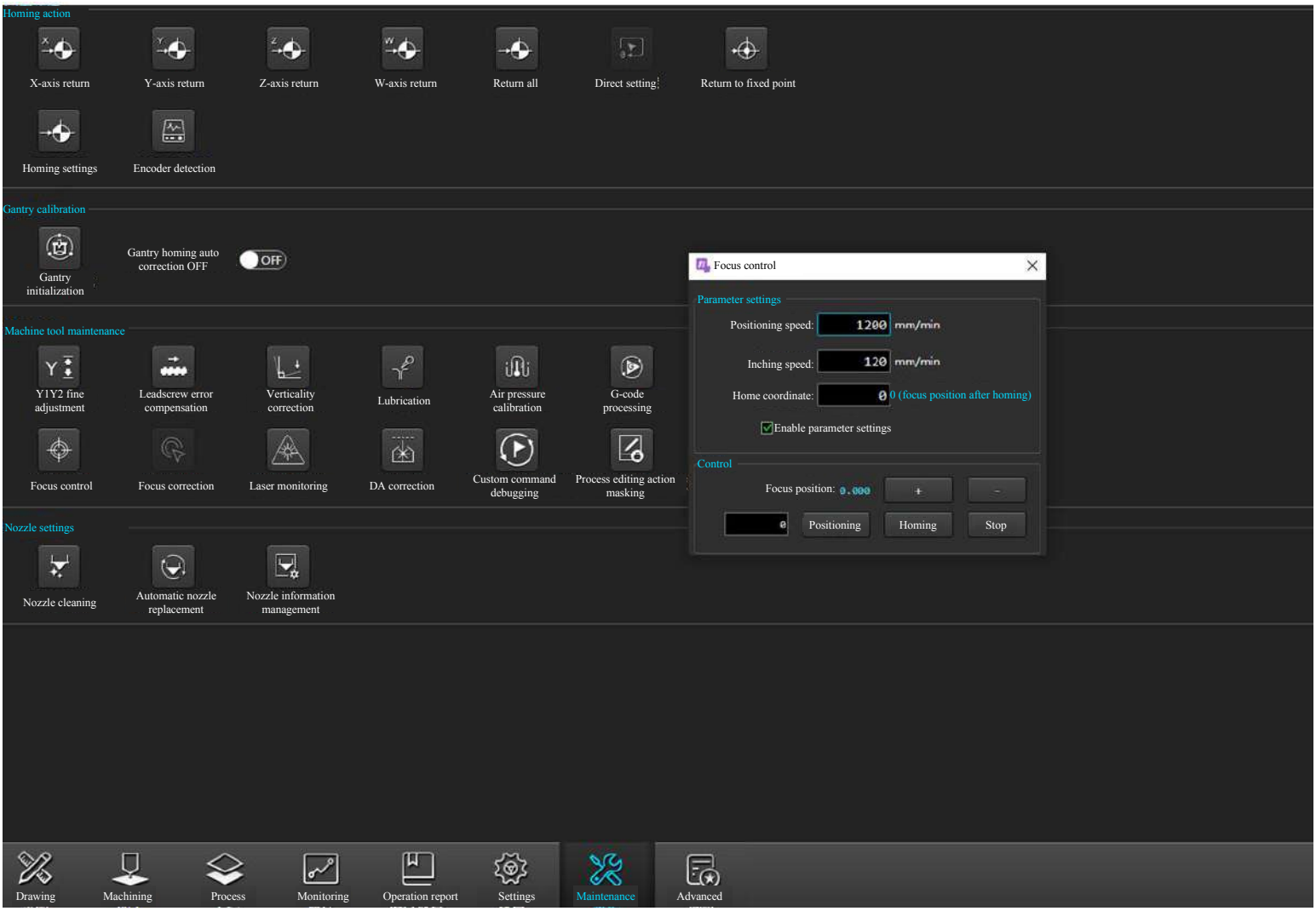
Use Z-phase signal: No; coarse positioning direction: 1;
Coarse positioning speed: 120mm/min; fine positioning speed: 3mm/s;
Coarse positioning direction: 1; retraction distance: 15;
Retraction speed: 1mm/min;

4.1.3.3: Focus Control Configuration



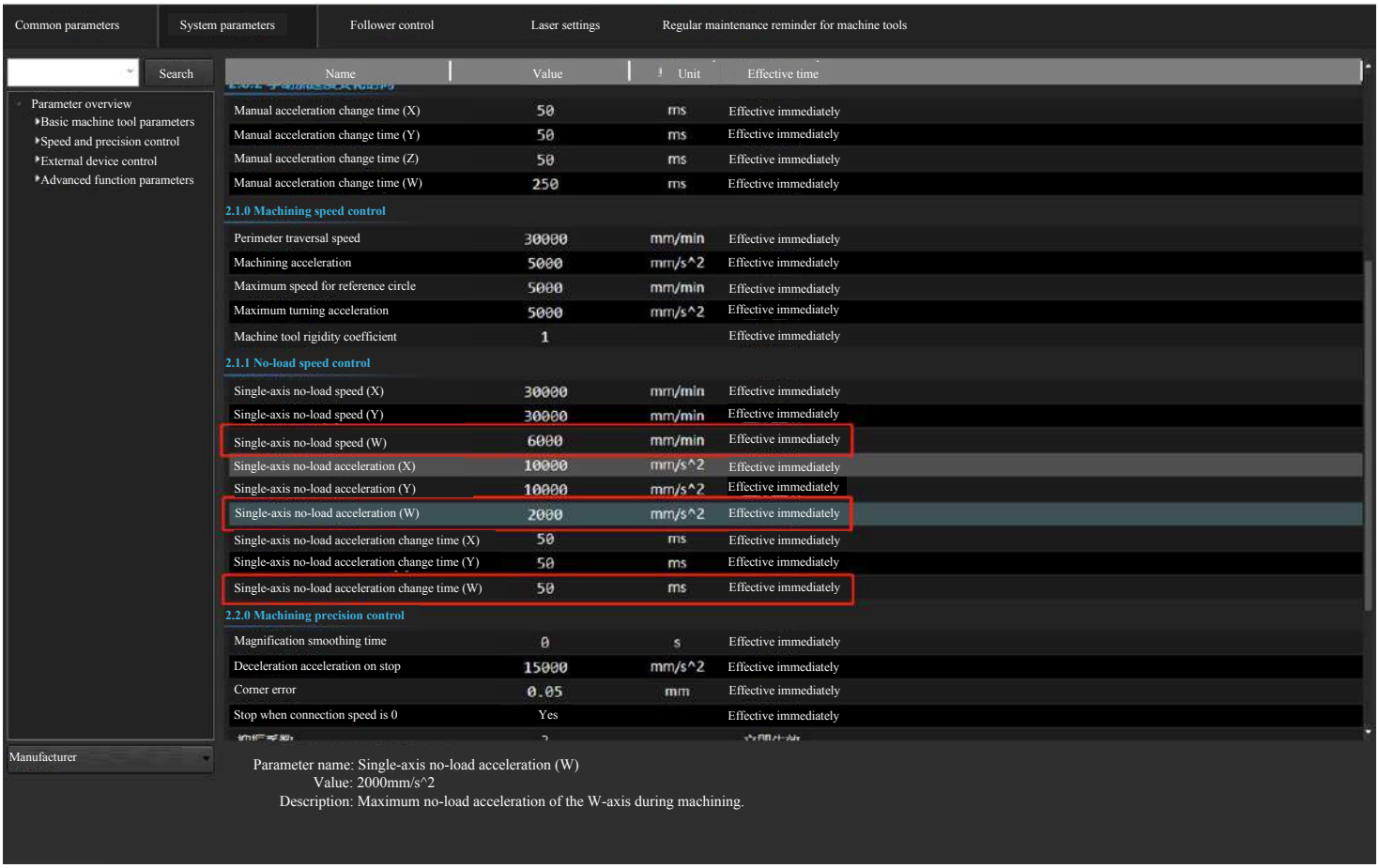
Focus control enabled: Yes;
Focus control mode: Axis port control;

4.1.3.4: Focus Control Configuration



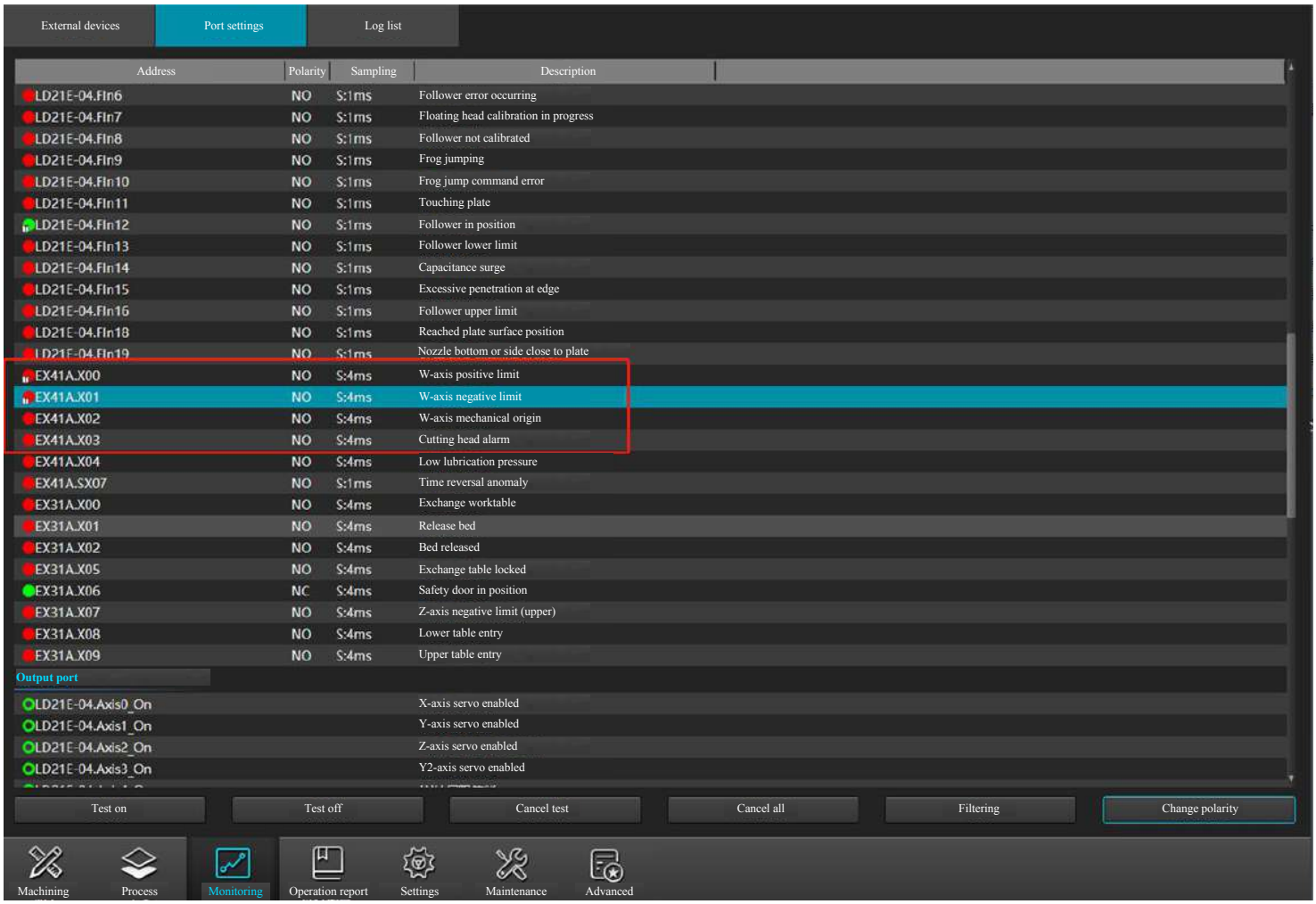
Positioning speed: 1200mm/min;
Jogging speed: 120mm/min;
Home coordinate: 0;
Parameter setting enabled: Checked;

4.1.3.5: W Axis No-Load Speed Setting



Single axis no-load speed (W): 6000mm/min;
Single axis no-load acceleration (W): 2000mm/s^2;
Single axis no-load acceleration Time (W): 50ms;

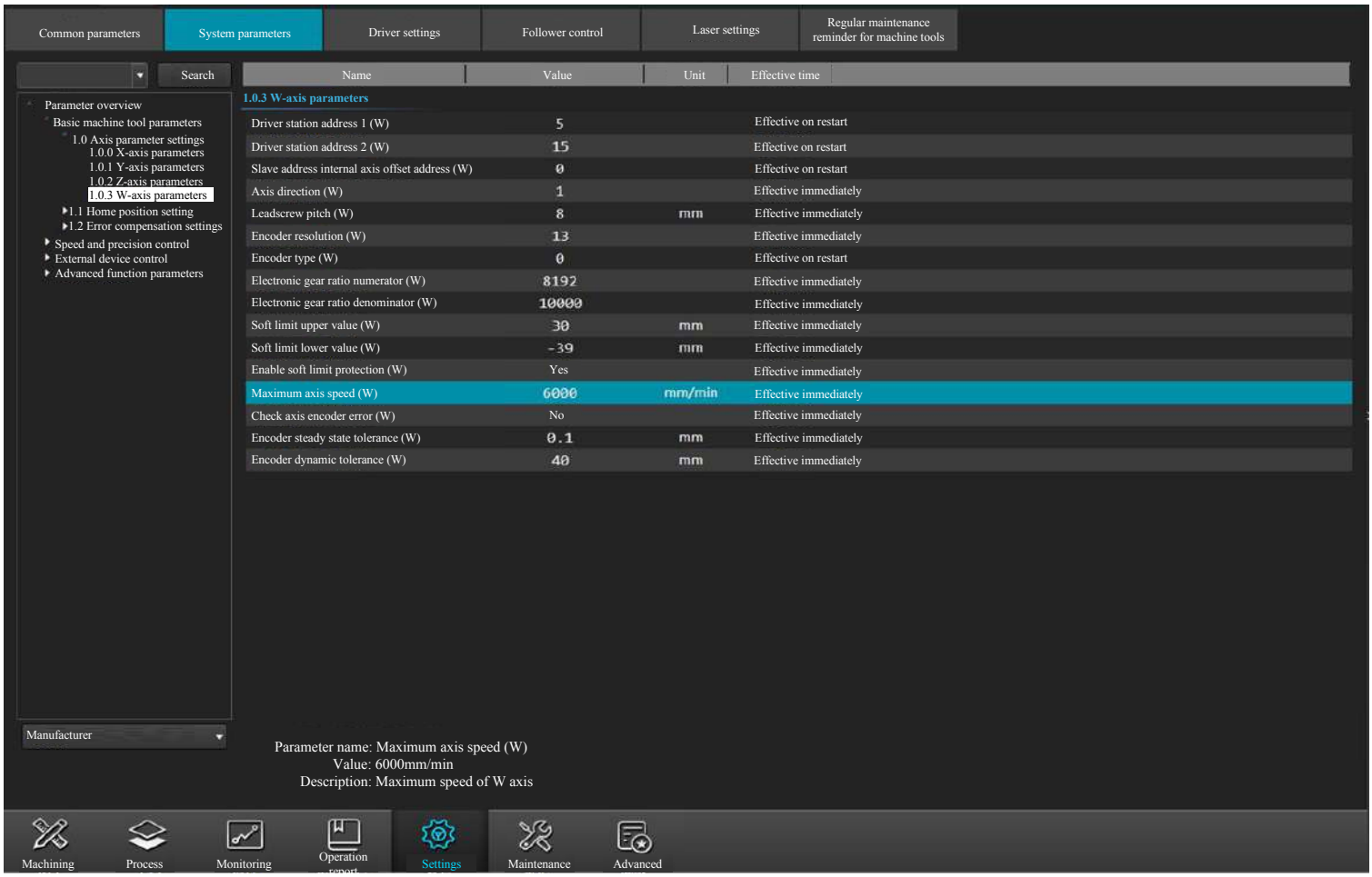
4.1.3.6: W Axis Signal Association



EX41A.X00 NO (normally open) W-Axis Positive Limit
EX41A.X01 NO (normally open) W-Axis Negative Limit

4.1.4: LS6000M Bus System Configuration

4.1.4.1: W Axis Parameter Configuration



LCS03 Platform Configuration

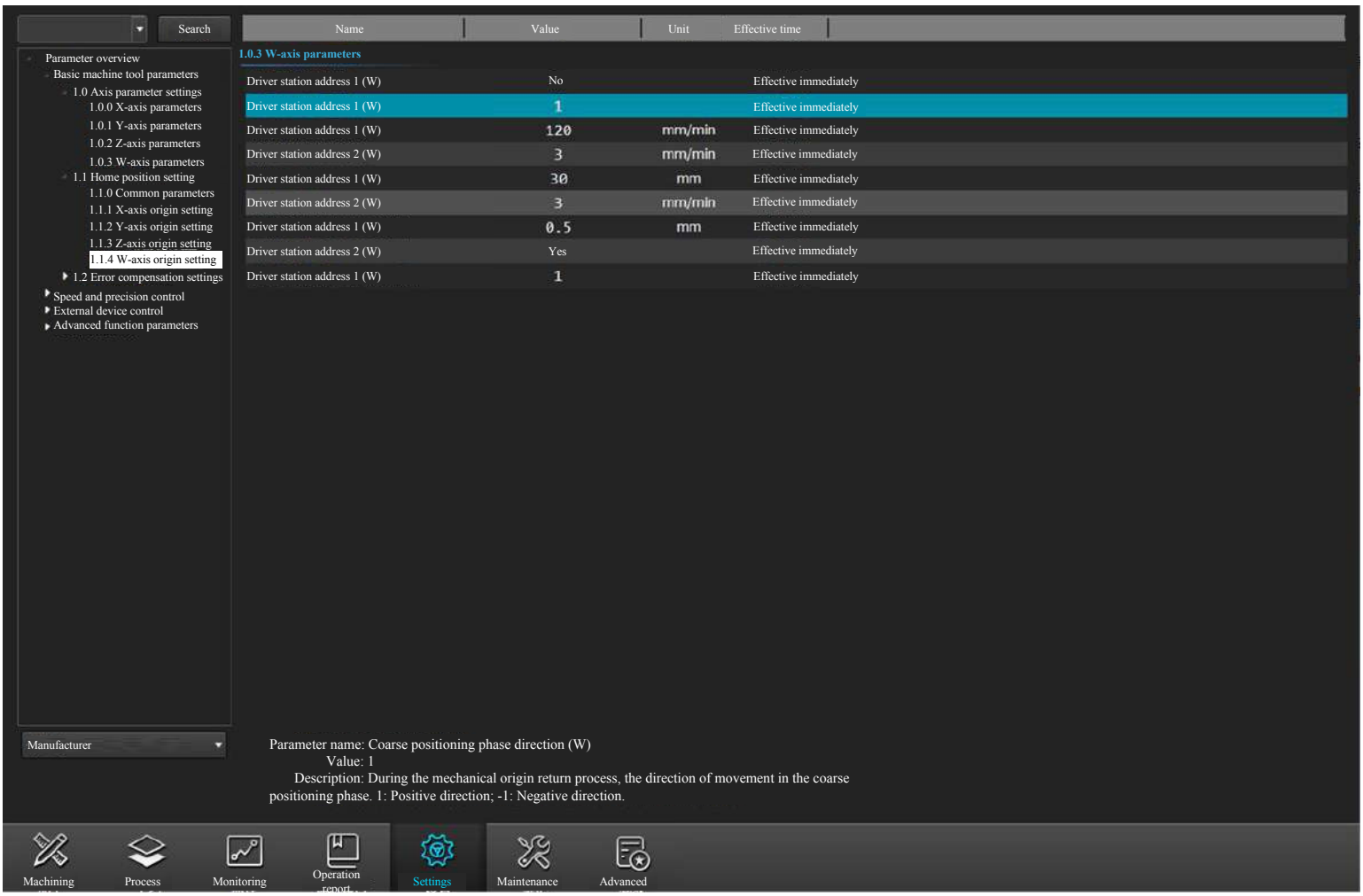
100 collimation, 200 focus:

Driver slave address 1 (W):	5;
Driver slave address 2 (W):	15;
Axis direction:	1;
Lead screw pitch:	8;
Encoder resolution:	13 bits;
Encoder type:	0;
Electronic gear ratio numerator (W):	8192;
Electronic gear ratio denominator (W):	10,000;;
Upper soft limit (W):	26;
Lower soft limit (W):	-32;
Soft limit protection enabled (W):	Yes;
Maximum axis speed (W):	6000mm/min;

100 collimation 125 focus, 100 collimation 150 focus:

Driver slave address 1 (W):	5;
Driver slave address 2 (W):	15;
Axis direction:	1;
Screw pitch:	4.5;
Encoder resolution:	13 bits;
Encoder type:	0;
Electronic gear ratio numerator (W):	8192;
Electronic gear ratio denominator (W):	10,000;;
Upper soft limit (W):	15;
Lower soft limit (W):	-18;
Soft limit protection enabled (W):	Yes;
Maximum axis speed (W):	6000mm/min;

4.1.4.2: W Axis Parameter Configuration



LCS03 Platform Configuration

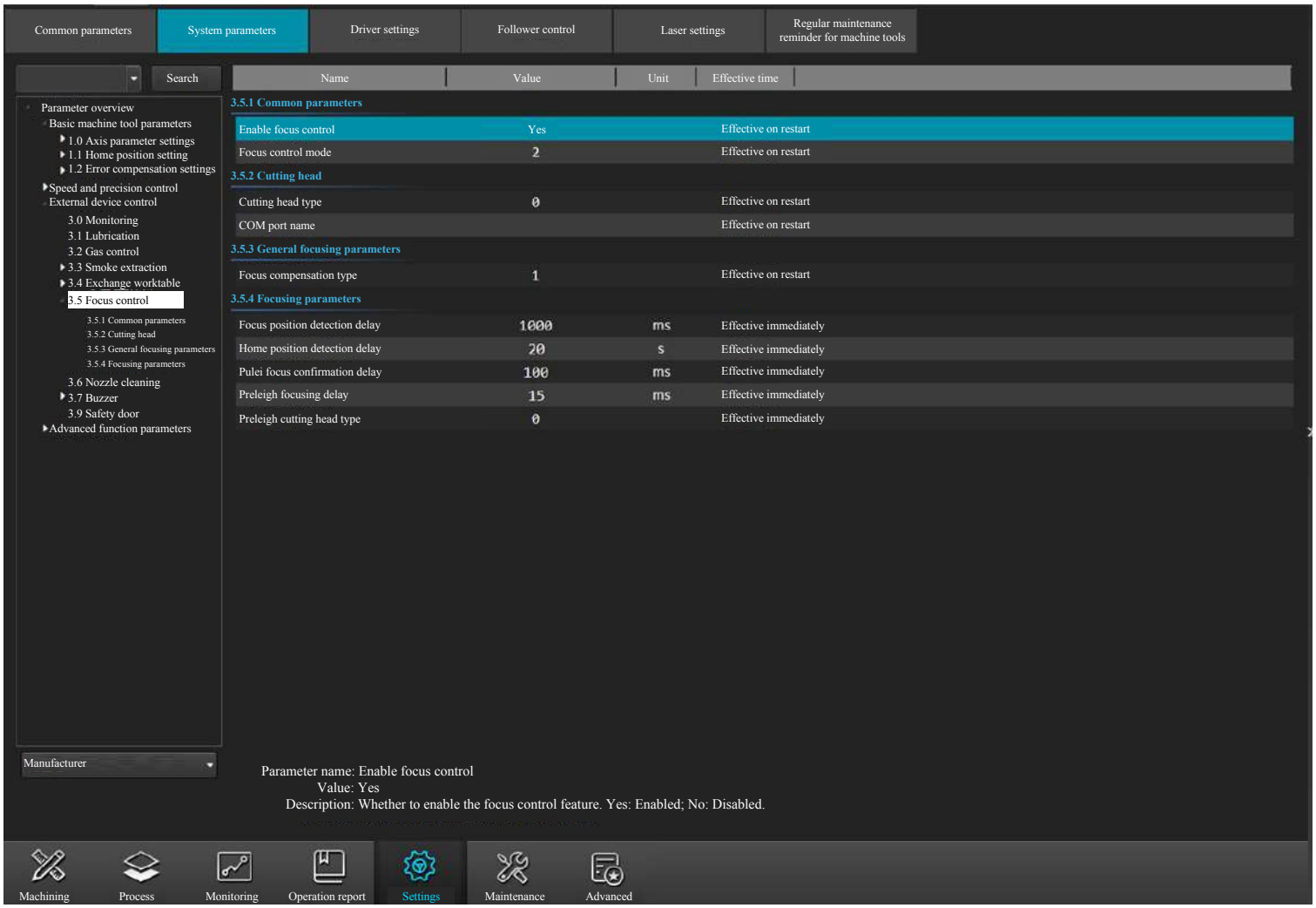
100 collimation, 200 focus:

Use Z-phase signal: No; coarse positioning direction: 1;
Coarse positioning speed: 120mm/min; fine positioning speed: 3mm/s;
Coarse positioning direction: 1; retraction distance: 26;
Retraction speed: 1mm/min;

100 collimation 125 focus, 100 collimation 150 focus:

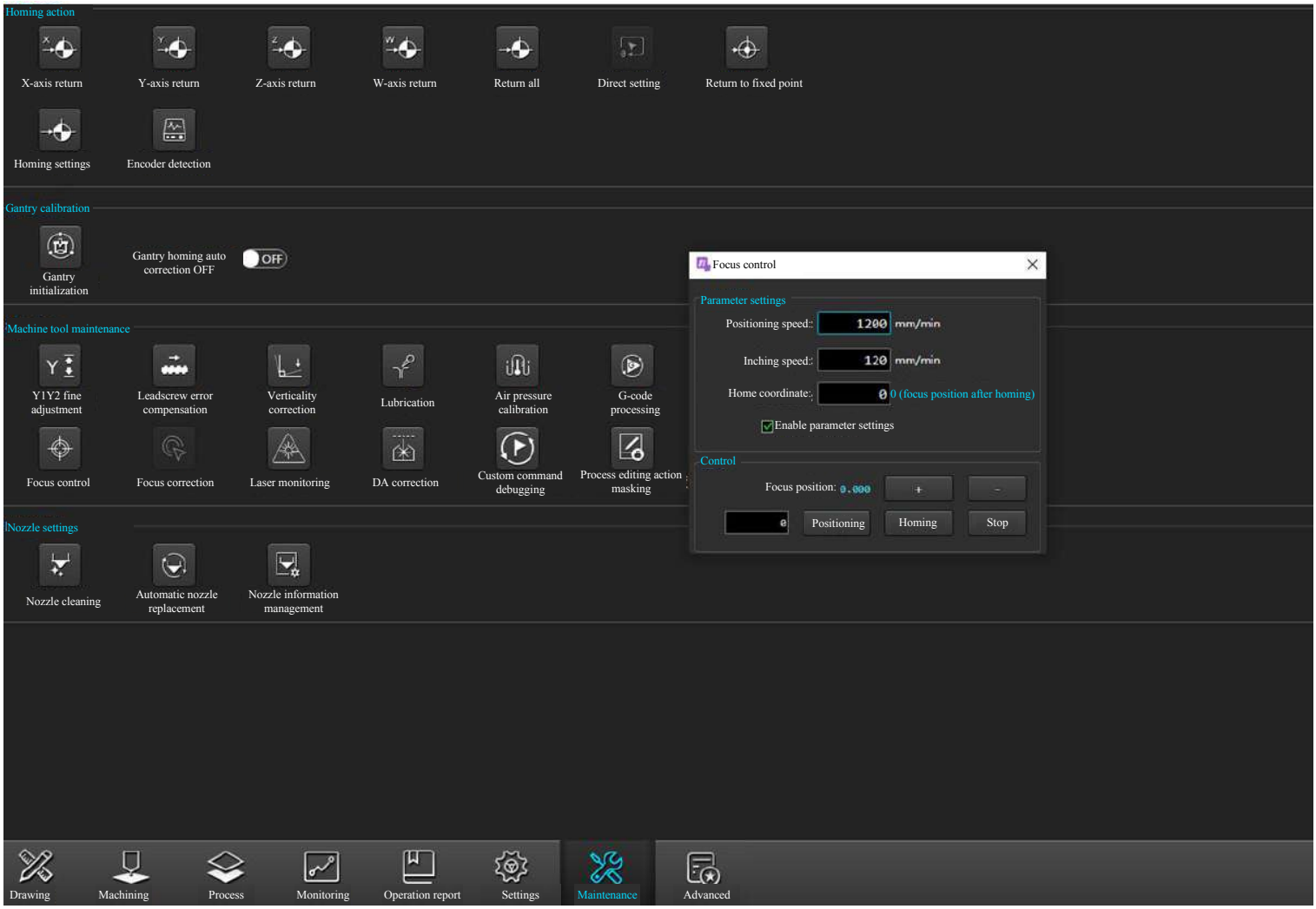
Use Z-phase signal: No; coarse positioning direction: 1;
Coarse positioning speed: 120mm/min; fine positioning speed: 3mm/s;
Coarse positioning direction: 1; retraction distance: 15;
Retraction speed: 1mm/min;

4.1.4.3: Focus Control Configuration



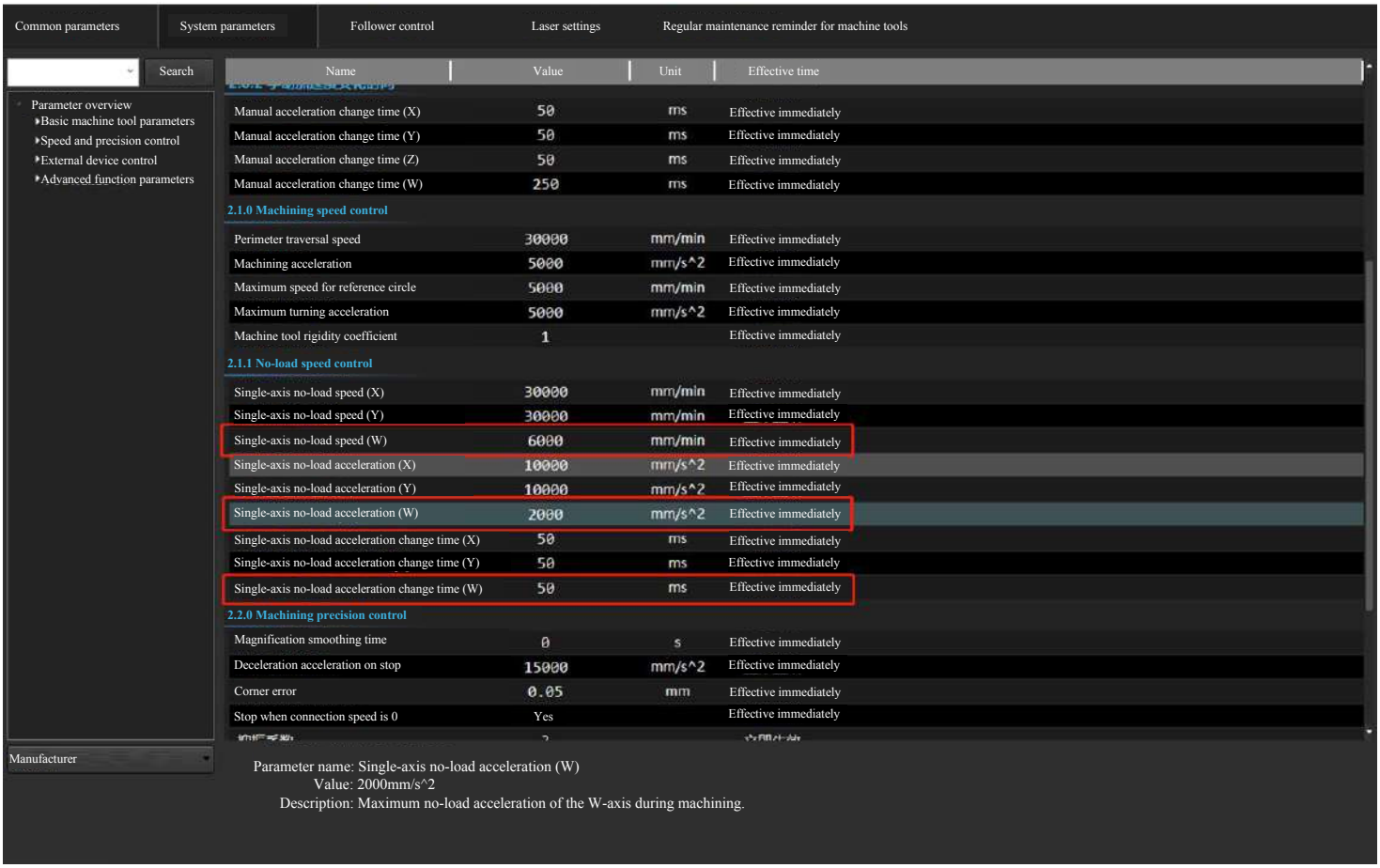
Focus control enabled: Yes;
Focus control mode: EtherCAT Bus

4.1.4.4: Focus Control Configuration



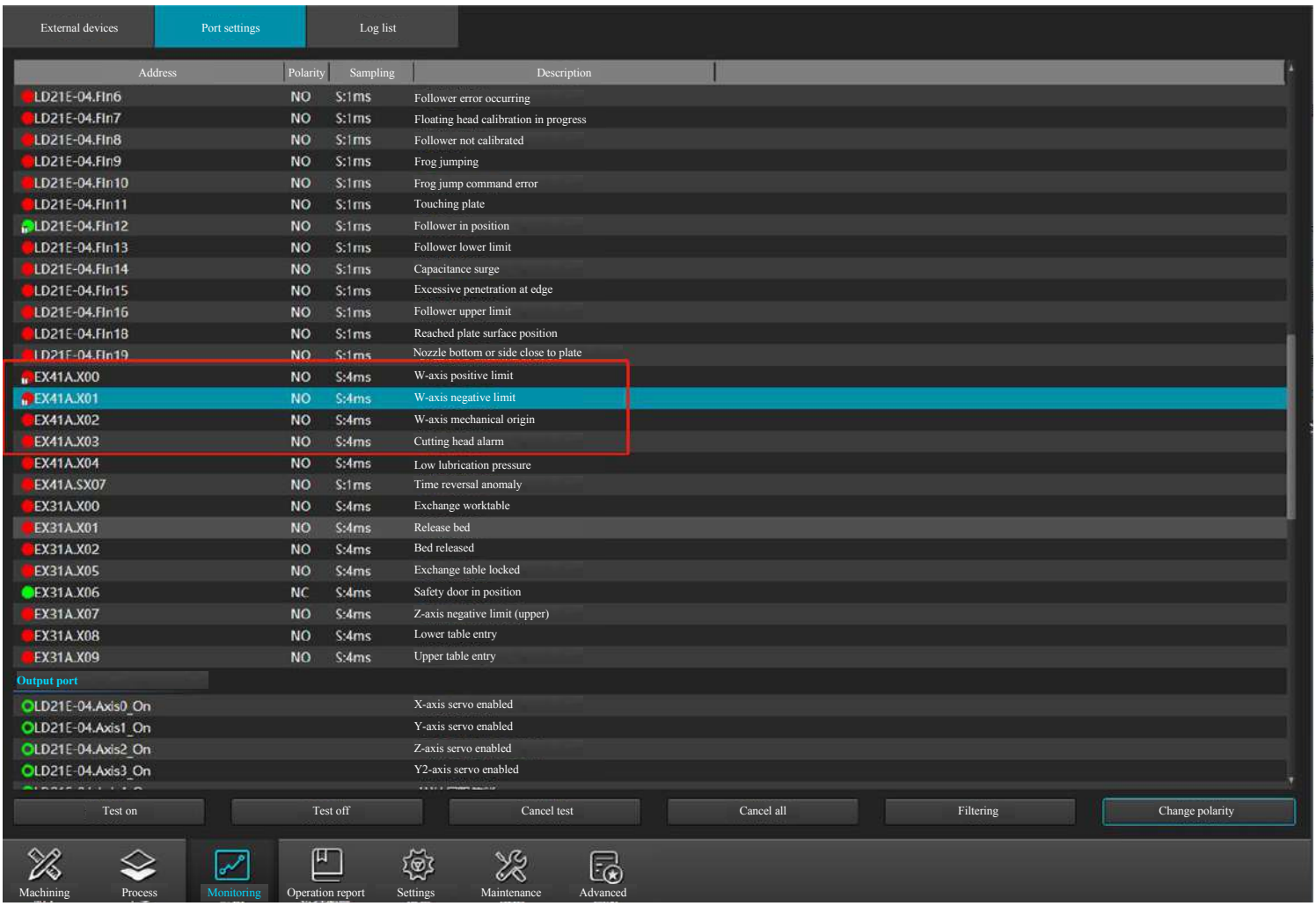
Positioning speed: 1200mm/min;
Jogging speed: 120mm/min;
Home coordinate: 0;
Parameter setting enabled: Checked;

4.1.4.5: W Axis No-Load Speed Setting



Single axis no-load speed (W): 6000mm/min;
Single axis no-load acceleration (W): 2000mm/s^2;
Single axis no-load acceleration Time (W): 50ms;

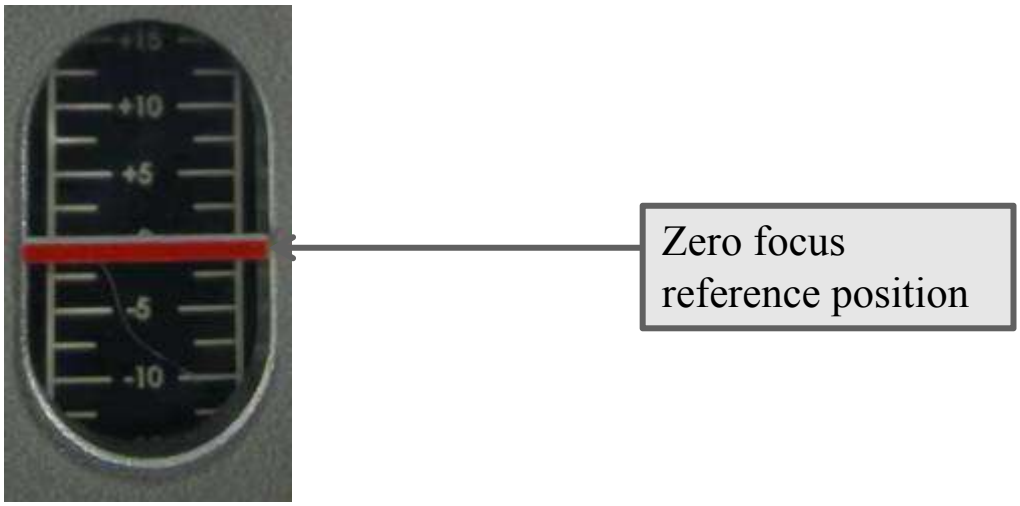
4.1.4.6: W Axis Signal Association



EX41A.X00 NO (normally open) W-Axis Positive Limit
EX41A.X01 NO (normally open) W-Axis Negative Limit

4.2 Observing Scales

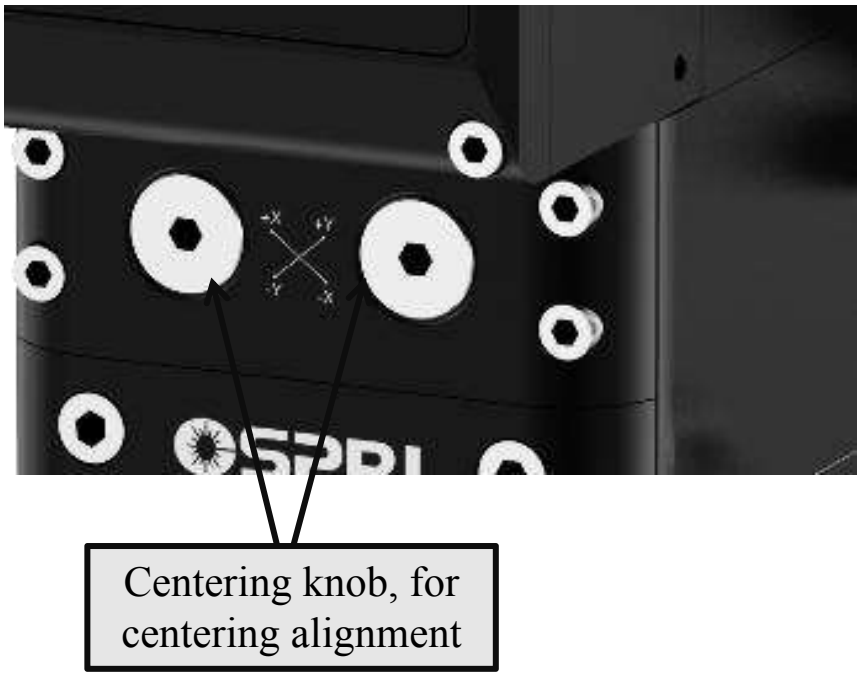
After setting, open the cutting software and reset the focus to observe whether the focus moves,
as shown in the figure below:



Note: The scale numbers are for reference only, and the actual zero point shall be subject to the actual focus. Different lasers may vary.

4.2 Collimation Adjustment Instructions

The laser beam must be kept in the center of the nozzle to achieve good joint-cutting effect. When it deviates from the center of the nozzle, it needs to be adjusted through the beam centering module.

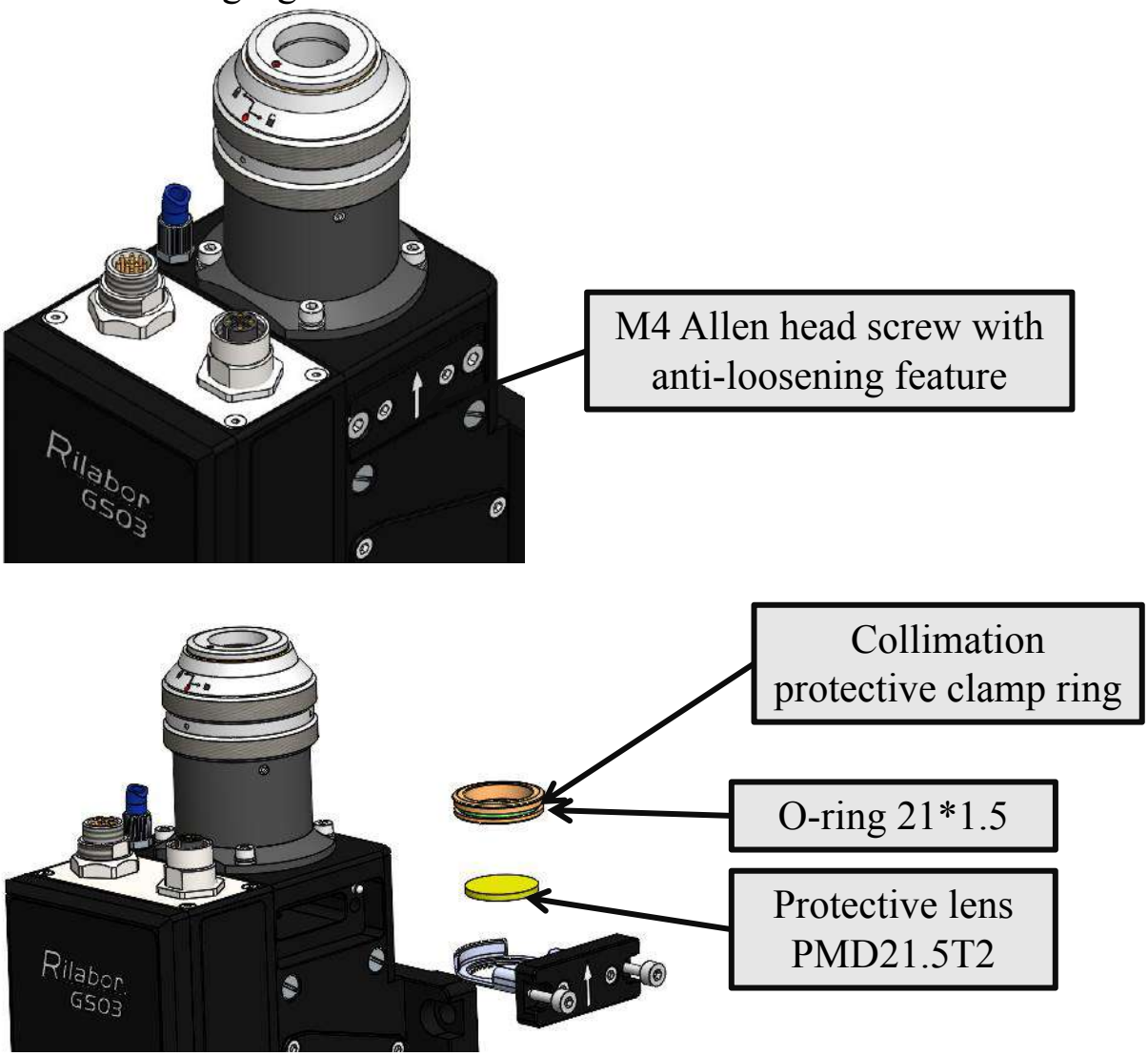


Chapter 5 Product Maintenance

5.1 Maintenance and Replacement of Protective Lens

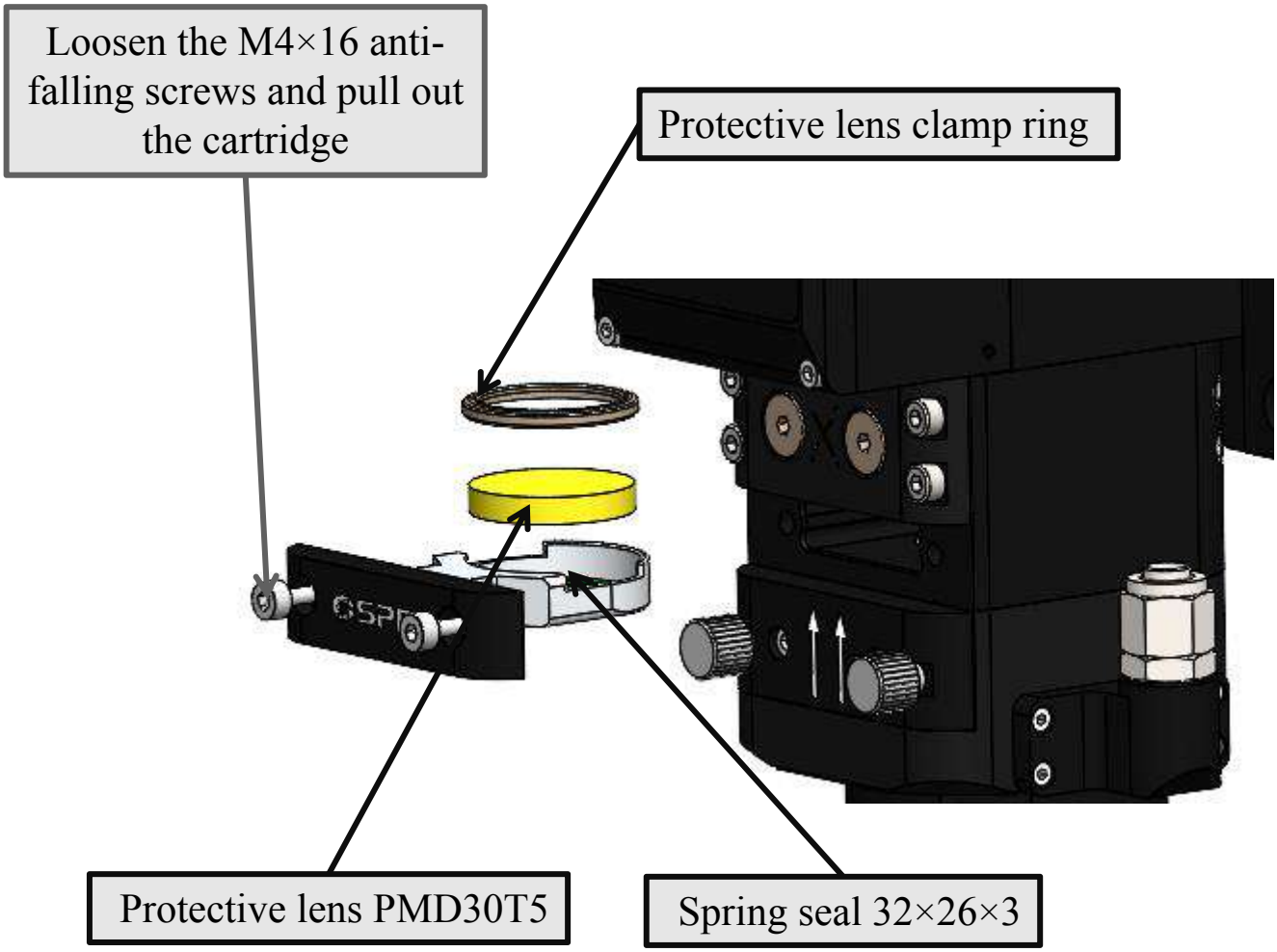
In case poor cutting performance occurs while cutting protective lens is normal, but burning points on the ceramic piece, the collimation protective lens or focus protective lens possibly is polluted or damaged. In this condition, please pull out the protective lens cartridge to check the lens. Before checking, use a clean cloth dampened with alcohol to wipe the exterior clean.

5.1.1 Disassembly of Collimation Protective Lens The disassembly method is as shown in the following figure:



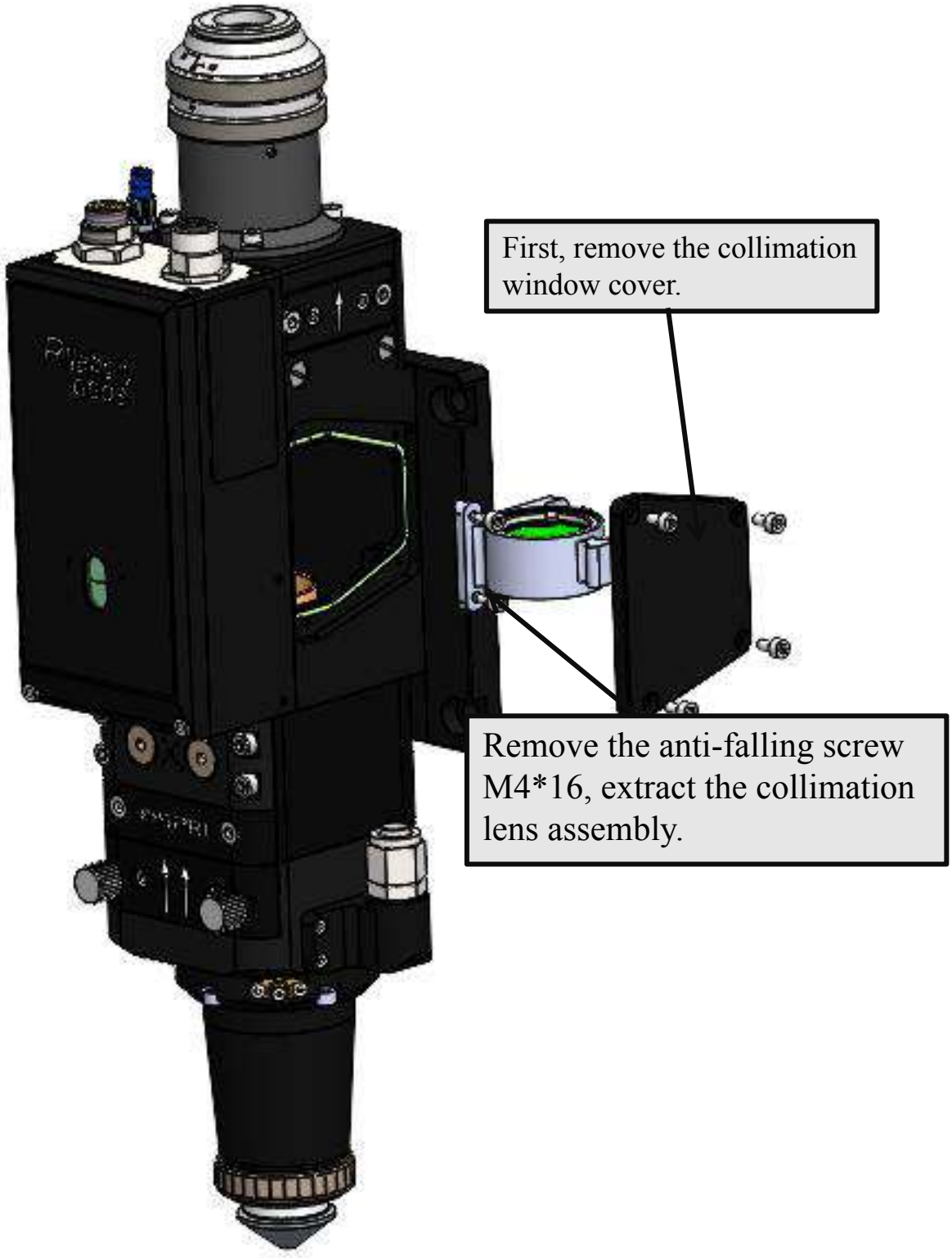
5.1.2 Disassembly and Assembly of Focus Protective Lens

Loosen the two M4×16 hexagon socket anti-falling screws, pull out the protective lens cartridge, and replace the protective lens (PMD30T5).

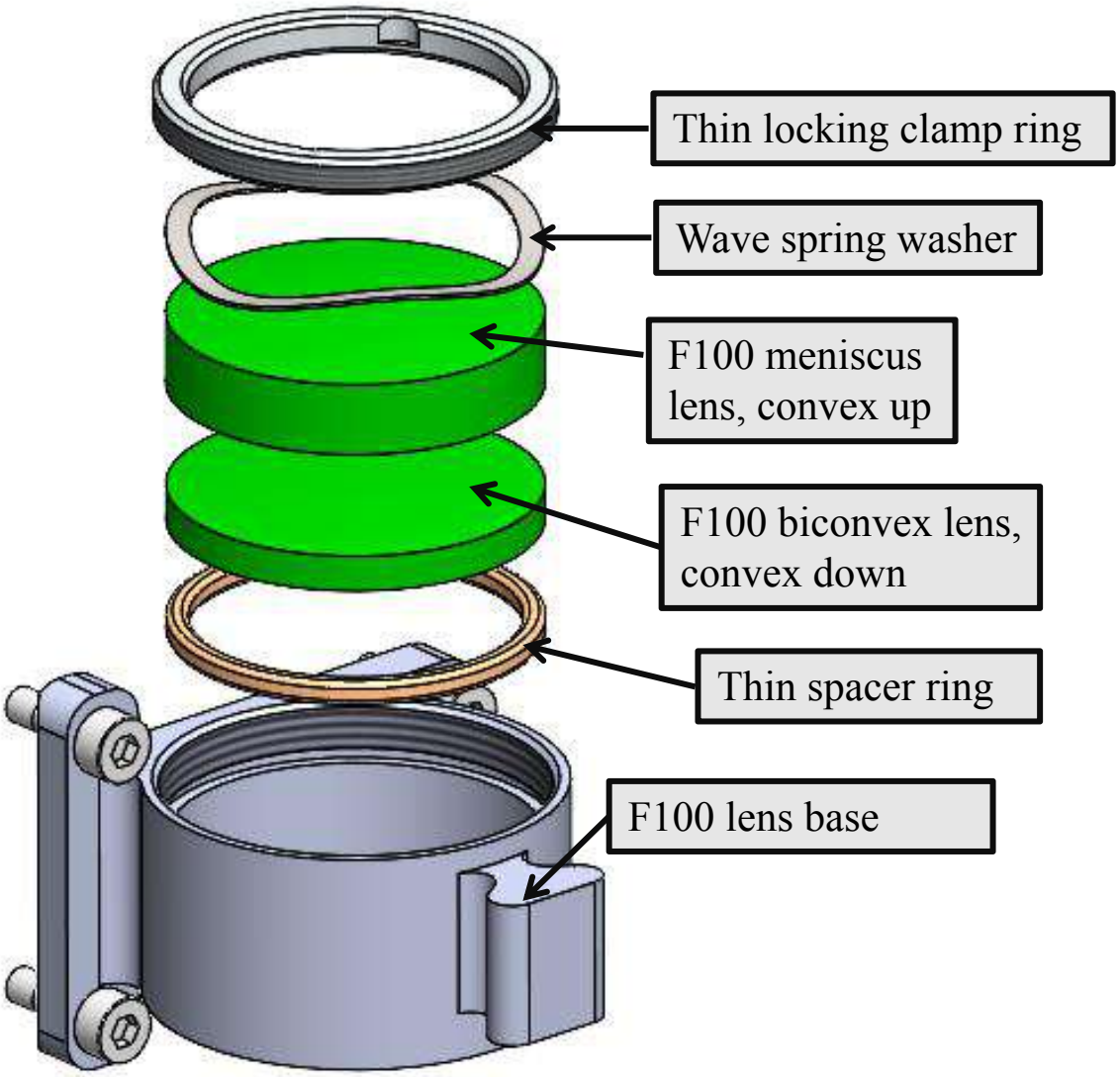


5.2 Maintenance and Replacement of Collimation Lens

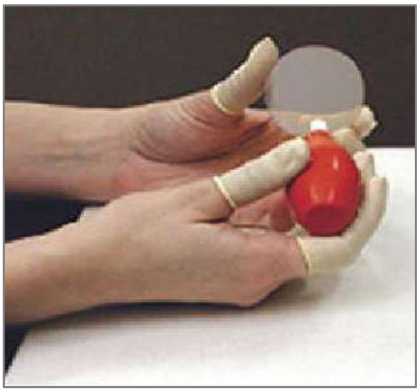
5.2.1 Disassembly of Collimation Lens



5.2.1.1 Disassembly and Assembly of Collimation Lens F100



5.2.2 Cleaning of Collimation Lens



①Tools: Dust-free wiping swabs, isopropyl alcohol, dry and pure compressed air.

②Spray isopropyl alcohol onto the dust-free wiping swabs.

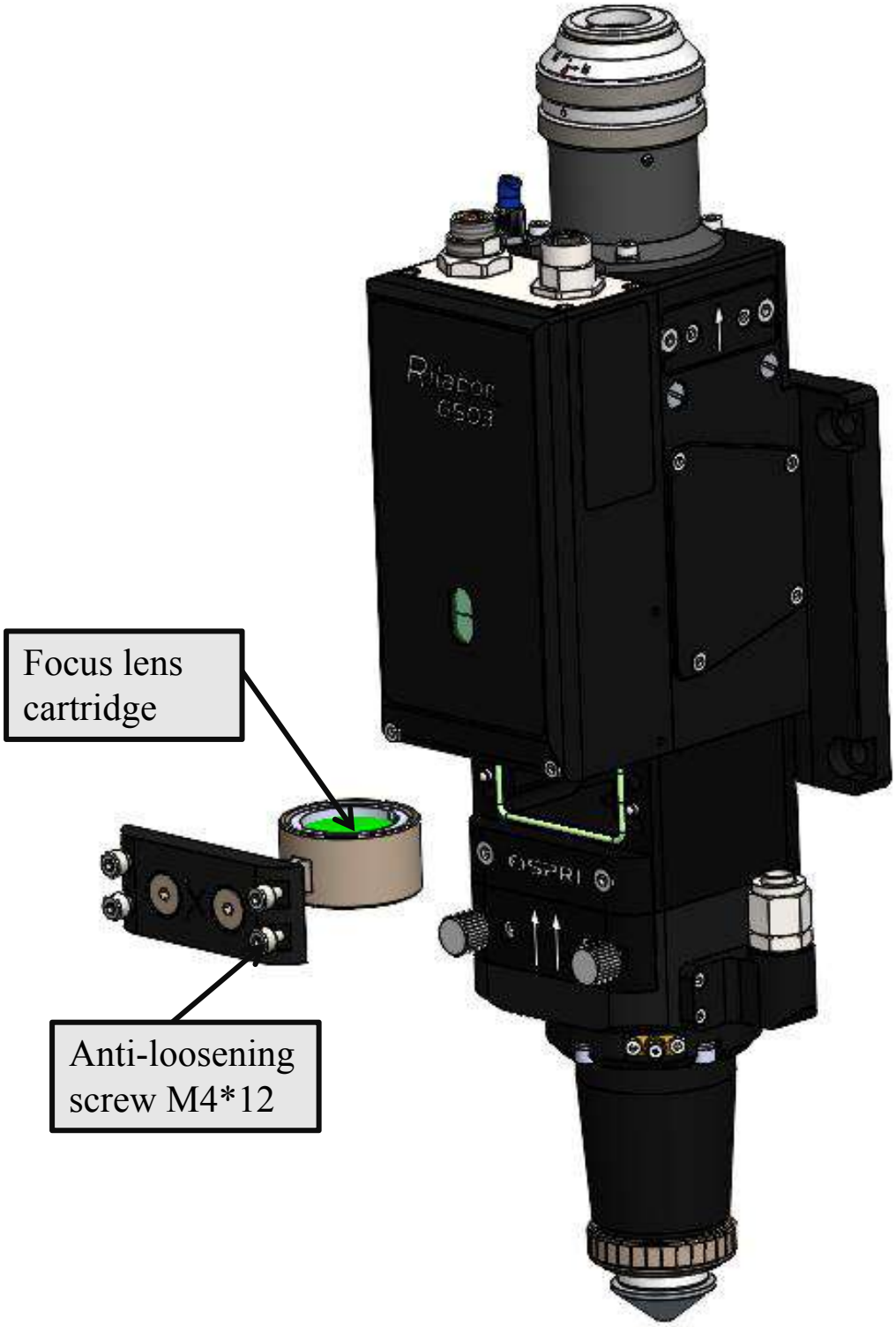
③Gently pinch the both sides of the lens with the left thumb and index finger.

④Hold the wiping swabs with right hand to gently wipe both sides of the lens in a single direction from bottom to top or from left to right, and blow the lens surface with the rubber air blower to confirm that there is no foreign matters on the cleansed lens surface.

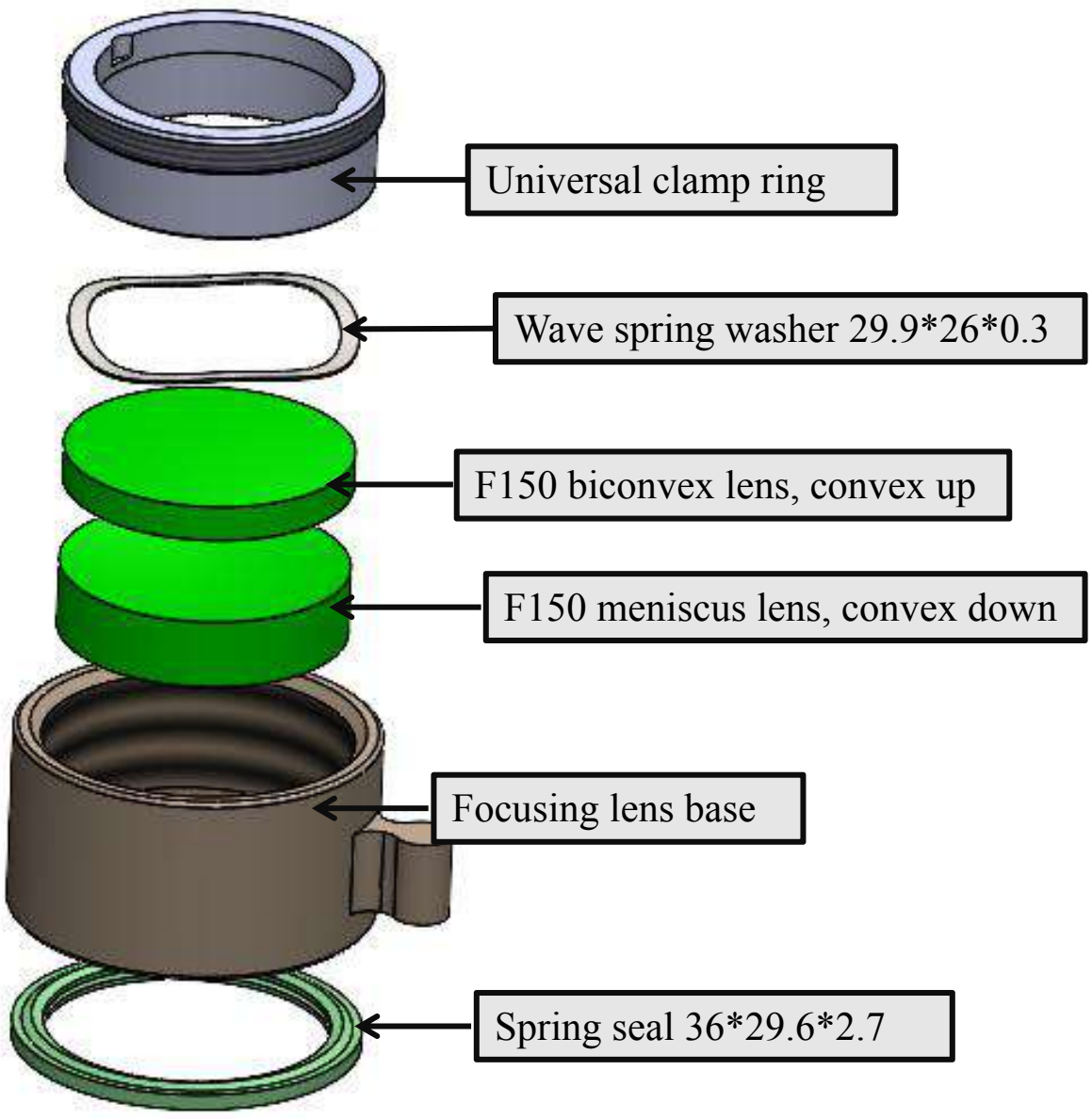
⑤The cleaned collimation lens must be installed into the collimation lens base and inserted into the cutting head as soon as possible.

5.3 Maintenance and Replacement of Focus Lens

5.3.1 Disassembly and Assembly of Focus Lens



5.3.1.1 Disassembly and Assembly of Focus Lens



5.3.2 Cleaning of Focus Lens



①Tools: Dust-free wiping swabs, isopropyl alcohol, dry and pure compressed air.

②Spray isopropyl alcohol onto the dust-free wiping swabs.

③Gently pinch the both sides of the lens with the left thumb and index finger.

④Hold the wiping swabs with right hand to gently wipe both sides of the lens in a single direction from bottom to top or from left to right, and blow the lens surface with the rubber air blower to confirm that there is no foreign matters on the cleansed lens surface.

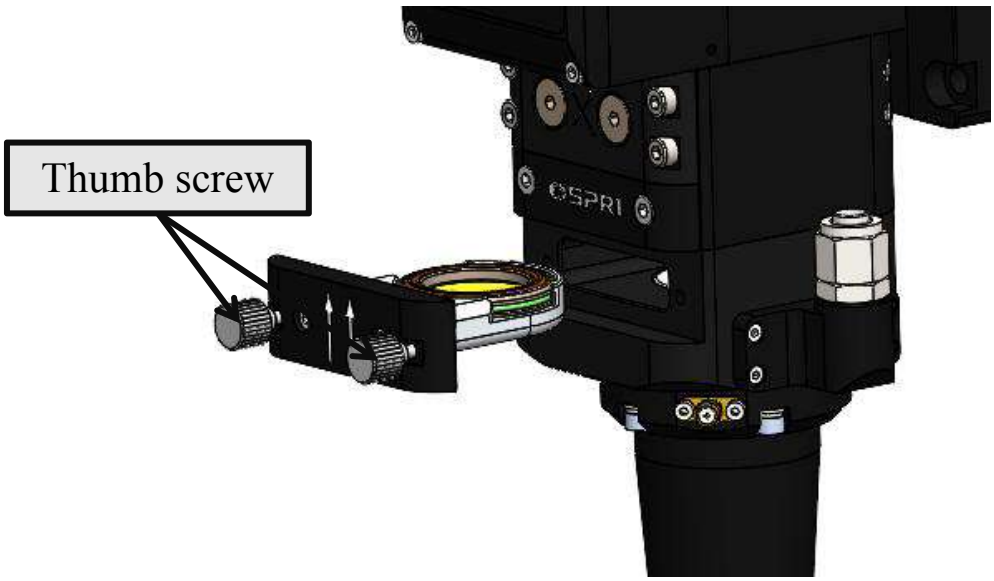
⑤The cleaned focus lens must be installed into the focus lens base and inserted into the cutting head as soon as possible.

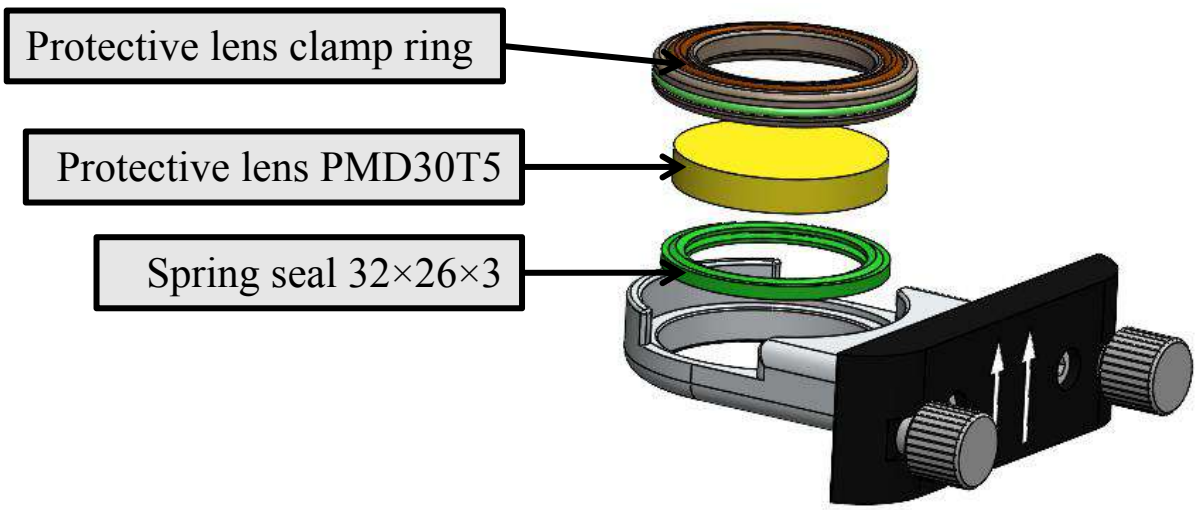
5.4 Maintenance of Cutting Protective Lens

When the protective lens has impurities or foreign matters, they will absorb laser and heat up, resulting in damage to protective lens. Therefore, it is recommended to clean the protective lens once a week. Besides, the protective lens is a wearing part and should be replaced in time if damaged.

5.4.1 Disassembly of Protective Lens

Loosen the thumb screws with hand, hold the screws and slowly pull out the focus protective lens assembly, and move it to a clean and dust-free environment.





The assembly sequence is as shown in the figure above

5.4.2 Cleaning of Protective Lens



①Tools: Dust-free wiping swabs, isopropyl alcohol, dry and pure compressed air.

②Spray isopropyl alcohol onto the dust-free wiping swabs.

③Gently pinch the both sides of the lens with the left thumb and index finger.

④Hold the wiping swabs with right hand to gently wipe both sides of the lens in a single direction from bottom to top or from left to right, and blow the lens surface with the rubber air blower to confirm that there is no foreign matters on the cleansed lens surface.

⑤The cleansed lens must be installed into the cutting head's body as soon as possible or stored in other clean and sealed container.

Attention: When cleaning and replacing the protective lens, avoid the grease on hands or dust in the environment from contaminating the protective lens . In principle, focusing lenses, collimation lenses, and cutting lenses should not be disassembled. If you feel that the lens is contaminated, you can first take the optical lens for testing. If necessary, you can contact the technical staff of our company.

5.5 Maintenance of Sensor Parts

Ceramic body is a wearing part but can be replaced after being damaged. The ceramic body should be aligned with the two locating pins of the body in the installation process. Otherwise, the ceramic body cannot be properly installed in place, thus causing operating failure of the sensor component. When locking the ceramic, tighten it with the locking nut. The different degree of tightness on locking nuts would directly affect the operating parameters of the sensor parts.

The laser nozzle is the sensitive element of the sensing component and is connected to the body through the thread. It is a wearing part. After it has worked for a period of time, it is necessary to remove the bonded slag and replace it in time when the burning loss is serious.

After assembling the ceramics, tighten the locking nut and expose the ceramic evenly about 2-3mm.

The following cautions should be taken in use:

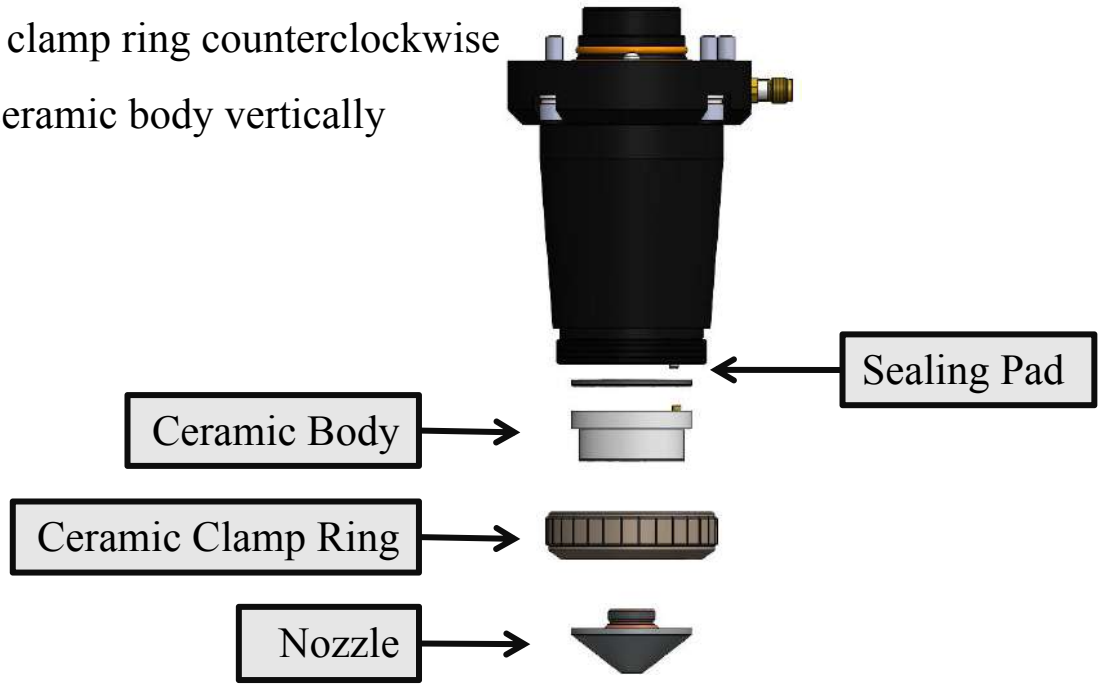
①Dry and clean auxiliary gas should be used when cutting. If there is water, oil and other impurities in the gas, mutations may occur at working clearance, and even cause work disorder of the sensor. It is suggested to use high purity oxygen and configure the gas dryer, oil-water separator and other devices.
②The sensor after being defaced should be cleaned with clean and dry cotton cloths, etc. Do not use liquid to clean the cutting head and ceramic, and then connect and assemble it properly after cleaning.
③The ceramic body can be replaced after being damaged. After ceramic body is replaced, an initialization of electrical system together with the amplifier should be conducted through a reset operation.
④The shape and size of the cutting nozzle would directly affect the characteristics of the sensor. Therefore, specified cutting nozzle must be used.

5.5.1 Replacement of Nozzles and Ceramic Body

① Screw off the nozzle counterclockwise

② Screw off the clamp ring counterclockwise

③ Remove the ceramic body vertically downward



5.5.2 Cleaning of Ceramic Rings

① Take out the ceramic and clean it with anhydrous alcohol or isopropyl alcohol.

② Ensure that the ceramic surface is clean and dry without moisture before installation.

Note: Cleanliness of ceramic surface is directly related to the operating performance of the following system. It is necessary to clean timely the dirt on the ceramic surface in order to ensure the working performance of the system.

Shenzhen Ospri Intelligent Technology Co.,Ltd

Tel: 0755-85225225

Fax: 4008266163-19300

e-Mail: mj.chen@sz-osprey.com

Add: Room 1001, Building A, No.4 Factory, Baolong Zhizaoyuan, New Energy 1st Road, Baolong Community, Longgang District, Shenzhen