LCR04-H02 User Manual

Product Description

Shenzhen Ospri Intelligent Technology Co., LTD

Foreword

Dear Users:

Welcome to use the 3D laser cutting head LCR04-H02 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:

The contents of User Manual are protected by the Copyright Law. Without the approval of Shenzhen Ospri Intelligent Technology Co., Ltd, any organization or individual shall not copy or tamper it by any means and forms.

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

Contents

Chapter 4 Product Debugging

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Chapter 1 Overview

1.1 Product Parameter

① Product parameters, as shown in Table 1.0.

Name	3D fiber laser cutting head
Model	LCR04
Interface Type	QBH
Wavelength	1080±10nm
Rated Power	≤4KW
Focus Length	150mm
Collimation Length	75mm
Nozzle	Various models and specifications
Focusing Range	-24mm~+20mm
Centering Range	±1.5mm
Focusing Speed	≤200mm/s
Repeated Positioning Accuracy of Focusing Axis	0.05mm
Focusing Stroke	12mm
Focusing Speed	≤50mm/s
Follow-up Stroke	27mm
Follow-up Speed	≤250mm/s
Gas Pressure	≤2.5Mpa
Weight	7.0KG

Table 1.0

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

Brief description of product structure, as shown in Figure 1.0.

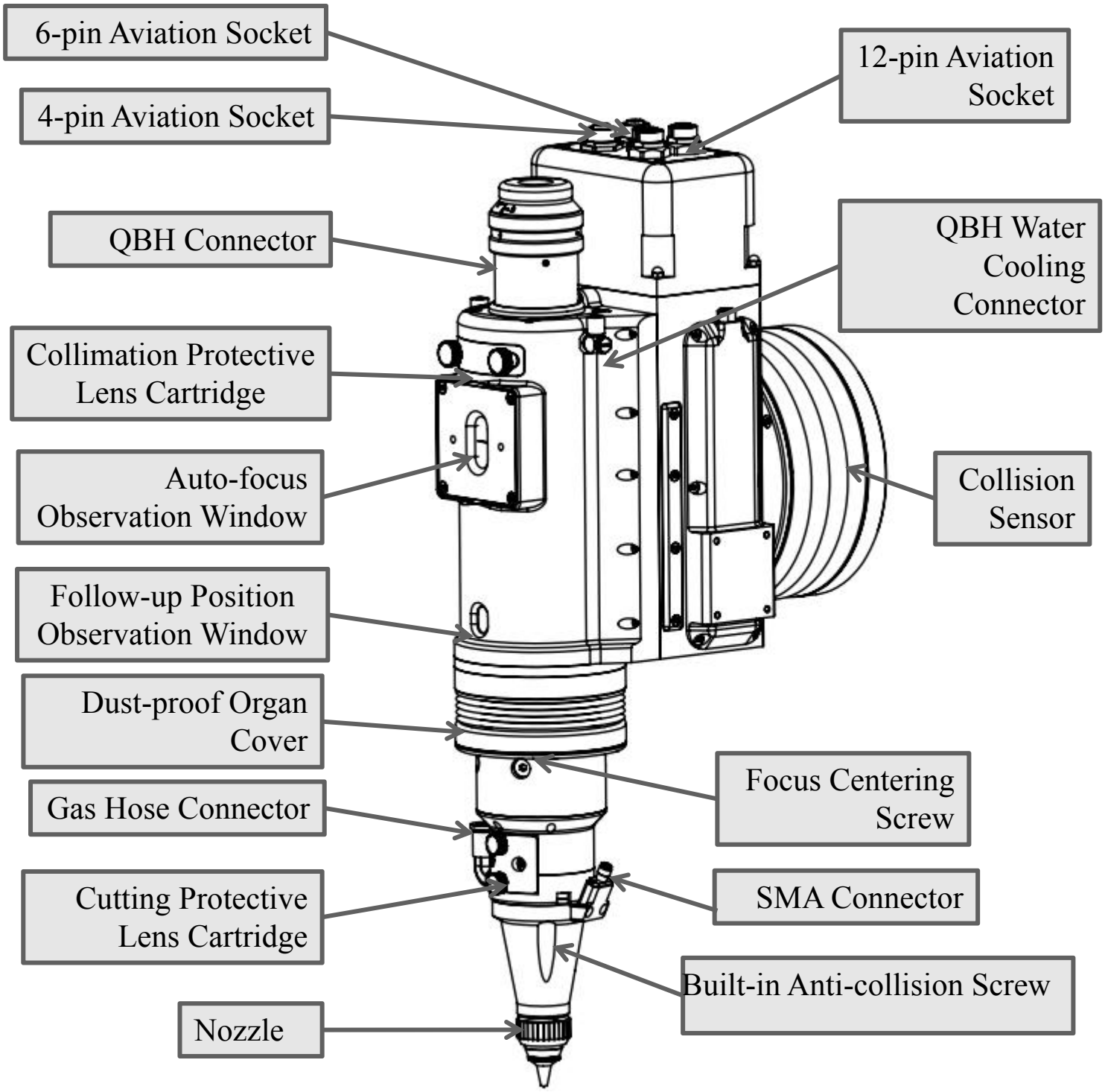

Figure 1.0

2.2 Brief Description of Product Parts

1. Laser rod connector: QBH connector.
2. Cutting gas connector: Connect to 8mm gas hose.
3. SMA connector: Connect to amplifier.
4. Water cooling connector: Cool collimation protective lens.
5. Centering alignment: Adjust the concentricity of laser and nozzle.
6. Focusing module: Adjust the cutting focus.
7. Cutting protective lens cartridge: Seal the cutting gas and protect the focus lens.
8. Amplifier installation: Install the amplifier to the M3 threaded hole, with the hole distance of 31mm*36mm.
9. Aviation plug connector: Output for motor cable, encoder cable, limit signal and anti-collision signal, etc.
10. Collimation protective lens module: It can avoid the dust from falling down inside the cutting head, for protecting the collimation lenses when plug or remove the fiber laser tip.
11. Focusing scale window: Observation window for cutting focus, for reference only.
12. Follow-up scale window: Observation window for cutting follow-up distance, for reference only.
13. Focus lens cartridge: Replace and maintain the focus lens, and center the laser beam spot;
14. Focus protective lens: Protect the focus lens and facilitate fast replacement.
15. Focus protective lens cartridge: Protect the focus lens.
16. Collision sensor module: Connect the cutting head to the robot mounting flange. When a collision occurs, the machine immediately stops working.
17. Anti-collision bolt: Break immediately upon collision with the sensor, causing the machine to immediately stop working.

2.3 Brief Description of Product Parts (Lens Size)

As shown in Figure 1.1.

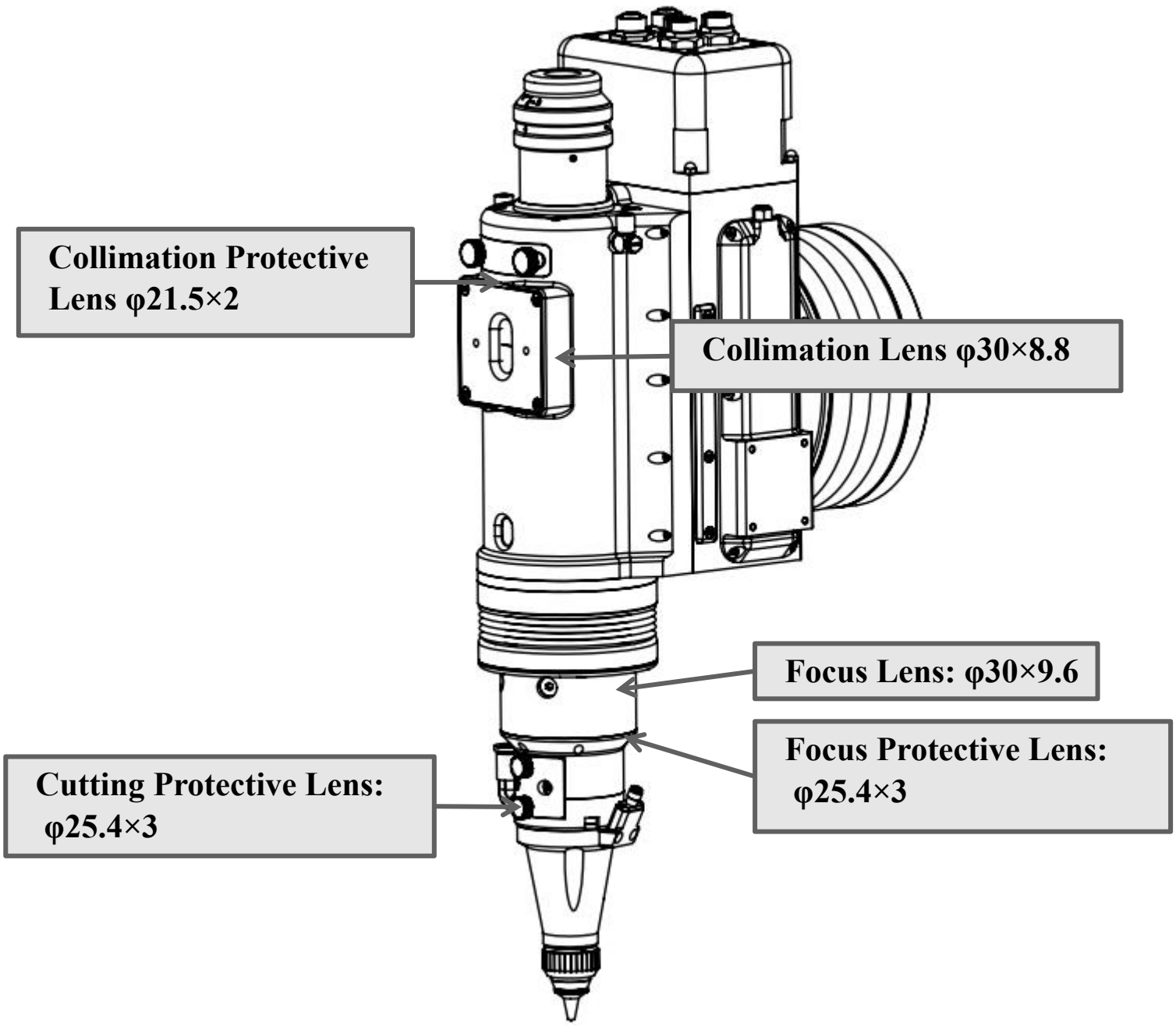

Figure 1.1

Chapter 3 Product Installation

3.1 Cutting Head Installation

The external dimensions and installation dimensions of the cutting head (Collimation F75/Focus F150) are shown in Figures 1.2 and 1.3.

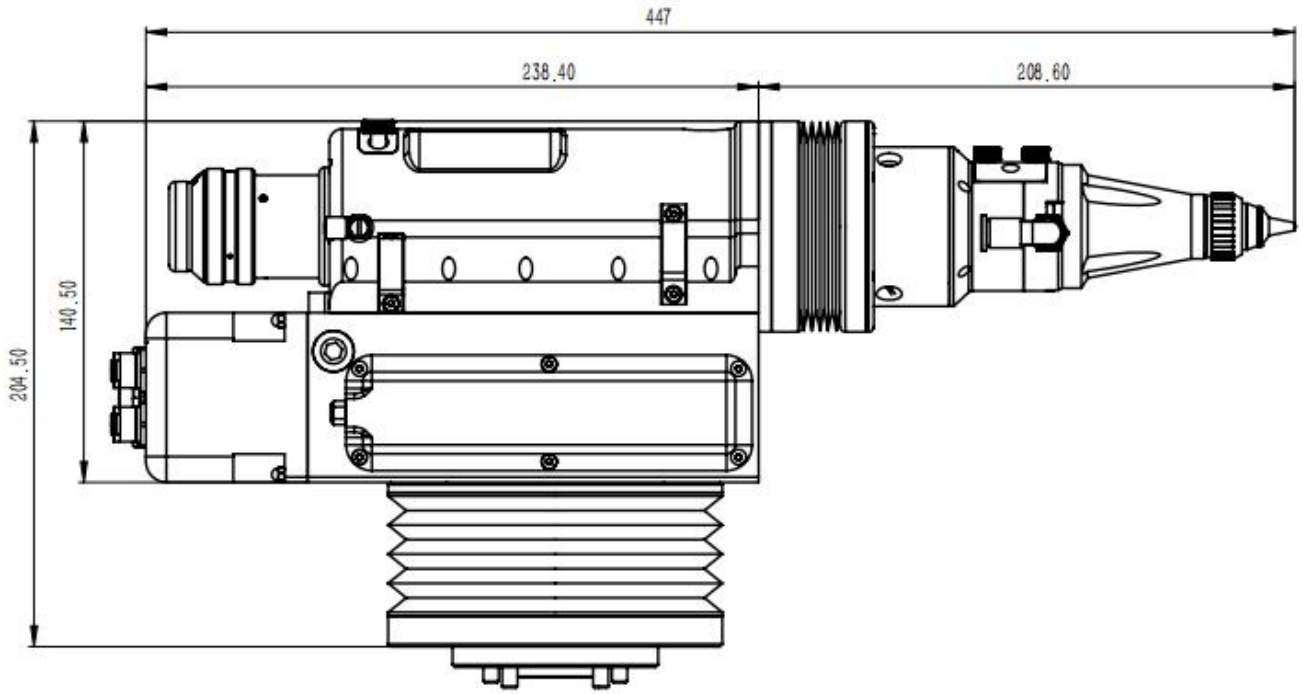

Figure 1.2

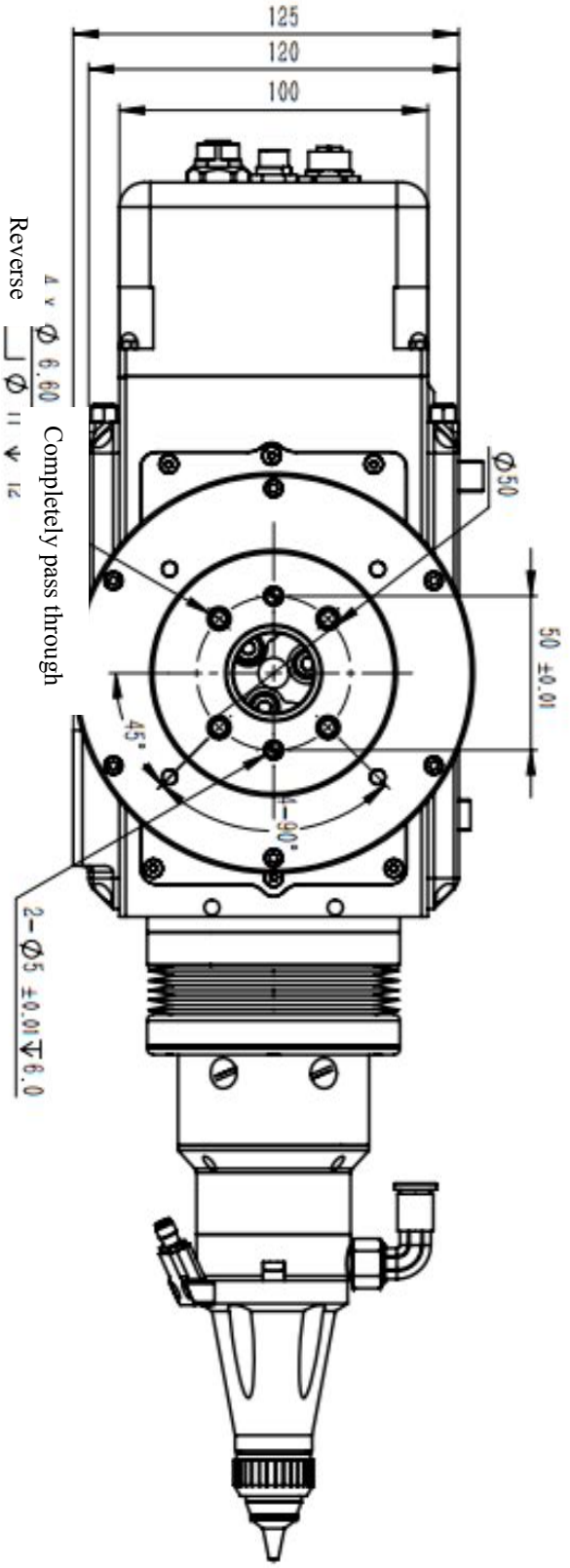
125
120
100
Reverse
Completely pass through
Ø50
50 ±0.01
45°
2-Ø5 ±0.01↧6.0

Figure 1.3

3.2 Connection of Cutting Head and Manipulator

3.2.1 Disassembly of Cutting Head Mounting Flange

Remove the six M3x10 cylindrical head screws, push the dust cover up to the flange, then remove the four M6x20 hexagonal bolts, and remove the welding head adapter flange, as shown in Figure 1.4.

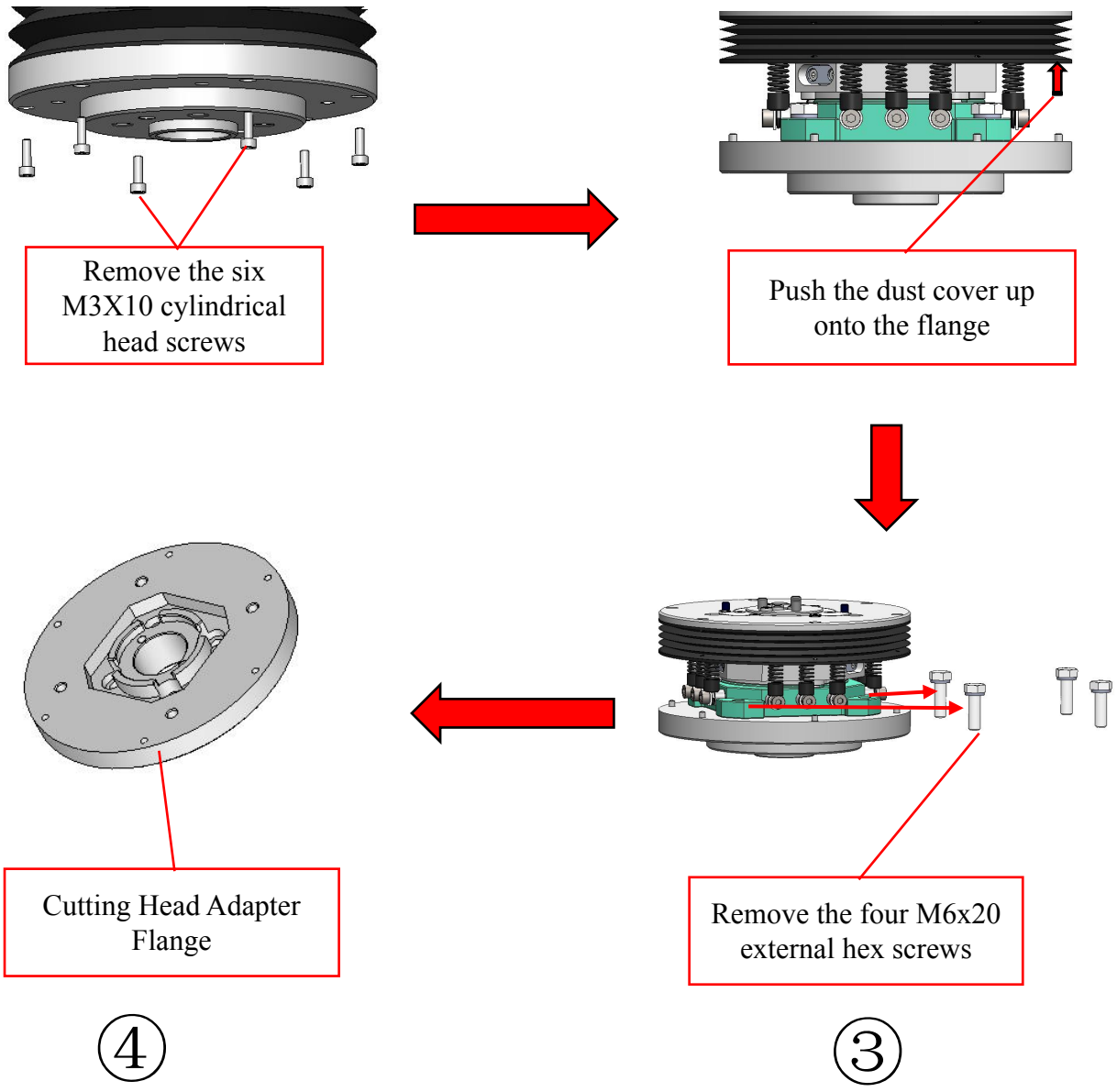

Figure 1.4

3.2.2 Assembly of Cutting Head and Manipulator

After assembling the two Ø6x10 pins with the adapter flange, mount it on the manipulator mounting flange. Tighten the four M6x16 hexagon socket head cap screws. After assembling the two Ø4x10 pins, install the welding head with the adapter flange, and tighten the four M6x20 external hex bolts. Tighten the dust cover with the six M3x6 countersunk screws, as shown in Figure 1.5.

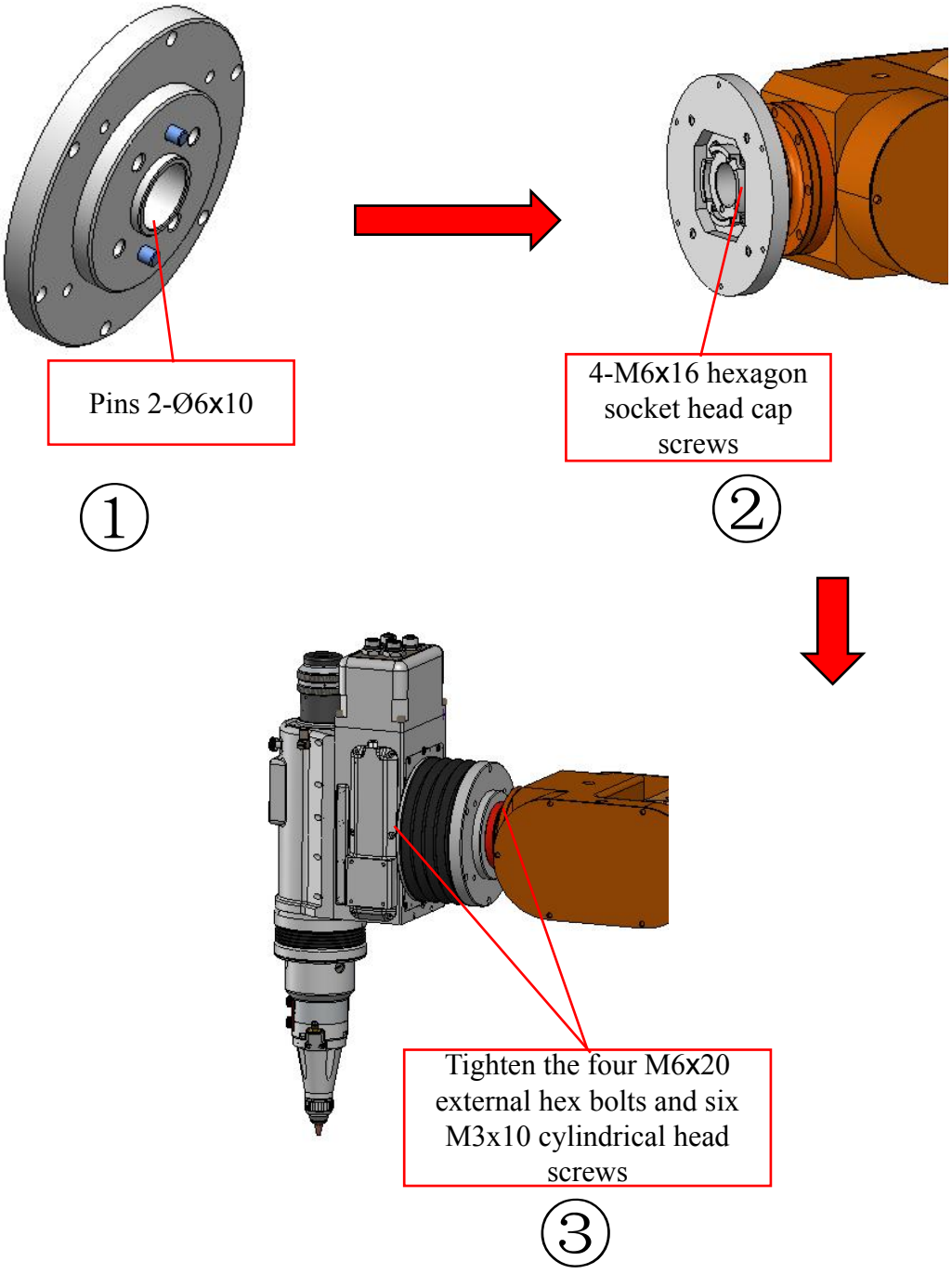

Figure 1.5

3.3 Cutting Head Connection

3.3.1 Cooling Water Connection

① Used for cooling QBH and reflector, with 1-inlet and 1-outlet cooling connection, as shown in Figure 1.6.

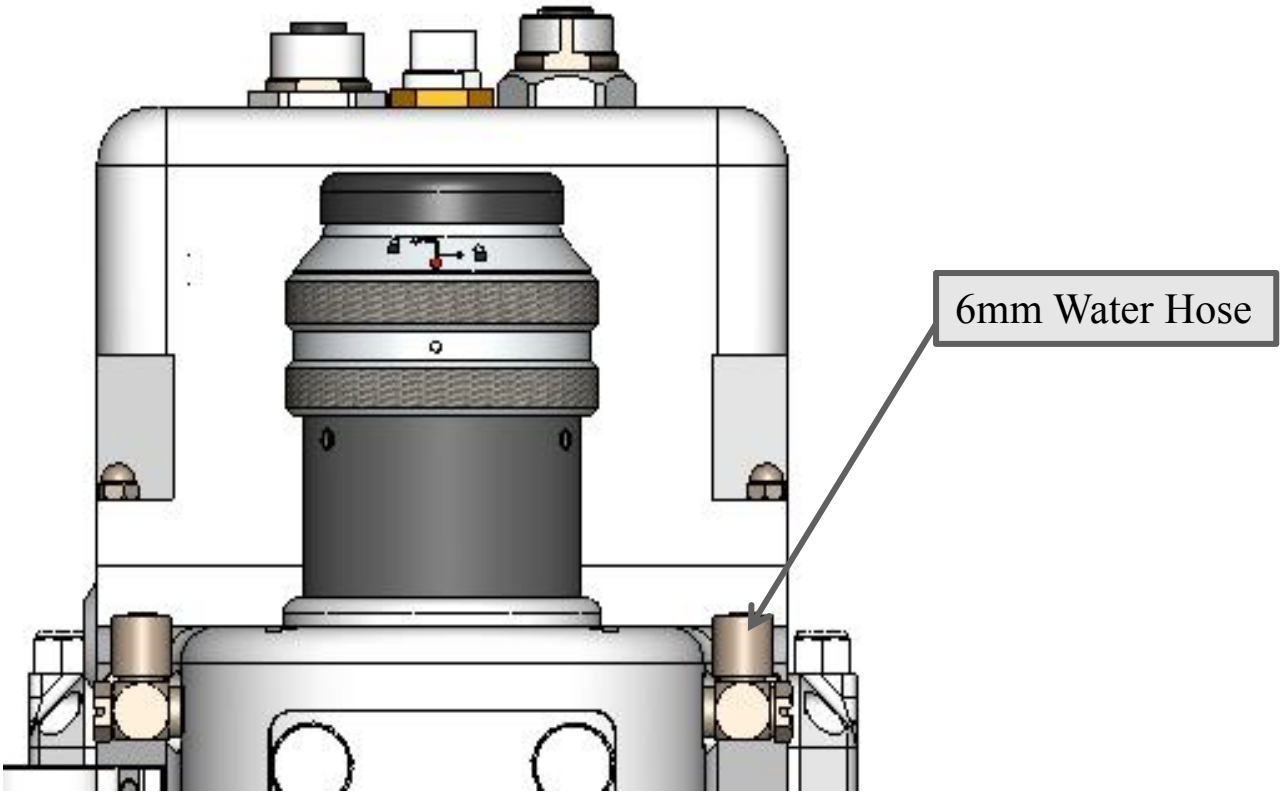

Figure 1.6

3.3.2 Auxiliary Gas Pipeline

① The inlet is connected to 8mm gas hose, as shown in the Figure 1.7, and is used to connect cutting gas, with inlet pressure <2.5 Mpa.
Common gas: Oxygen, nitrogen and compressed air.

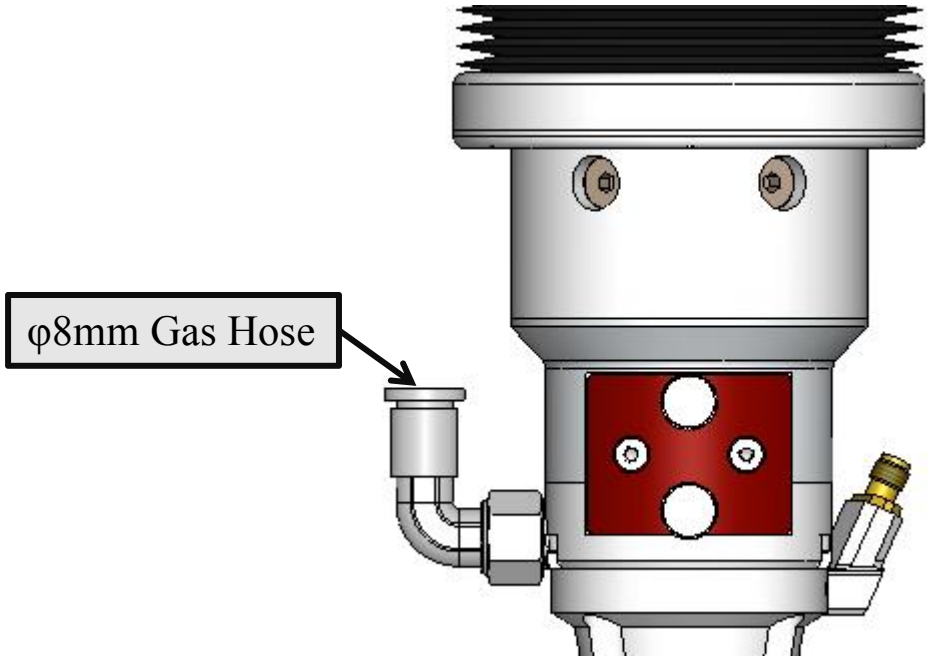

Figure 1.7

Attention: The gas entering the gas connection must be filtered and dried, otherwise it will contaminate the protective lens and cause damage to it.

3.4 Wiring Definition and Requirements

3.4.1 Aviation Plug Connector

① When inserting and removing the aviation plug, cut off the power; otherwise, the motor may be burnt out. When connecting the power line and the signal line, pay attention to the notch position to avoid damage to the pin, as shown in Figure 1.8.

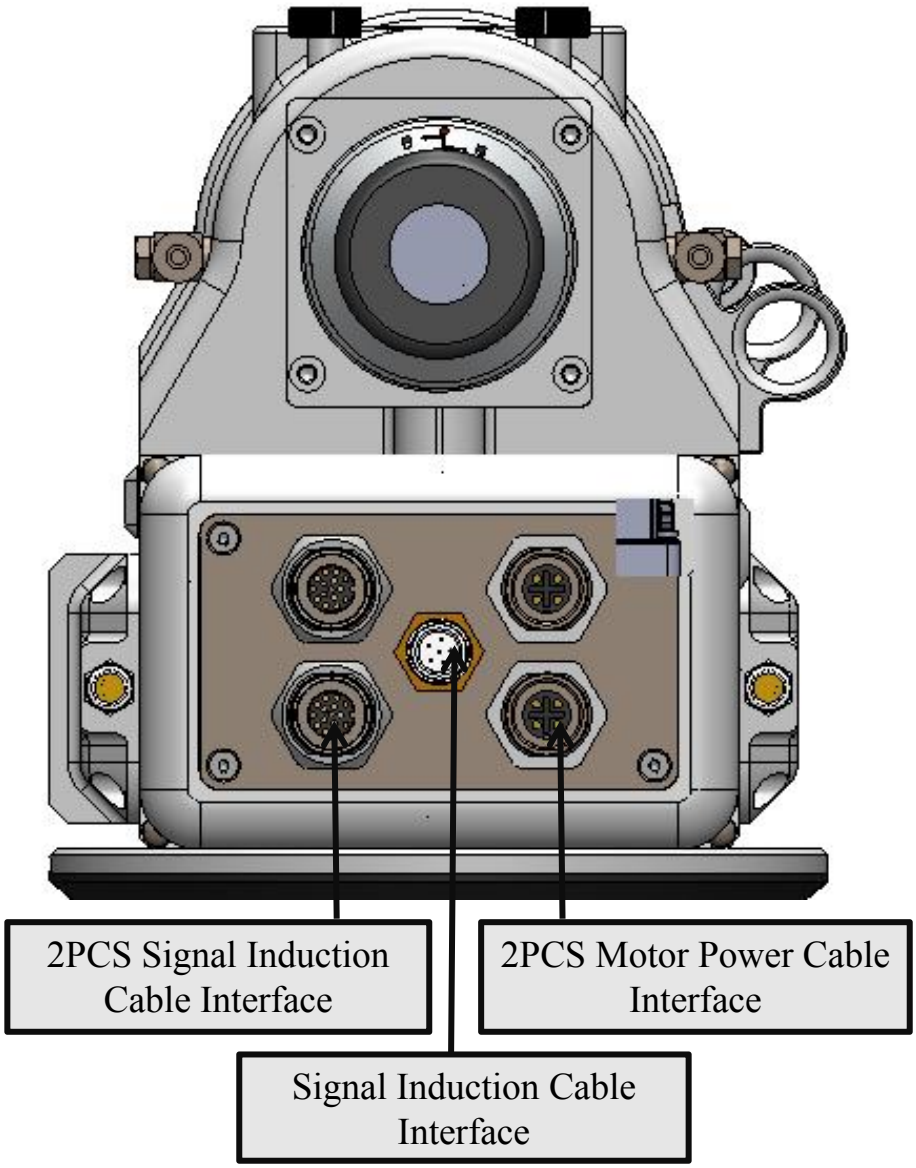

Figure 1.8

3.4.2 LCR04-PC Wiring Overview

① Focusing axis wiring, as shown in Figure 1.9.

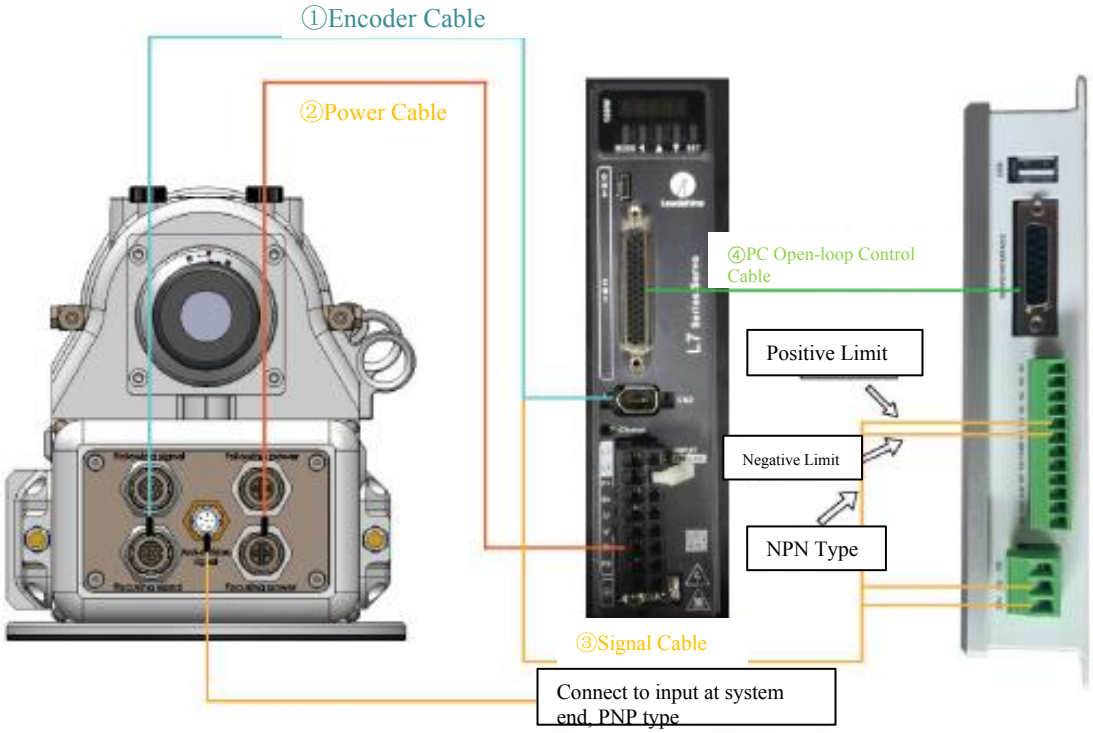

Figure 1.9

② Follow-up axis wiring (L7RS-100), as shown in Figure 2.0.

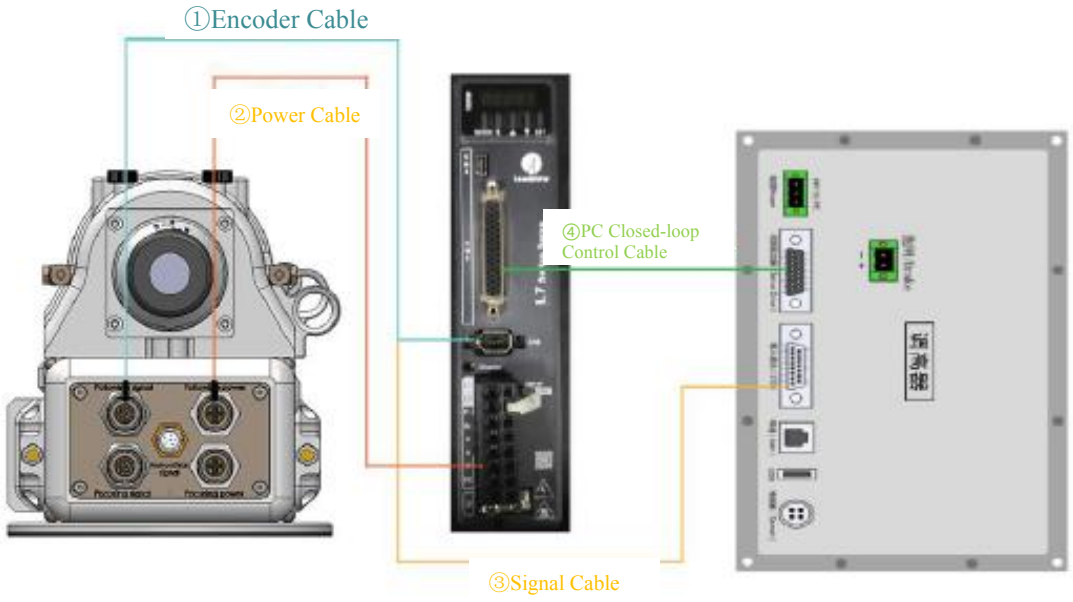

Figure 2.0

3.4.3 Wiring Definition

Power cable wiring of servo drive (single phase 220 V), as shown in Figure 2.1 below.

Figure 2.1

3.4.4 Interface Description

As shown in Figure 2.2.

Figure 2.2

① CON1 corresponding pin signal description, as shown in Table 1.1 below.

Signal Type	Pin	Signal
Power supply	24V	Power input 24V
	0V	Power input 0V
	PE	Ground

Table 1.1

② CON2 corresponding pin signal description, as shown in Table 1.2 below.

Signal Type	Pin	I/O	Signal	Voltage	Remarks
Analog quantity	AD	I	Focus setting	0~10V	Focus position set input voltage
	GND	-	Analog ground	-	Analog signal ground
Digital quantity	ALM	0	Alarm output	0V	No abnormal alarm output
				24V	Abnormal alarm output
	INP	0	Focus in place	0V	Focus set position not reached
				24V	Focus set position reached
	EN	I	Focus enablement	0V	Focus off
				24V	Focus on
	HOME	I	Return to zero	0V	RTN signal input invalid
				24V	RTN signal input valid
	NE		Lower limit	0V	Lower limit signal triggered
				24V	Lower limit signal not triggered
	PO	I	Upper limit	0V	limit signal triggered
				24V	Upper limit signal not triggered
	NC				Reserved signal

Table 1.2

3.4.5 Driver IO Connection and Parameter Setting

① Focusing module servo wiring, as shown in Figure 2.3 below.

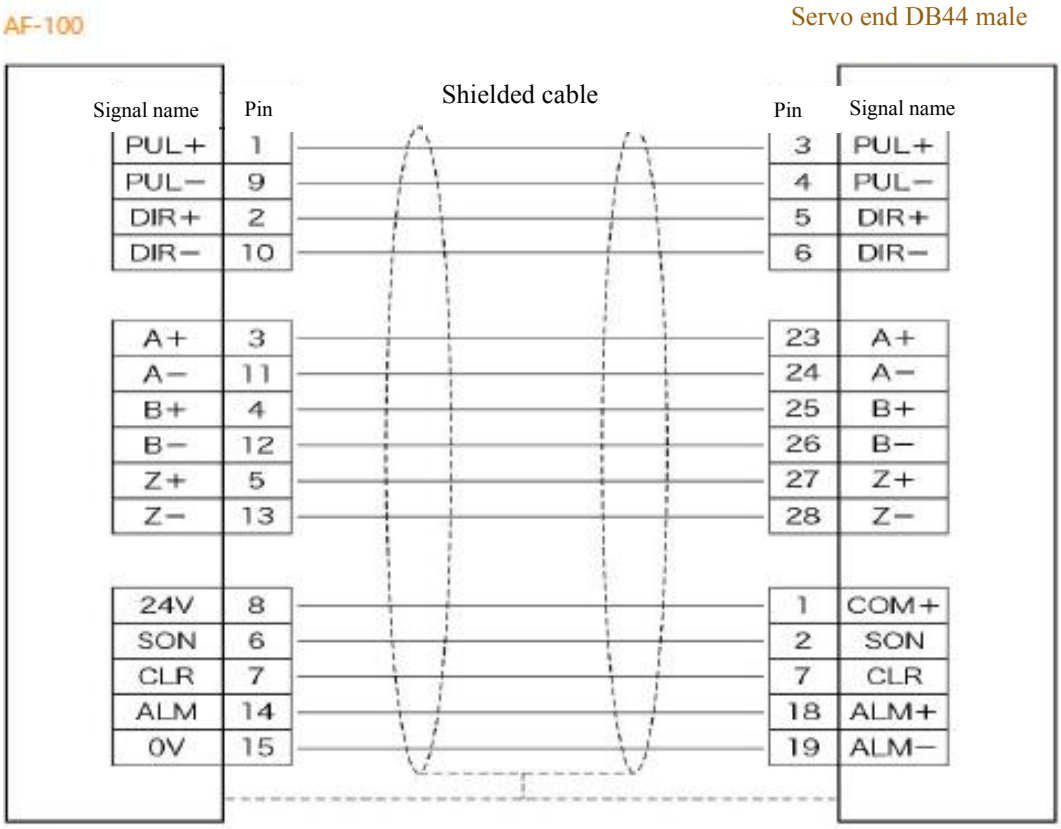

Figure 2.3

② Focusing drive parameter setting, as shown in Table 1.3.

Parameter No.	Parameter Value	Parameter Content
PA001	0	Position mode
PA003	18	Rigidity class
PA004	150	Inertia ratio
PA006	0	Rotation direction
PA007	3	Pulse train pattern
PA008	10000	Number of pulses required per circle of motor rotation
PA011	2500	Number of output pulses per circle of motor rotation
PA400	3	Servo enablement
PA410	1	Alarm output signal

Table 1.3

③ Height adjuster wiring, as shown in Figure 2.4 below.

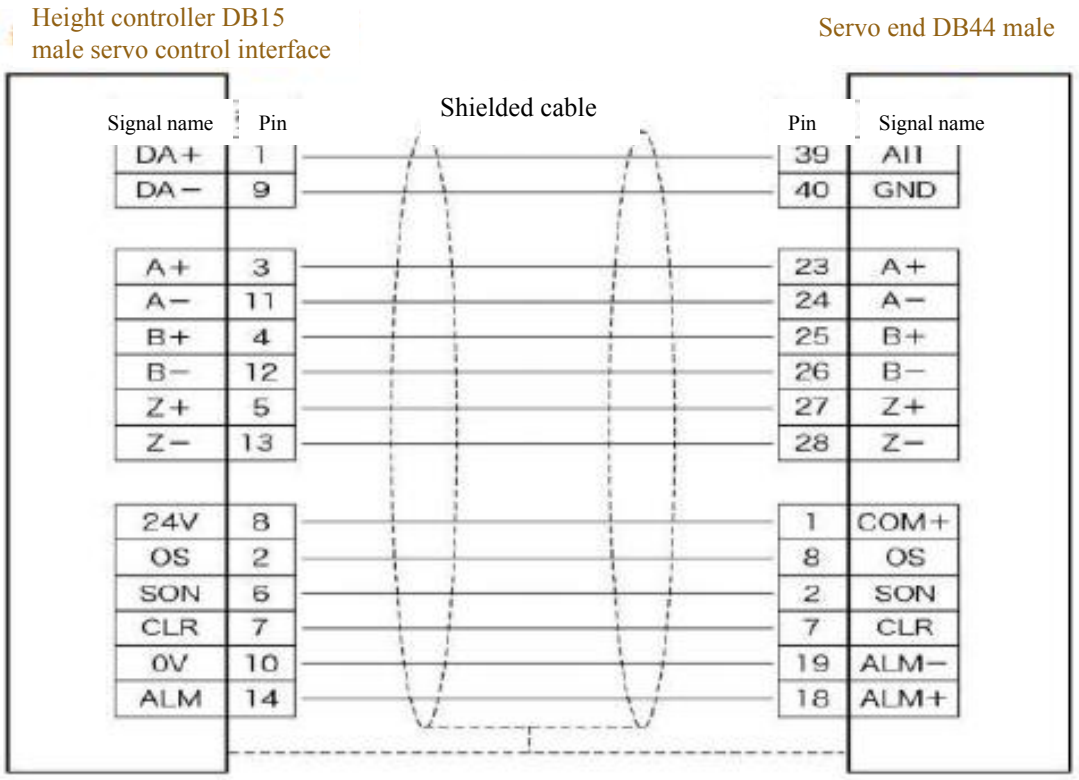

Figure 2.4

④ Driver closed-loop parameter setting, as shown in Table 1.4 below.

Parameter No.	Parameter Value	Parameter Content
PA001	1	Speed mode
PA003	18	Rigidity class
PA004	150	Inertia ratio
PA008	10000	Number of pulses required per circle of motor rotation
PA0011	2500	Number of output pulses per circle of motor rotation
PA012	0	Encoder direction
PA300	0	Speed mode selection
PA303	0	Motor rotation direction
PA302	500	1V corresponding rotation speed
PA312	0	Acceleration time
PA313	0	Deceleration time
PA315	1	Zero speed function selection
PA400	3	Servo enablement
PA402	91	Zero speed clamping

During inching, if the focus has no response and the system displays an alarm, but the drive has no alarm, change parameter value of PA402 to 11

Table 1.4

3.4.6 Pulse Equivalent Settings

75 collimation 150 focus:

For every 4 mm movement, the corresponding number of pulses is 10,000

3.5 QBH Fiber Connection

① Put the cutting head horizontally, remove the white cover and static sticker, and then take out the dust-proof cover, as shown in Figure 2.5.

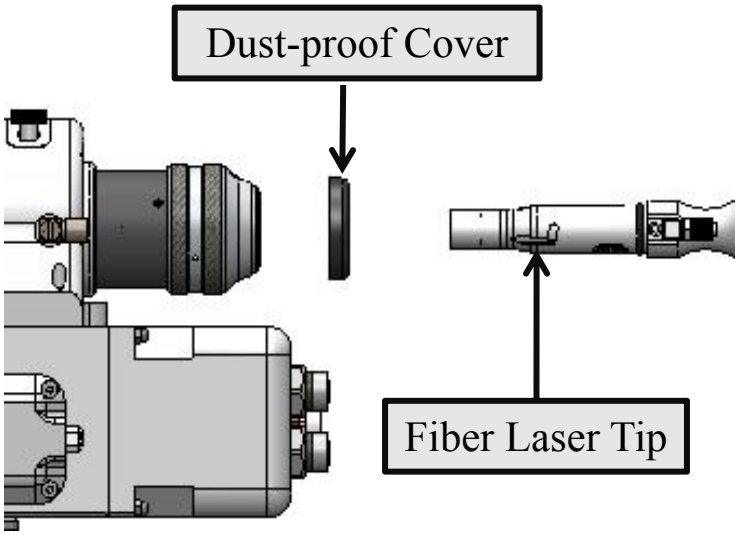

Figure 2.5

② Cover the dust-proof cover which is in the white accessory box, onto the fiber laser tip, as shown in Figure 2.6:

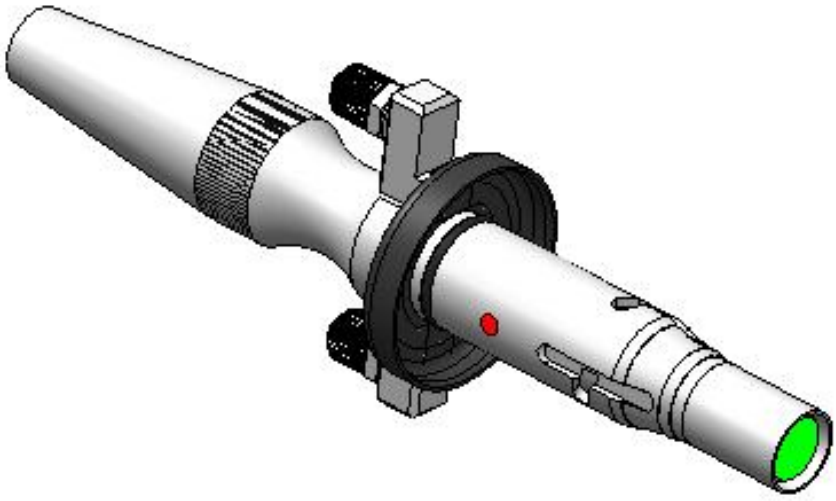

Figure 2.6

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 Turn the QBH connector into the open state, that is, screw it to the limit position counterclockwise (a "thump" sound can be heard). Do not twist with great force, otherwise the internal structure of the QBH may be damaged, as shown in Figure 2.7.

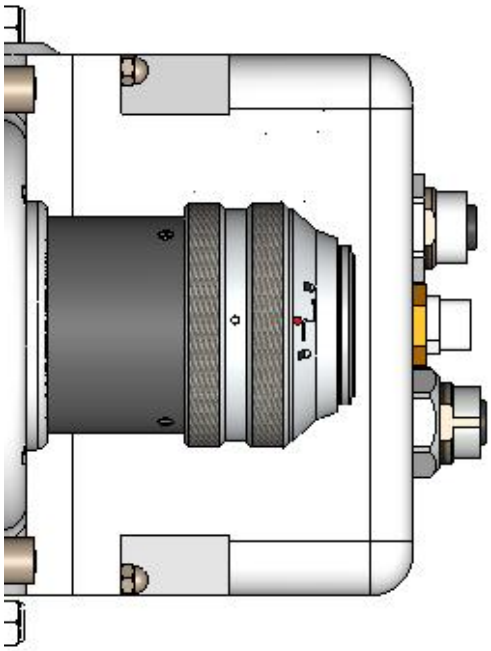

Figure 2.7

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 2.8:

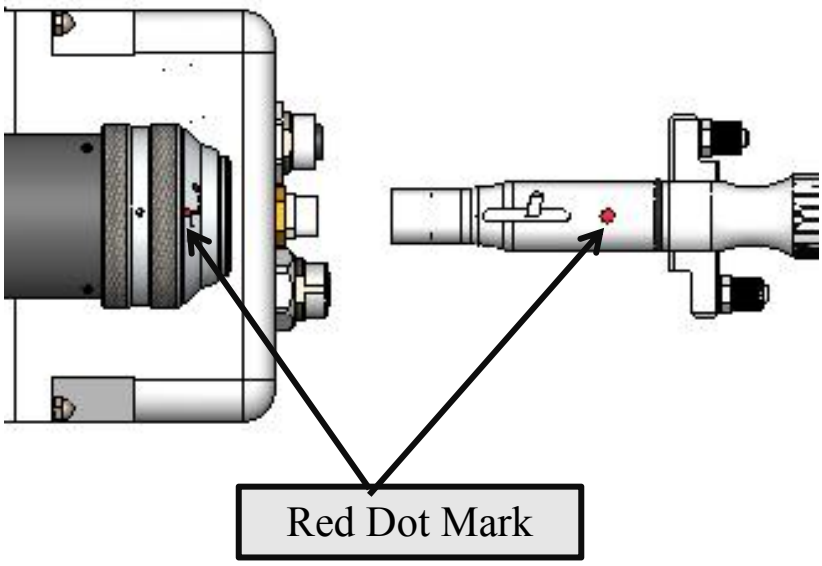

Figure 2.8

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. (Clockwise: toward the direction of the "locked" icon). (Do not twist with great force, otherwise the internal structure of the QBH may be damaged, as shown in Figure 2.9.

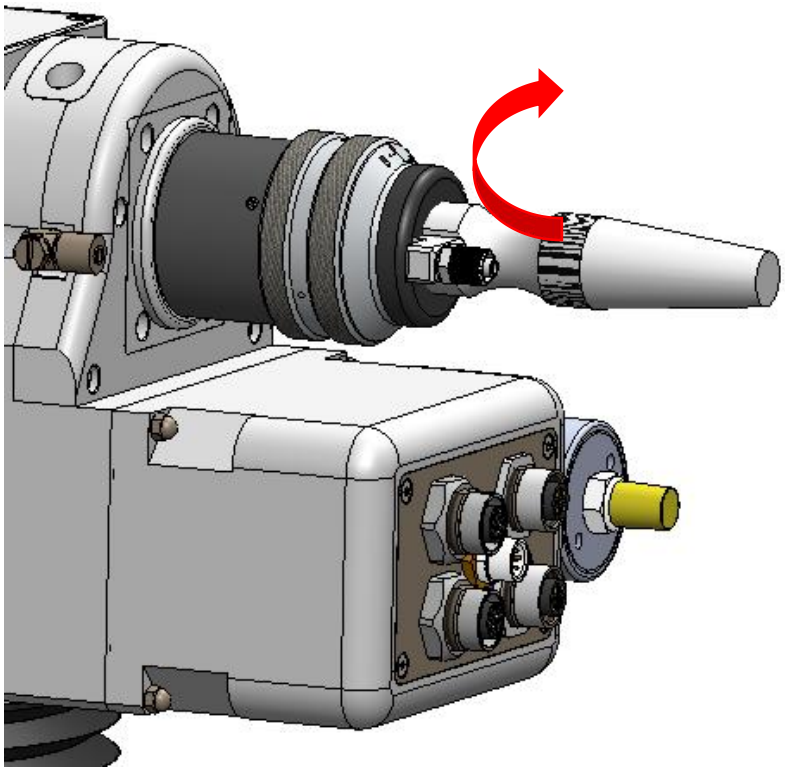

Figure 2.9

Attention: Wrap it with masking tape after plugging fiber to better protect the laser head from dust.

Chapter 4 Product Debugging

4.1 Collimation Focusing Instruction

Focusing scale reset - First reset the 4th axis after powering on the machine tool to ensure the focus of the focusing scale is at the zero point, specifically as follows:

Figure 3.0

① Open the software configuration platform and set the focus return distance as 20mm (which can be adjusted according to actual situation) in order that the focus is at the zero point (taking Cypcut as an example), as shown in Figure 3.0.

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

② After setting, open the cutting software and reset the focus to observe whether the focus moves, as shown in Figure 3.1:

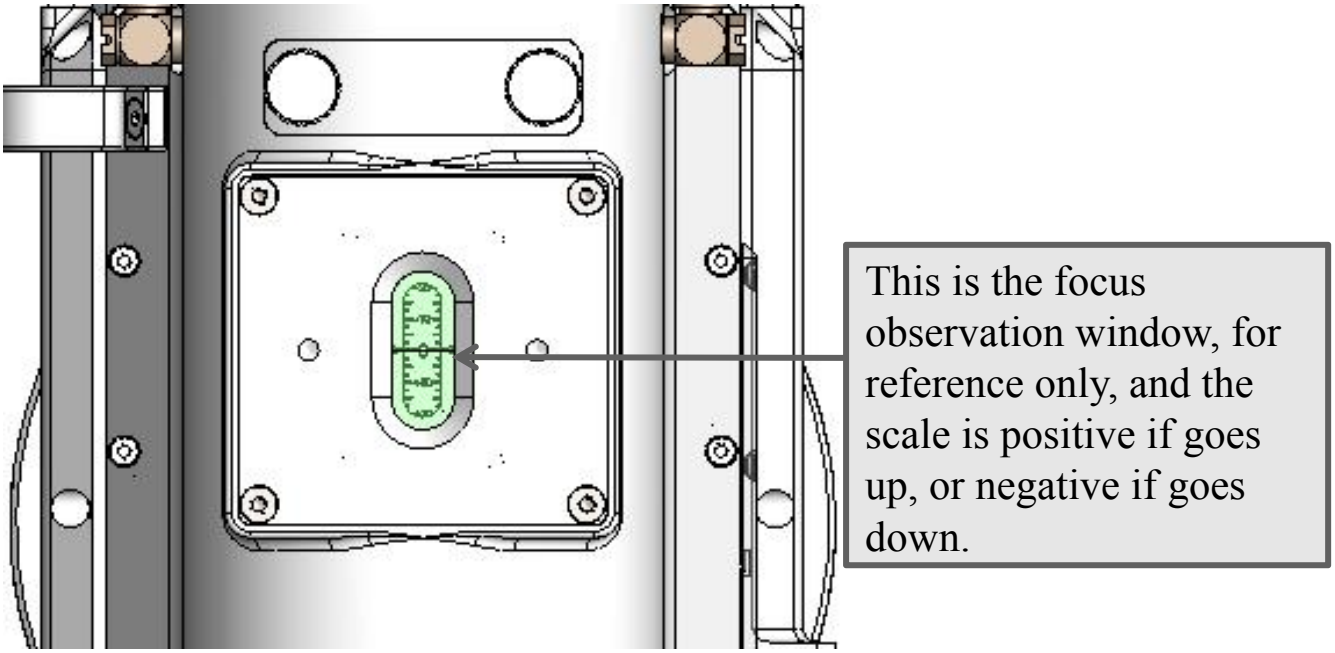

Figure 3.1

Attention: The scale numbers are for reference only, and the actual zero point should be subject to the actual focus. If looking straight ahead when the pointer returns to the origin, need to align with the zero point.

4.2 Follow-up Observation Instruction

After setting the parameters, reset directly, manually adjust and observe through the window whether the calibration is moving, as shown in Figure 3.2:

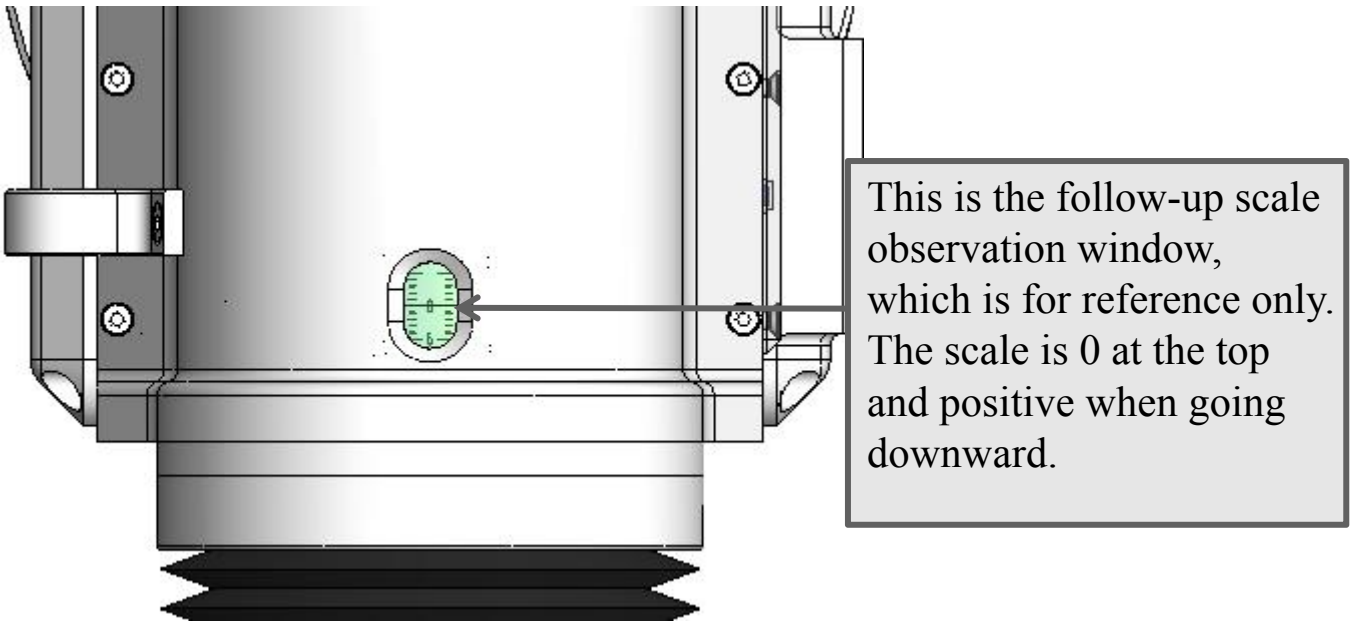

Figure 3.2

Attention: The scale numbers are for reference only, and the actual zero point shall be subject to the actual operation reference.

4.3 Focusing Instruction

To achieve good cutting effects, the laser beam must remain in the nozzle center. When it deviates from the nozzle center, it needs to be adjusted through the beam centering module, as shown in Figure 3.3.

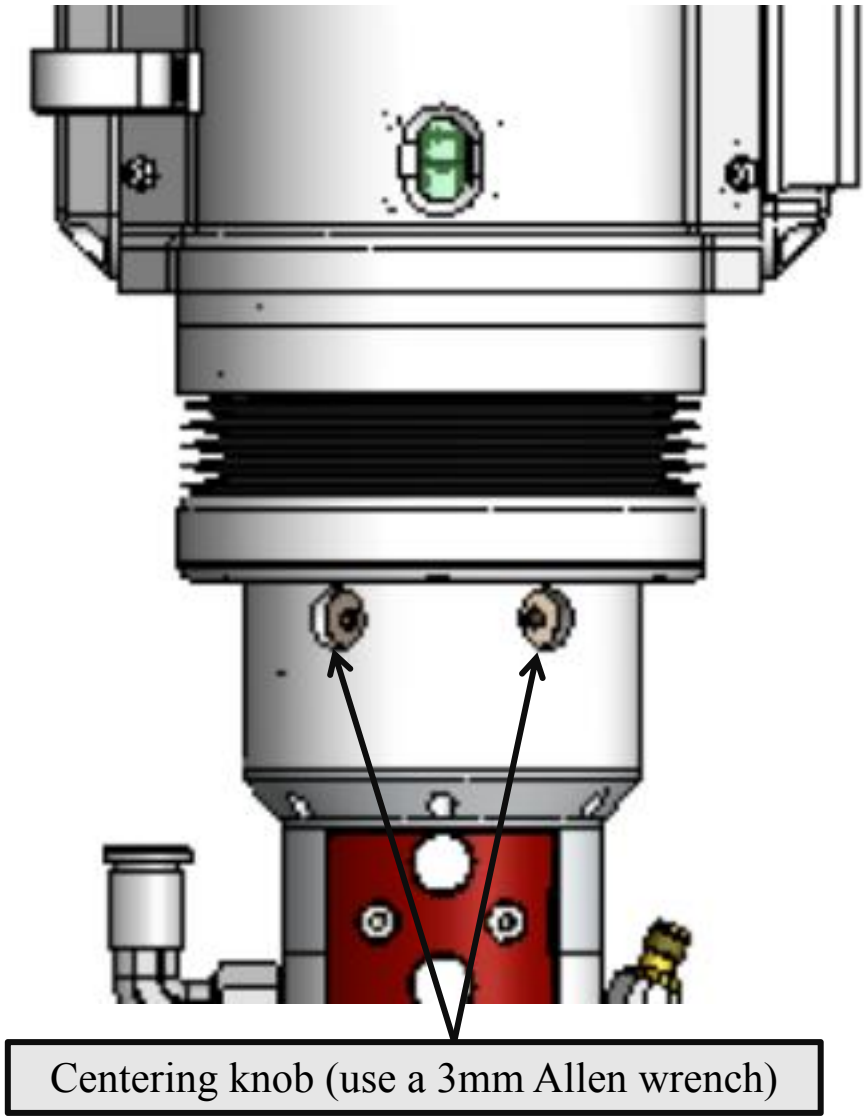

Figure 3.3

Relationship between beam position and adjustment knob

① Adjust the two centering knobs.

② Adjustment method: Forward and backward.

③ The beam movement position is consistent with the knob movement.

Chapter 5 Product Maintenance

5.1 Maintenance 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

As shown in Figures 3.4 and 3.5 below.

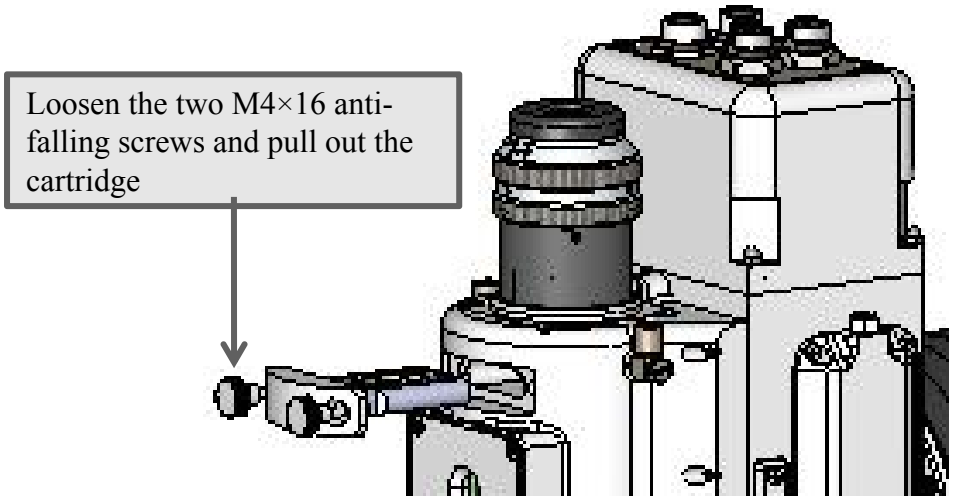

Figure 3.4

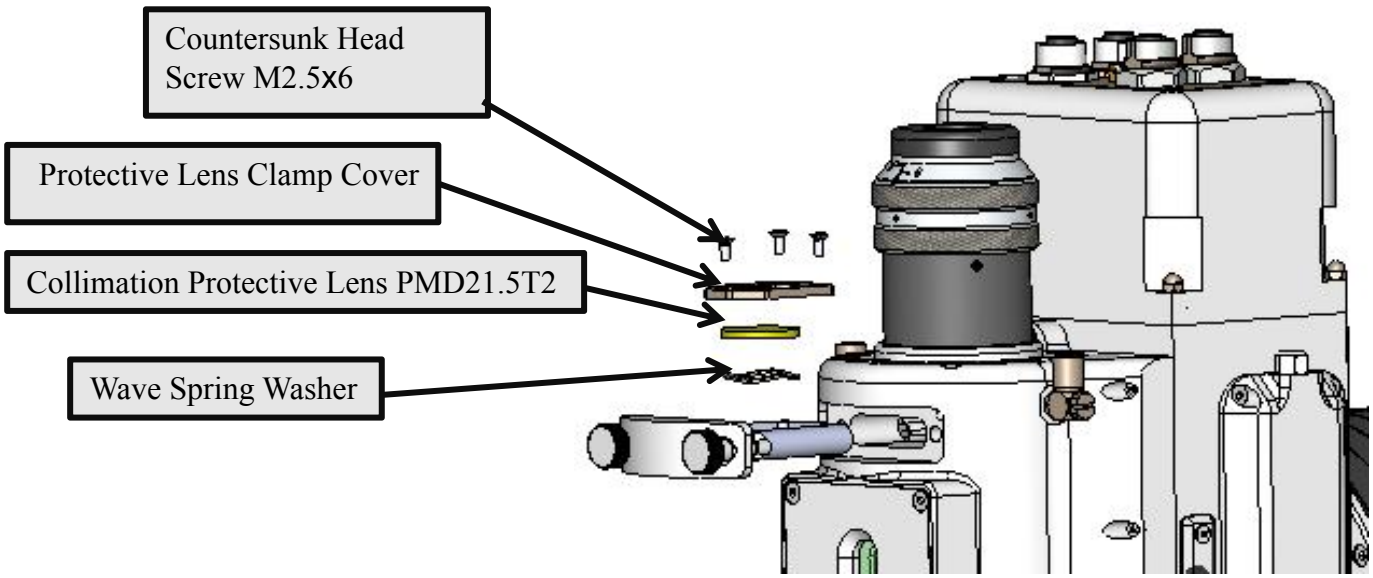

Figure 3.5

5.1.2 Disassembly of Focus Protective Lens

Remove the four M5x8 anti-collision screws and three M4x45 cylindrical head screws, take off the lower component; after taking out the protective lens clamp ring, take out the lens. Replace the protective lens (PMD25.4T3) as shown in Figures 3.6 and 3.7.

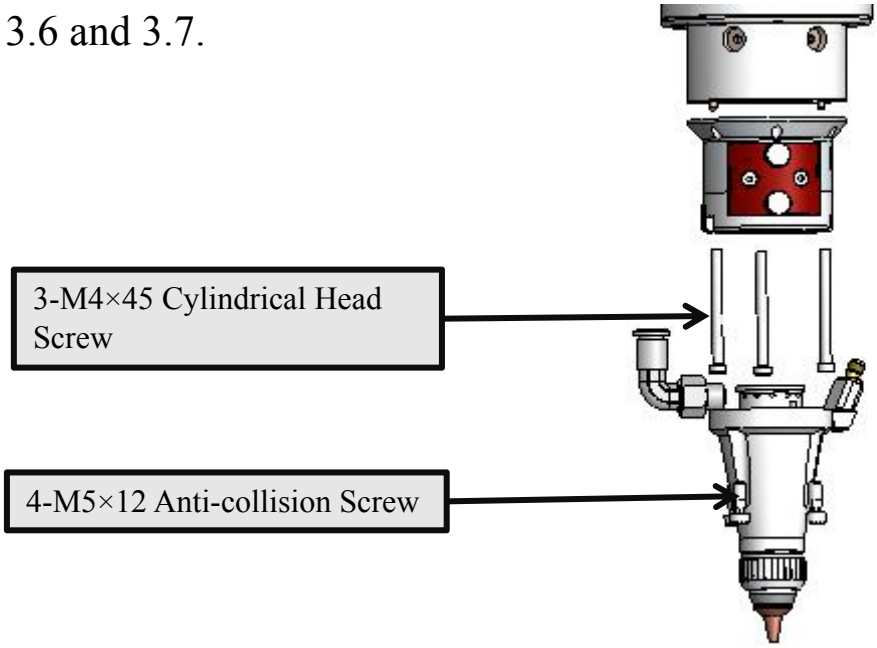

Figure 3.6

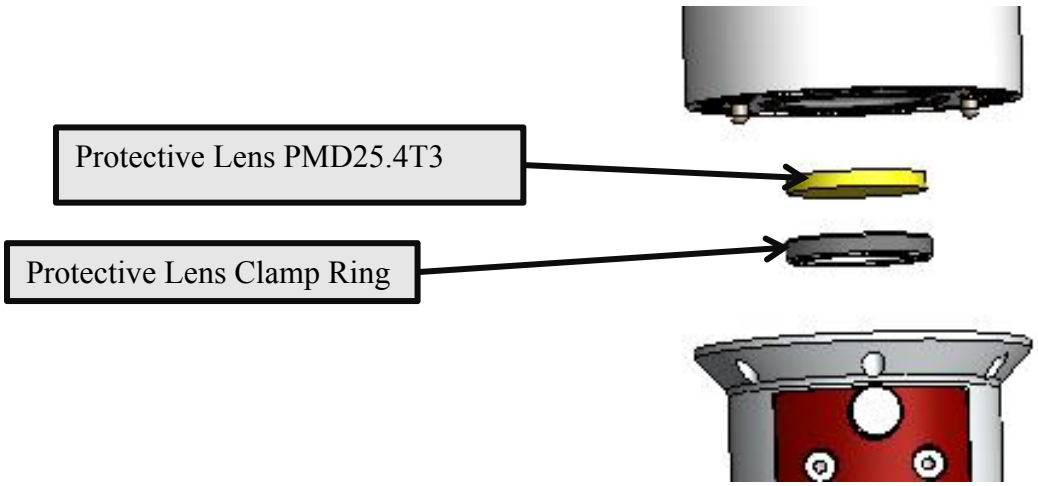

Figure 3.7

5.2 Maintenance of Collimation Lens

5.2.1 Disassembly of Collimation Lens

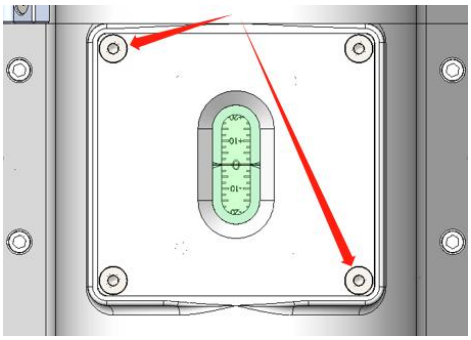

Figure 3.8

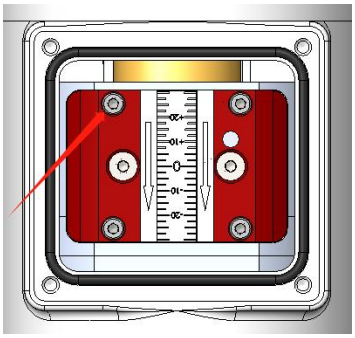

Figure 3.9

1. Remove the four M3x8 hexagon socket countersunk head screws for the collimation observation window cover as shown in Figure 3.8 and remove it.
2. Remove the four M2.5X8 cylindrical head screws as shown in Figure 3.9; and pull out the collimation lens cartridge for maintenance. Please mind the proper direction of collimation lens when assembling it.

5.2.2 Cleaning of Collimation Lens

Figure 4.0

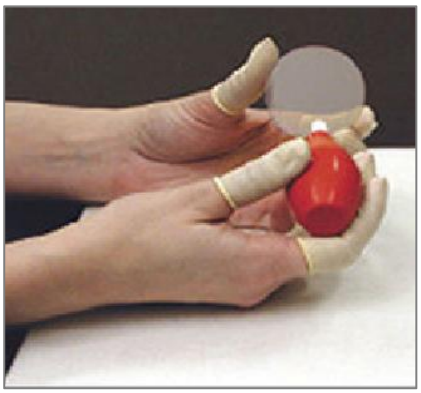

Figure 4.1

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

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

③ Gently pinch the both sides 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 4.0.

④ After wiping, blow the lens surface again with filled dry and pure compressed air to ensure that the cleaned lens surface is free of any foreign matter, as shown in Figure 4.1.

⑤ The 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 of Focus Lens

① As shown in Figure 4.2, remove the focus lens barrel placement assembly together with the sensor assembly; use a 3mm Allen wrench to remove the centering screws; after taking out the focus lens base, remove the lens clamping ring, take out and replace the lens.

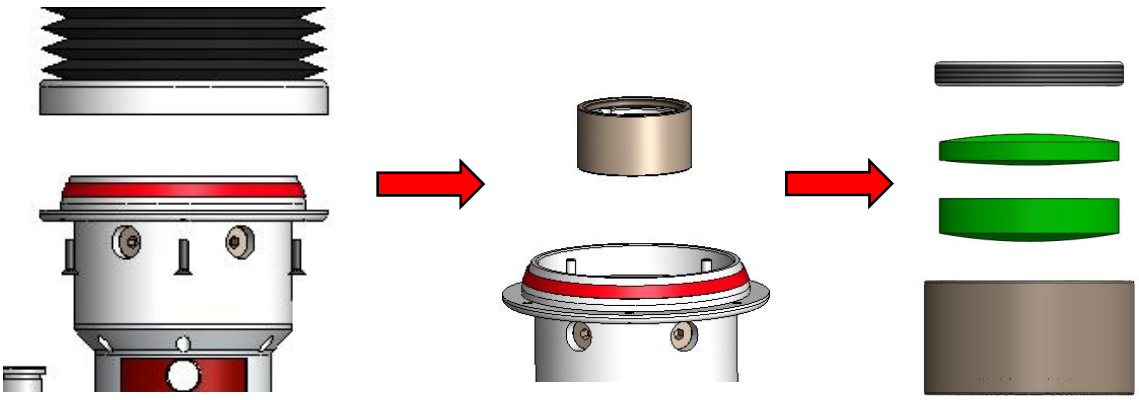

Figure 4.2

5.3.2 Cleaning of Focus Lens

Figure 4.3

Figure 4.4

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

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

③ Gently pinch the both sides 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 4.3.

④ After wiping, blow the lens surface again with filled dry and pure compressed air to ensure that the cleaned lens surface is free of any foreign matter, as shown in Figure 4.4.

⑤ The 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 M3×10 and M3x13 hand-tightened anti-falling screws, hold the screws and slowly pull out the protective lens assembly, and move it to a clean and dust-free environment, as shown in Figure 4.5. The detailed diagram of replacing lens is as shown in Figure 4.6.

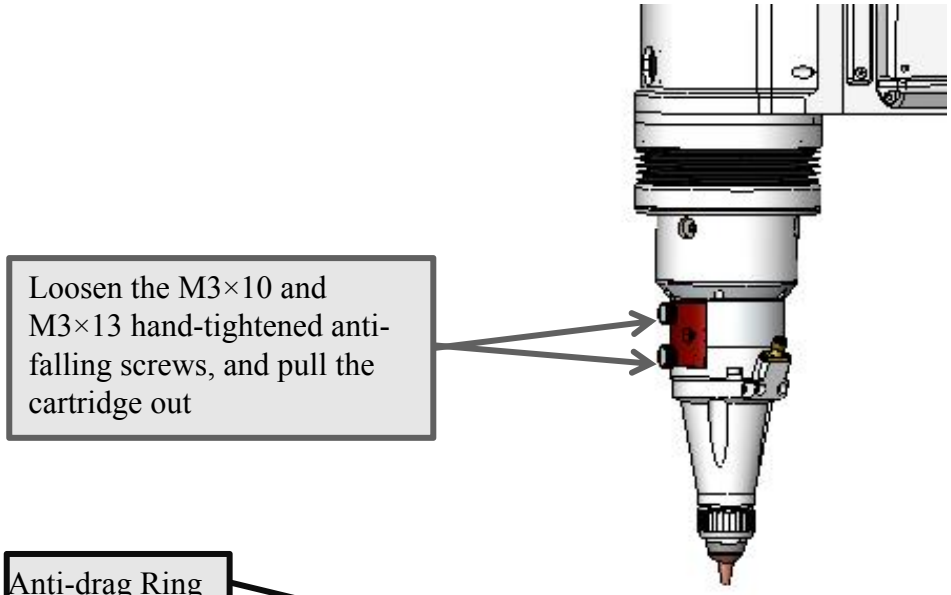

Figure 4.5

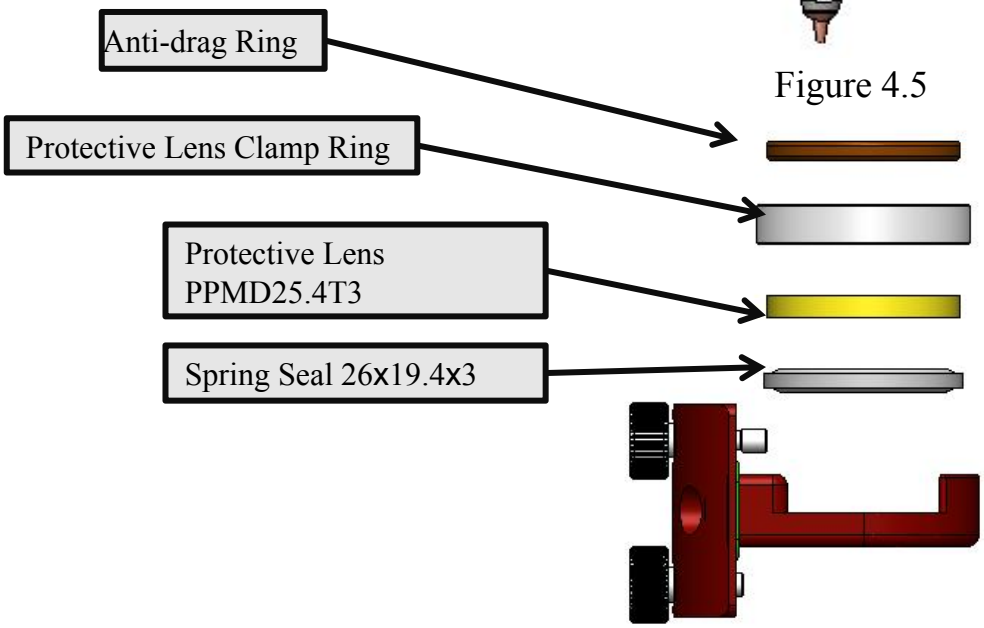

Figure 4.6

The assembly sequence is as shown in the figure above

5.4.2 Cleaning of Protective Lens

Figure 4.7

Figure 4.8

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

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

③ Gently pinch the both sides 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 4.7.

④ After wiping, blow the lens surface again with filled dry and pure compressed air to ensure that the cleaned lens surface is free of any foreign matter, as shown in Figure 4.8.

⑤ The 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, the focus lens, collimation lens and cutting lens are generally forbidden to be disassembled. If lenses may be contaminated, users can first test the lenses with ceramic piece, or contact with our technical staff if necessary .

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:

① Dry 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.

② The 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.

③ The 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.

④ The shape and size of the cutting nozzle would directly affect the characteristics of the sensor. Therefore, specified cutting nozzle must be used.

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