User Manual of LCF08A2-H00

Product Description

Shenzhen Ospri Intelligent Technology Co., LTD

Foreword

Dear users,

Thanks for choosing the LCF08A2 (simple-pendulum right-angle) fiber laser automatic focusing cutting head produced by Shenzhen Ospri Intelligent Technology Co., LTD. We do much appreciate your trust in our products.

To help gain an overall understanding on our products, and facilitate your use, we prepare the user manual, which specifies the features, structural characteristics, technical characteristics, operating instructions, maintenance, etc. of the products. Please consult this manual where necessary.

Before using the product, please read this manual carefully to help you use the product more efficiently. For any problem during use, please feel free to call us and we will provide you services wholeheartedly.

Important:

Please read this manual carefully before using the product, in order to ensure your safety and normal functioning of the product.

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Appendix A

Chapter 1 Overview

1.1 Technical Parameters

① See Table 1.0 for the technical parameters of the product:

Name	Fiber laser cutting head
Model	LCF08A2
Interface type	QBH and G5
Applicable wavelength	1,064±10nm
Rated power	≤8kW
Focal length	200mm/250mm
Collimation focal length	100mm
Nozzle model	Various models and specifications
Adjustment range of focus	-35mm~+30mm -50mm~+50mm
Adjustment range of alignment	±1.5mm
Speed of focus adjustment	400mm/s
Repetitive positioning accuracy of focusing axis	0.05mm
A-axis action range	±45°
Rated rotation speed	30r/min
Angular acceleration	240rad/s²
Positioning accuracy	1arcmin
Auxiliary gas pressure	≤3Mpa
Weight	9kg

Table 1.0

1.2 Precautions

① Please wear specialized laser safety goggles to ensure personal safety when the cutting head is used in coordination with laser cutting machine.
② Please take preventive measures and operate with caution 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 and tidy and 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 personal injury.

Chapter 2 Structural Characteristics

2.1 Structure

See Figure 1.0 for the brief description of product structure.

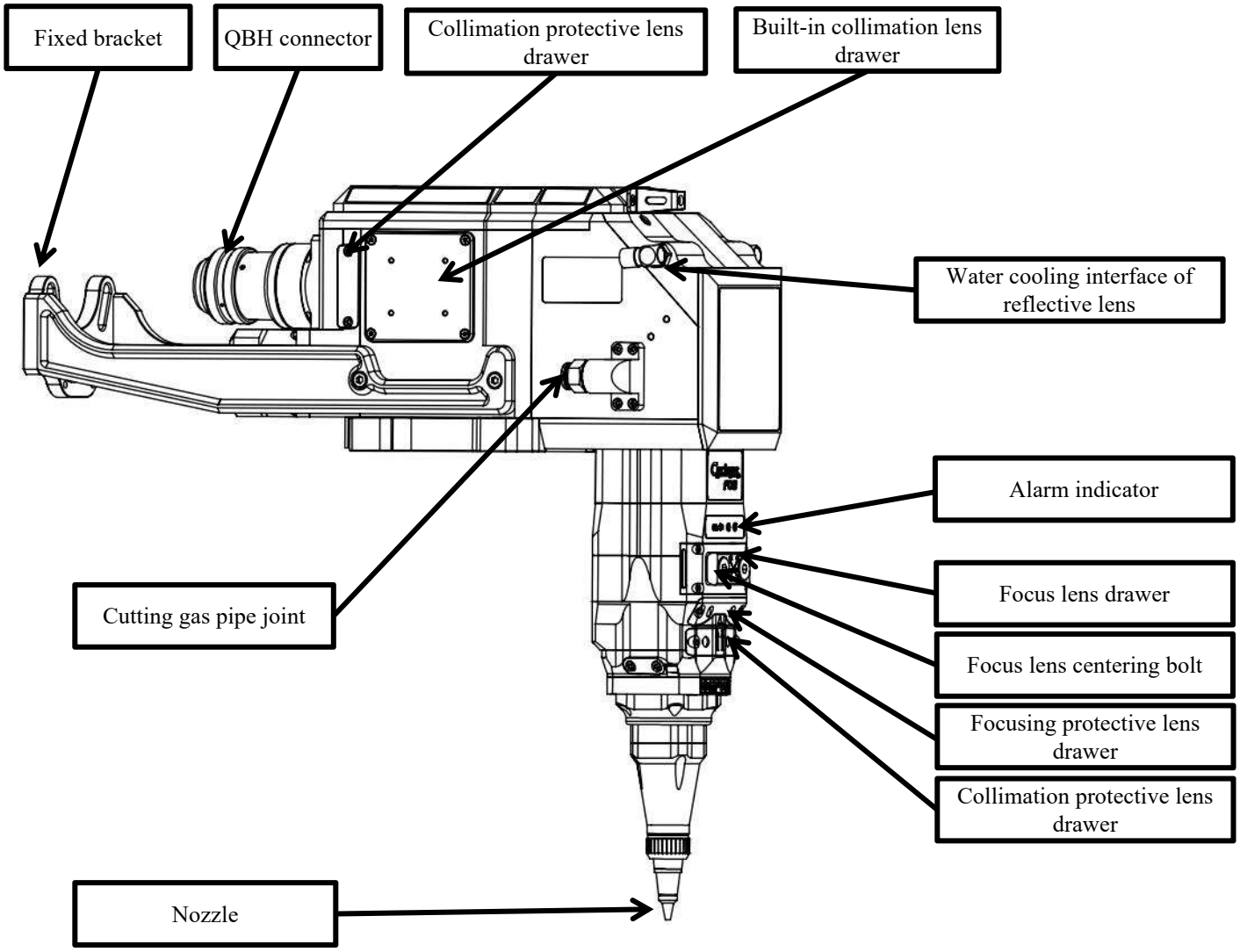


Figure 1.0

See Figure 1.1 for the brief description of product structure.

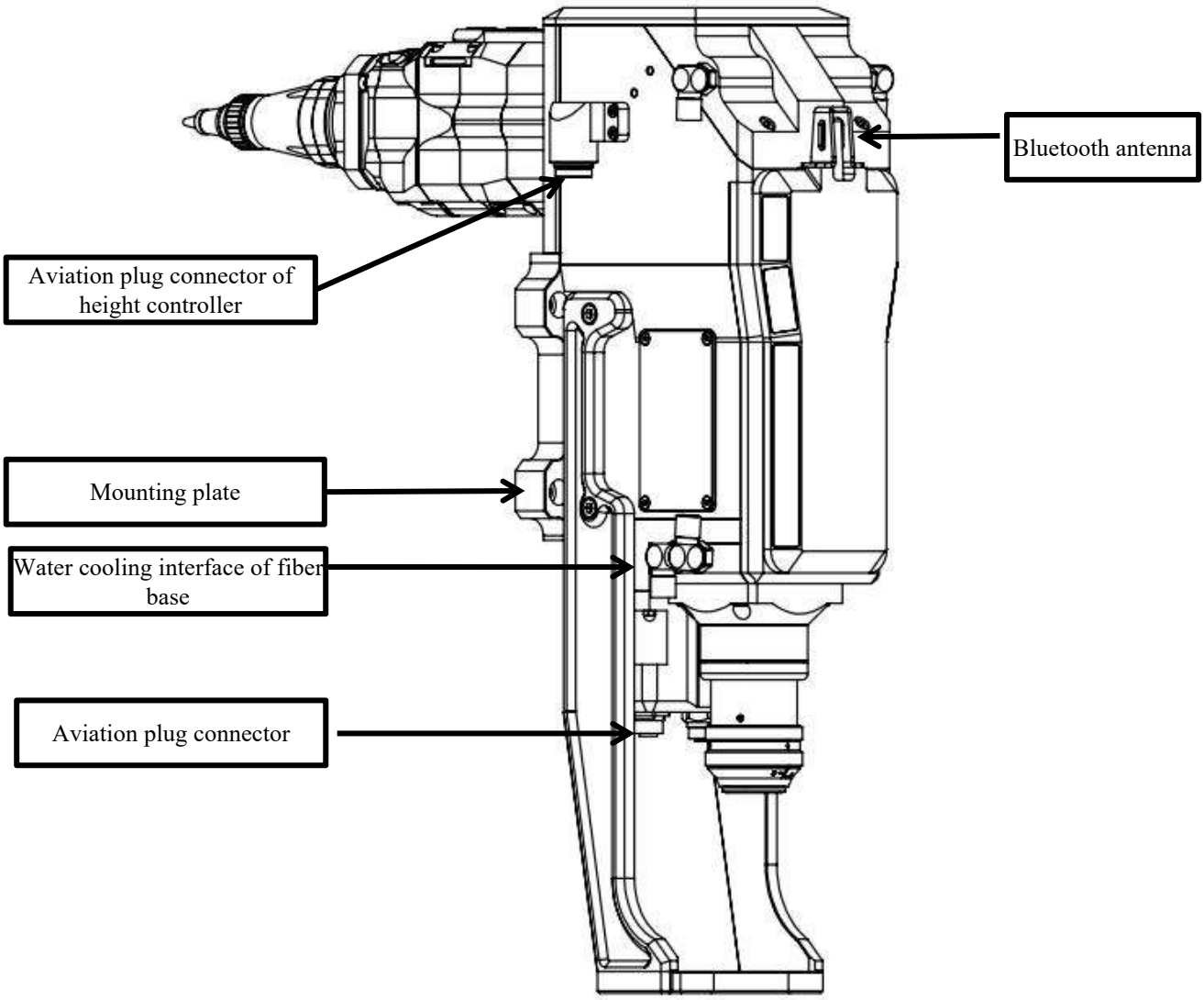


Figure 1.1

2.2 Parts

1. Water cooling interface of fiber base: Mainly used for cooling fiber interface and collimation protective lens.
2. Aviation plug connector: Signal outputs such as power lines for motor, encoder line, limit, etc.
3. Collimation protective lens drawer: When inserting and removing the fiber head, prevent dust from entering the cutting head to protect the collimation lens.
4. Collimation lens drawer: The inserting and removing component for replacing and maintaining collimation lens.
5. Focus lens drawer: Inserting and removing window for replacing and maintaining the focus lens; centering the laser beam spot.
6. Focus protective lens drawer: Protecting the focus lens for fast replacement.
7. Cutting protective lens drawer: Sealing the cutting gas and protecting the focus lens.
8. Cutting gas pipe interface: 10mm gas pipe interface, which is used for inputting gas during cutting.
9. Centering knob: Adjusting the center so that the light beam passes through the center of the nozzle.
10. Aviation plug connector of height controller: The interface for connecting the cutting head and height controller.
11. Alarm light: It is in green during normal working, in yellow for pre-warning and in red for alarming.
12. Fixed bracket: Used for fixing the fiber.
13. Fiber interface: Compatible to such interfaces as QBH and G5.
14. Bluetooth antenna: Used for enhancing signal, and transmitting to and connecting mobile APP.

2.3 Parts (Lens Size)

See Figure 1.2 for details.

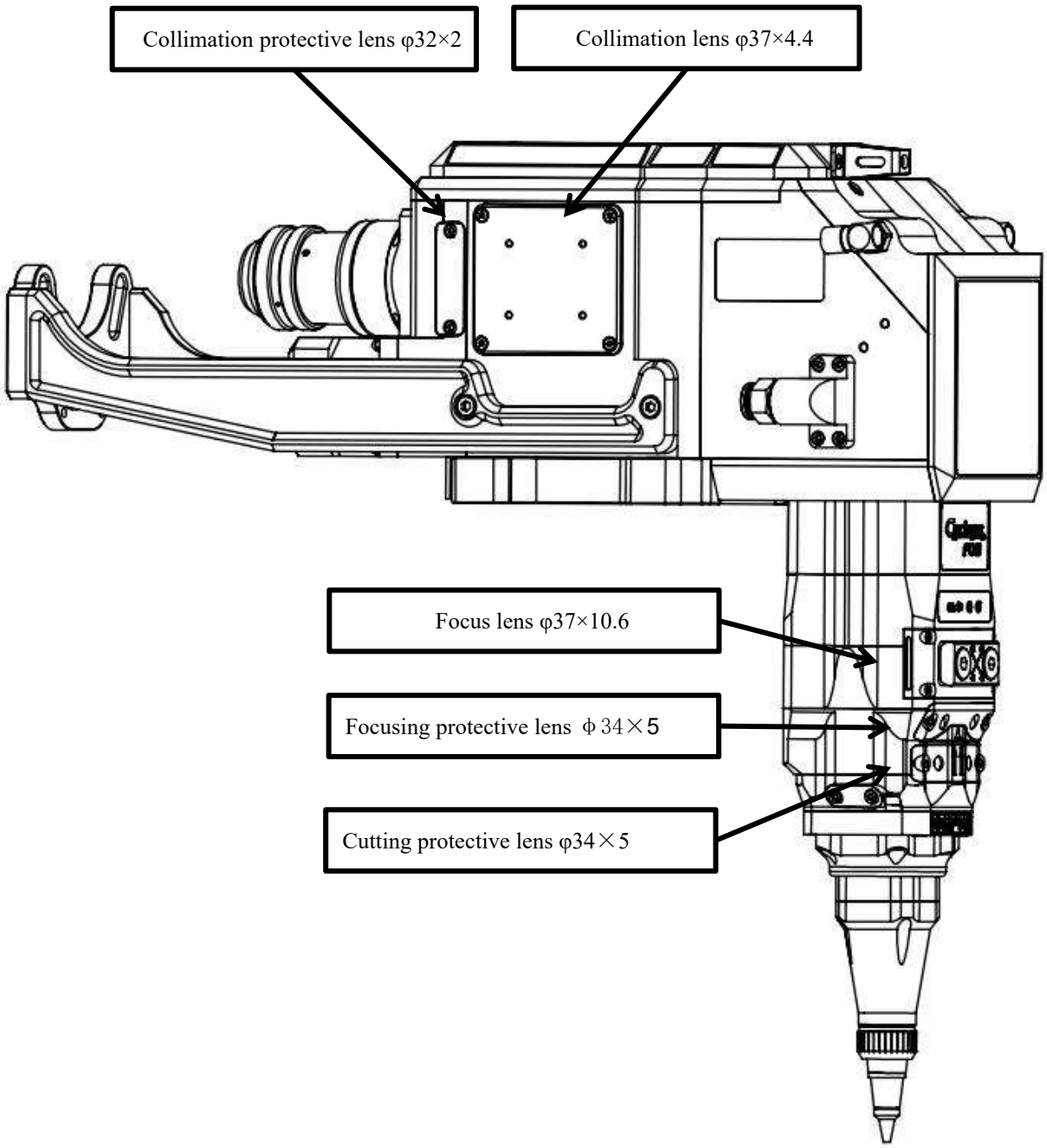


Figure 1.2

Chapter 3 Installation

3.1 Cutting Head Installation

Dimensional drawing of cutting head installation (collimation F100/Focus F200), as shown in Figure 1.3 below.

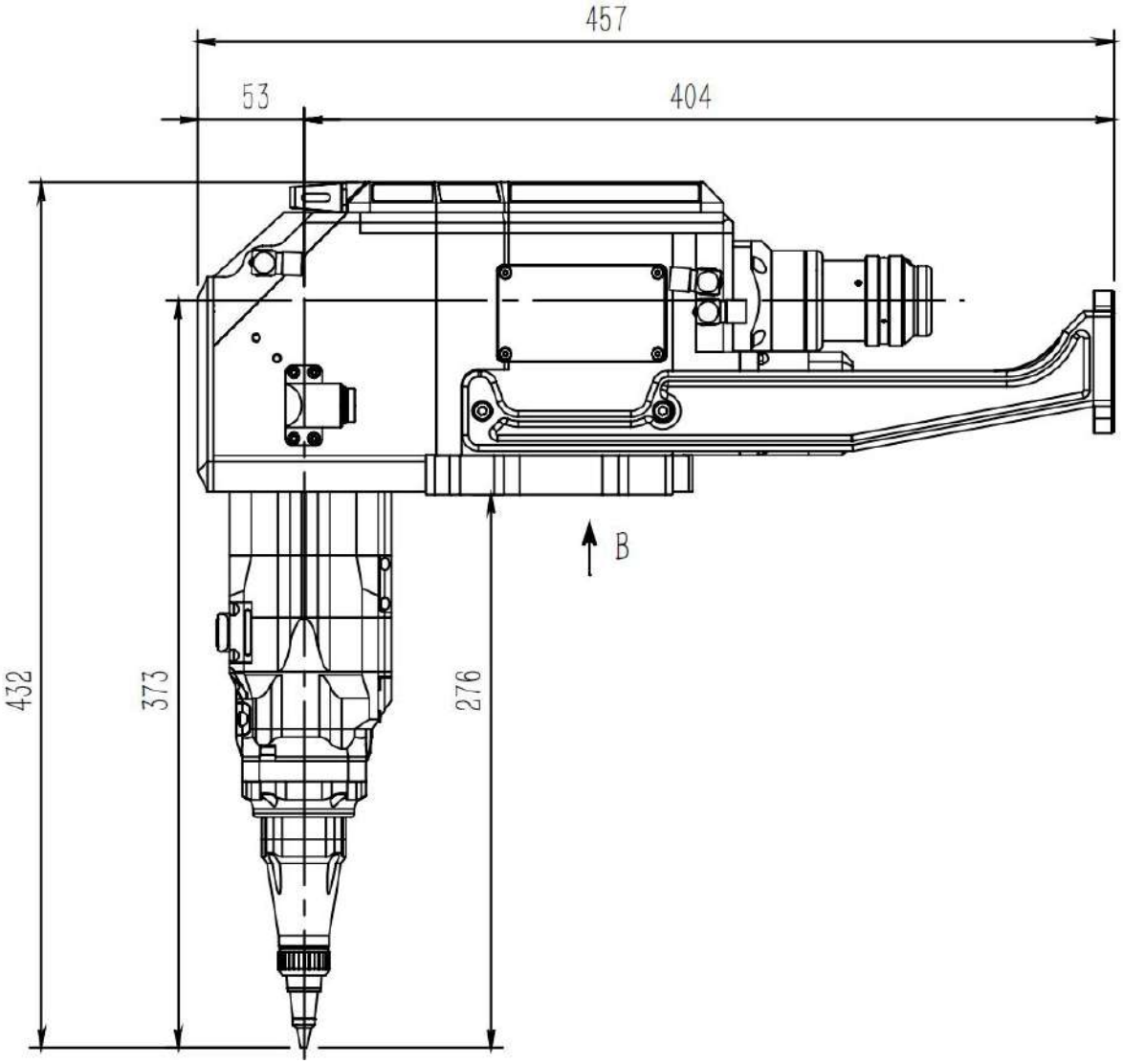


Figure 1.3

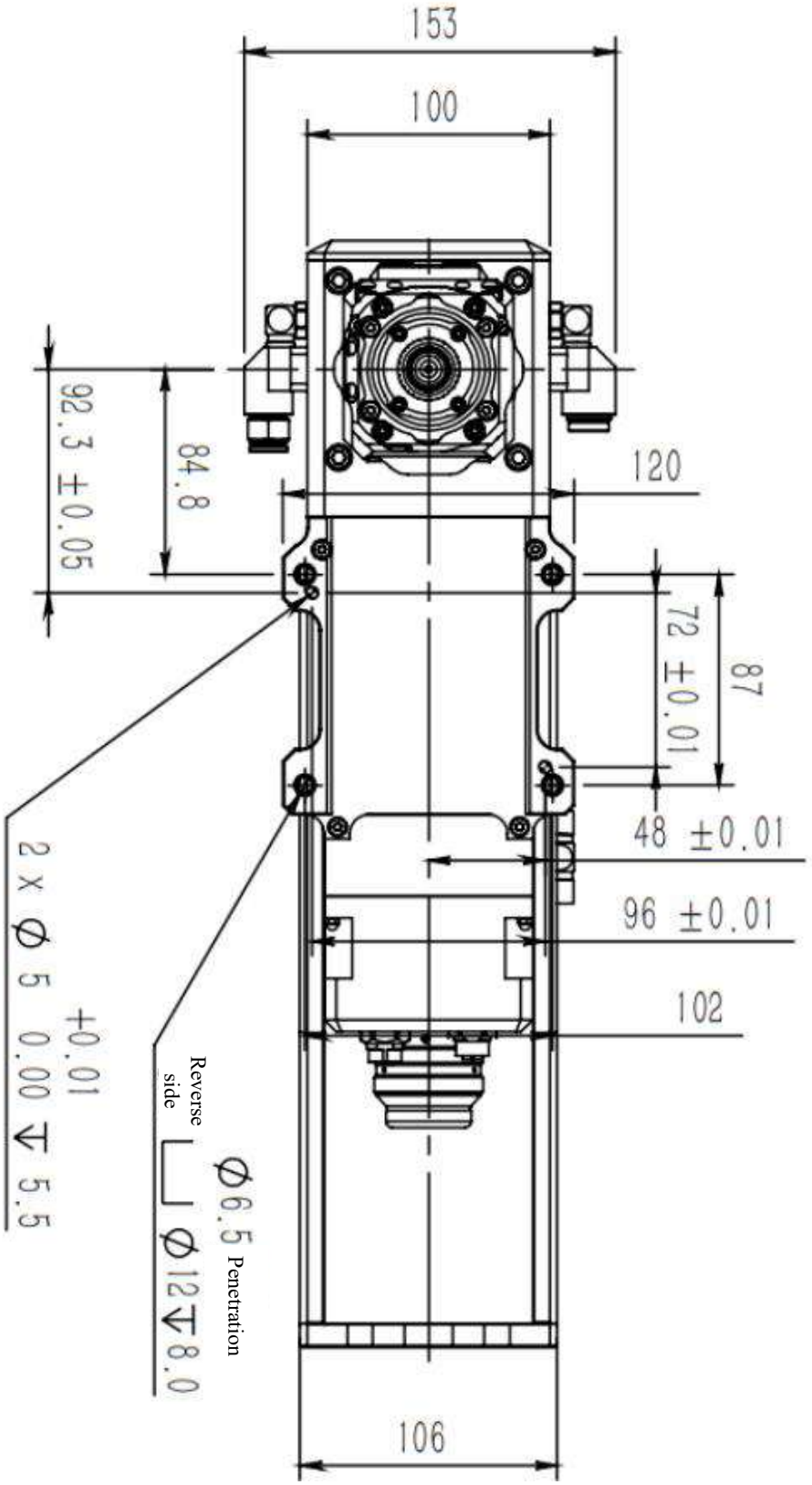

153
100
92.3 ±0.05
84.8
120
72 ±0.01
87
48 ±0.01
96 ±0.01
102
2 x Ø 5 +0.01 0.00 ↧ 5.5
Reverse side
Ø6.5 Penetration
Ø12 ↧ 8.0
106

Figure 1.3

3.2 Pipeline Connection

3.2.1 Water Cooling Pipeline.

① Used for cooling the fiber base, collimation protective lens, reflective lens and sensor; 1 inlet and 1 outlet cooling pipes, as shown in Figure 1.4 below.

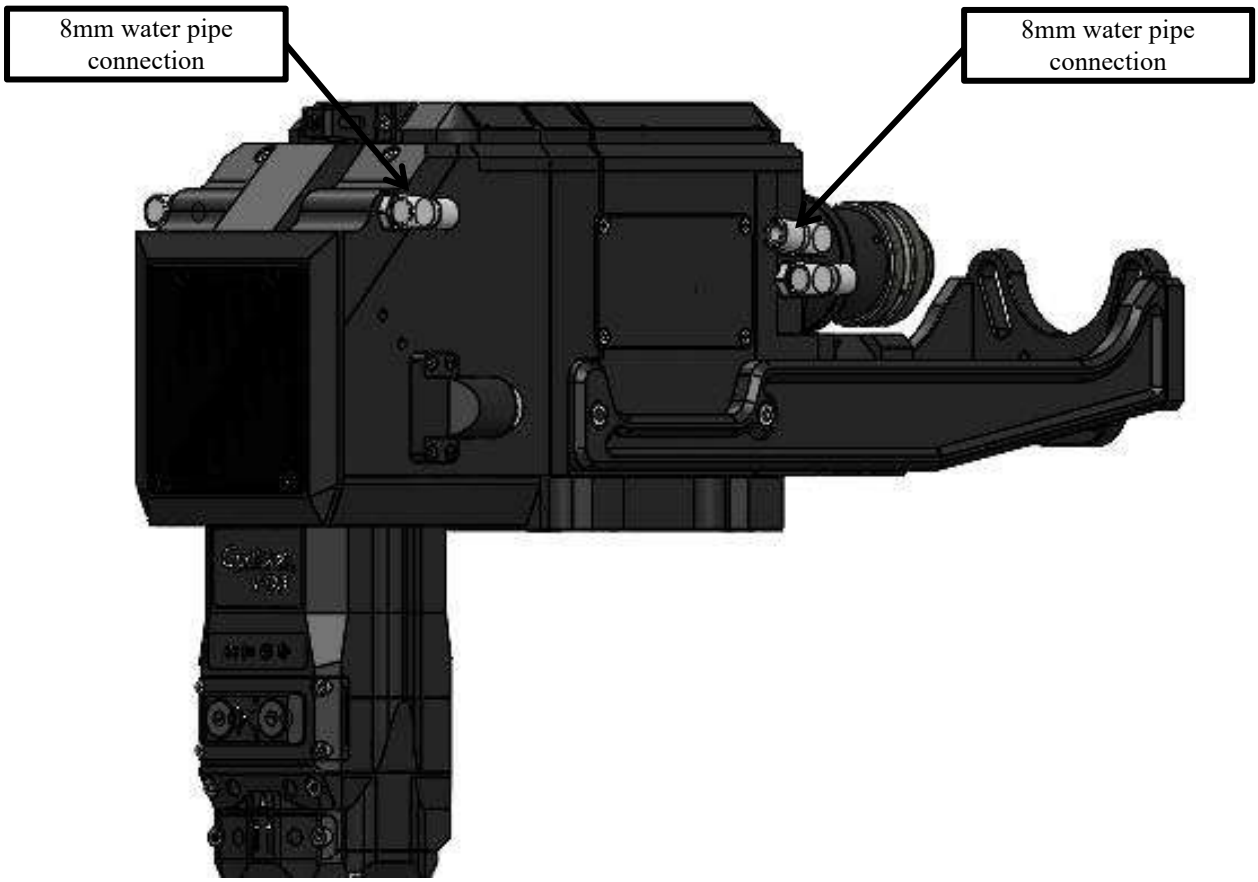


Figure 1.4

3.2.2 Auxiliary Gas Pipeline.

① The inlet is connected to a 10mm gas pipe, as shown in Figure 1.5, for docking cutting gas; input pressure ＜3.0Mpa.
Variety of conventional gases: Oxygen, nitrogen and compressed air.

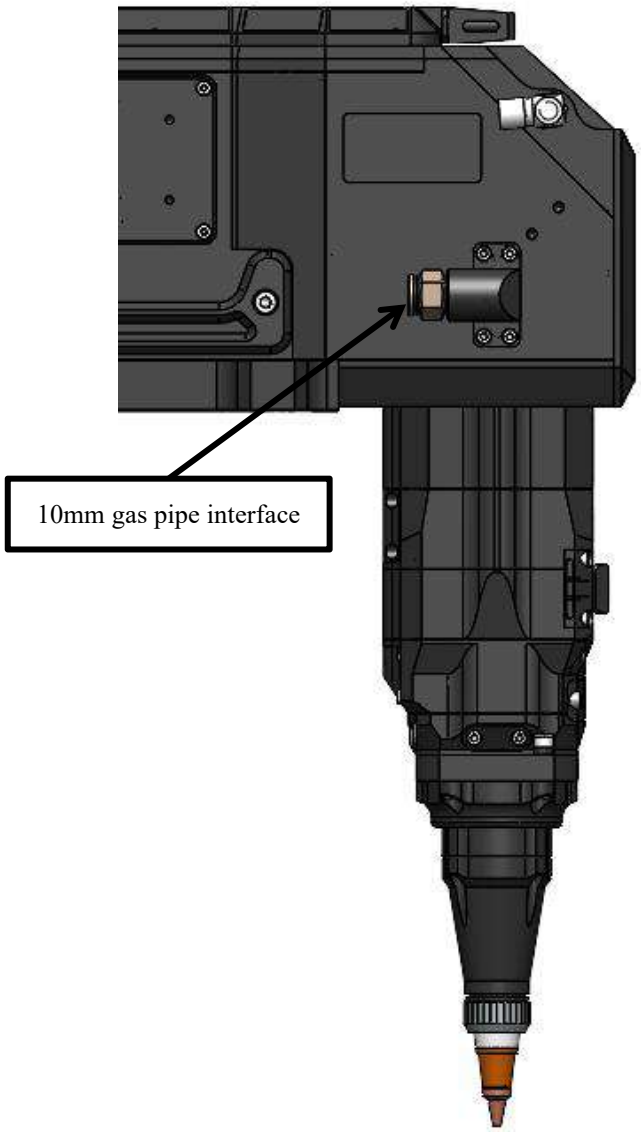


Figure 1.5

Note: The gas entering auxiliary pipelines must be filtered and dried; otherwise, it will contaminate and finally damage the protective lens.

3.3 Wiring Definitions and Requirements

3.3.1 Aviation Plug Interfaces.

① Cut off the power supply before inserting or removing the aviation plug; otherwise, the motor may be damaged; while connecting power line and signal line, pay special attention to the position of gap. Avoid damaging the pin. See Figure 1.6 below for details.

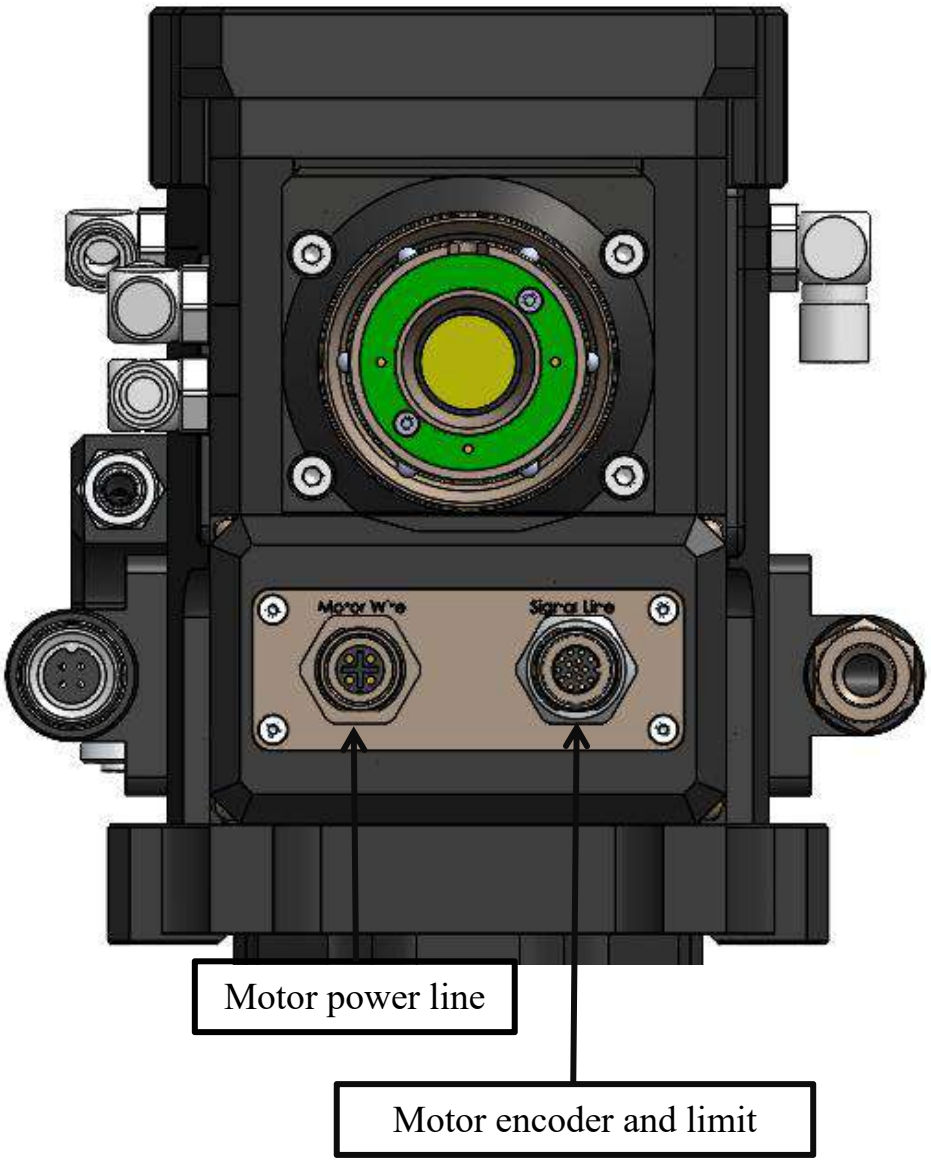
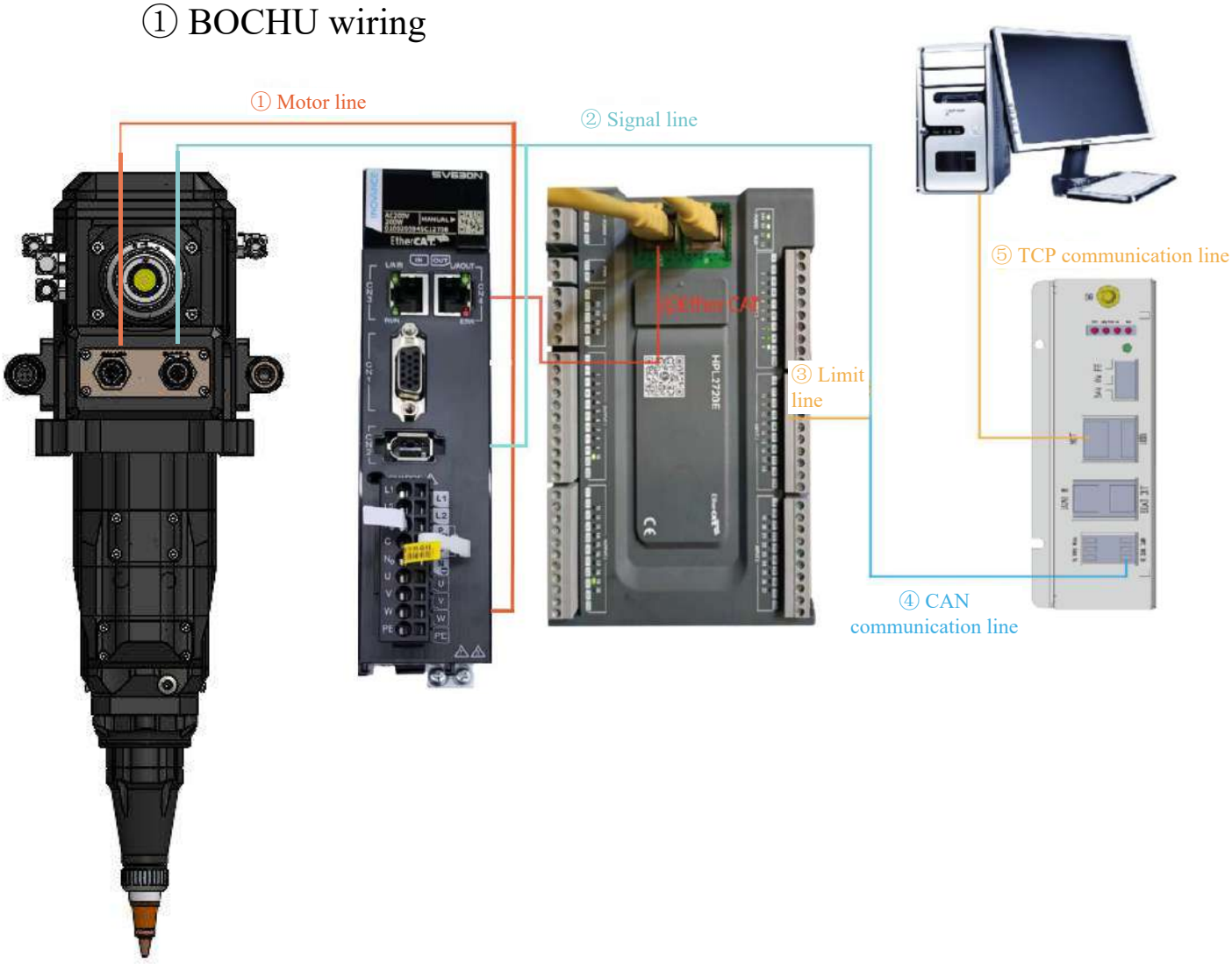


Figure 1.6

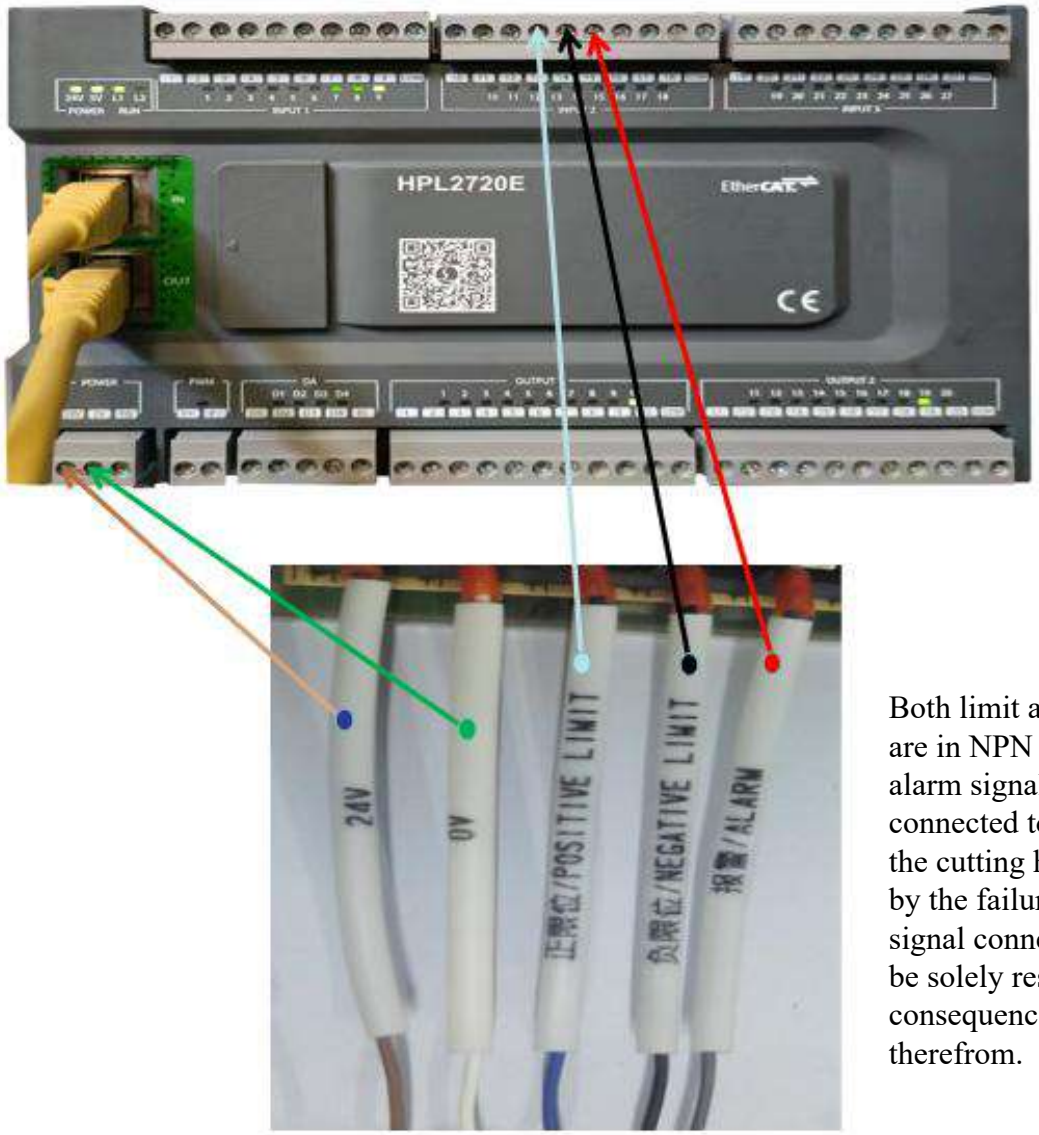
3.3.2 BOCHU Wiring Definition

① BOCHU wiring



② Connection of servo driver power supply (single-phase 220V)

③ Signal line and IO wiring



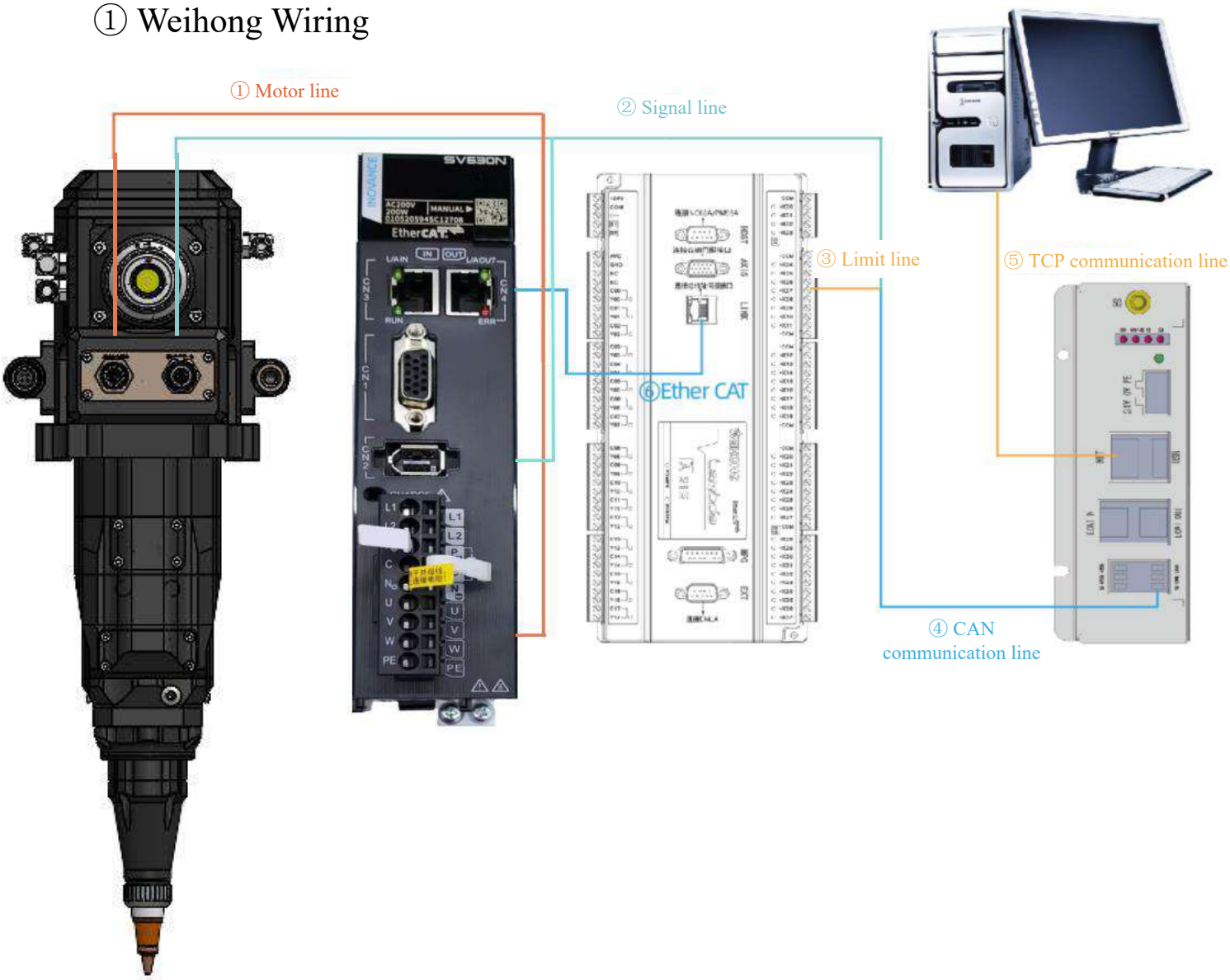
Both limit and alarm signals are in NPN output. The alarm signal must be connected to the system. If the cutting head is damaged by the failure in alarm signal connection, user shall be solely responsible for the consequences arising therefrom.

④ Setting of wiring parameters

Parameter No.	Parameter value	Parameter content
H0200	9	Control mode
H0202	1	Rotation direction
H0900	1	Self-adjusting mode
H0901	18	Rigidity grade
H0507	262144	Numerator of electronic gear ratio
H0509	10000	Denominator of electronic gear ratio
H0E31	2	Synchronization mode

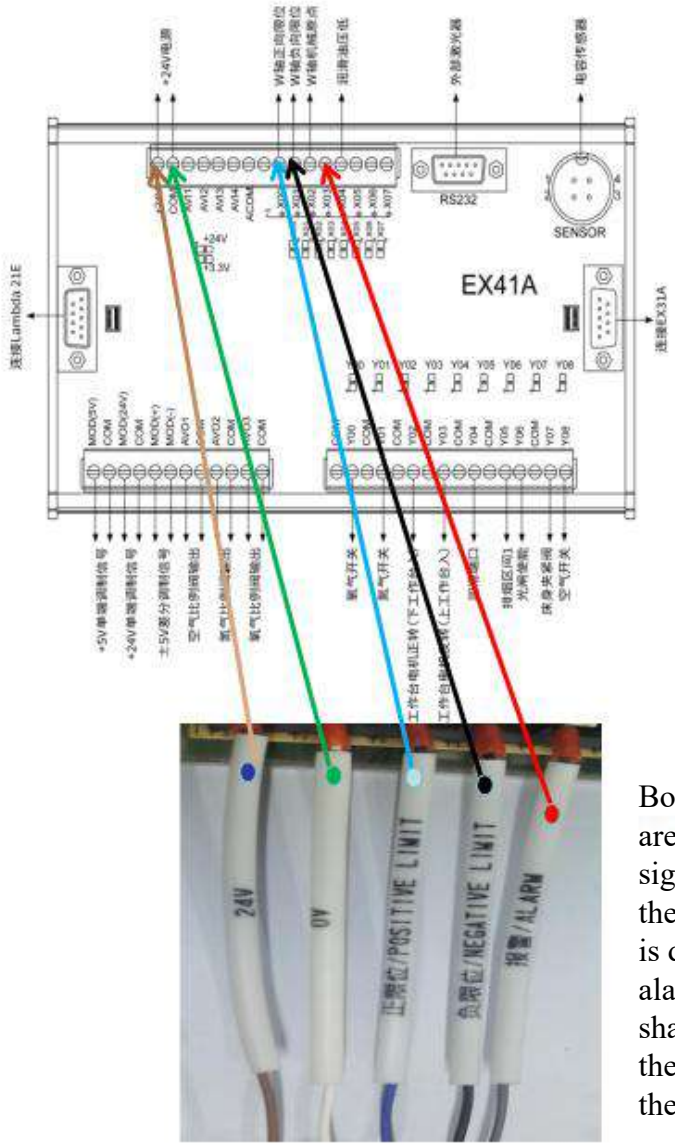
3.3.3 Weihong Wiring Definition

① Weihong Wiring



② Connection of servo driver power supply (single-phase 220V)

③ Signal line and IO wiring



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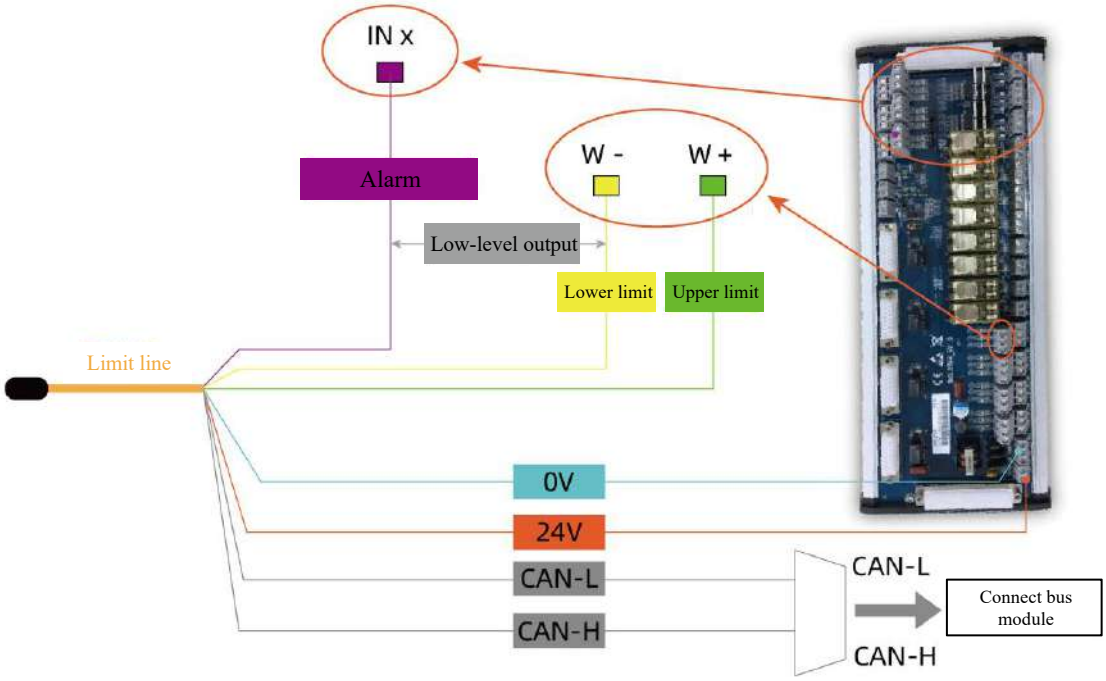
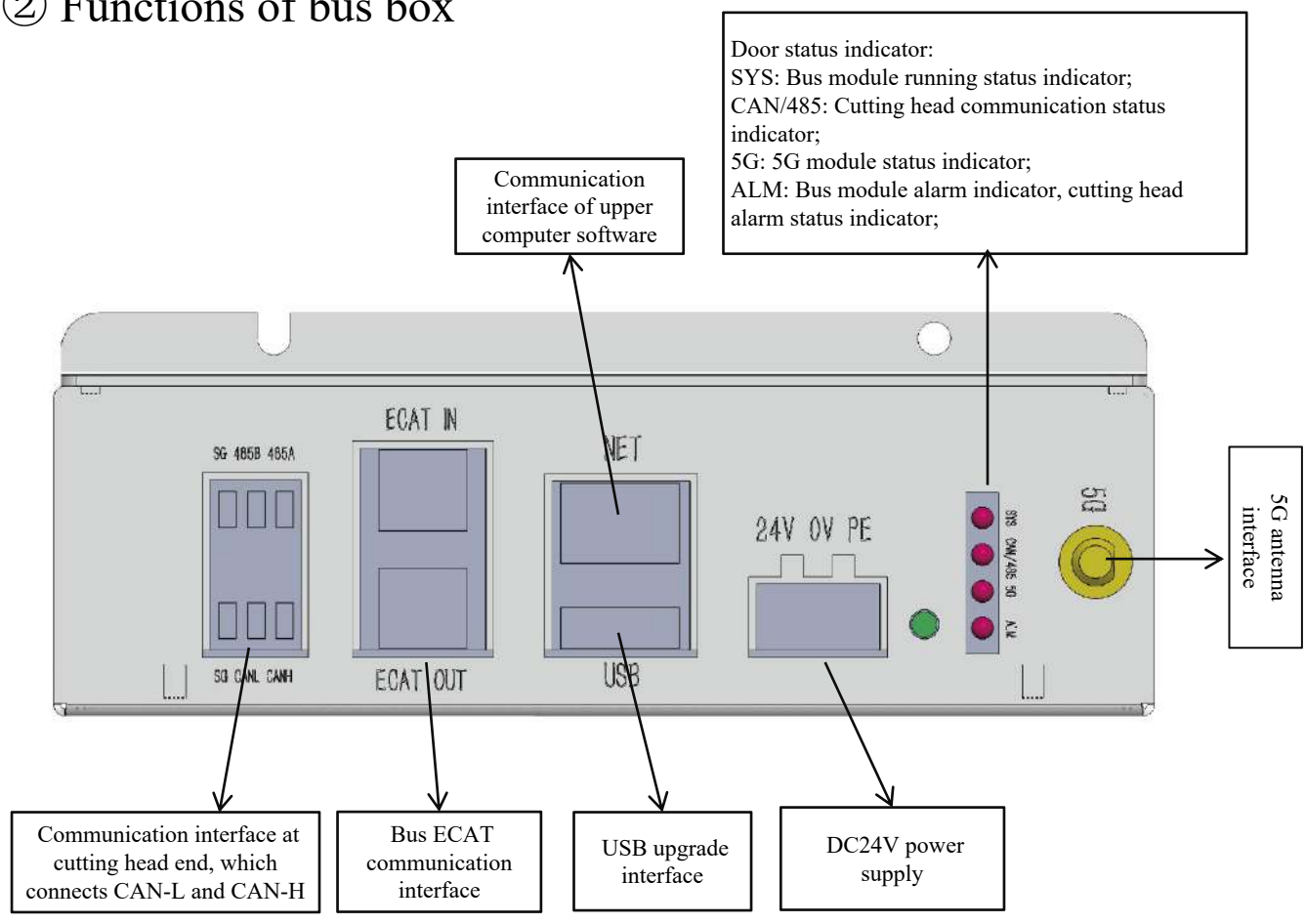
H0901	18	Rigidity grade
H0507	262144	Numerator of electronic gear ratio
H0509	10000	Denominator of electronic gear ratio
H0E31	2	Synchronization mode

3.3.4 Wiring Instructions of Bus Box

① Connection of signal line CAN bus



② Functions of bus box



3.4 QBH Fiber Laser Head Installation

① Put the cutting head horizontally, remove the white cover on the cutting head and static sticker, and then take out the dust-proof plug and dust-proof cover, as shown in Figure 2.2:

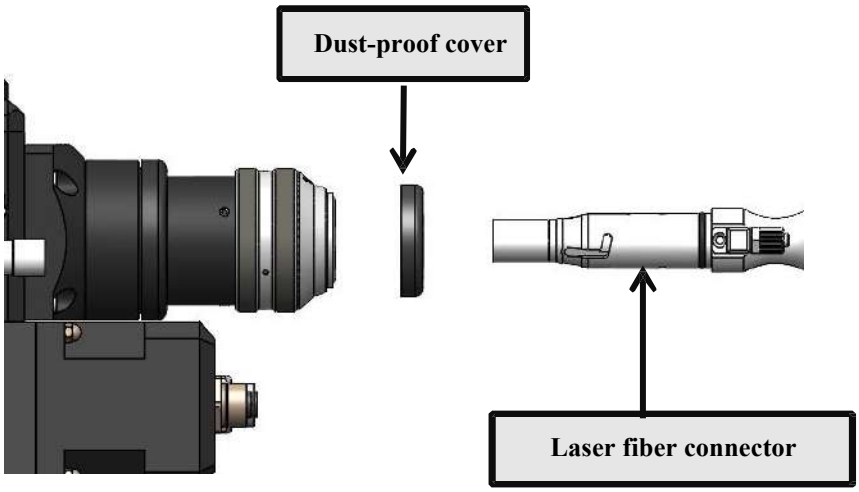


Figure 2.2

② Cover the dust-proof cover which is in the white accessory box onto the fiber laser tip, as shown in Figure 2.3:

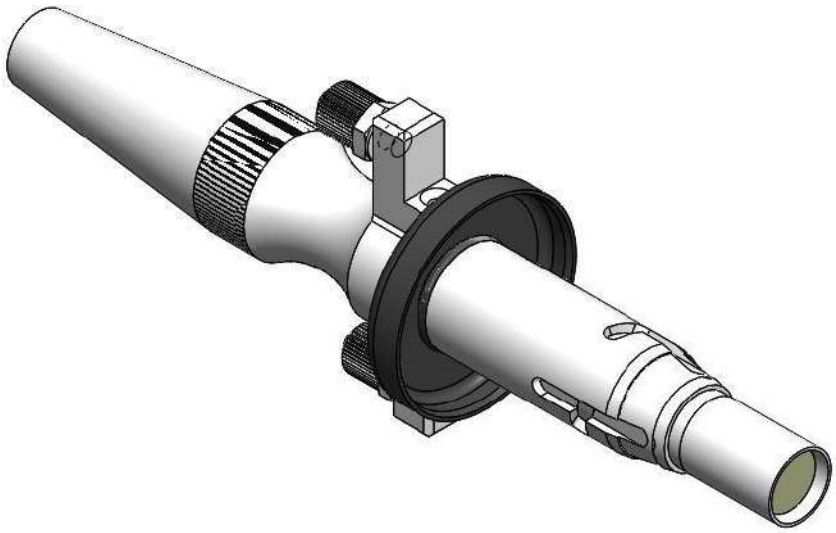


Figure 2.3

Attention: If the fiber head is attached with the original dust-proof gasket, users can choose whether to install dust-proof cover or not during installation.

③ Turn the QBH connector into the open state: Turn it to the limit position counterclockwise (a "thud" sound can be heard). Do not twist with too much force; otherwise the internal structure of the QBH may be damaged, as shown in Figure 2.4:

Figure 2.4

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 Figure 2.5:

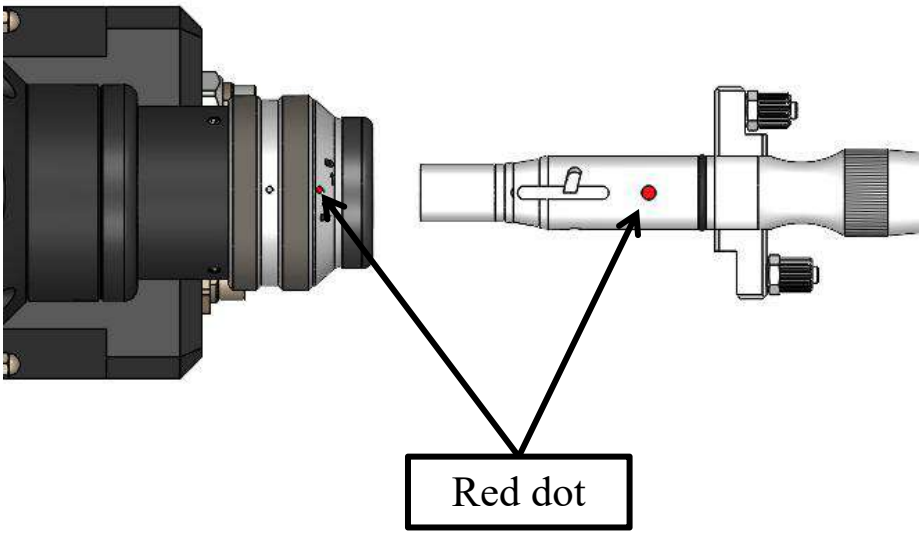


Figure 2.5

⑤Rotate it to the limit position clockwise (a "thud" sound can be heard). Lift the rotation nut upward, rotate the nut again clockwise until it presses the fiber head tightly; fasten the QBH connector to locking status (rotate it to place; do not apply too much force; otherwise, the internal structure of QBH may be damaged), as shown in Figure 2.6:

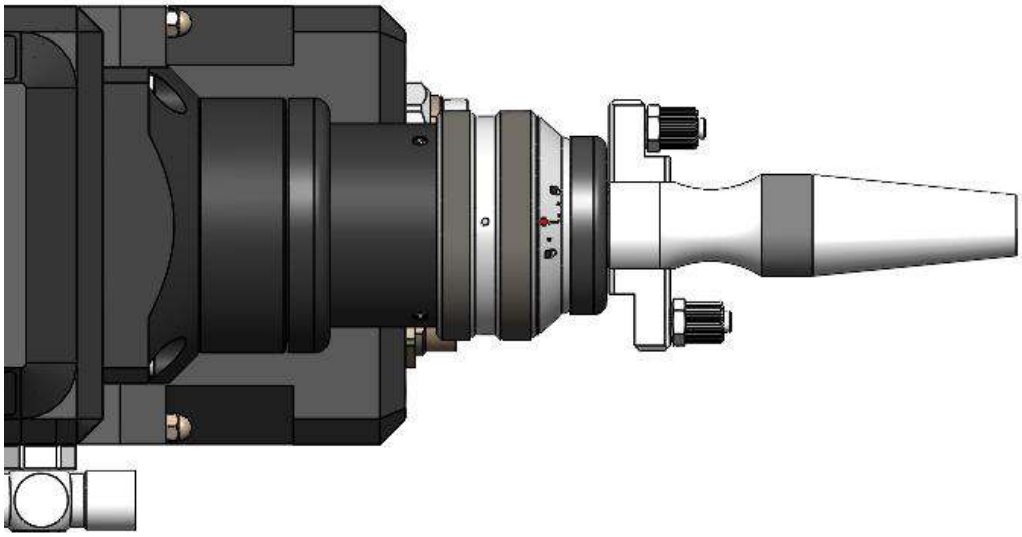


Figure 2.6

Note: After inserting the fiber, wind it with adhesive paper for several circles to resist dust better and improve the protective effect of the laser head.

3.5 Mobile APP Operation Instructions

3.5.1 Install mobile APP software.

① After installation, the icon shown in Figure 2.7 will appear; continue by clicking "Install"; the icon shown in Figure 2.8 will appear after installation. This APP currently only supports installation on Android devices.

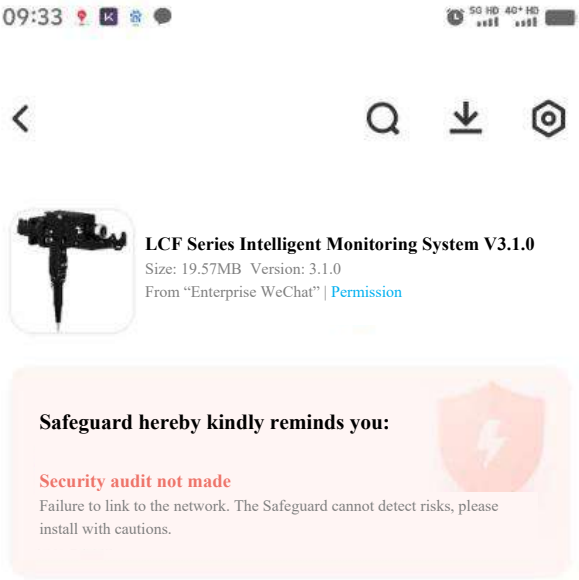


Figure 2.8

Icon display after installation

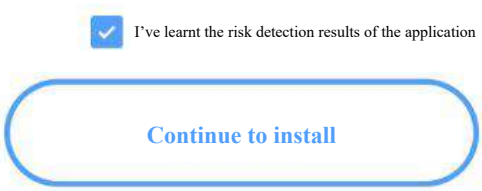


Figure 2.7

3.5.2 APP Software Connection.

Figure 2.9

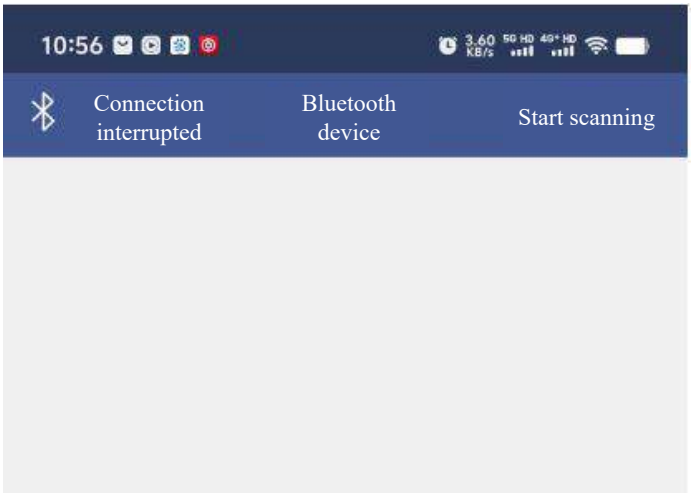


Figure 3.0

① Click the Bluetooth icon to open the Bluetooth connection interface, as shown in Figure 2.9.

② Start scanning; if nothing is displayed, click it for more times, as shown in Figure 3.0.

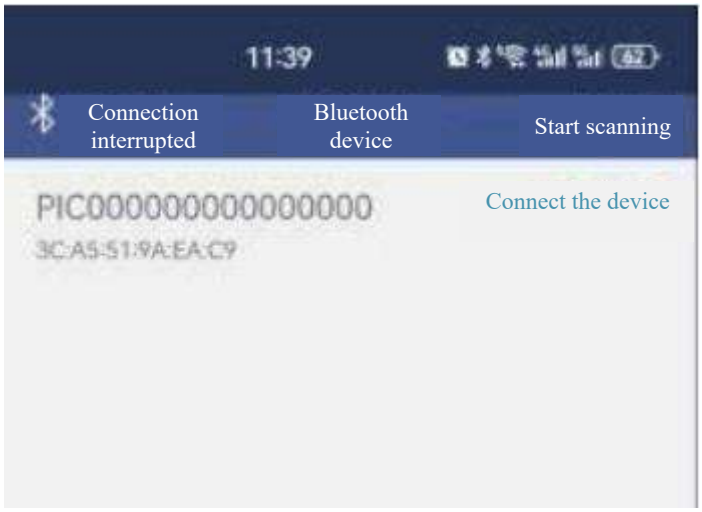


Figure 3.1

③ After finding the device through scanning, choose the device to be connected and click [Connect the Device] button and the mobile end will communicate with the device in real time, as shown in Figure 3.1.

3.5.3 Software Introduction.

① After running LCF APP application, the color of progress bar on the main interface will change based on the actual temperature value detected, as shown in Figure 3.2.
Green: The lens temperature is normal according to the monitoring results and can be used normally.
Yellow: The lens temperature is too high; check if the lens are polluted.
Red: The lens temperature is extremely high and cannot be used continuously. Shut down the device for check.

Figure 3.2

3.5.4 Settings of Temperature Parameters

① This APP software supports temperature setting function. Different threshold values can be set based on the specific application scenarios. Click the manufacturer settings option and enter the password 85225225 to enter the temperature setting interface, as shown in Figure 3.3.

② The software can also monitor the real-time dimensions of the electronic scale, internal temperature and humidity of the cavity, cutting gas pressure, and detect any leaks in the cutting gas.

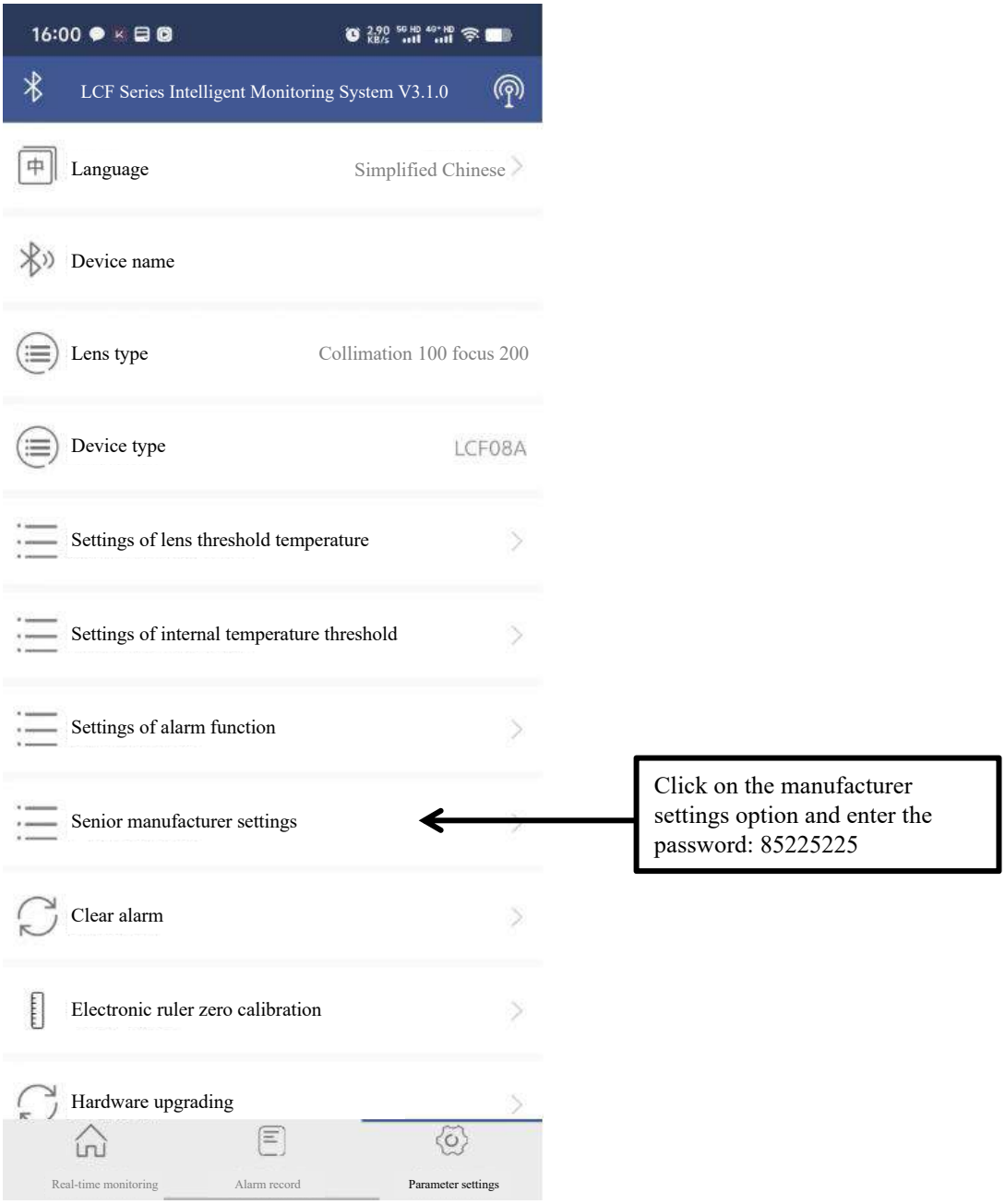


Figure 3.3

② On the temperature setting interface, set temperature according to the realities. The pre-warning value must be lower than the alarm value. Click "OK" button after finishing setting This window can also be used for setting the cutting head encoding; when the Bluetooth mode is disconnected, it will automatically switch to the 5G model state, as shown in Figure 3.4:

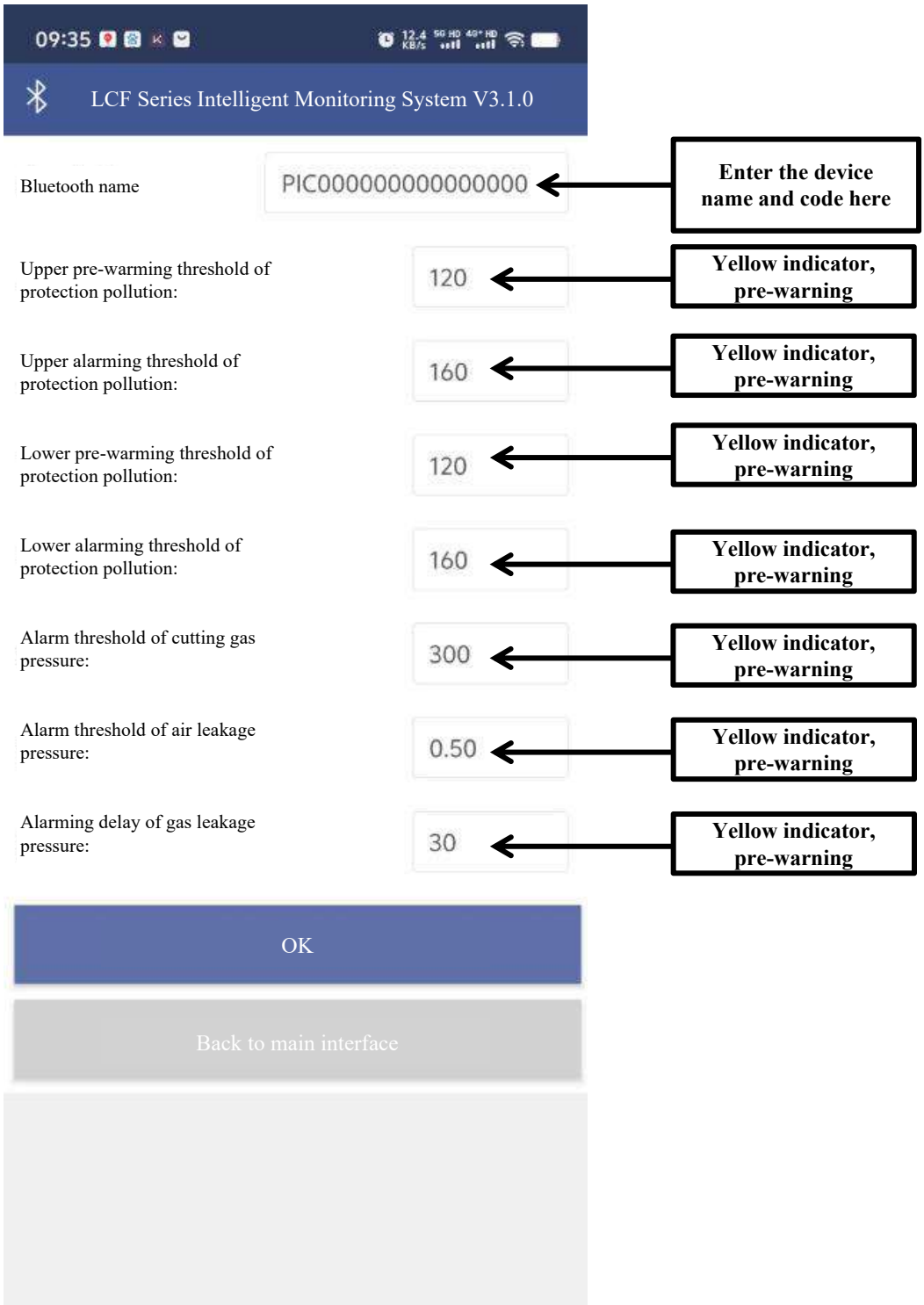


Figure 3.4

Chapter 4 Debugging

4.1 Focusing

Focus reset - After powering up the machine, the fourth axis should reset first to bring the focus to the zero position. The figure below shows the cutting head platform parameter configuration for collimation 100/focus 200:

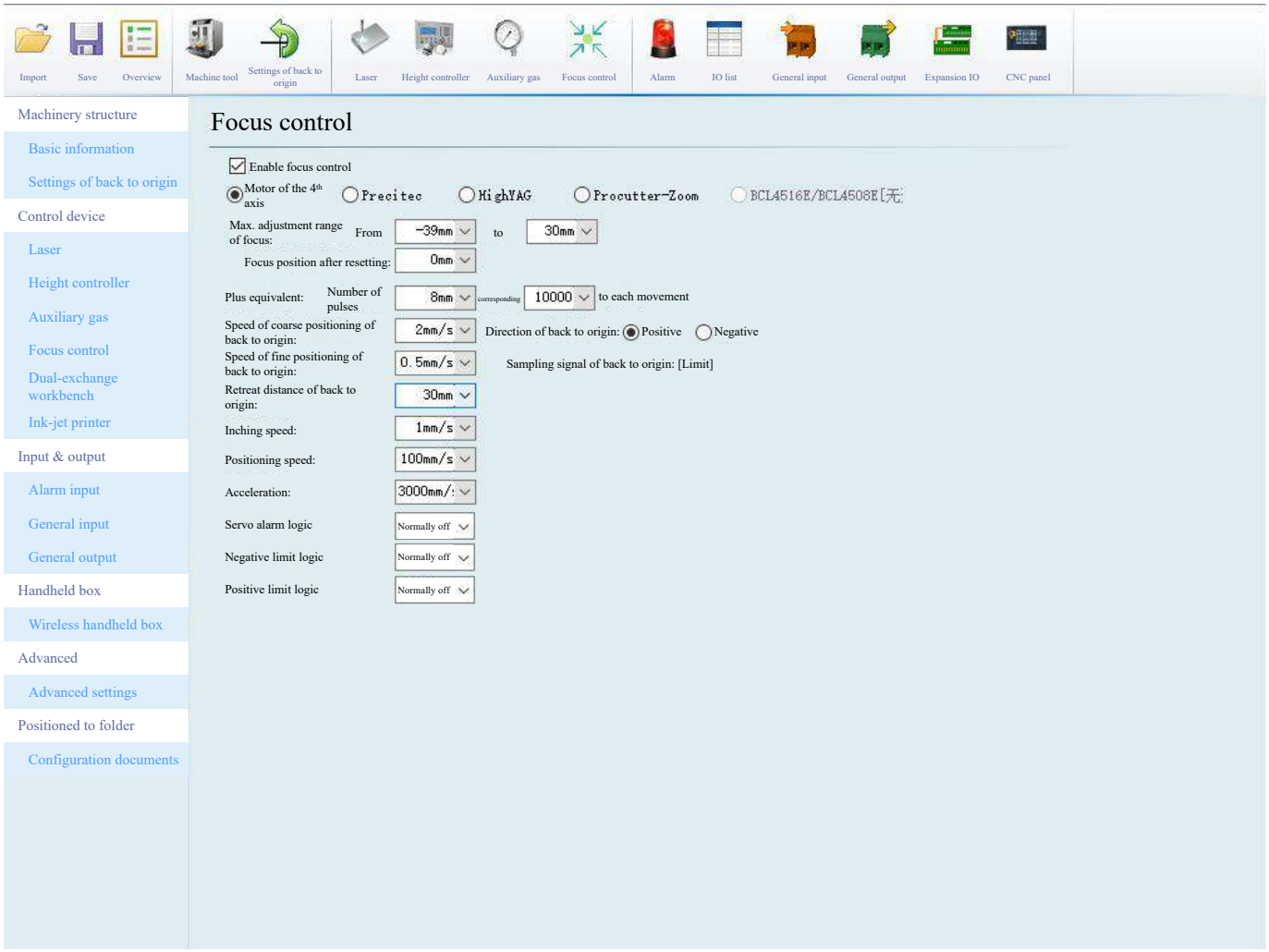


Figure 3.5

① Open the software configuration platform and set the focus retreat distance as 70mm (slightly adjusted based on realities) to make the collimation focus at the zero position (by taking BOCHU as an example), as shown in Figure 2.5.

Note: The retreat distance can be adjusted slightly based on the actual cutting focus.

4.1.1 LCF08A2BOCHU Platform Configuration

100Collimation200Focus:

Max. adjustment range of focus:	-35mm~30mm;
Screw lead:	8mm;
Number of pulses per cycle:	10000;
Positive limit:	A13;
Negative limit:	A14;
Limit logic:	Normally on;
Back to origin direction:	Positive;
Retreat distance:	30mm;

100 collimation 250 focus:

Max. adjustment range of focus:	-50mm~50mm;
Screw lead:	12.5mm;
Number of pulses per cycle:	10000;
Positive limit:	A13;
Negative limit:	A14;
Limit logic:	Normally on;
Back to origin direction:	Positive;
Retreat distance:	50mm;

4.1.2 Configuration of Alarm Signal

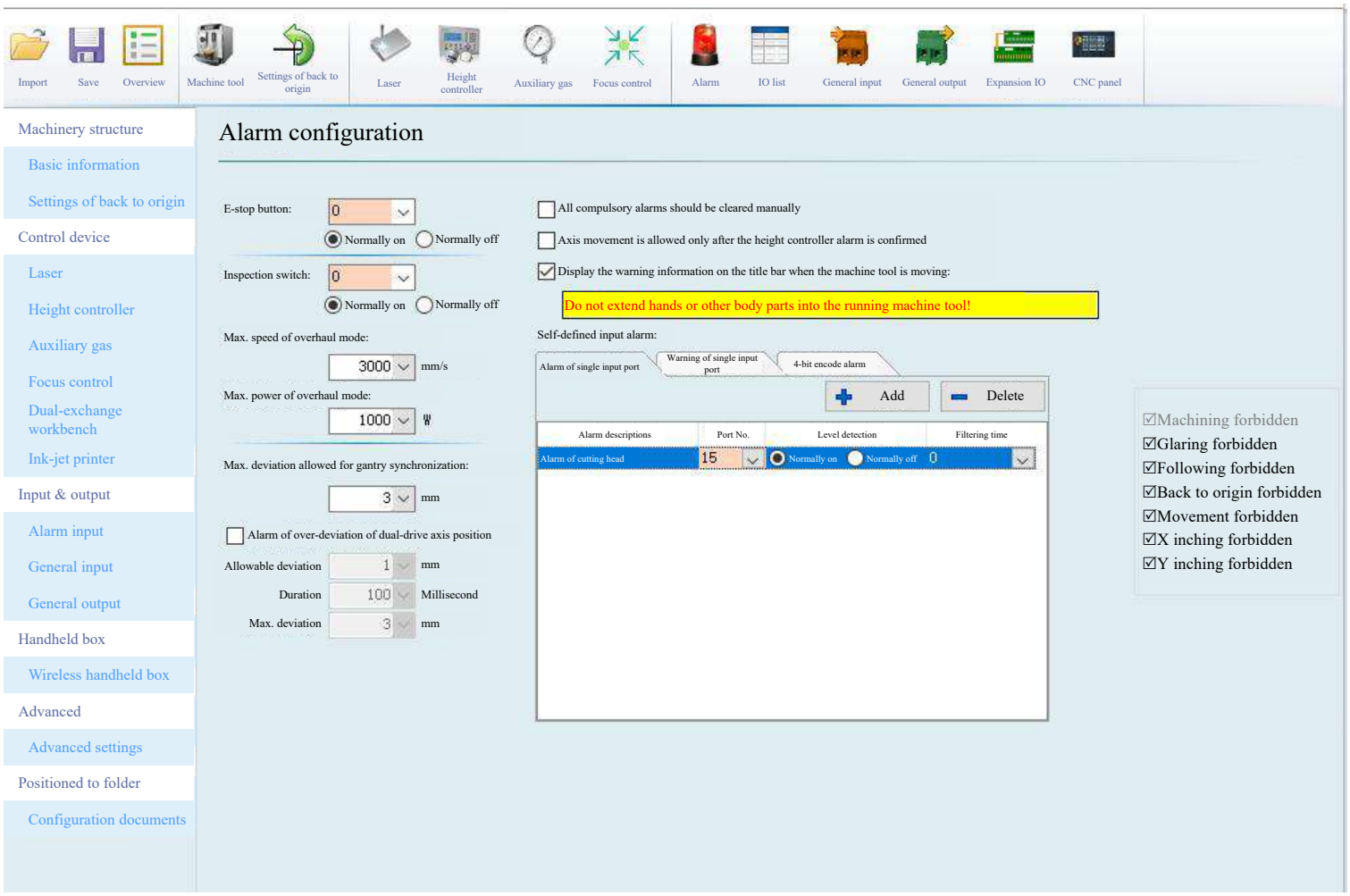


Figure 3.2

Set the input port IN15 as the cutting head alarm signal and logic as normally on. Connect the self-defined port of IO to the corresponding input port, as shown in Figure 3.2.

4.2 FSCUT8000 System Configuration (Bus System)

4.2.1 Configuration of Focus Control and Limit, as shown in Figure 3.3.

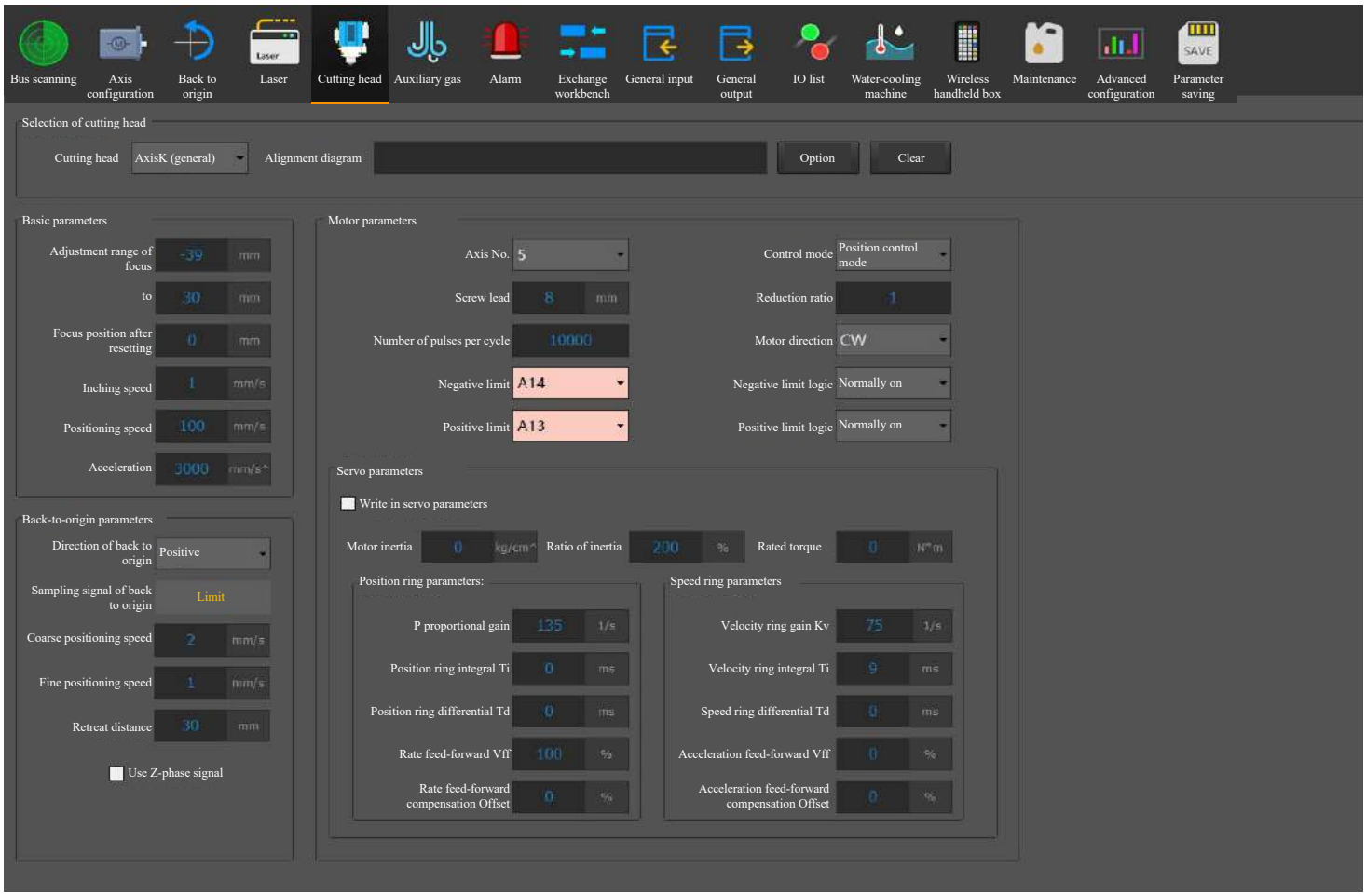


Figure 3.3

LCF08A2 BOCHU Platform Configuration

100Collimation200Focus:

Max. adjustment range of focus:	-35mm~30mm;
Screw lead:	8mm;
Number of pulses per cycle:	10000;
Positive limit:	A13;
Negative limit:	A14;
Limit logic:	Normally on;
Back to origin direction:	Positive;
Retreat distance:	30mm;

100 collimation 250 focus:

Max. adjustment range of focus:	-50mm~50mm;
Screw lead:	12.5mm;
Number of pulses per cycle:	10000;
Positive limit:	A13;
Negative limit:	A14;
Limit logic:	Normally on;
Back to origin direction:	Positive;
Retreat distance:	50mm;

4.2.2 Configuration of Alarm Signal

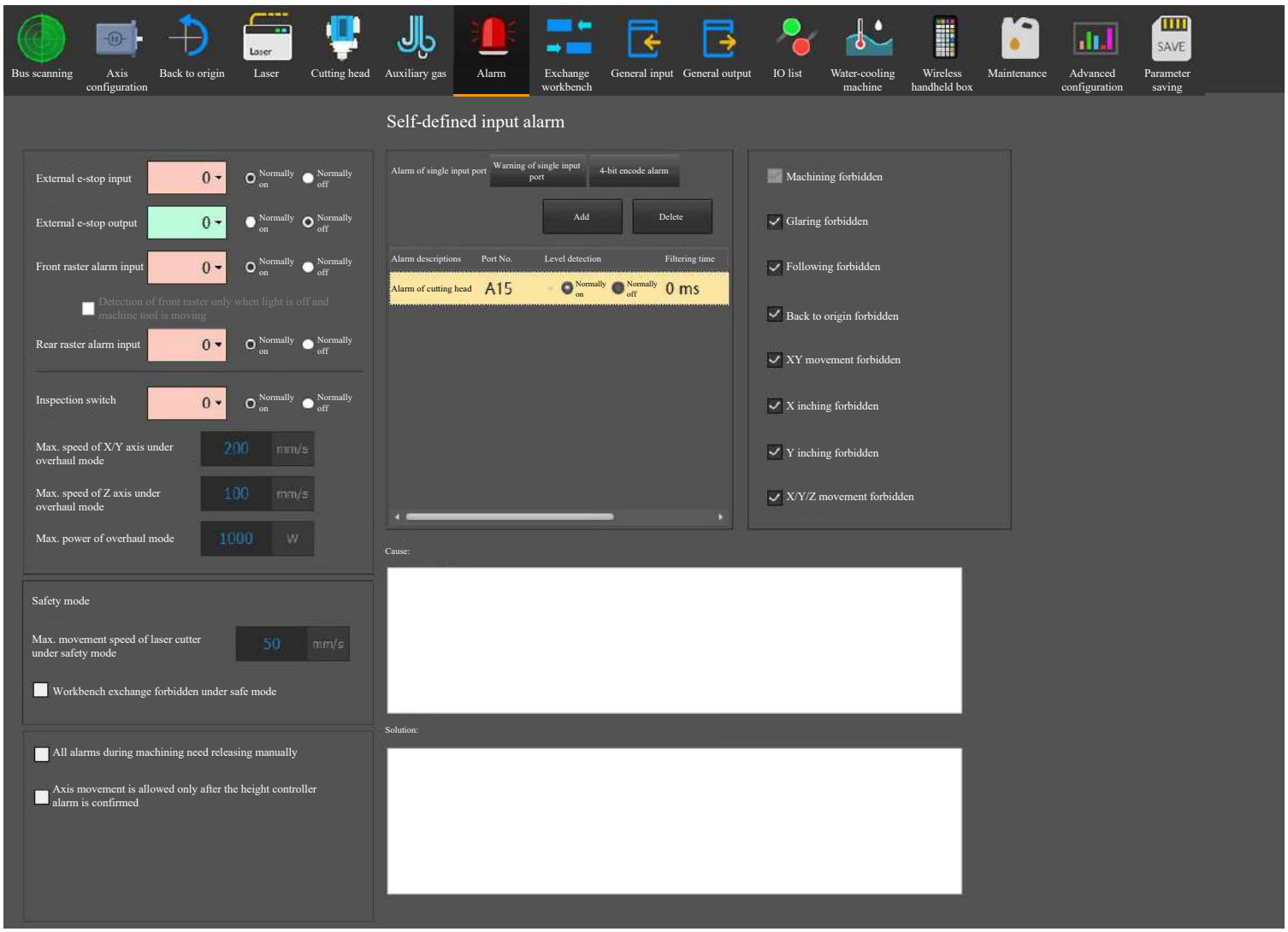


Figure 3.4

Set the input port IN15 as the cutting head alarm signal and logic as normally on. Connect the self-defined port of IO to the corresponding input port, as shown in Figure 3.4.

4.3 Configuration of LS6000M Bus System

4.3.1 Configuration of W-axis Parameters, as shown in Figure 3.8.

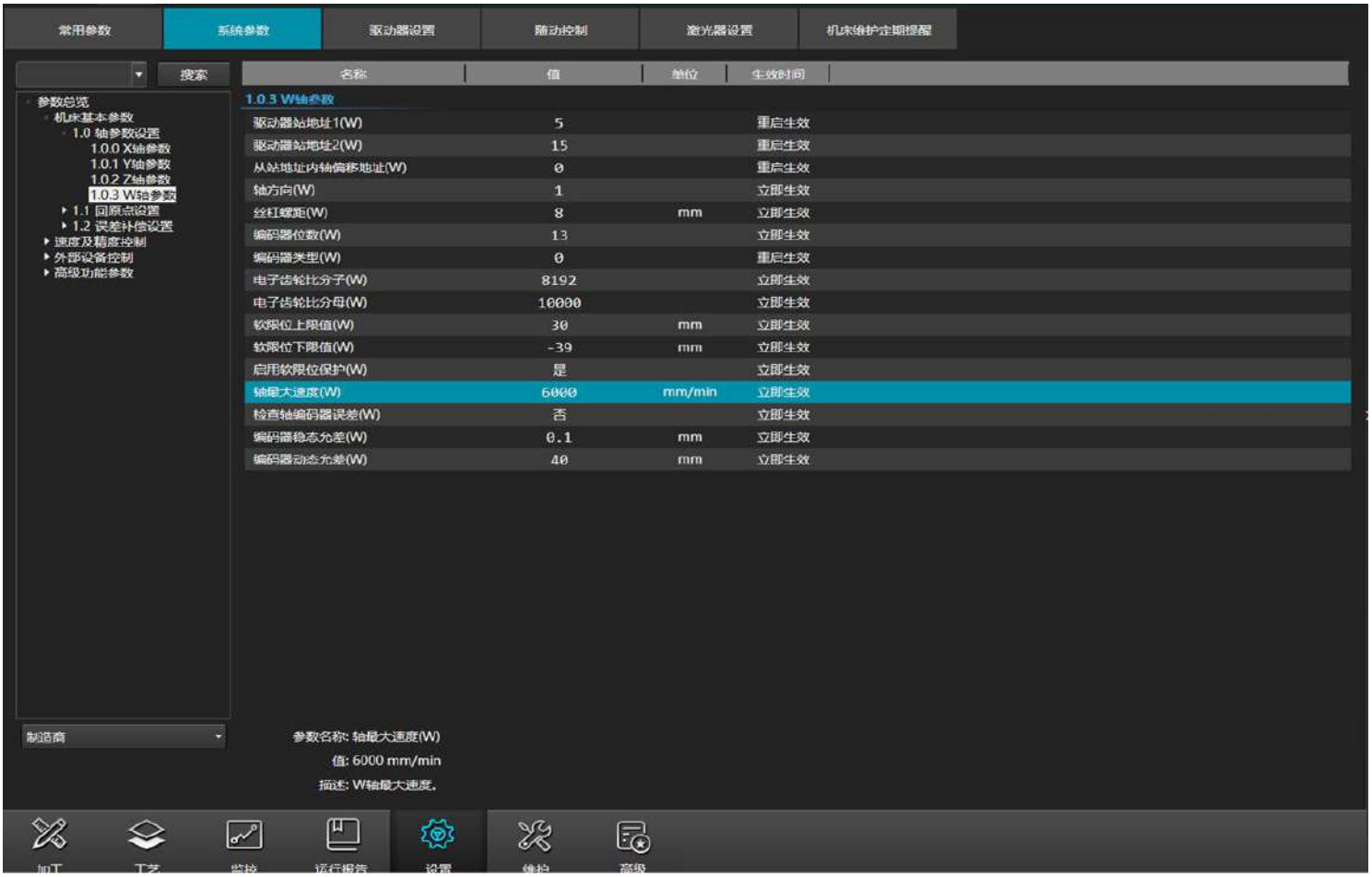


Figure 3.8

LCF08A2Weihong Platform Configuration

100Collimation200Focus:

Address of driver slave1（W）:	5;
Address of driver slave2（W）:	15;
Axis direction:	1;
Screw pitch:	8;
Number of encoder bits:	18;
Encoder type:	0;
Numerator of electronic gear ratio（W）:	262144;
Denominator of electronic gear ratio（W）:	10000;
Retreat distance:	30;
Upper limit of soft limit（W）:	30;
Lower limit of soft limit（W）:	-35;
Enabling soft limit protection（W）:	Yes;
Max. speed of axis（W）:	6000mm/min;

100 collimation 250 focus:

Address of driver slave1（W）:	5;
Address of driver slave2（W）:	15;
Axis direction:	1;
Screw pitch:	12.5;
Number of encoder bits:	18;
Encoder type:	0;
Numerator of electronic gear ratio（W）:	262144;
Denominator of electronic gear ratio（W）:	10000;
Retreat distance:	50;
Upper limit of soft limit (W):	50;
Lower limit of soft limit (W):	-50;
Enabling soft limit protection（W）:	Yes;
Max. speed of axis（W）:	6000mm/min;

Focus control of LCF08A2Weihong Platform Configuration

100Collimation200Focus:

Z-phase signal used or not: No;
Coarse positioning direction: 1;
Coarse positioning speed: 600mm/min;
Fine positioning speed: 60mm/min;
Coarse positioning direction: 1;
Retreat distance: 30;
Retreat speed: 200mm/min;

100 collimation 250 focus:

Z-phase signal used or not: No;
Coarse positioning direction: 1;
Coarse positioning speed: 600mm/min;
Fine positioning speed: 60mm/min;
Coarse positioning direction: 1;
Retreat distance: 50;
Retreat speed: 200mm/min;

4.3.2 Correlation of W-axis Alarm Signal

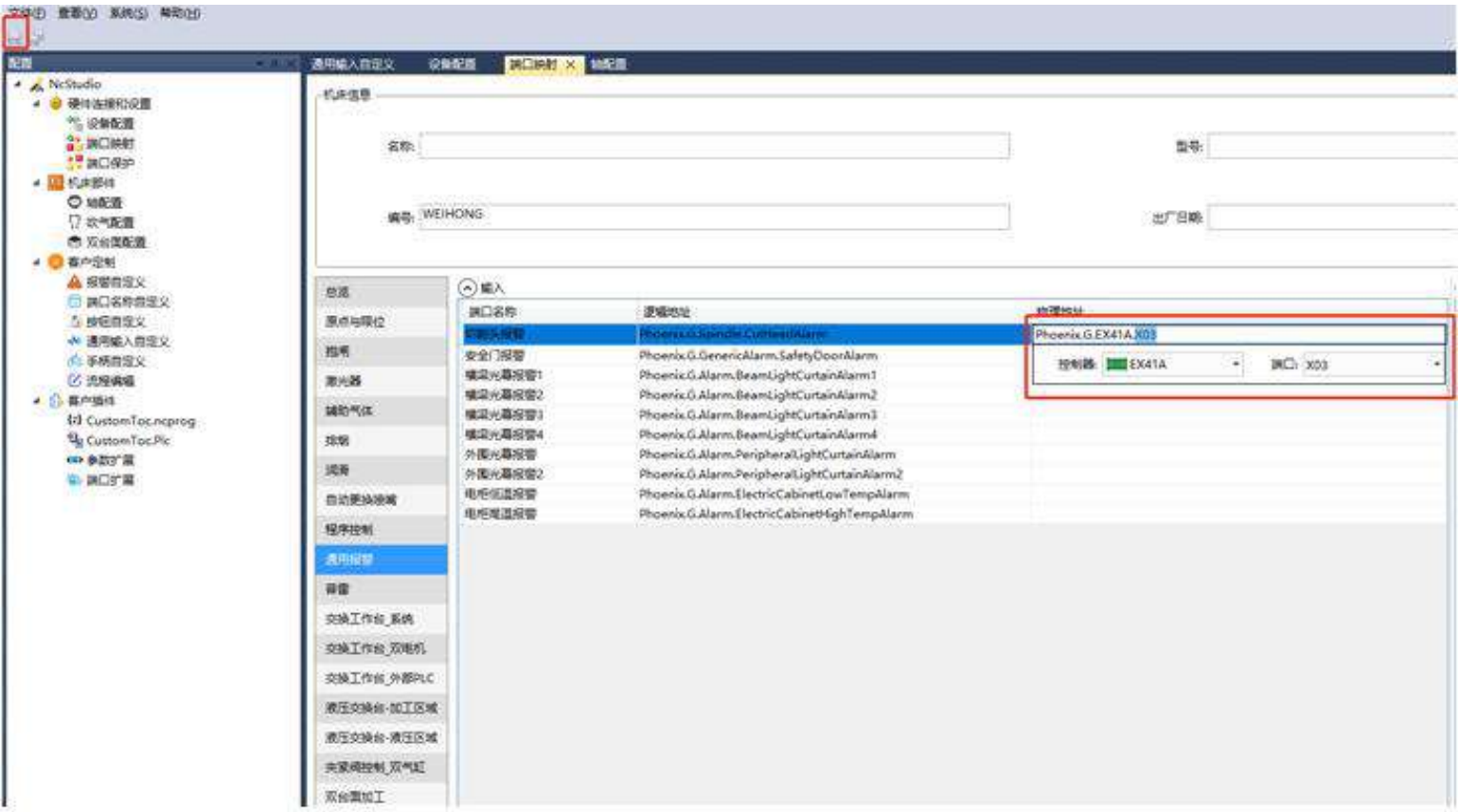


Figure 3.9

General alarm column. Select cutting head alarm and associate the address. Select controller. By taking EX41A as an example, choose Port X03 and connect the self-defined port of IO to the corresponding input port, as shown in Figure 3.9.

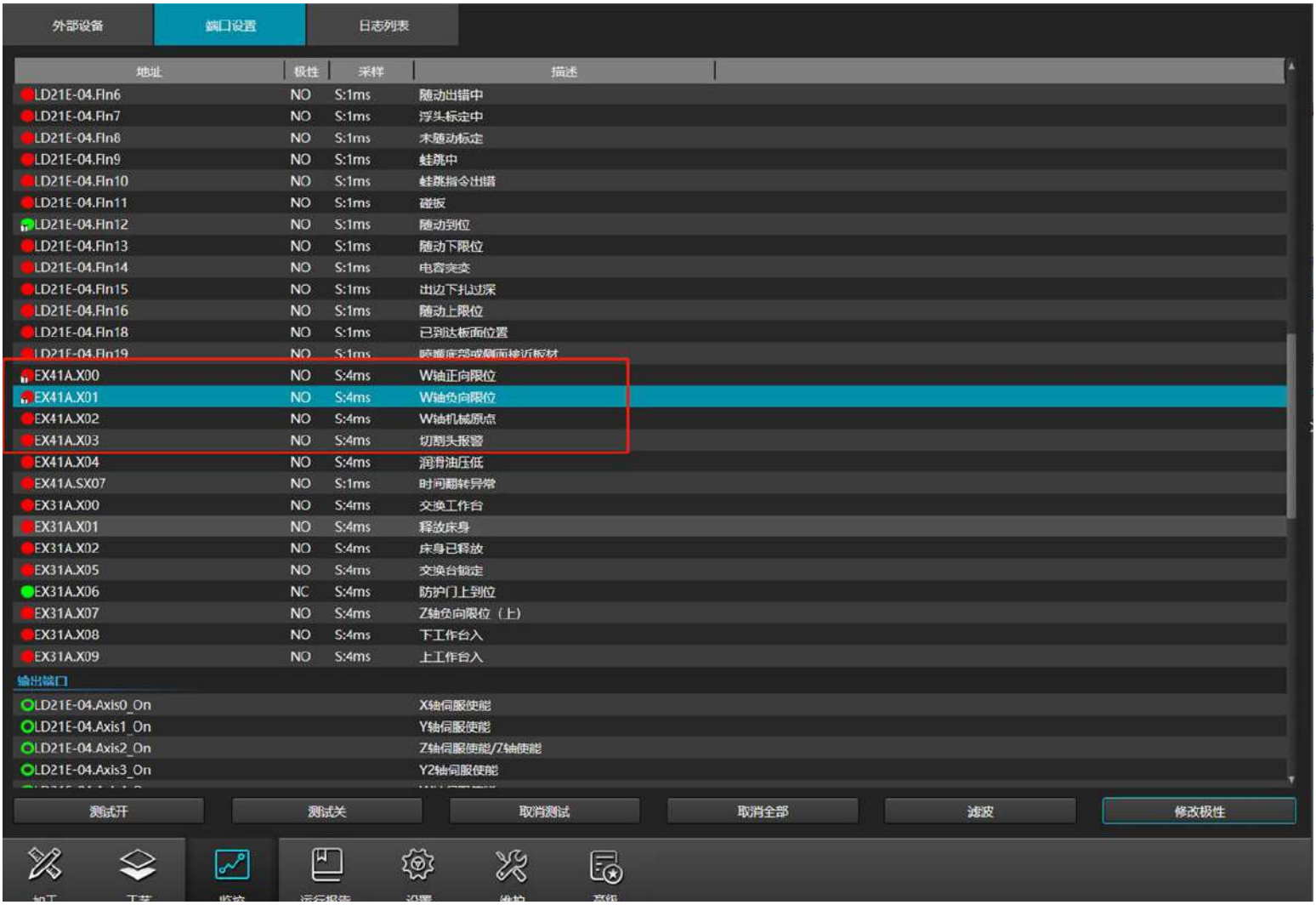


Figure 4.0

EX41A.X00	NO(normally on)	W-axis positive limit
EX41A.X01	NO(normally on)	W-axis negative limit
EX41A.X03	NO(normally on)	cutting head alarm

4.4 Instructions for Focusing Adjustment

① 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, make adjustment through the beam centering module, as shown in Figure 4.1 below.

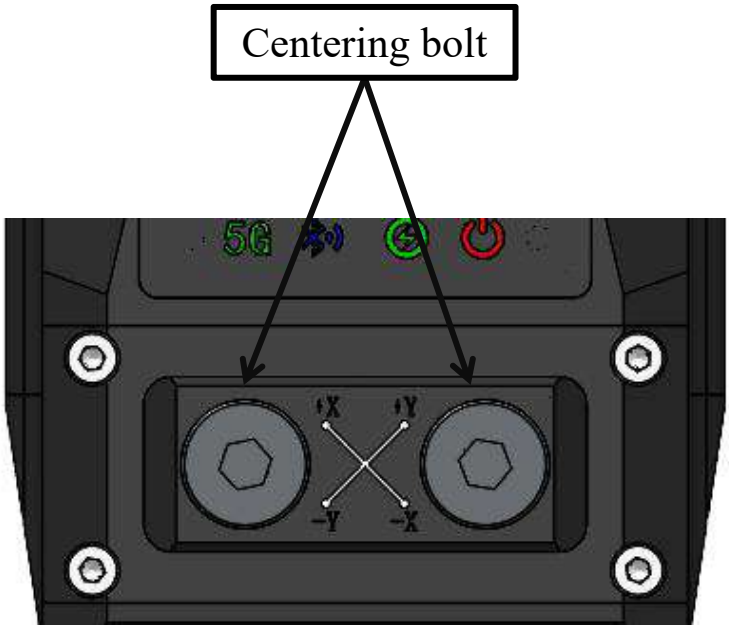


Figure 4.1

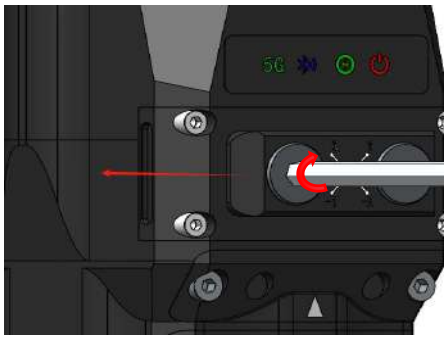


Figure 4.2

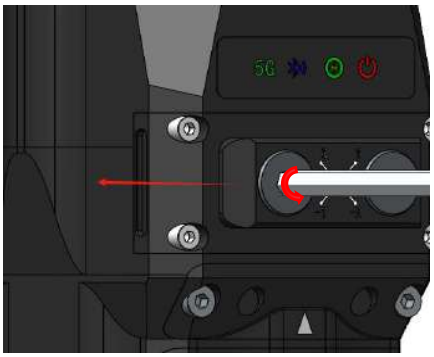


Figure 4.3

Note: When the centering bolt rotates clockwise, the center direction of the lens is shown in Figure 4.2.
When the centering bolt rotates counterclockwise, the center direction of the lens is shown in Figure 4.3.

Chapter 5 Maintenance

5.1 Maintenance and Replacement of Protective Lens

If the cutting effect is poor but the cutting protective lens is normal and burning points are detected on the ceramic piece, the collimation protective lens or focus protective lens possibly is polluted or damaged. In this condition, the after-sales service personnel should check if there is any burning point on the lens. Before checking, use a clean cloth dampened with alcohol to wipe the exterior surface

5.1.1 Disassembly of collimation protective lens, as shown in Figures 4.1 and 4.2 below.

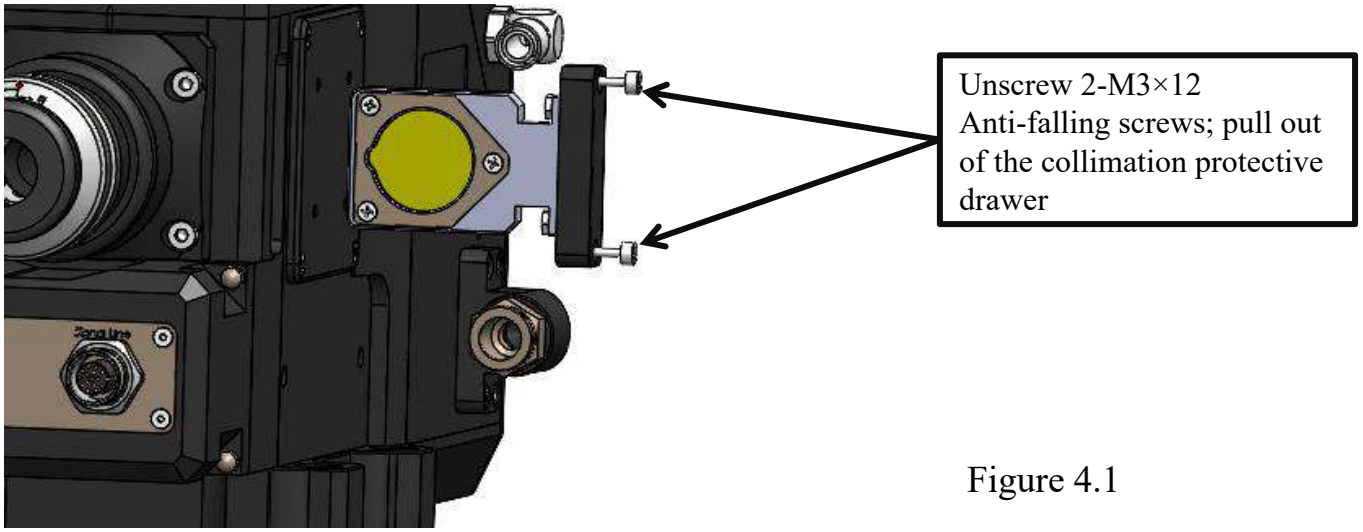


Figure 4.1

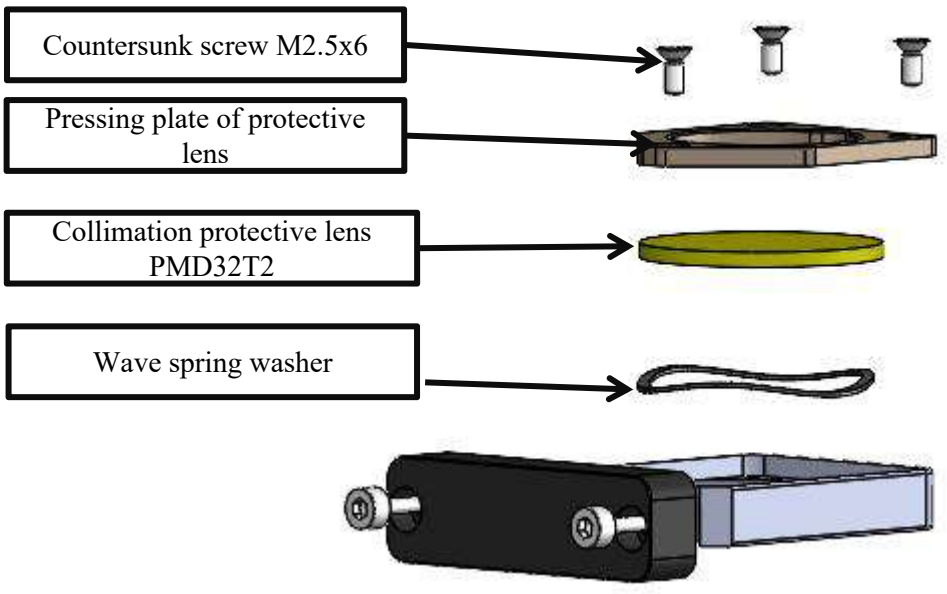


Figure 4.2

5.1.2 Disassembly and Assembly of Focusing Protective Lens

Loosen the two M4×16 hexagon socket anti-falling screws, pull out the protective lens drawer, and replace the protective lens (PMD34T5), as shown in Figures 4.4 and 4.5 below.

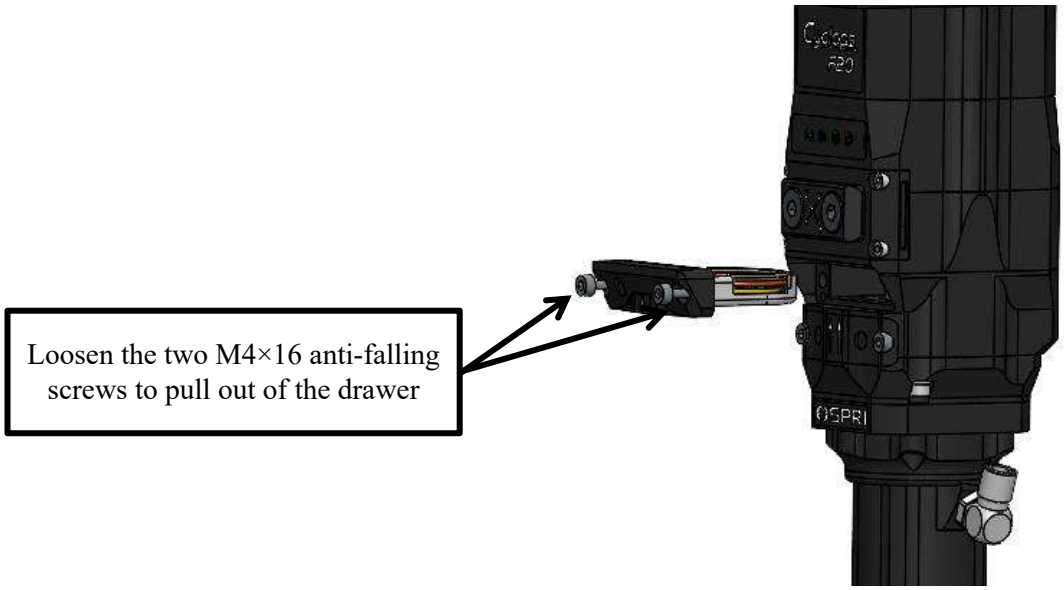


Figure 4.4

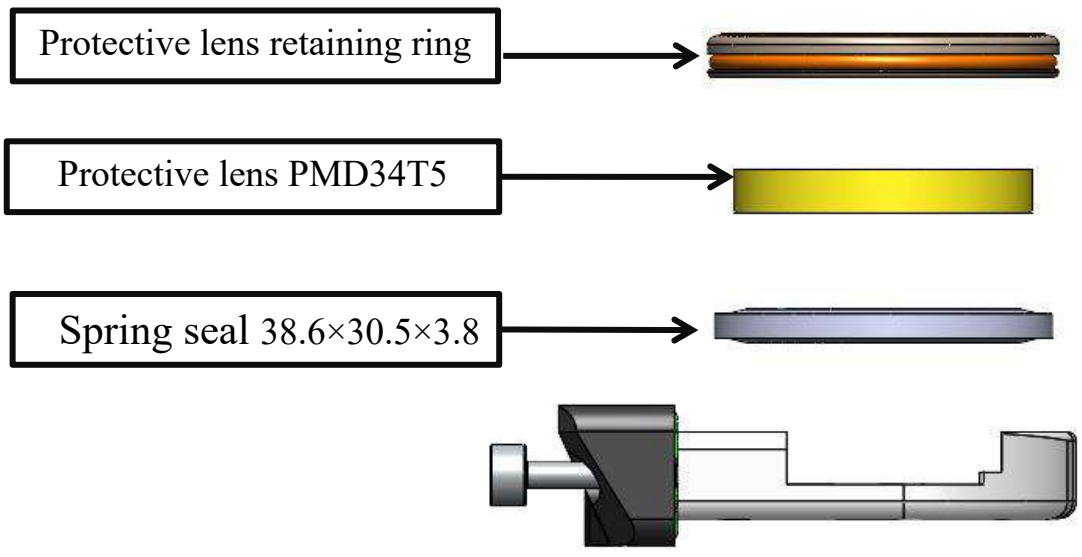


Figure 4.5

5.2 Maintenance and Replacement of Collimation Lens

5.2.1 Disassembly and Assembly of Collimation Lens

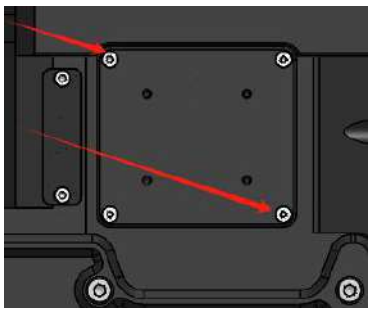


Figure 4.6

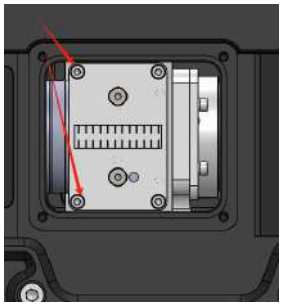


Figure 4.7

Remove the 4 M3X6 countersunk screws shown in Figure 4.6 above in order. After removing the cover plate, remove the 4 M2.5X6 bolts in Figure 4.7 above and pull out of the collimation lens drawer for maintenance. Pay attention to the direction of the collimation lens drawer during installation.

5.2.2 Cleaning of Collimation Lens

Figure 4.8

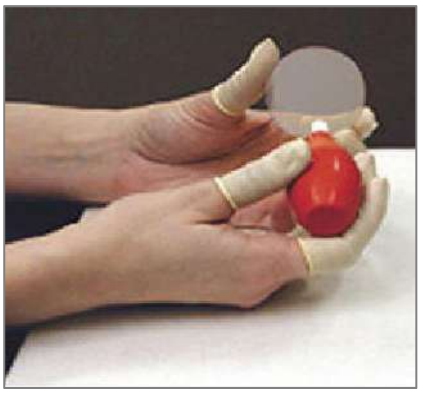


Figure 4.9

① Tools: Dust-free swab, isopropyl alcohol, and canned dry and purified compressed air.
② Spray isopropyl alcohol onto the dust-free swab.
③ Gently pinch the side edge of the lens with the left thumb and index finger, and hold 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, as shown in Figure 4.8.
④ After wiping, blow the lens surface again with canned dry and purified compressed air to ensure that the lens surface is free of any foreign matter, as shown in Figure 4.9.
⑤ The cleaned collimation lens must be installed into the base quickly and inserted into the cutting head.

5.3 Maintenance and Replacement of Focus Lens

5.3.1 Disassembly and Assembly of Focus Lens.

① As shown in Figure 5.0 below, loosen the 4 M3×12 anti-falling screws to pull out of the focus lens drawer; then take the focus lens out by using wrench.

Figure 5.1

5.3.2 Cleaning of Focus Lens.

Figure 5.1

Figure 5.2

① Tools: Dust-free swab, isopropyl alcohol, and canned dry and purified compressed air.
② Spray isopropyl alcohol onto the dust-free swab.
③ Gently pinch the side edge of the lens with the left thumb and index finger, and hold 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, as shown in Figure 5.1.
④ After wiping, blow the lens surface again with canned dry and purified compressed air to ensure that the lens surface is free of any foreign matter, as shown in Figure 5.2.
⑤ The cleaned focus lens must be installed into the base quickly and inserted into the cutting head.

5.4 Maintenance and Replacement of Cutting Protection Lens

When impurities or foreign objects adhere to the protective lens, they can absorb laser heat and cause damage to the lens. Therefore, it is necessary to clean the protective lens regularly, with a recommended cleaning cycle of 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 two M4×10 anti-falling screws, hold the screws with both hands, slowly pull out the protective lens base, and move it to a clean and dust-free environment, as shown in Figure 5.3 below. The detailed diagram of replacing lens is shown in Figure 5.4.

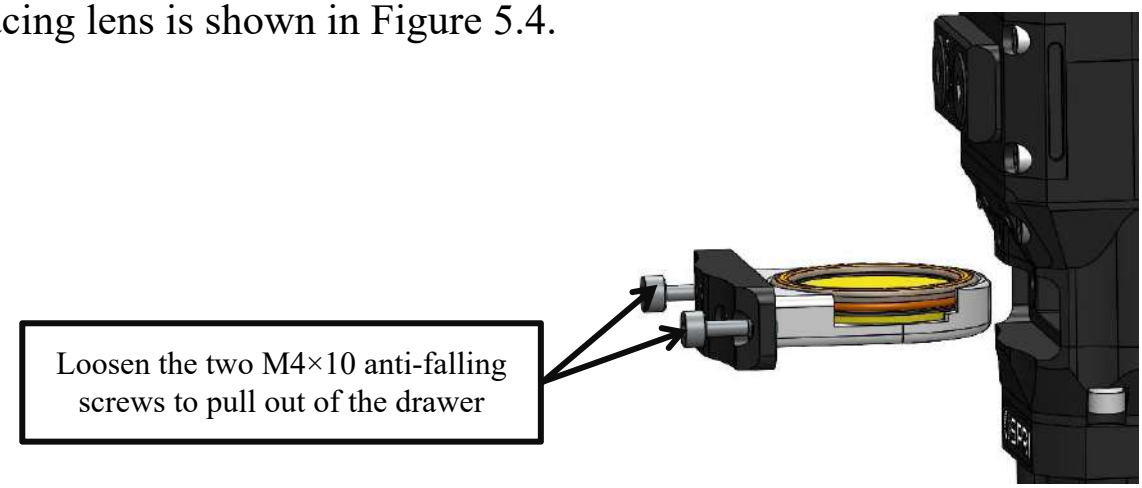


Figure 5.3

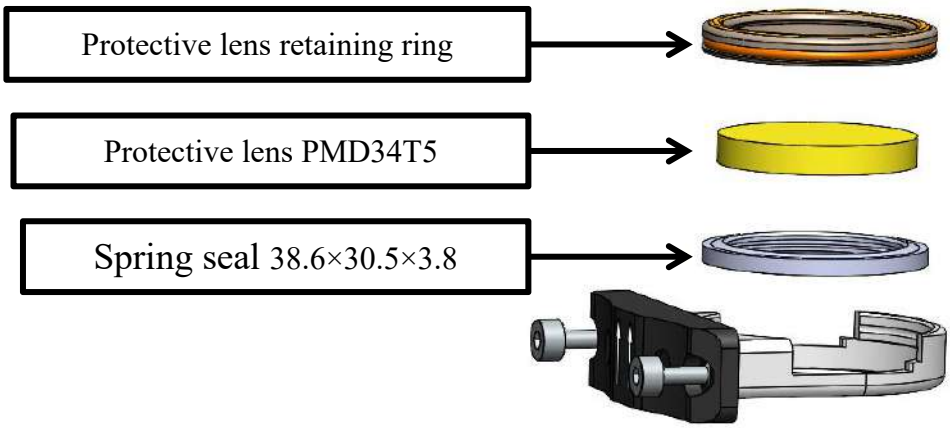


Figure 5.4

Assembly sequence is shown in the figure above.

5.4.2 Cleaning of Protective Lens

Figure 5.5

Figure 5.6

① Tools: Dust-free swab, isopropyl alcohol, and canned dry and purified compressed air.

② Spray isopropyl alcohol onto the dust-free swab.

③ Gently pinch the side edge of the lens with the left thumb and index finger, and hold 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, as shown in Figure 5.5.

④ After wiping, blow the lens surface again with canned dry and purified compressed air to ensure that the lens surface is free of any foreign matter, as shown in Figure 5.6.

⑤ The cleansed lens must be installed into the base quickly and inserted into the cutting head.

Note: When cleaning or replacing the protective lens, avoid contaminating it with oil from your hands or dust from the environment.
In principle, it is forbidden to disassemble the focus lens, collimation lens and cutting lens. If any lens is contaminated, make test using trial lens. If necessary, contact the Company's technicians.

5.5 Maintenance of Sensory Parts

The ceramic body is a wearable part and can be replaced after damage. When installing the ceramic body, align it with the two positioning pins on the main body. Otherwise, the ceramic body cannot be installed correctly in place, which may cause the failure of sensory parts. When tightening the ceramic body, use locking nut to secure it tightly. Inconsistent tightness of the locking nut will directly affect the operating parameters of the sensory parts.

The laser nozzle is the sensitive element of the sensory part and is connected to the main body through threading. It is a wearable part. After it is used for a period of time, remove the bonded slag. If the burnout is severe, replace it in a timely manner.

After assembling the ceramic body, tighten the locking nut so that the ceramic is evenly exposed by about 2-3mm.

Pay attention to the followings during use:

① Use dry and purified auxiliary gas for cutting. When the gas contains impurities such as water or oil, the working gap may undergo sudden changes, and may even cause sensor malfunction. It is recommended to use high-purity oxygen, and to also equip gas dryers, oil-water separators, etc.

② Clean the contaminated sensor. Use a clean, dry cotton cloth or similar material for cleaning. Do not use liquids to clean the cutting head or ceramic body. After cleaning, ensure proper connection and assembly.

③ The ceramic body can be replaced if damaged. After replacement, initialize the electrical system through a reset operation using an amplifier.

④ The shape and size of the cutting nozzle directly affect the characteristics of sensor. Therefore, it is necessary to use the specified cutting nozzle.

5.5.1 Replacement of Nozzles and Ceramic Body

① Remove the nozzle counterclockwise, as shown in Figure 5.7.
② Remove the ceramic clamp ring counterclockwise, as shown in Figure 5.7.
③ Remove the ceramic body vertically downward, as shown in Figure 5.7.

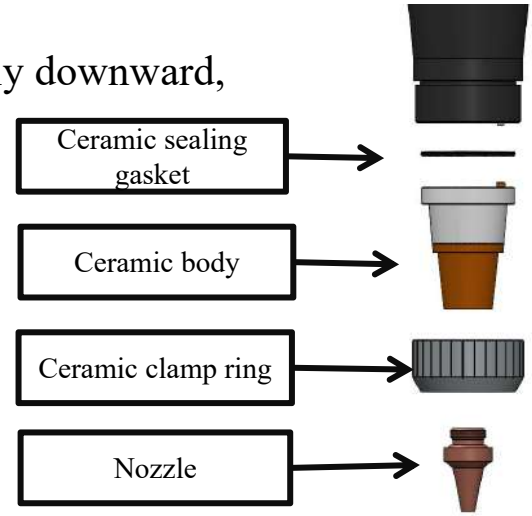


Figure 5.7

5.5.2 Cleaning of the Ceramic Ring.

① Take out the ceramic and clean it with anhydrous alcohol or isopropyl alcohol, as shown in Figure 5.8.
② Spray isopropyl alcohol onto the dust-free swab, remove the ceramic ring and clean it with the swab, as shown in Figure 5.9.
③ After wiping, blow the ceramic ring with filled dry and purified compressed air to clean it and ensure that the ceramic surface is clean, dry and free of moisture before installation, as shown in Figure 6.0.

Figure 5.7

Figure 5.8

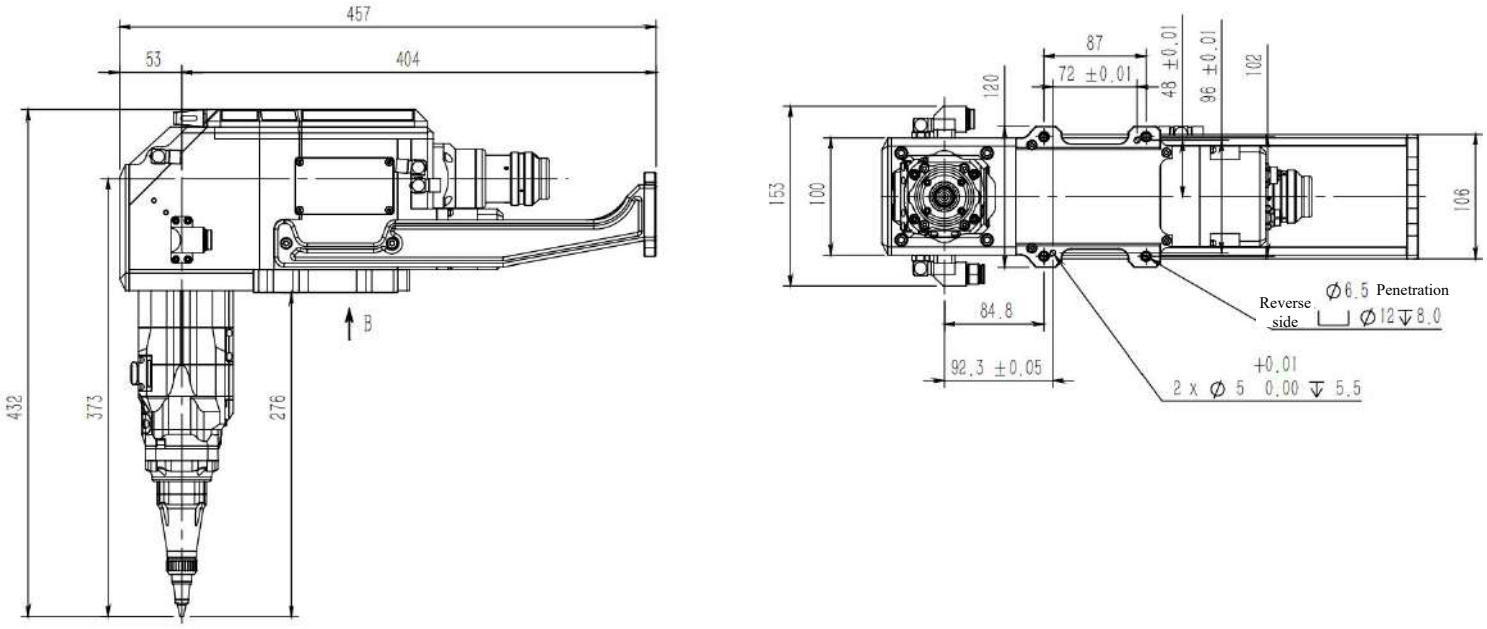
Figure 5.9

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.

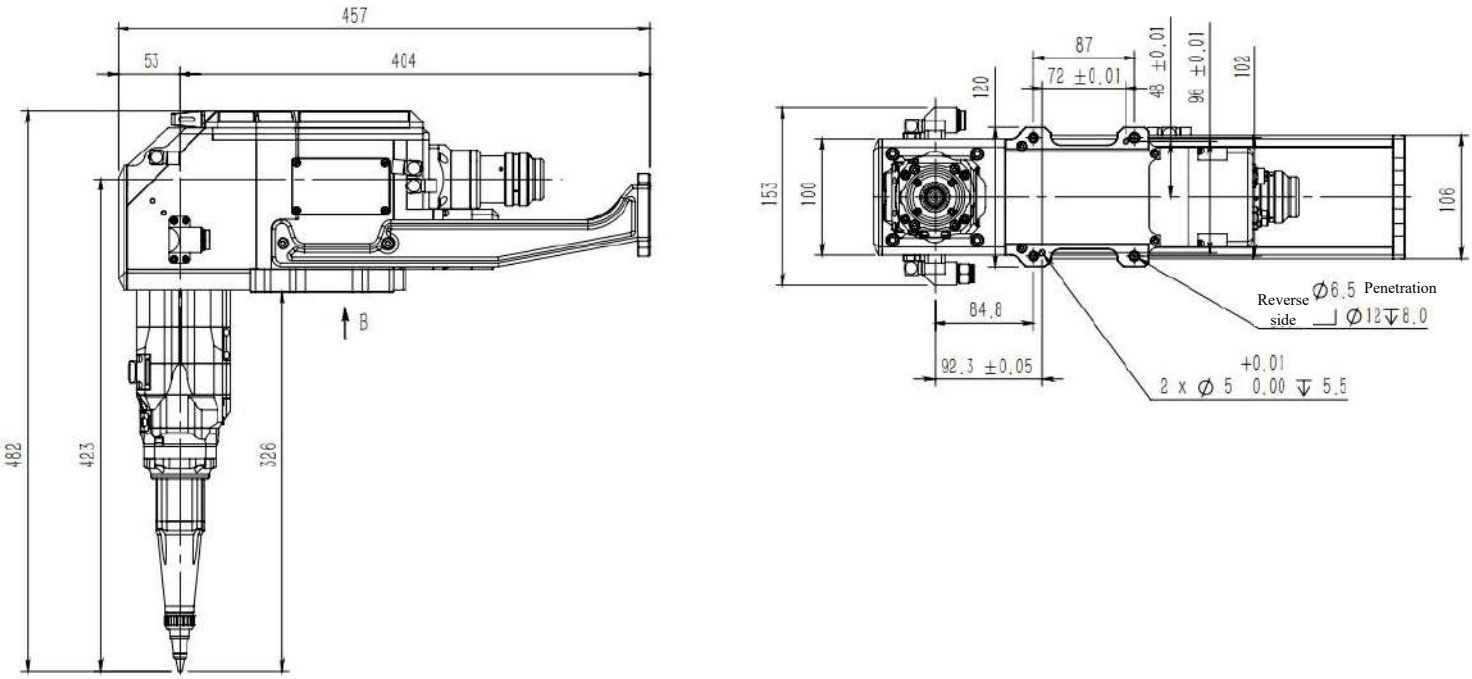
Appendix A

1. Installation diagram of different cutting sensors

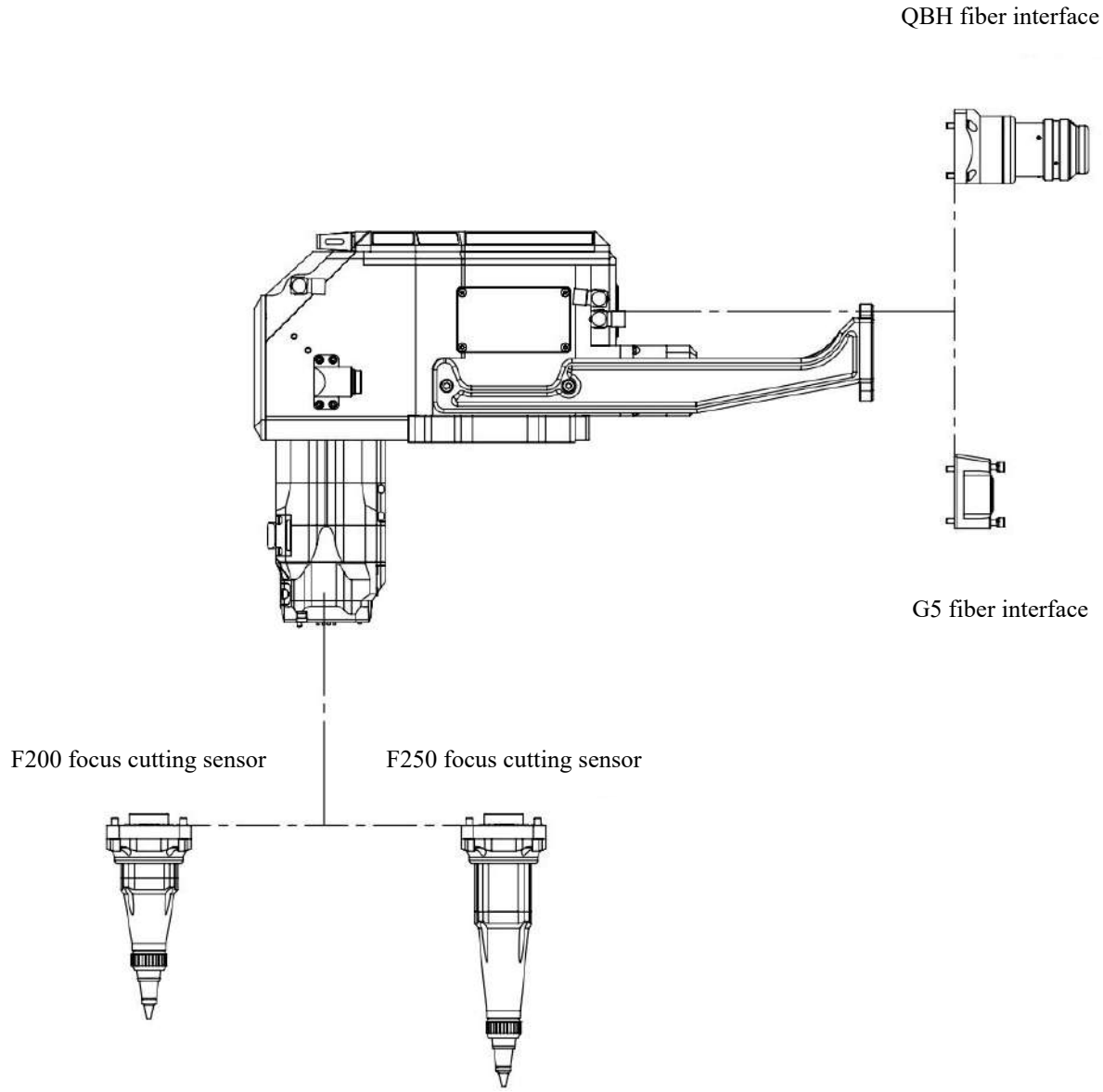
① Installation diagram of F200 focus



② Installation diagram of F250 focus



2. Introduction to Fiber Interface and Sensors with Different Focal Lengths

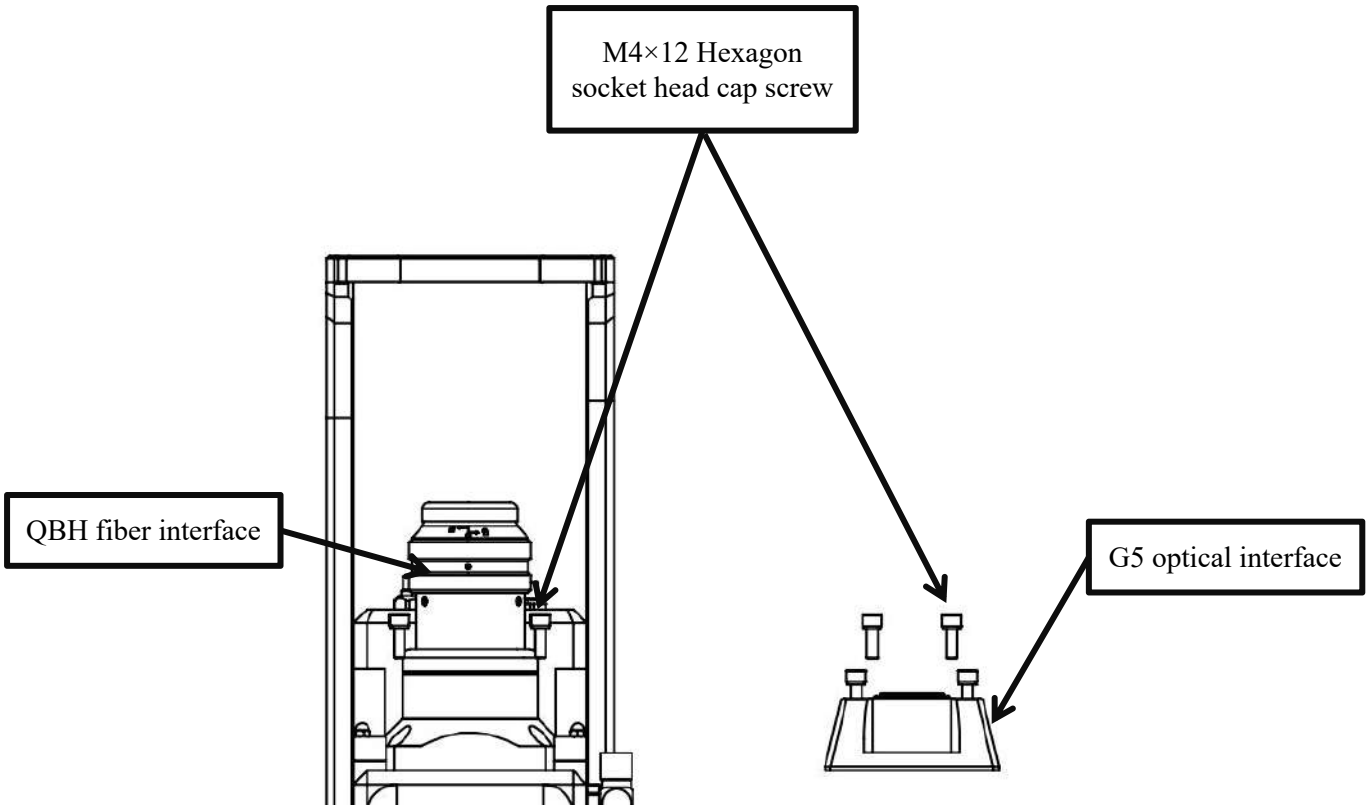


3. Replacement of Fiber Interface and Sensors with Different Focal Lengths

3.1 Replacement of Fiber Interface (Taking the replacement of QBH to G5 interface as an example)

① Remove QBH fiber interface: Move the cutting head to a dust-free environment, unscrew the 4-M4×12 Hexagon socket head cap screw and spring washer to remove the QBH interface.

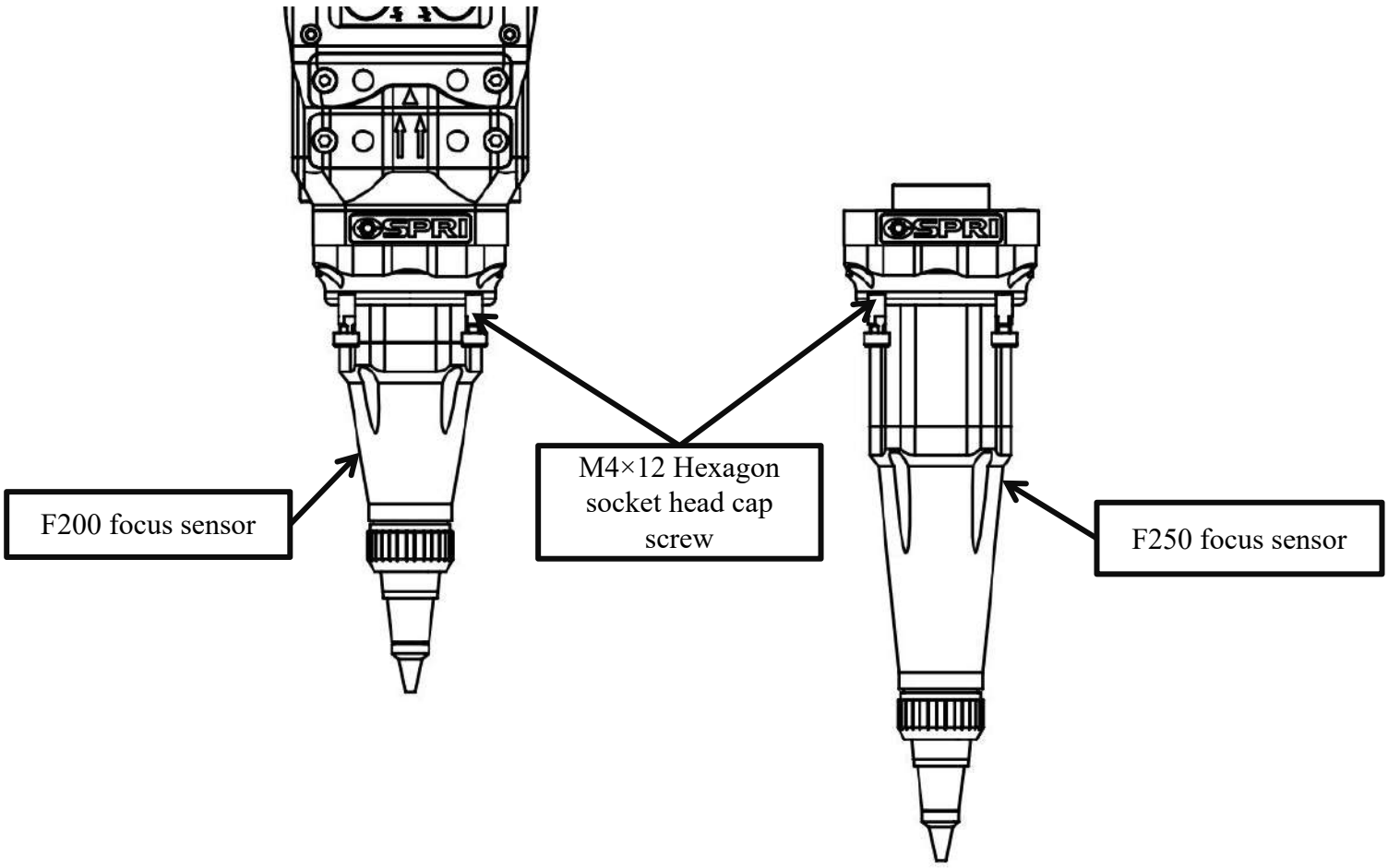
② Assemble G5 fiber interface: Lock the 4-M4×12 hexagon socket head cap screw and spring washer to fasten and assemble G5 interface.



3.2 Replacement of Cutting Sensor (Taking the replacement of F200 focus to F250 focus as an example)

① Remove F200 focus sensor: Move the cutting head to a dust-proof environment and remove 4-M5 anti-collision screw to remove F200 focus sensor.

② Assemble F250 focus sensor: Lock 4-M5 anti-collision screw, and fasten and assemble F250 focus sensor.



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