LCR03-Instruction Manual

Product Description

Shenzhen Ospri Intelligent Technology Co., LTD

Foreword

Dear Users:

Welcome to use the 3D laser cutting head LCR03 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 5 Product Maintenance

Chapter 1 Overview

1.1 Product Parameters

① Product parameters, as shown in Table 1.0.

Name	3D fiber laser cutting head
Model	LCR03
Interface Type	QBH
Wavelength	1080±10nm
Rated Power	≤4KW
Focus Length	125mm /150mm
Collimation Focal Length	75mm
Nozzle Model	Various models and specifications
Focusing Range	-12mm~+12mm -9mm~+9mm
Centering Range	±1.5mm
Manual Focus Positioning Accuracy	0.1mm
Follow-up Stroke	27mm
Follow-up Speed	≤250mm/s
Gas ressure	≤2.5Mpa
Weight	5KG

Table 1.0

1.2 Precautions

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 the cutting head and laser nozzle due to deviation of the laser beam from the central axis.

③ Keep the cutting head clean to prevent coolant, condensation, or other foreign matter from entering sensor parts, as this may cause sensor failure.

④ When processing products with a 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.

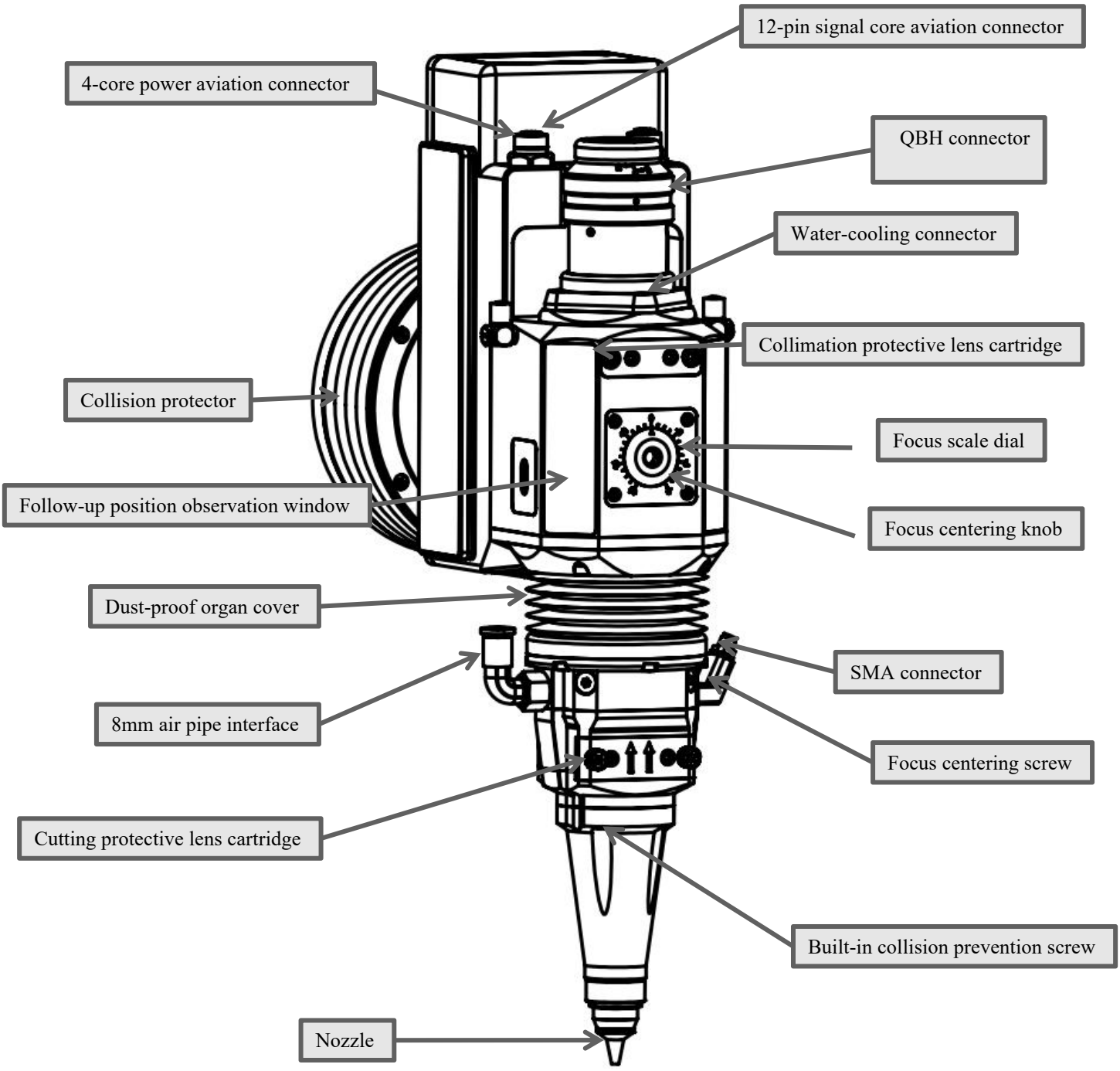


Figure 1.0

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. Focus centering knob: Adjust focus position.
7. Cutting protective lens cartridge: Seal the auxiliary 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 cartridge: 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.

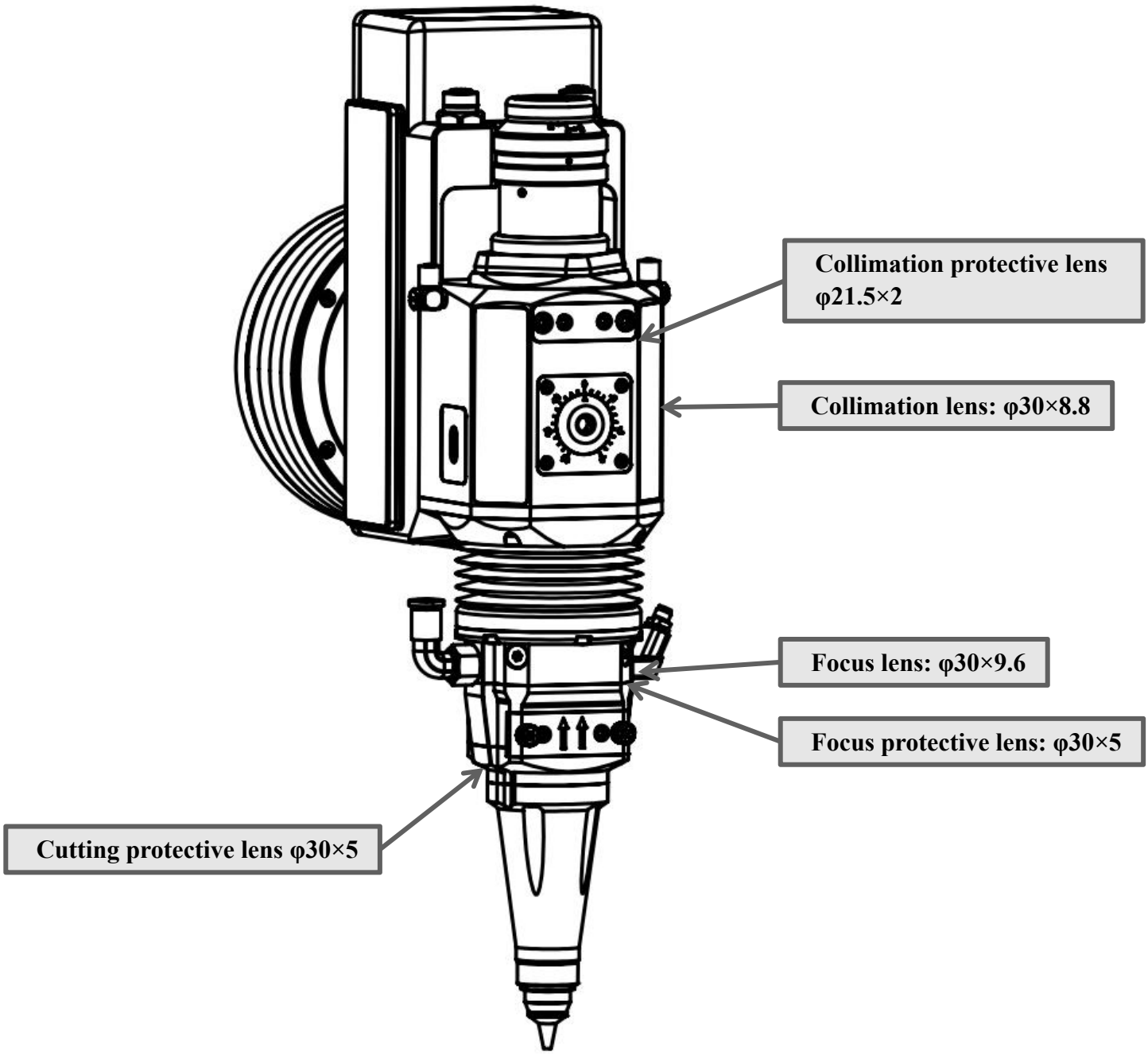


Figure 1.1

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.

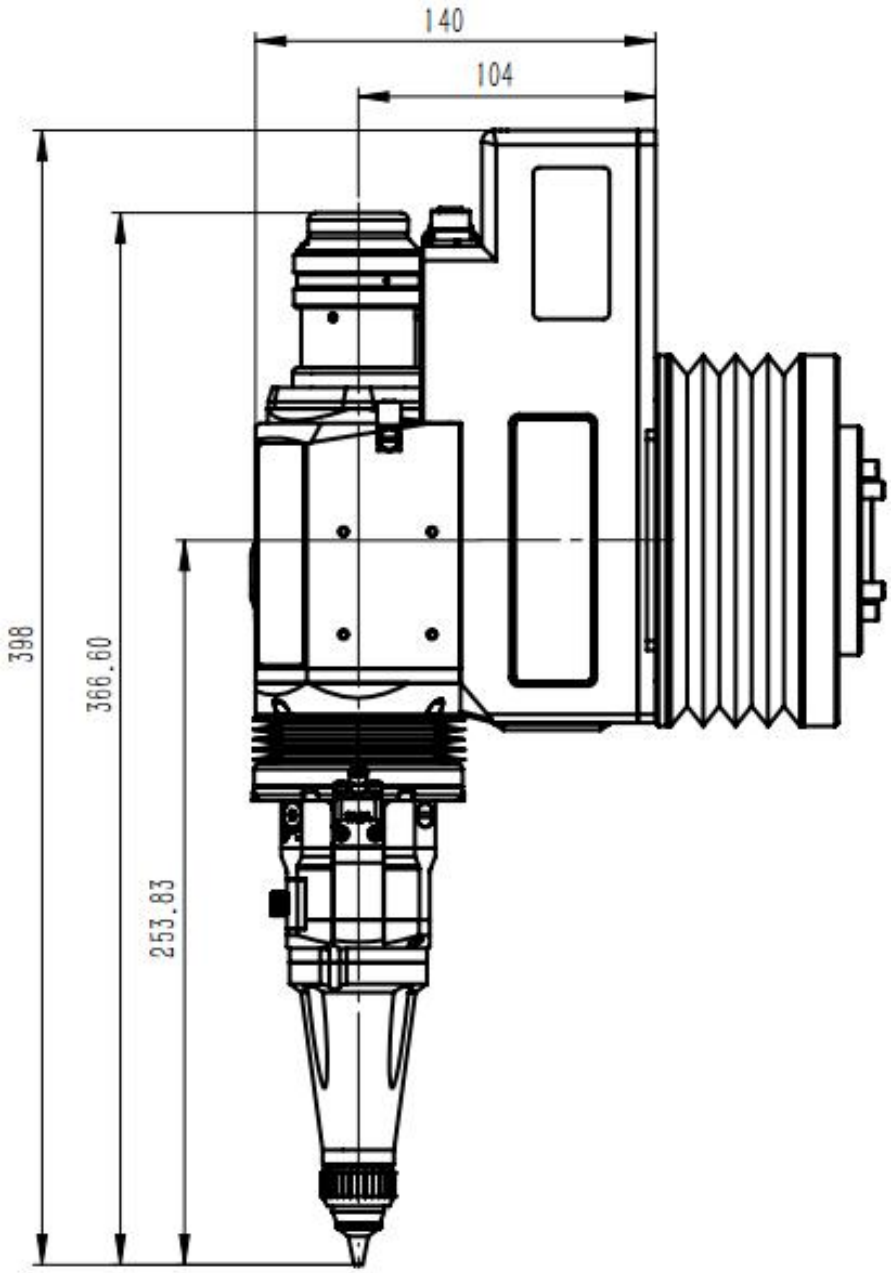


Figure 1.2

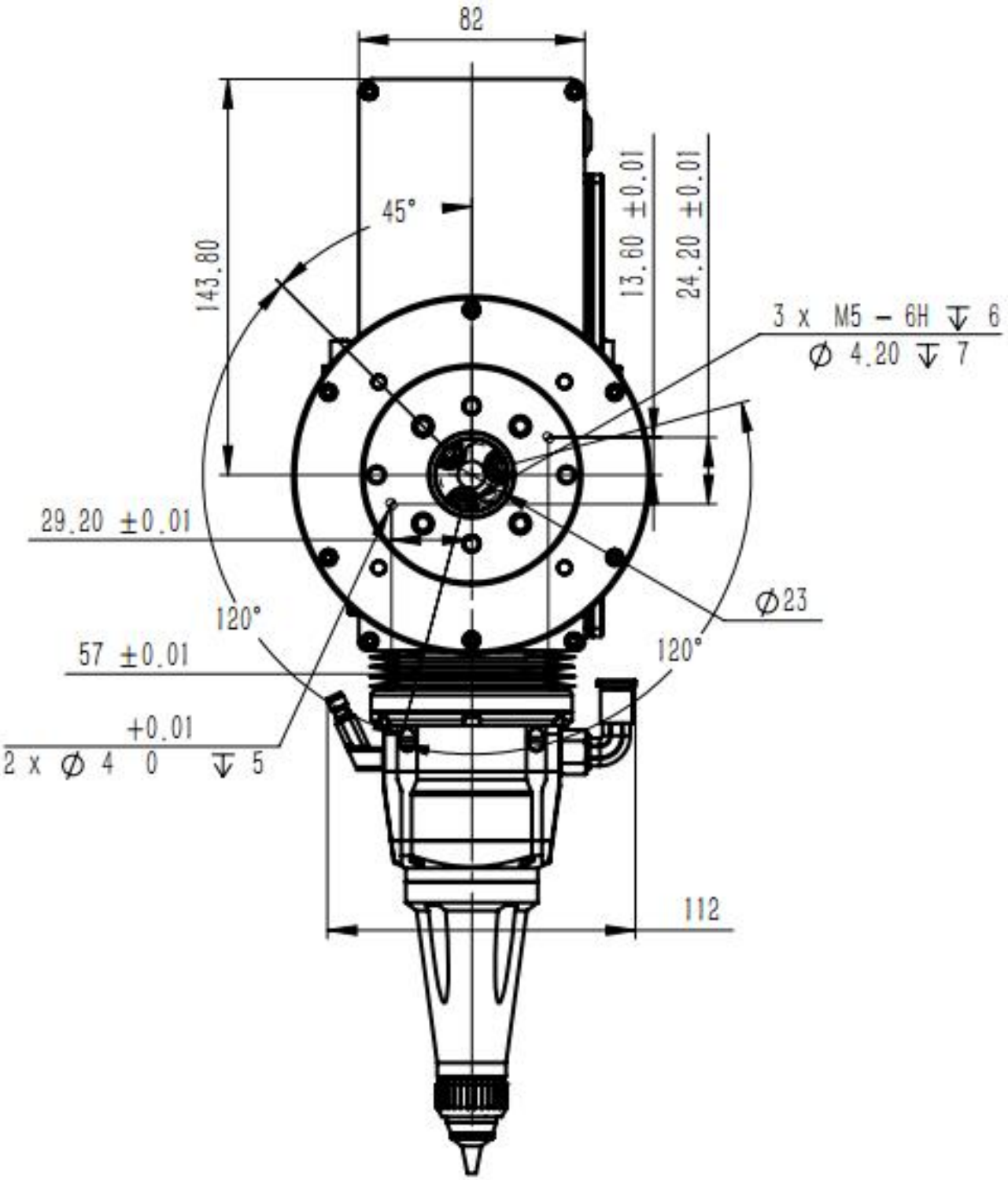

82
143.80
45°
13.60 ±0.01
24.20 ±0.01
3 x M5 – 6H ↧ 6
Ø 4.20 ↧ 7
29.20 ±0.01
Ø23
120°
57 ±0.01
120°
+0.01
2 x Ø 4 0 ↧ 5
112

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.

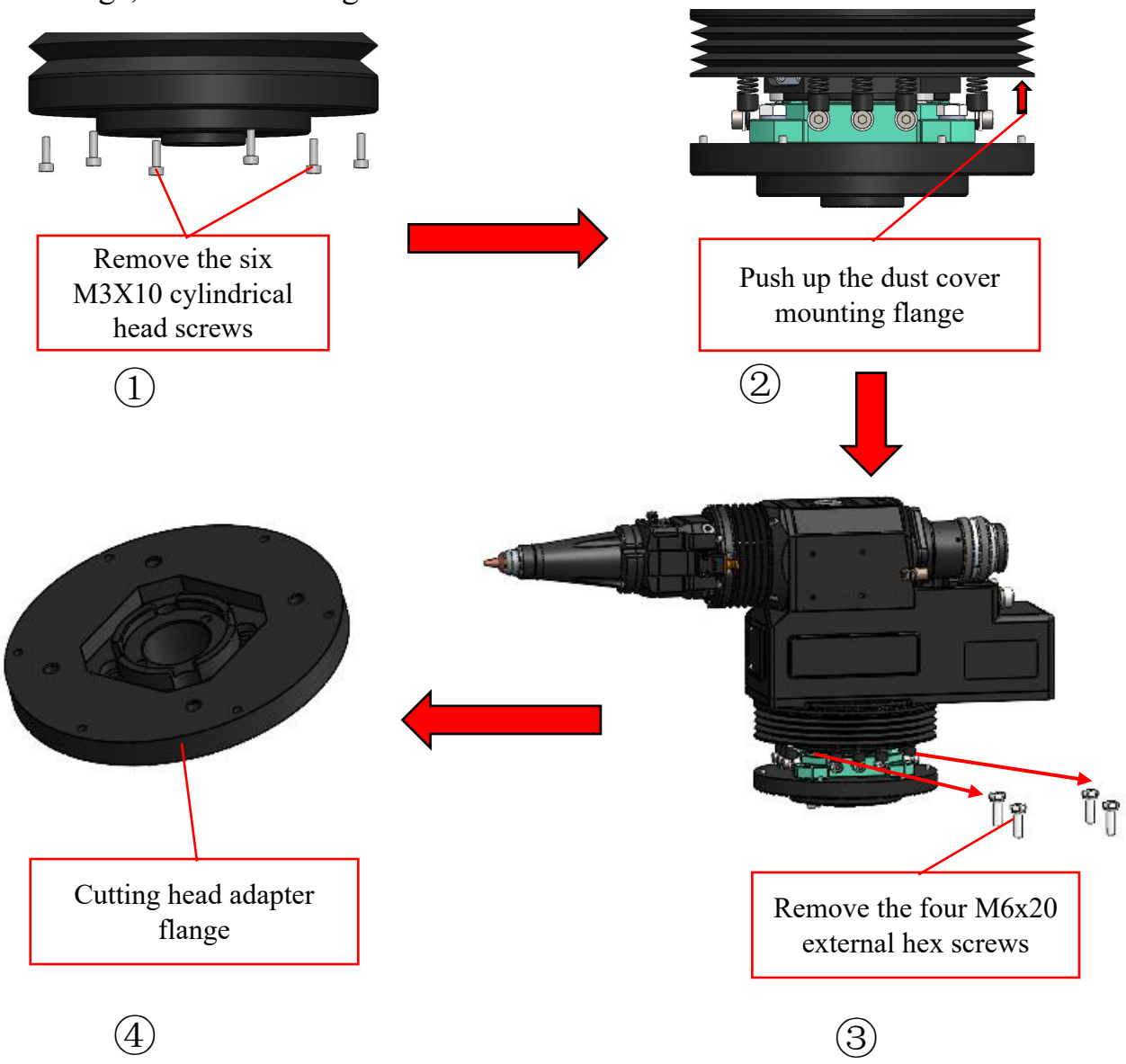


Figure 1.4

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.

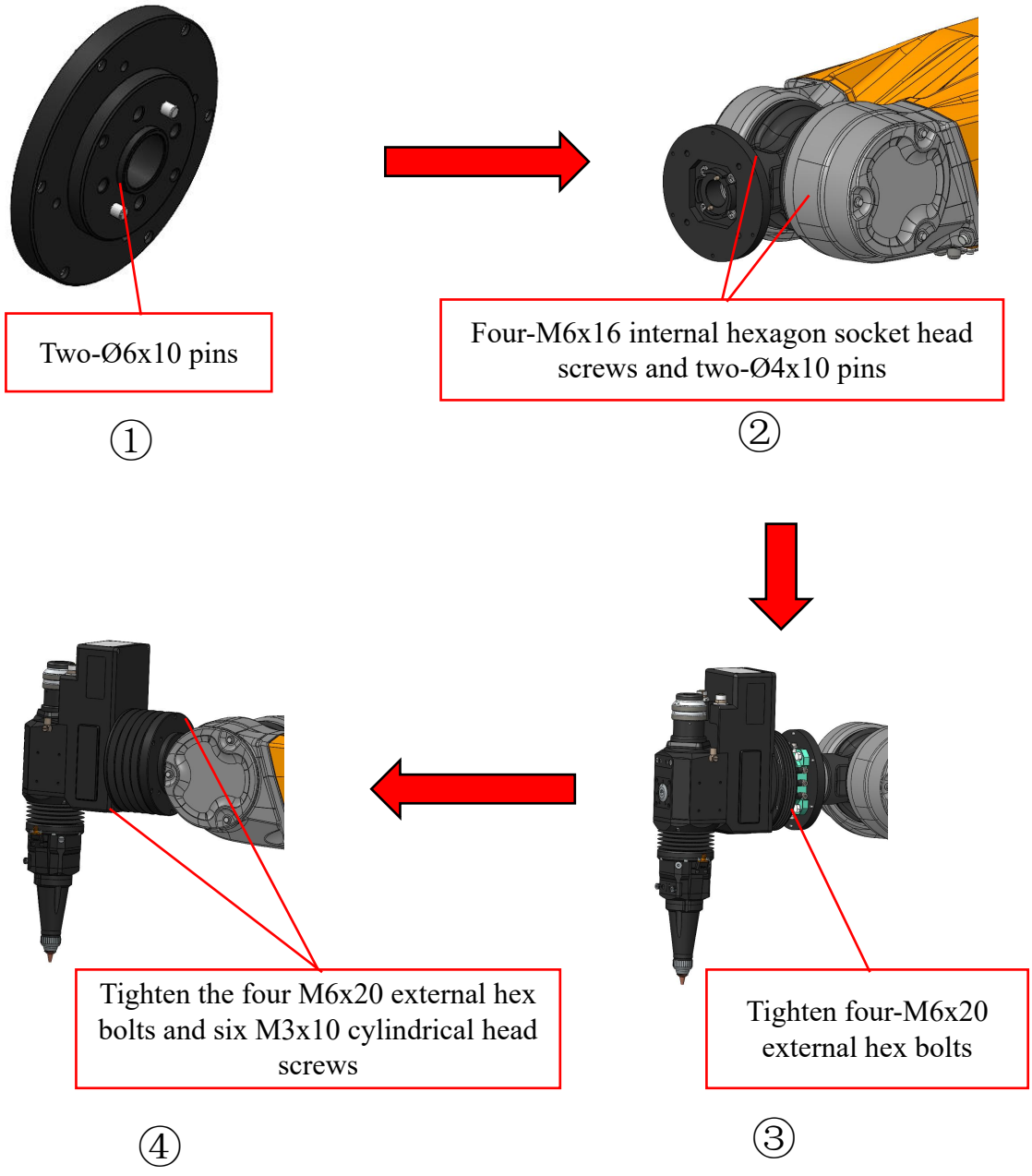


Figure 1.5

3.3 Pipeline Connection

3.3.1 Cooling Pipeline

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

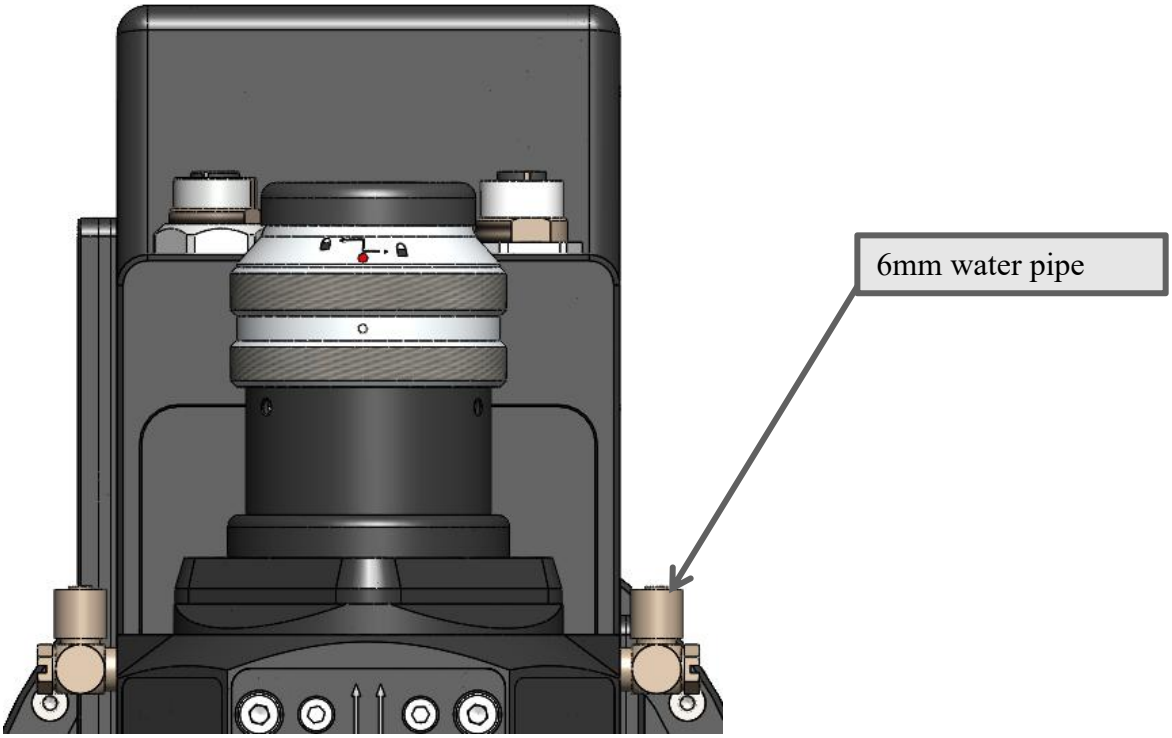


Figure 1.6

3.3.2 Auxiliary Gas Pipeline

①The 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.

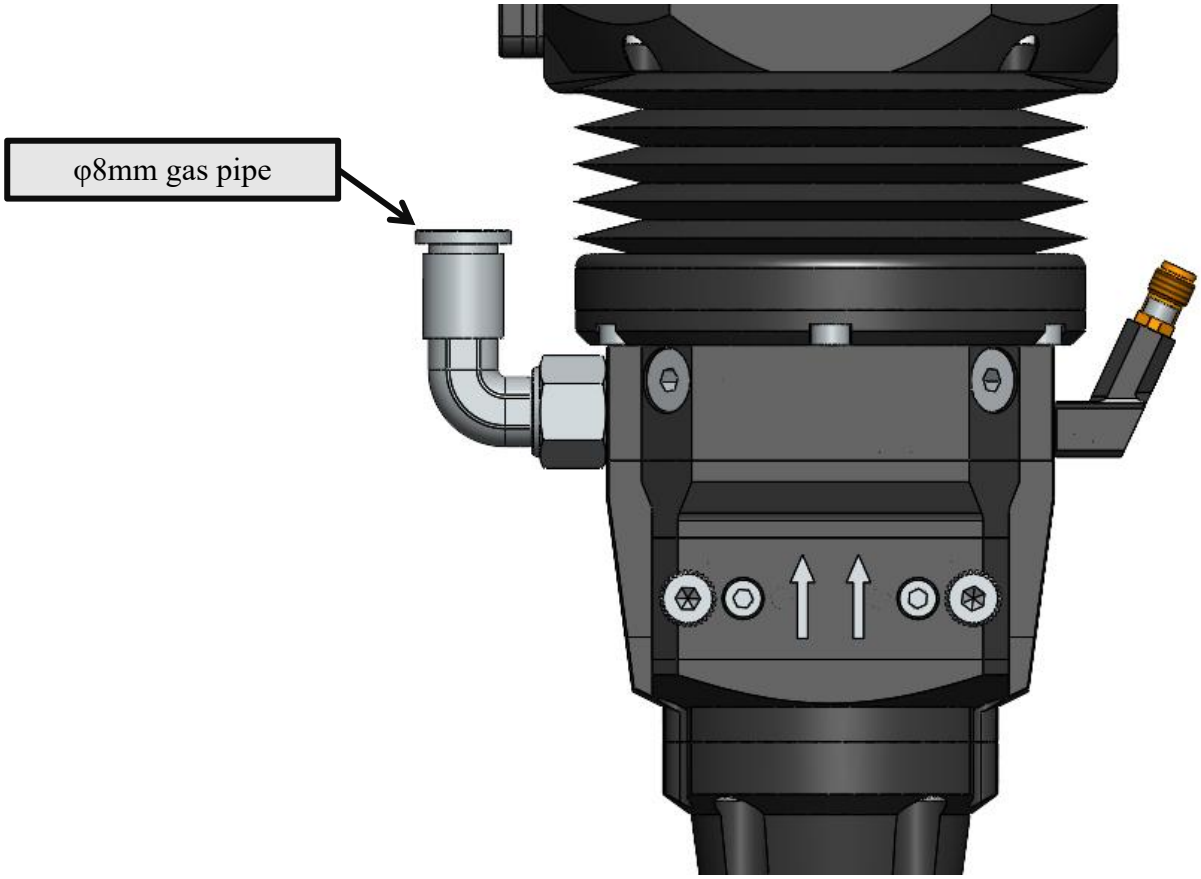
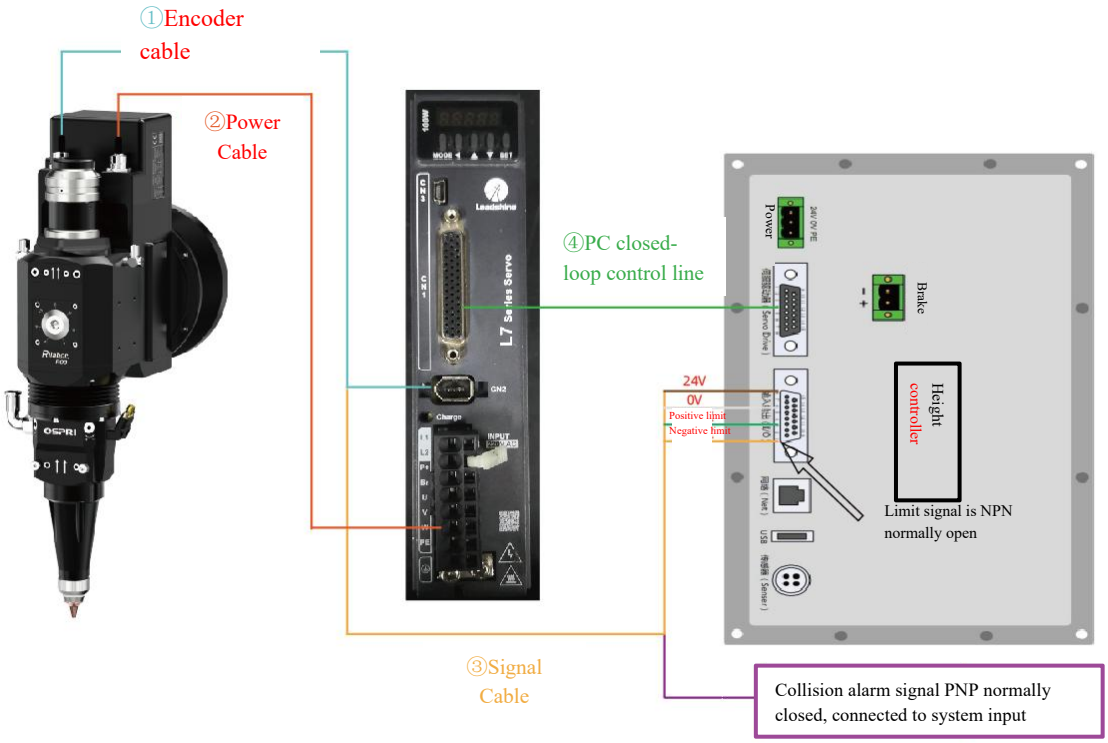


Figure 1.7

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

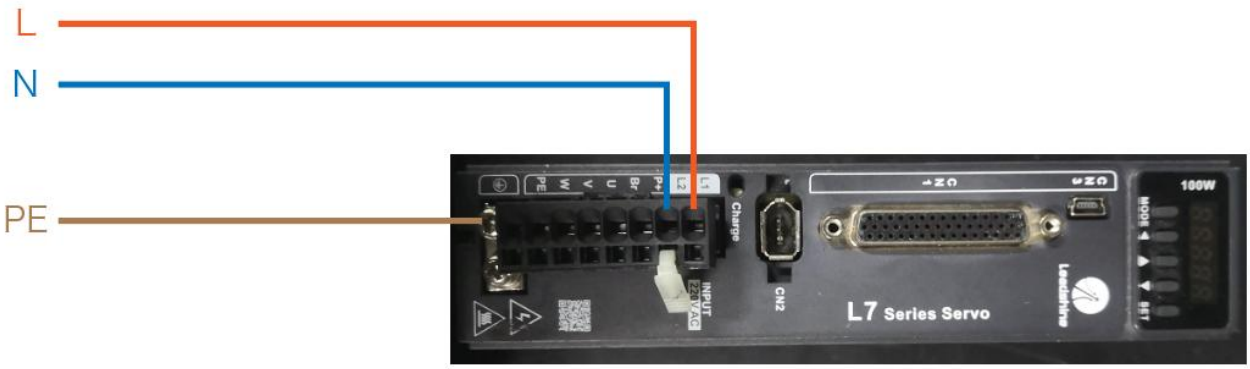
3.4 LCR03-PC Wiring Overview

3.4.1 Follow-up Axis Wiring Overview (L7RS-100).

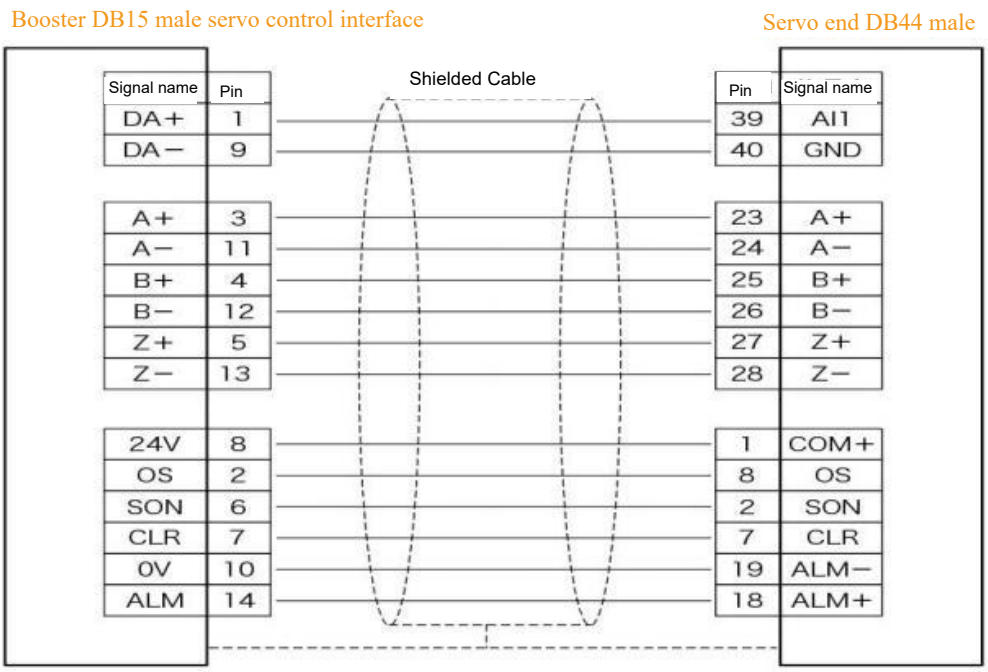


3.4.2 Line Definition

① Servo driver power wiring (single phase 220V)



② Booster wiring



③ Driver closed-loop parameter settings

Parameter number	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
PA011	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 clamp

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

Lead screw pitch is 5mm

3.5 QBH Fiber Laser Head Connection

① Place the cutting head horizontally, remove the white cap and the electrostatic sticker from the head, and take out the dust seal and dust cover, as shown in Figure 1.8.

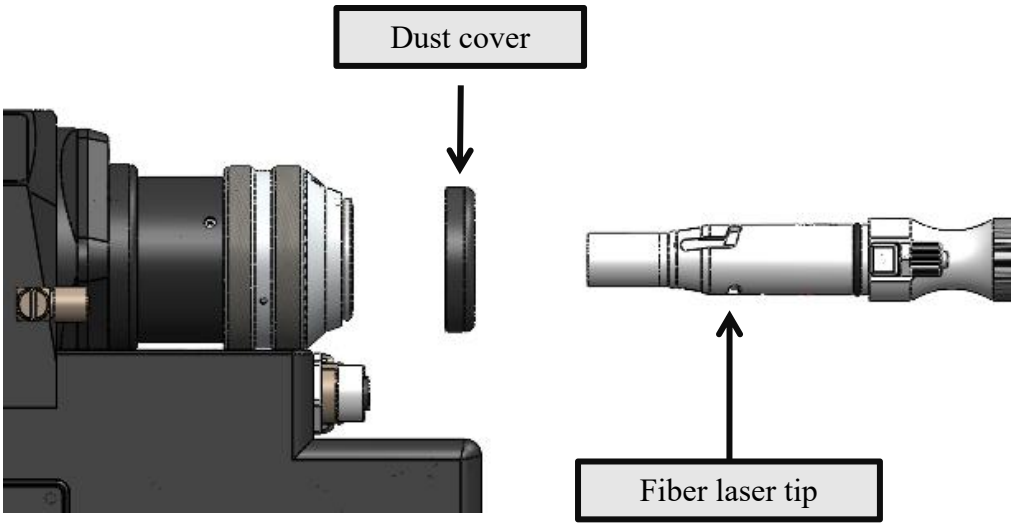


Figure 1.8

② Insert the dust cover from the white box into the fiber head, as shown in Figure 1.9:

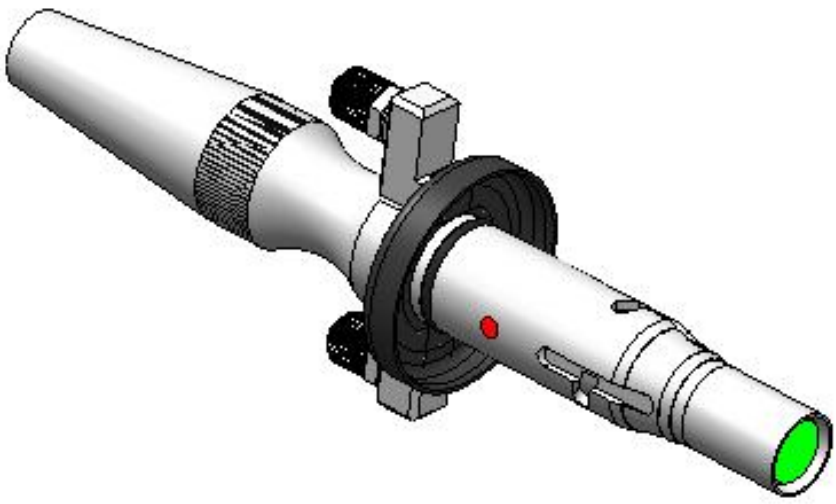


Figure 1.9

Note: If the laser head is originally equipped with a dust-proof pad, choose whether to install a dust cover based on actual conditions.

③ Unscrew the QBH connector to the open position: turn counterclockwise to the limit (you will hear a "click"), be careful to just turn it into place without over-tightening, which could damage the internal structure of the QBH, as shown in Figure 2.0.

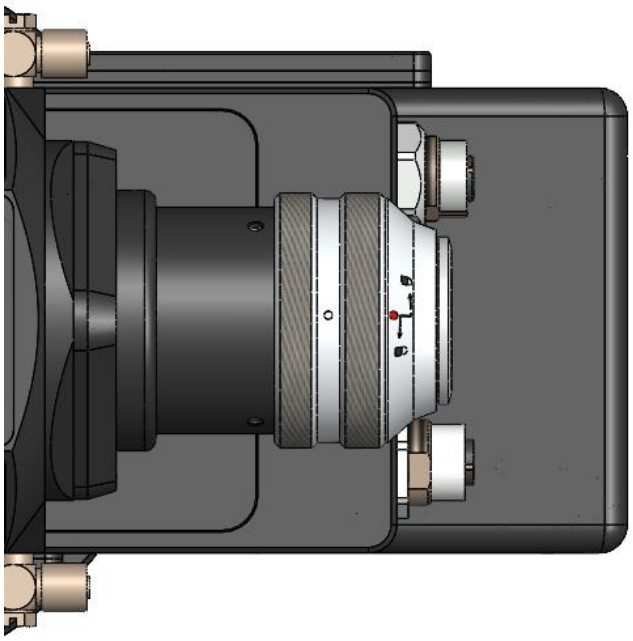


Figure 2.0

④ Align the red dot on the fiber head with the red dot on the QBH connector, slowly insert the fiber head into the QBH connector, as shown in Figure 2.1:

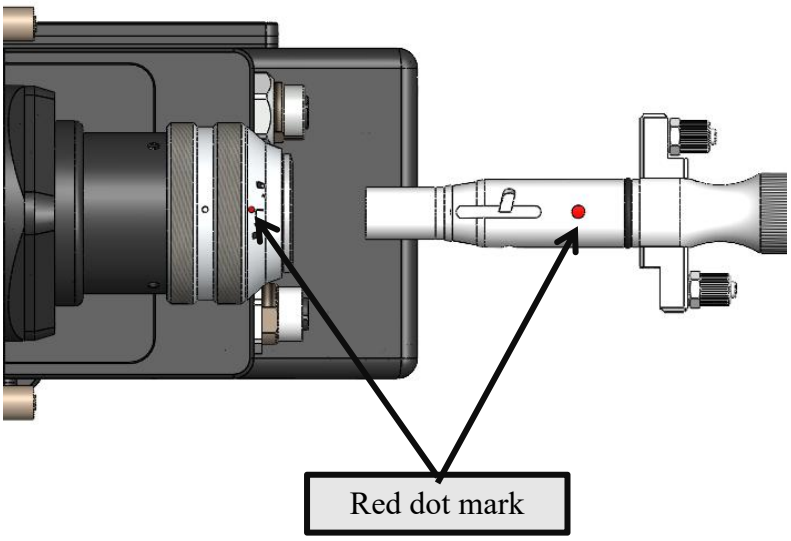


Figure 2.1

⑤ Turn clockwise to the limit position (you will feel a "click"), lift the rotating nut upwards, and then turn the nut clockwise again until it compresses the fiber head, screw the QBH connector to the locked position (be careful to just turn it into place without over-tightening, as this may damage the internal structure of the QBH), as shown in Figure 2.2.

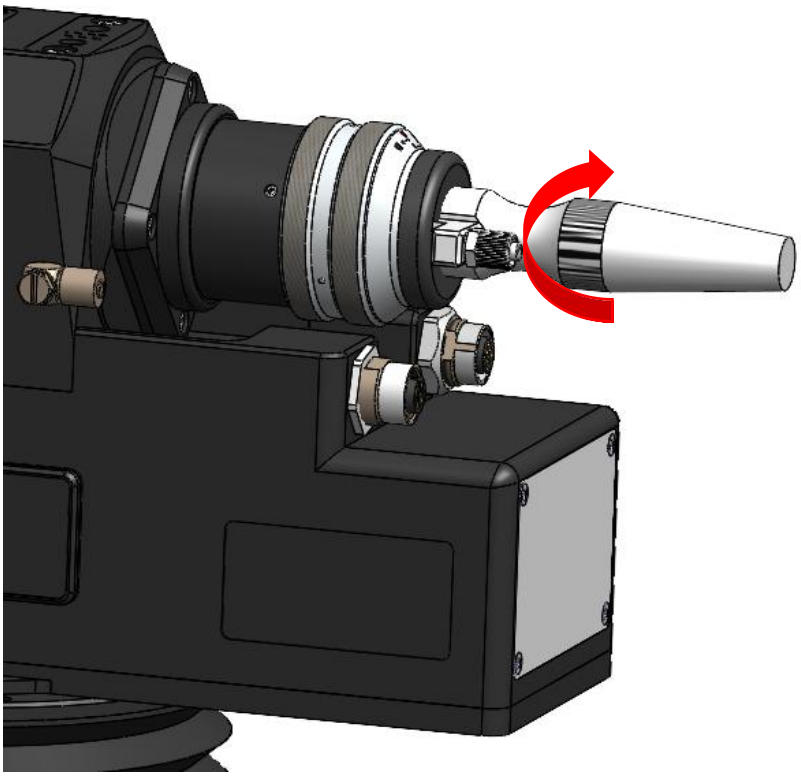


Figure 2.2

Note: After inserting the fiber, you can wrap several turns with masking tape for better dust protection and enhanced protection of the laser head.

Chapter 4 Product Debugging

4.1 Collimation Focusing Instruction

To achieve optimal cutting results for different materials and thicknesses, focus adjustment should be made using the focus adjustment module.

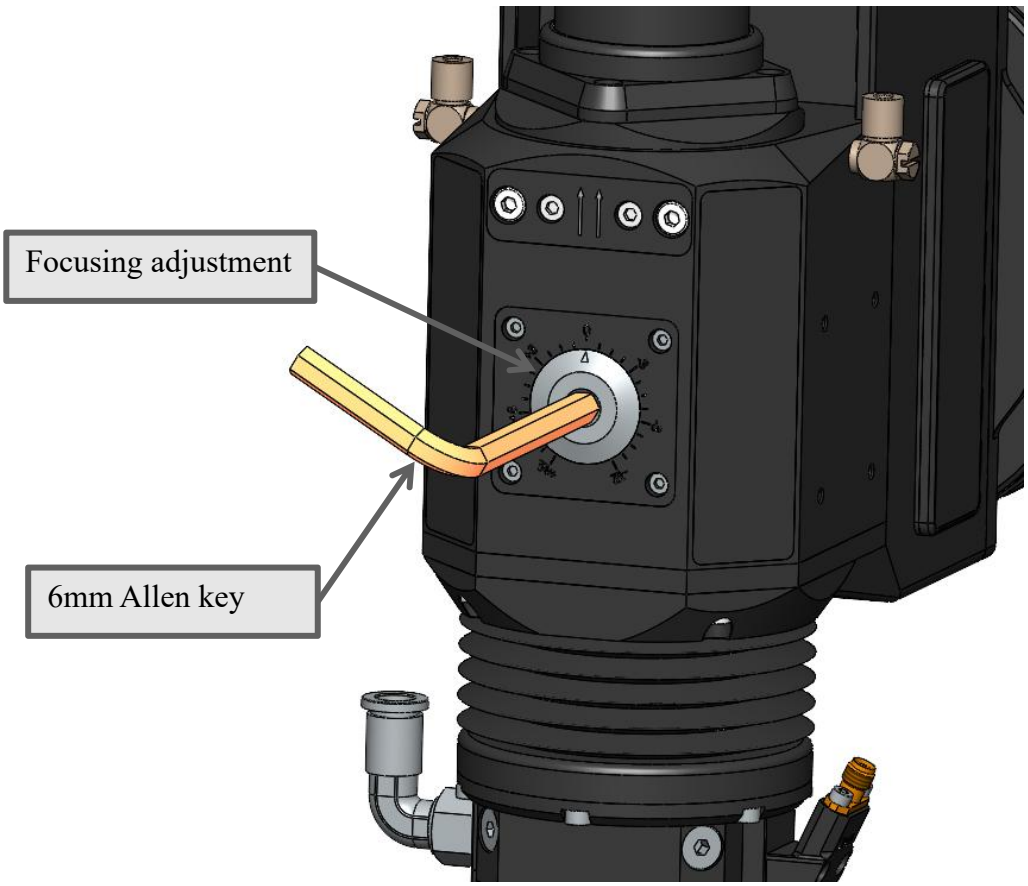


Figure 2.3

Relationship between focus position and adjustment knob
① The rotation angle of the adjustment knob is 0-300 degrees.
② The adjustment travel for the focus position is 24 (±12) mm / 18 (±9) mm.
③ The smallest scale increment is 1.0mm; at scale number 0, the focus is at the plane of the nozzle's end.
④ For example, when the scale is adjusted clockwise to +5, the focus is at the top (within 5mm of the nozzle plane). When the scale is adjusted counterclockwise to -5, the focus is at the bottom (outside 5mm of the nozzle plane).

4.2 Follow-up Observation Instruction

After setting parameters, reset directly and manually check through the window to observe if the scale is moving, as shown in Figure 2.4.

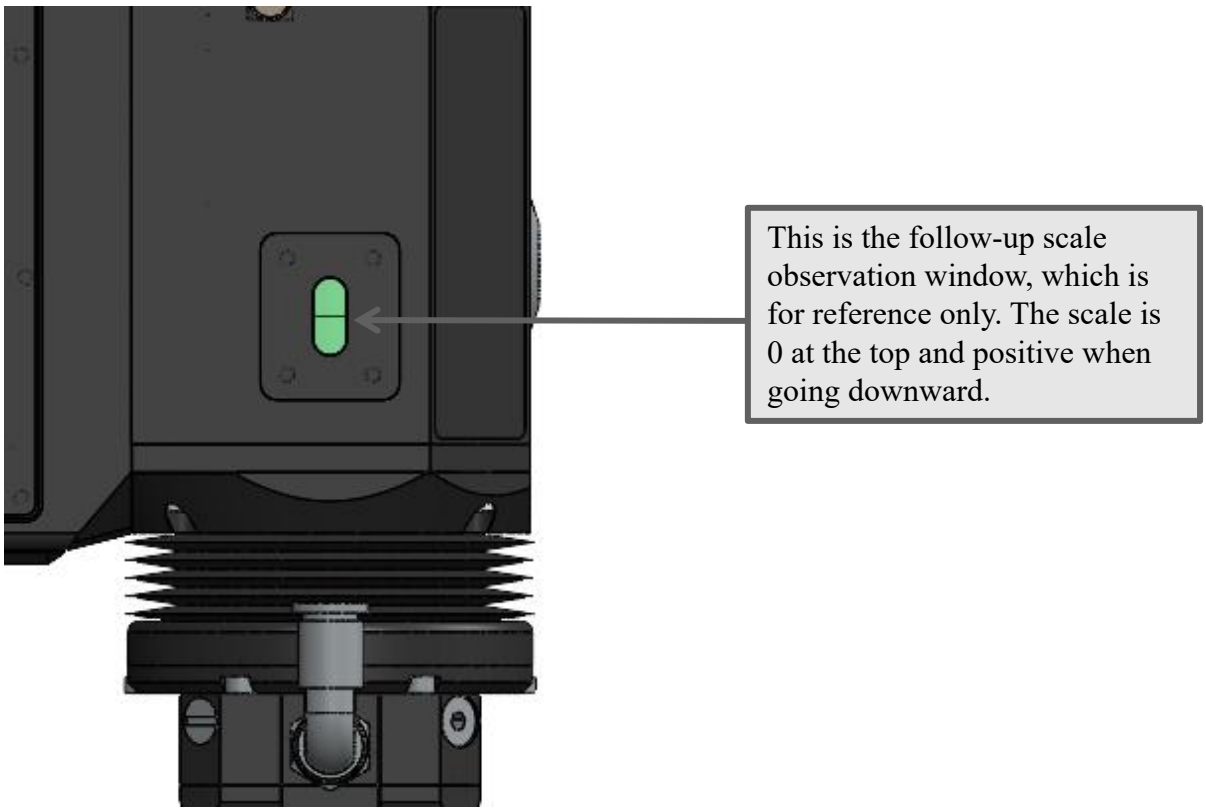


Figure 2.4

Note: The numbers inside the scale are for reference only; the actual zero point should be determined based on operational reference.

4.3 Focusing Instruction

To achieve optimal cutting performance, the laser beam should be centered in the nozzle. If it deviates, adjust it using the beam centering module, as shown in Figure 2.5.

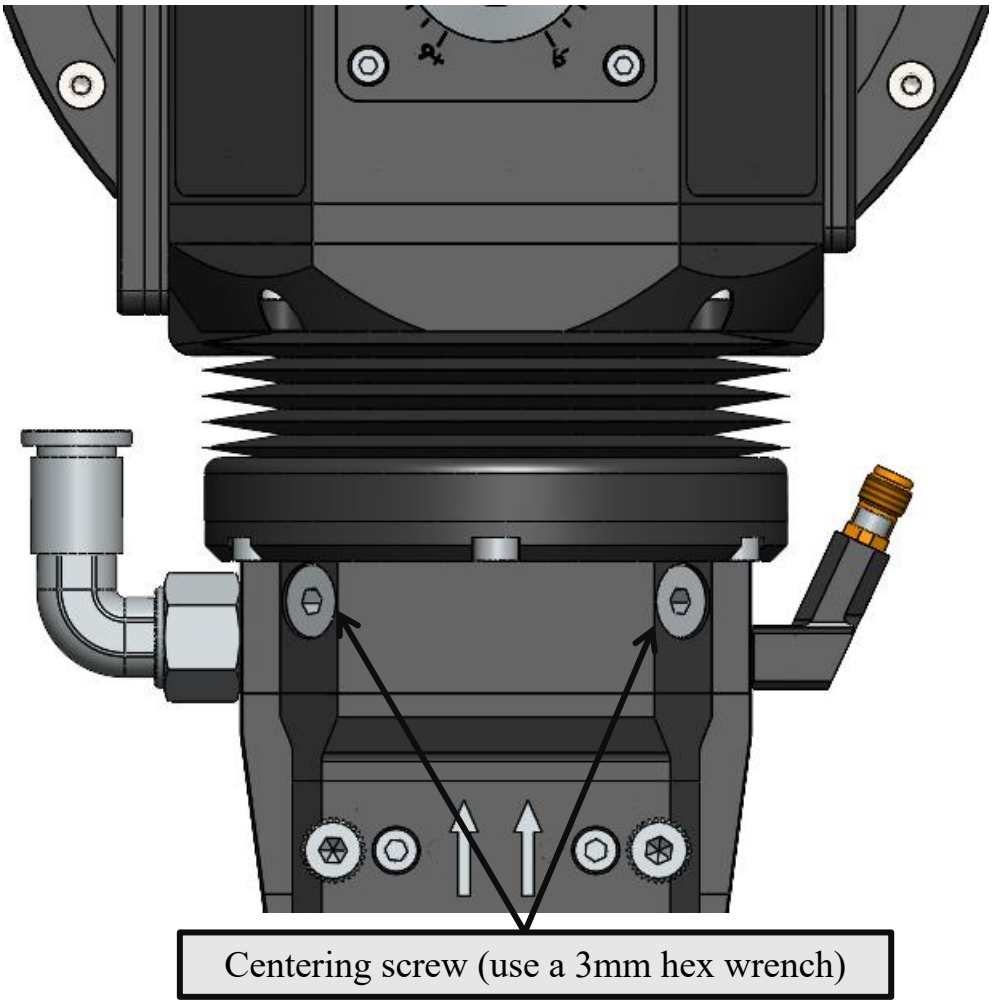


Figure 2.5

Relationship between beam position and adjustment knob

① There are two centering knobs.

② Adjustment method: Forward and backward.

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

Chapter 5 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, as shown in Figures 2.6 and 2.7 below.

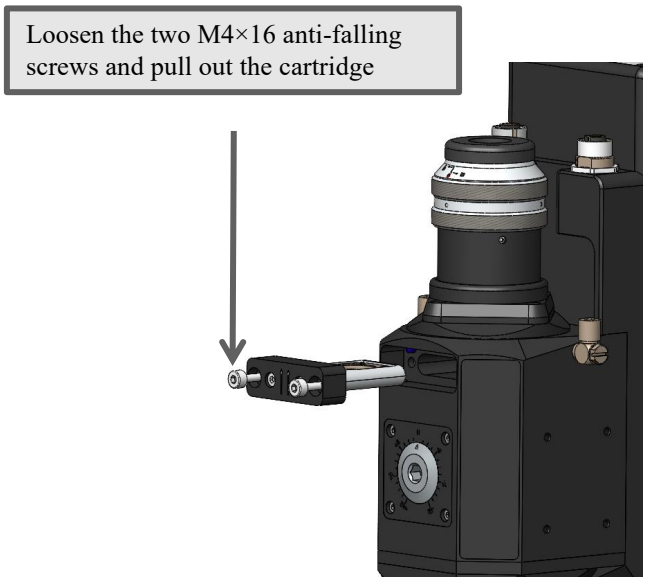


Figure 2.6

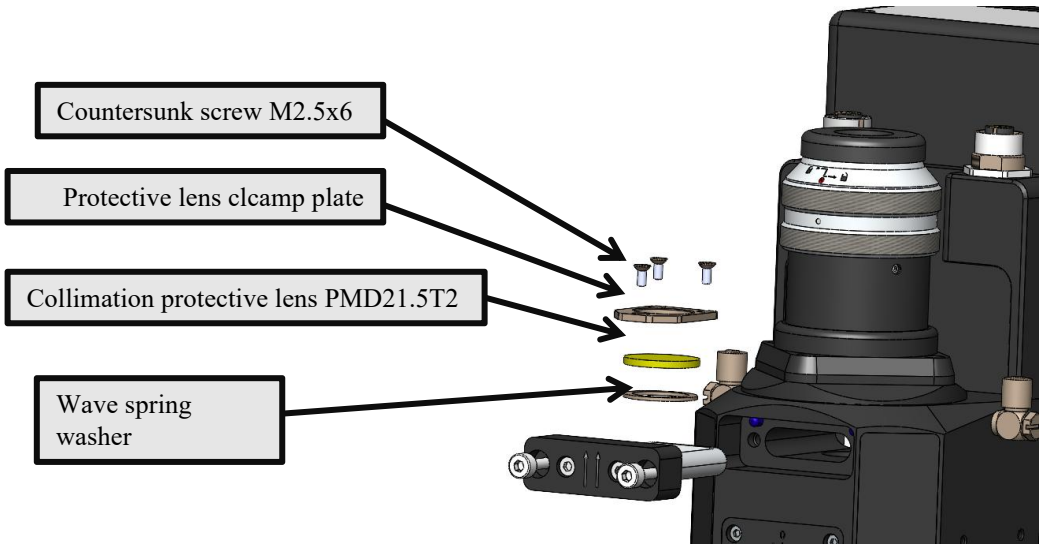


Figure 2.7

5.1.2 Disassembly and Assembly of Focus Protective Lens

Remove four-M3×35 (head 4.5) cylindrical head screws and take down the follow-up lower part assembly; after removing the protective lens clamp ring, take out the lens. Replace the protective lens (PMD30T5), as shown in Figures 2.8 and 2.9.

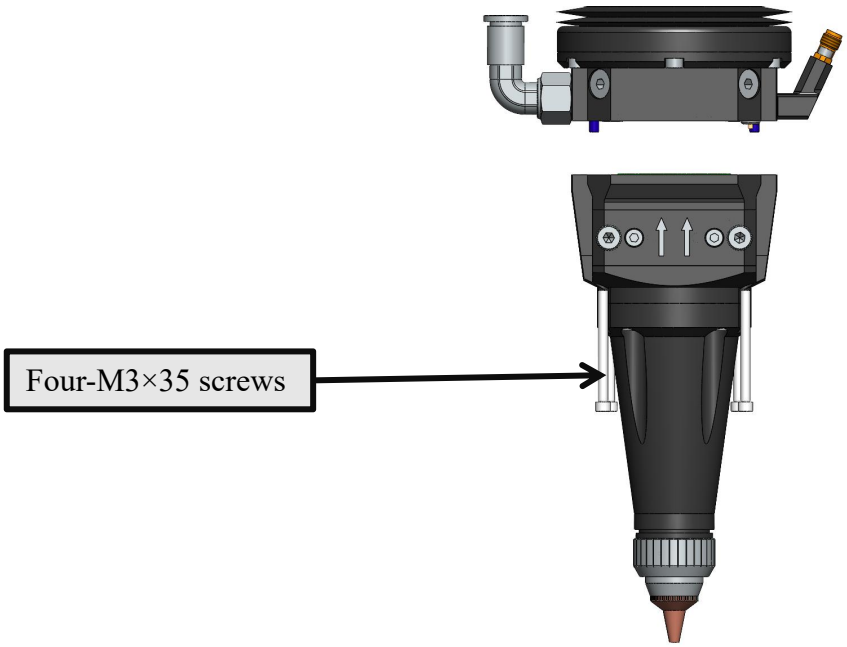


Figure 2.8

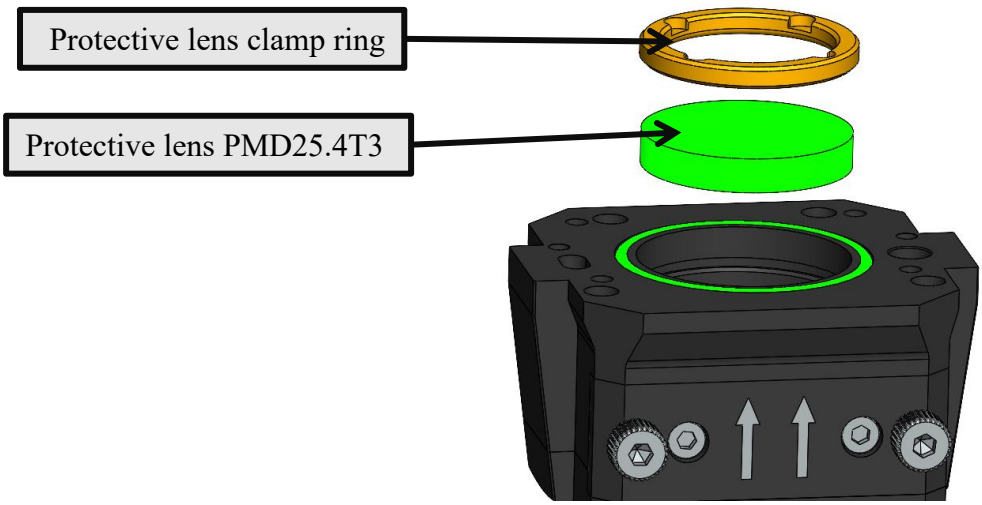
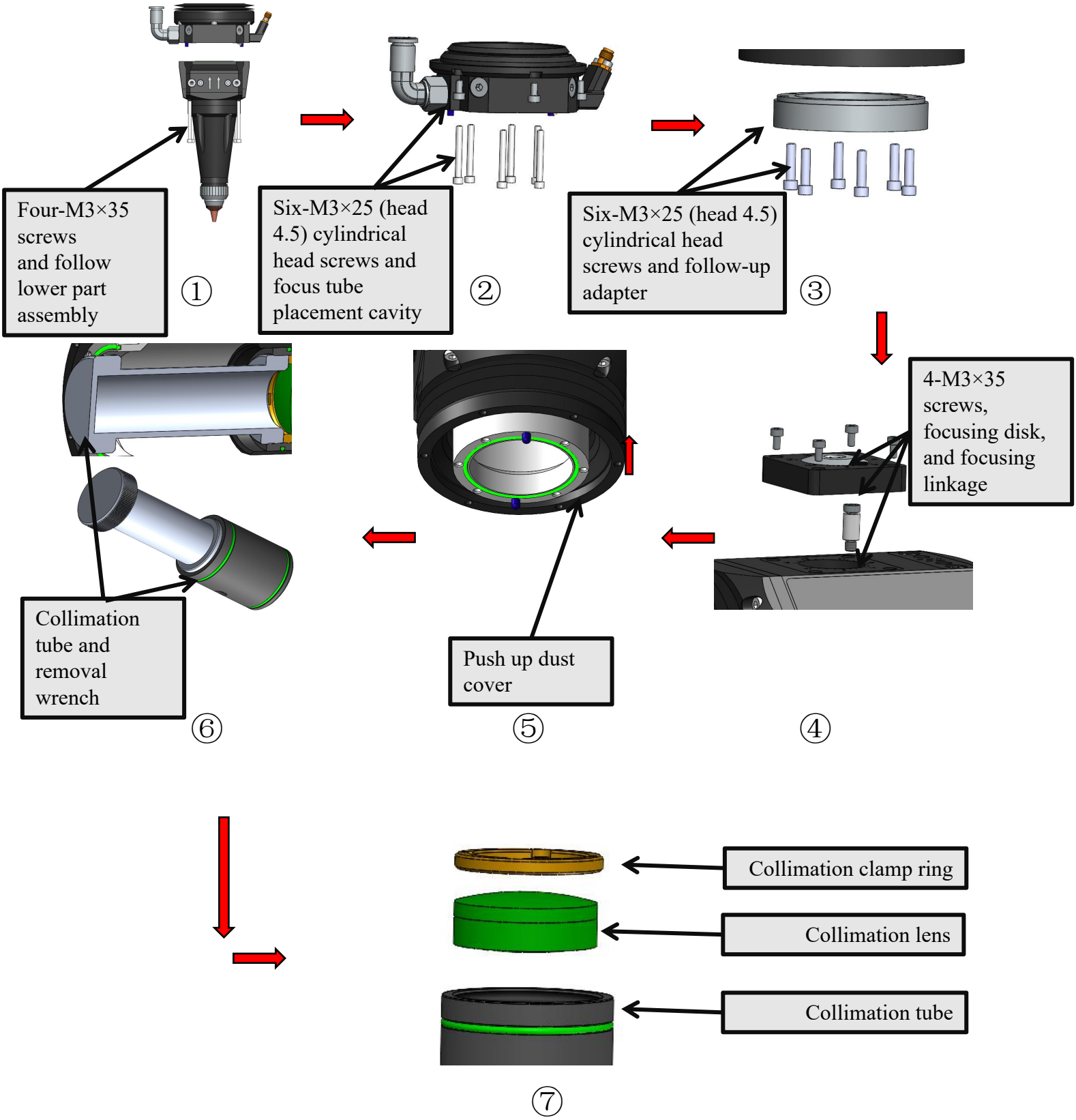


Figure 2.9

5.2 Maintenance and Replacement of Collimation Lens

5.2.1 Disassembly and Assembly of Collimation Lens



Description of collimation lens removal and installation:

① Remove four-M3×35 screws and then take down the follow-up lower part assembly.
② After removing six-M3×25 (Head 4.5) cylindrical head screws, take down the focusing tube placement cavity.
③ After removing six-M3×12 (Head 4.5) cylindrical head screws, take down the follow-up adapter.
④ After removing 4-M3×35 screws, take down the focusing disk and focusing linkage.
⑤ Push up the dust cover.
⑥ Use the removal wrench to reach deep into the follow-up adapter, screw into the collimation tube, and then pull out the collimation tube.
⑦ After removing the collimation tube, unlock the lens clamp ring and remove the collimation lens for maintenance and servicing. Be mindful of the orientation of the collimation cartridge during installation to avoid incorrect assembly.

5.2.2 Cleaning of Collimation Lens

Figure 3.0

Figure 3.1

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 side edge of the lens between the thumb and index finger of the left hand, and with the right hand, using the lint-free swab, gently wipe the front and back surfaces of the lens in a single direction, either from bottom to top or left to right, as shown in Figure 3.0.
④ After wiping, blow the lens surface with dry, pure compressed air to ensure that there are no foreign substances on the lens surface, as shown in Figure 3.1.
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 3.2, remove the focusing tube along with the sensor assembly. Use a 3mm hex wrench to loosen the centering screw, remove the focus lens holder, then withdraw the lens clamp ring, and remove and replace the lens.

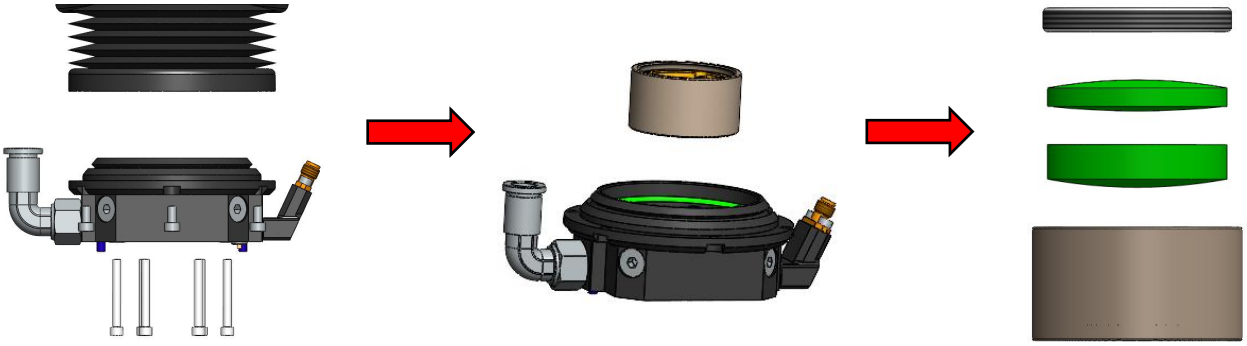


Figure 3.2

5.3.2 Cleaning of Focus Lens

Figure 3.3

Figure 3.4

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 side edge of the lens between the thumb and index finger of the left hand, and with the right hand, using the lint-free swab, gently wipe the front and back surfaces of the lens in a single direction, either from bottom to top or left to right.As shown in Figure 3.3.
④ After wiping, blow the lens surface with dry, pure compressed air to ensure no foreign objects remain on the lens surface, as shown in Figure 3.4.
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 and Replacement 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 two-M3×12 hand-tightened anti-loosening screws, then slowly and steadily pull out the protective lens holder with both hands and move it to a clean, dust-free environment, as shown in Figure 3.5. Detailed illustrations for lens replacement are shown in Figure 3.6.

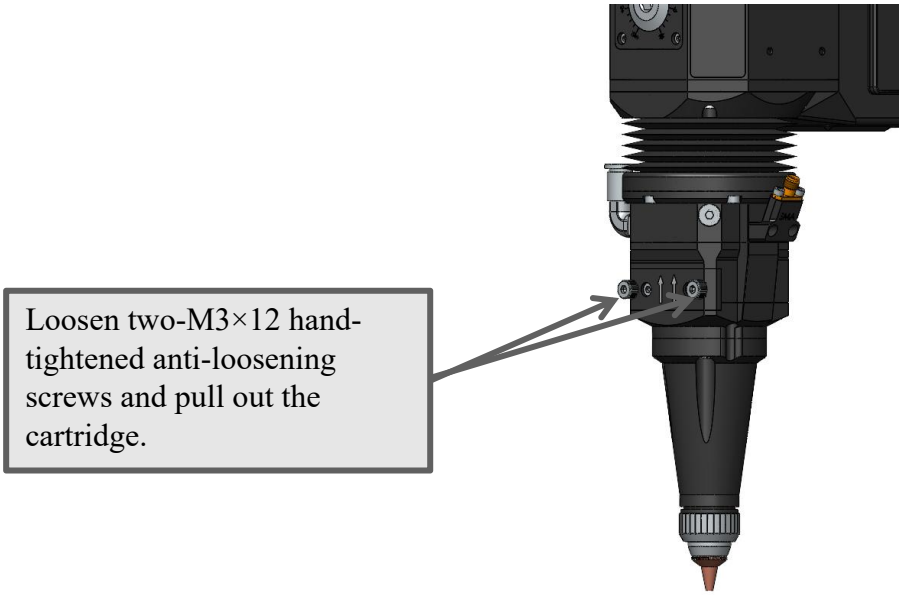


Figure 3.5

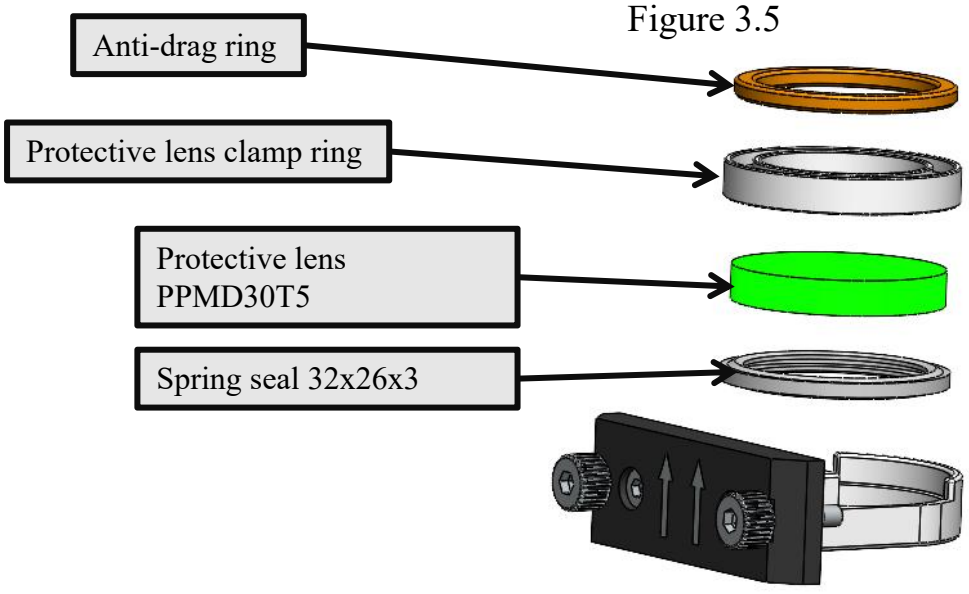


Figure 3.6

The assembly sequence is as shown in the figure above

5.4.2 Cleaning of Protective Lens

Figur
e 3.7

Figur
e 3.8

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 3.7.

④ After wiping, use dry, pure compressed air to blow on the lens surface to ensure it is clean and that there are no foreign objects on the lens surface, as shown in Figure 3.8.

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.

Note: When cleaning and replacing protective lens, avoid contamination from oils on hands or dust in the environment. 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 should be used.

5.5.1 Replacement of Nozzle and Ceramic Body

① Unscrew the nozzle counterclockwise, as shown in Figure 3.9.

② Unscrew the ceramic retaining ring counterclockwise, as shown in Figure 3.9.

③ Remove the ceramic vertically downwards, as shown in Figure 3.9.

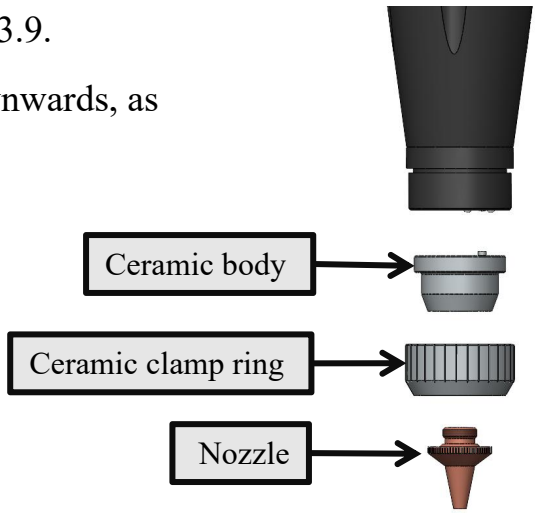


Figure 3.9

5.5.2 Cleaning of Ceramic Ring

① After removing the ceramic ring, clean it with anhydrous alcohol or isopropyl alcohol, as shown in Figure 4.0.

② Spray isopropyl alcohol onto the dust-free swab, remove the ceramic ring and clean it with the swab, As shown in Figure 4.1.

③ After wiping, use dry, pure compressed air to blow the ceramic ring clean, ensuring the ceramic surface is dry and moisture-free before installation, as shown in Figure 4.2.

Figure 4.0

Figure 4.1

Figure 4.2

Note: The cleanliness of the ceramic surface directly affects the performance of the tracking system. Clean the ceramic surface promptly when it becomes dirty to ensure system performance.

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