RAYTOOLS

BW290 SERIES

8KW Fiber/Diode Laser Welding Head-User Manual

Version	V1.0
Date	2021/11/22

Version History

Version	Publish	Name	Editor	Edit Date	Review	Review Date
V1.0	2021	User Manual	ZAK	2021/11/22		

Thank you for choosing products from us!

This manual provides detailed instructions on the installation and commissioning of product so that you can get started with the product quickly. If you have any other matters you need to know, you can consult us directly.

Due to the constant updating of product features, the products you receive may differ in some ways from the statements in this manual. We do apologize for this.

RayTools AG

Email: sales@raytools.com

Website: www.raytools.ch

Content

1 Summary

This manual mainly summarizes the basic installation, factory setting, operation and maintenance services of BW290 laser welding head. Due to a variety of configuration, this manual only introduces the main unit components.

BW290 laser welding head is compatible with 915nm - 1064nm laser. Due to the reliable internal design of the welding head, it can effectively avoid the pollution of optical lens and improve the service life. The cover glass adopts drawer structure which is simple and convenient to replacement.

The structure is shown as below.

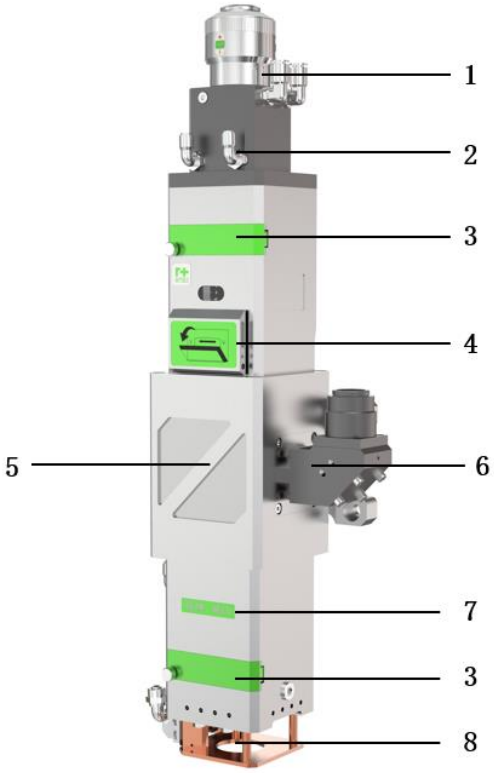


Figure 1-1 BW290 Structure

S/N	Item
1	QBH
2	Diaphragam Assy
3	Cover Glass Drawer Assy
4	Collimator
5	Beam Combiner Assy
6	CCD Interface
7	Focus Lens Assy
8	Tip Assy

Technical Data

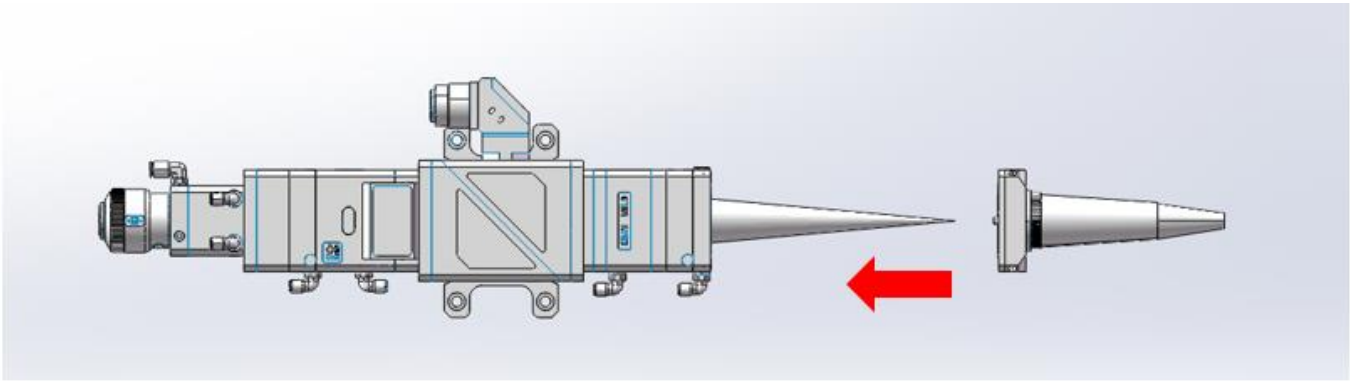
Laser Wavelength	915nm-1064nm
Fiber Interface	QBH（Default），QD，LLK-B，LLK-D
Clear Aperture	48mm
Collimation Length	85mm，100mm，150mm,200mm
Focus Length	150mm，200mm，250mm，300mm，400mm，500mm
Cover Glass	Φ50mm*2mm（Top and Bottom）
CCD Interface	C/CS

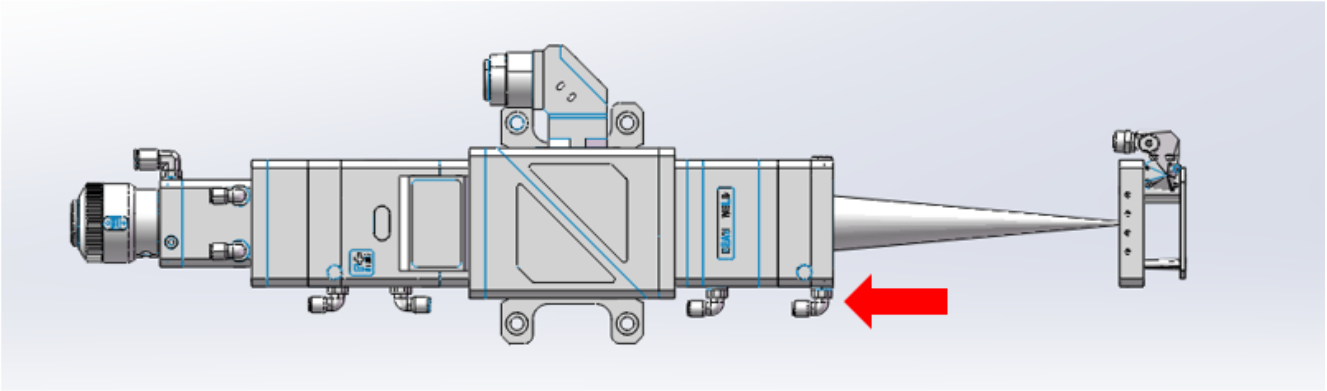
2 Installation and Operation

2.1 Preliminary

Since BW290 series tip assembly needs to be selected according to the customer's choice, please confirm whether the end coaxial nozzle or air knife + side blowing components are complete before installation.

Please install the laser head with tip assembly (fasten it with 5 * 20 hexagon socket screws) as shown in the figure below:





2.2 Mounting Size

The BW290 laser welding head is fixed by back mounting plate. See the following figure for the size and position of mounting holes. It is recommended that the customer install the laser head perpendicular to the workpiece surface (if to weld high reflection materials, it is recommended to install at a certain angle) and ensure that the laser head is locked without shaking during processing, which is one of the preconditions to ensure the subsequent stable welding effect.

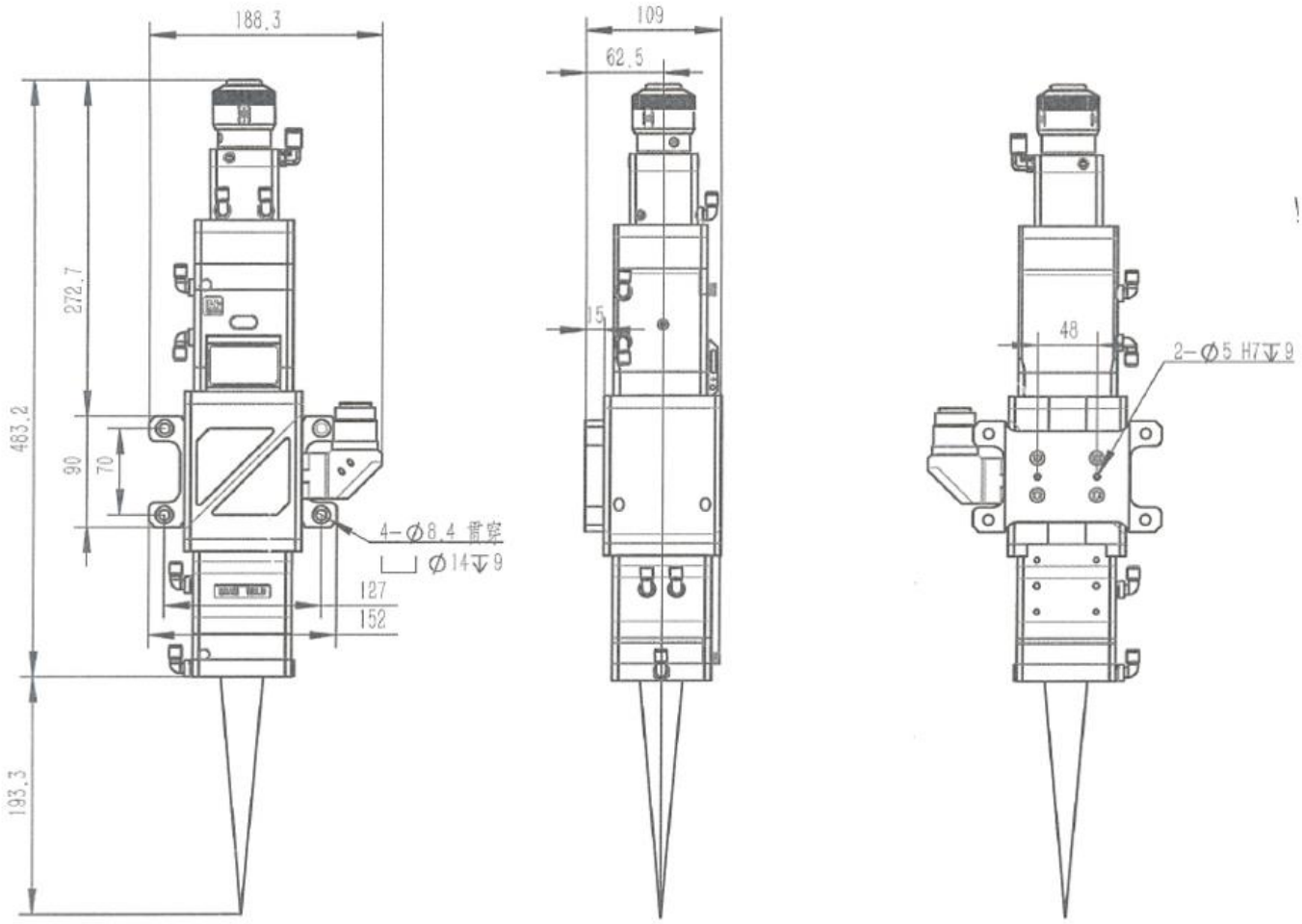
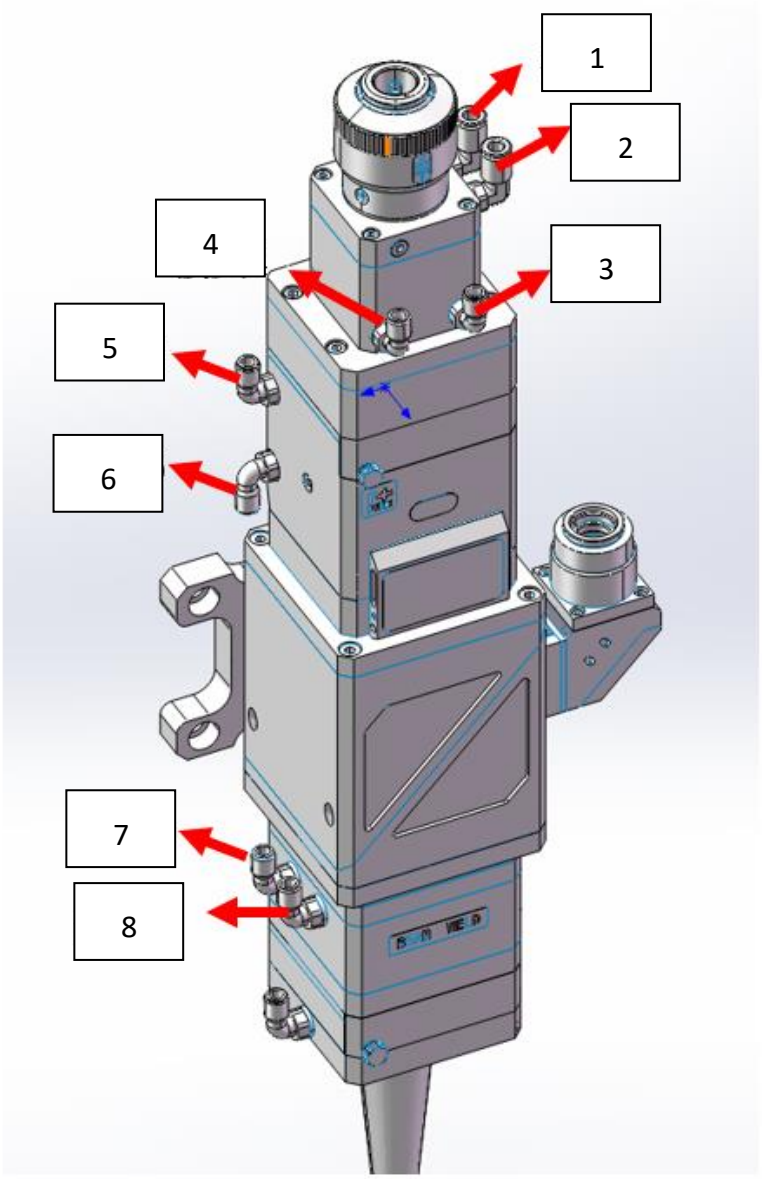


Figure 2-1 BW290 Mounting Size (Take BW2908W1J22 as an example)

2.3 Water and Gas Circuit

1) Water Circuit

Fig. 2-2 shows the recommended connection method of BW290 laser welding head water circuit and the diameter of water pipe is 6mm.



Dia.6mm water tube is to be used to connect 2-3-4-5-6-7 to establish a close loop.

1-Water Inlet

8-Water Outlet

Figure 2-2 BW290 Water Circuit

Cooling water is to follow specification as below.

Min. Flow Rate	1.8 L/Min（0.48gpm）
Water Pressure	>0.4Mpa
Entry Temperature	≥Ambient Temperature＞Dew Point
Hardness	(relative to CaCO3)＜250mg/liter
PH Range	6 to 8(Deionized or distilled water）
Particle Size Allowed	Diameter <200 Microns

2) Gas Circuit

The gas connection of BW290 with air knife + side blowing or coaxial nozzle is shown in Fig. 2-3 (a) and (b) respectively. The diameter of gas pipe is 6mm.

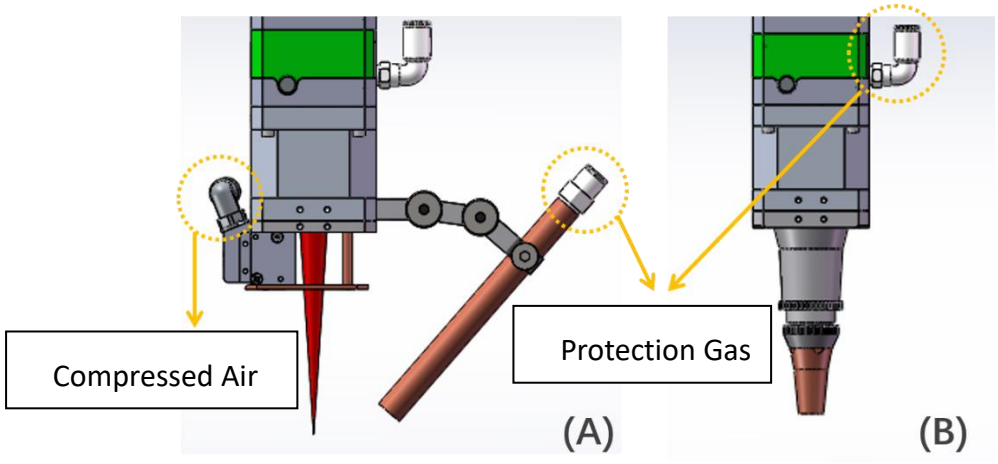


Figure 2-3 BW290 Gas Circuit

The requirements for the connected gas are shown in the table below. The pressure of compressed air is generally 0.4 ~ 0.6MPa, and the pressure of protective gas connected with nitrogen, argon or helium is about 0.1MPa, which shall be adjusted according to the welding requirements.

Gas	Max. content of water vapor (ppm)	Max. content of hydrocarbon (ppm)
Nitrogen	<5 ppm	<1 ppm
Argon	<5 ppm	<1 ppm
Helium	<5 ppm	<1 ppm

Air	<5 ppm	<1 ppm

Note: condensate, raw material belt for joint sealing and other impurities may be hidden in the gas pipeline at the customer's site. Please deflate for 3-5min at a pressure greater than 15bar before connecting the gas pipe to the laser head.

2.4 Fiber Interface

The optical fiber interface refers to the connecting part between the optical fiber end of the laser and the welding head. BW290 is suitable for most industrial lasers.

Common optical fiber interfaces include QBH, QD, LLK-D and LLK-B. Other optical fiber interfaces can also be adapted. Each type fiber interface has its own unique method of fixing the optical fiber. Please refer to the corresponding introduction to the use of optical fiber interface.

Warning: optics must be kept clean and all dust must be removed before use. If the laser head is vertically fixed with optical fiber, the laser head must be rotated 90 degrees to be placed horizontally and then the optical fiber must be inserted to prevent dust from falling on the lens surface. After inserting the optical fiber, fix the laser head.

The connection method between QBH and optical fiber is shown in Figure 2-4:

- Rotate the outer sleeve so that the red dot on the side of the outer sleeve is in line with the red dot on the inner sleeve.
- Remove the protective cap of fiber and check whether the crystal head is clean. If there is any pollution, it must be cleaned first.
- Align the cleaned optical fiber end with QBH and ensure that the red dot on QBH is in the same line with the longest slot on the fiber end.
- Insert the optical fiber end into QBH, lift and rotate the outer sleeve until the two contact surfaces fit.

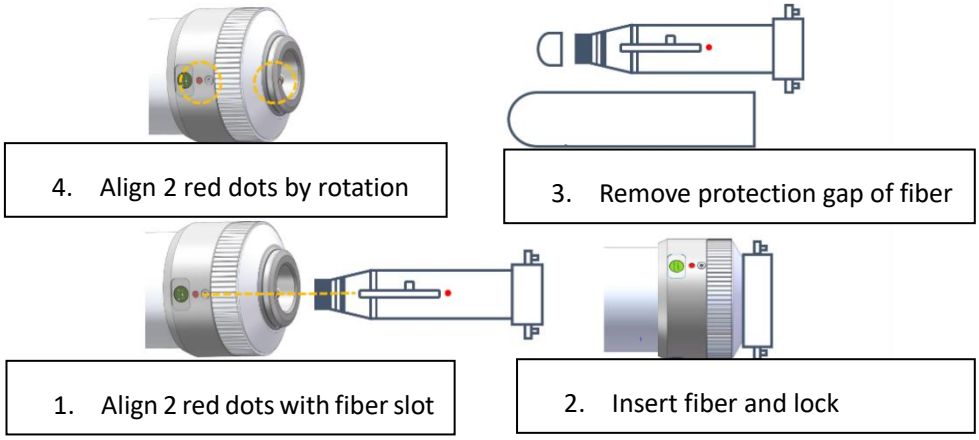


Figure 2-4 QBH Connection with Fiber

2.5 CCD Adjustment

- **Brightness**

Brightness adjustment can be realized by adjusting the top convex cylindrical structure in figure A.

- **Adjustment of Focus Length**

The focus length can be adjusted by adjusting the bottom convex cylindrical structure in figure B.

- **Alignment of View Field**

By tightening / loosening the two M4 adjusting screws in figure A, the field of view can be adjusted.

- **Rotation of View Field**

As shown in Figure B, loosen four M3x6 hexagon screws for 1-2 turns. Loosen M3x3 jackscrew for 1-2 turns. Grasp the upper cylindrical part and rotate it clockwise (thread tightening direction) for a certain angle to achieve the desired field of view direction. After adjusting the field of view direction, keep the cylindrical part still and lock four M3x6 hexagon screws. Tighten the M3x3 jackscrew to complete the field of view direction adjustment.

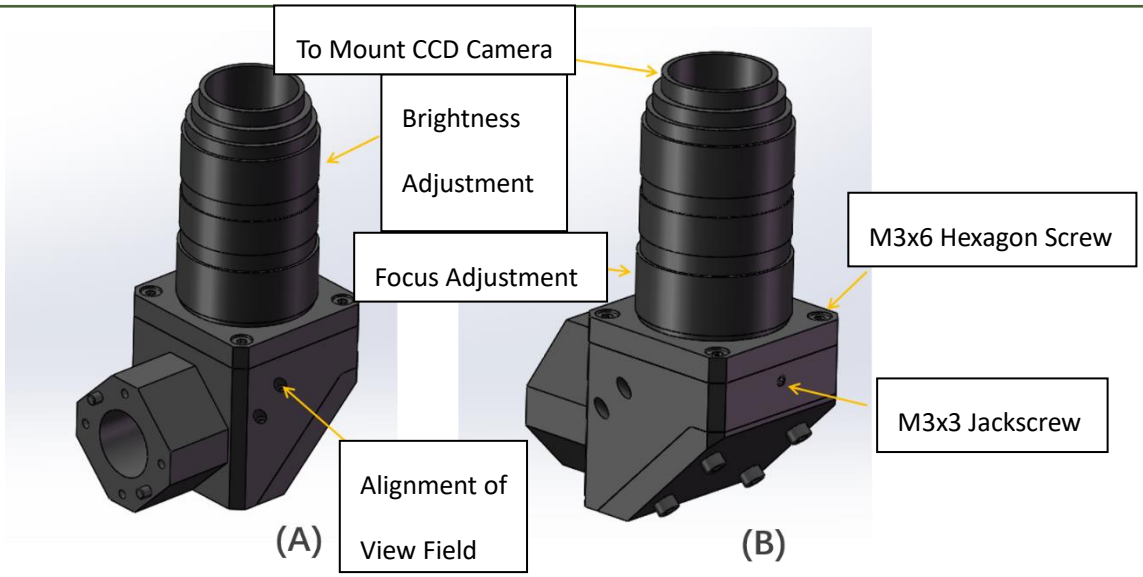
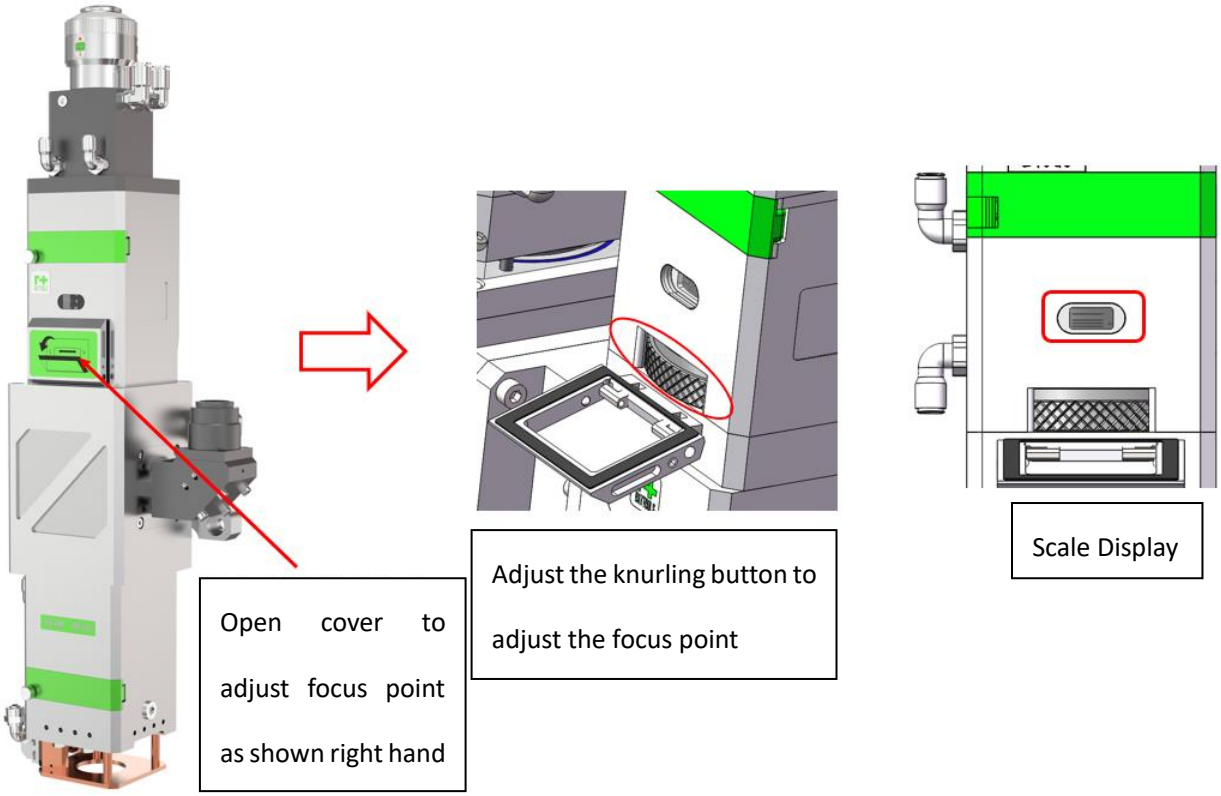


Figure 2-5 CCD Adjustment

2.6 Adjustment of Focus Point in Z Direction



- Open protection cover.

- Adjust the knurling button to adjust the focus point.
- The scale will show the exact focus point.
- The protection cover should be closed after the adjustment.

3 Maintenance

3.1 Dismantling and Mounting of Cover Glass

According to the processing characteristics of laser welding, the cover glass needs to be replaced regularly. The installation and disassembly of protective lens are shown in Figure 3-1 and 3-2.

- Loosen the screws.
- Pull out the cover glass holder.
- Press the cover glass with your fingers and push the cover glass out of the holder from the side without seal ring.
- Install the cover glass into the holder.
- Press the cover glass by seal ring.
- Insert the cover glass holder into the laser processing head.
- Lock the screw.

Note: It is forbidden to use nails or hard objects to directly pull out or pick out the seal ring. It will seriously cause damage to the seal ring, air leakage and even damage cover glass and focus lens. The seal ring shall be properly placed after being taken out to avoid unfavorable welding quality.

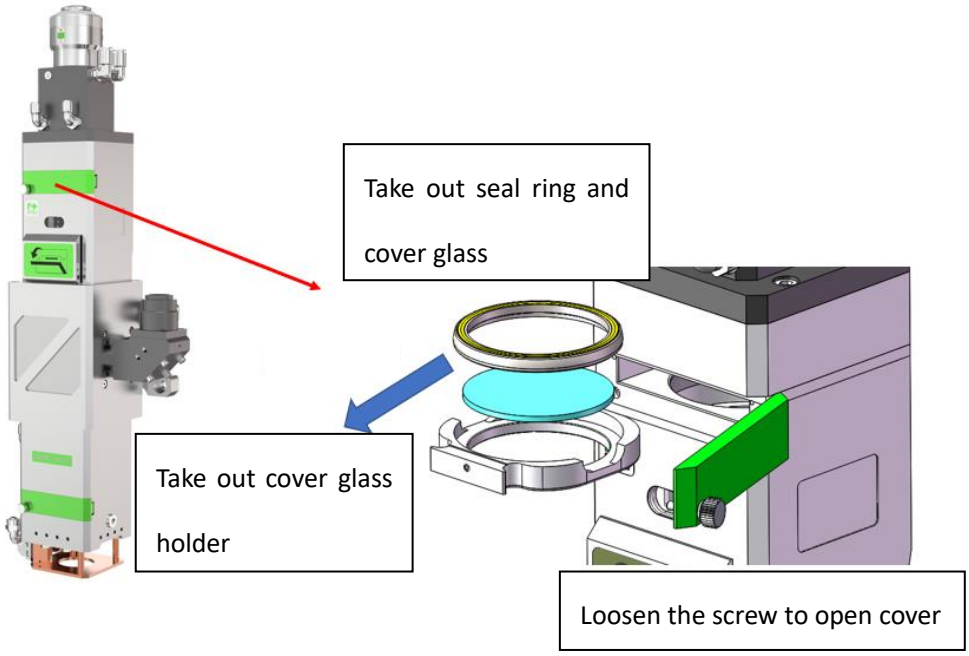


Figure 3-1 Dismantling and Mounting of Top Cover Glass

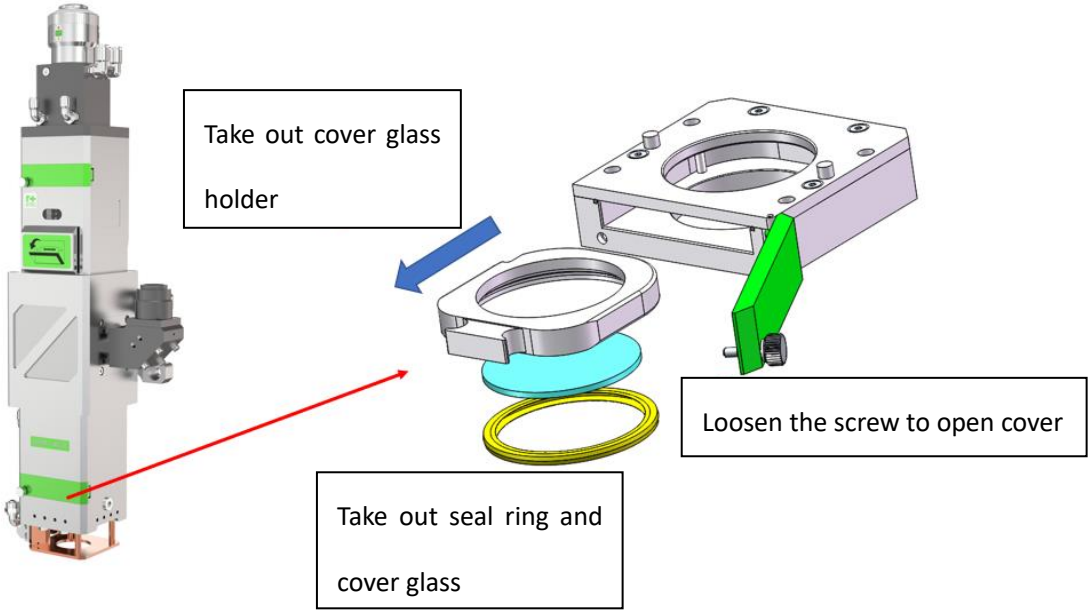


Figure 3-2 Dismantling and Mounting of Bottom Cover Glass

3.2 Dismantling and Mounting of Collimation Lens

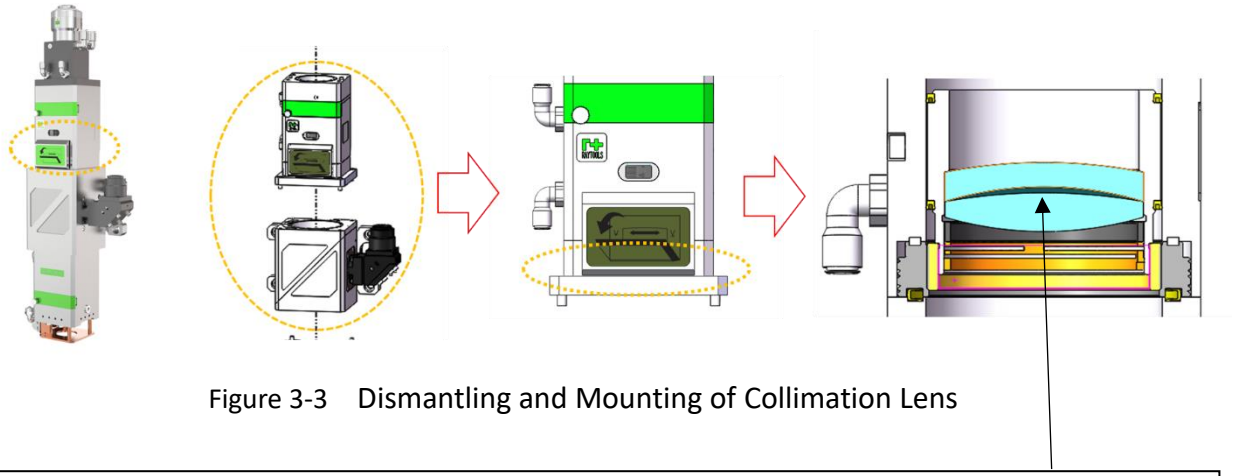


Figure 3-3 Dismantling and Mounting of Collimation Lens

Attention: the biconvex lens gets 1 big curve face and 1 small curve face. The small curve face shall be next to concave face of meniscus lens.

The exchange of collimation lens shall be done in dust-free room by wearing dust-proof gloves or fingertip after the laser head is disassembled from machine tool.

Unscrew the screw on the collimator with an Allen wrench and place it in a clean place.

Unscrew the screw fixing the collimation lens holder and take out the collimation lens and holder.

Install the new collimation lens into the lens holder. Screw the new collimation lens and lens holder into the collimator assembly and tighten the fixing screws.

Mount them back into the laser head.

Check whether the focus position is in the center of the nozzle hole. If it is not in the center, it needs to be re-aligned.

3.3 Dismantling and Mounting of Focus Lens

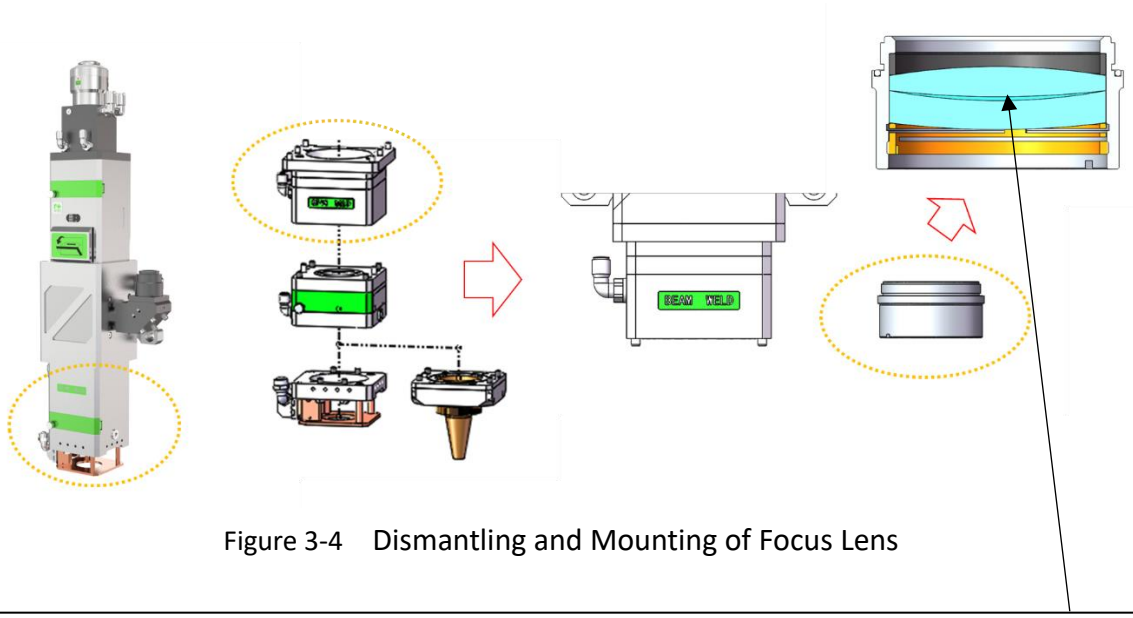


Figure 3-4 Dismantling and Mounting of Focus Lens

Attention: the biconvex lens gets 1 big curve face and 1 small curve face. The small curve face shall be next to concave face of meniscus lens.

The exchange of focus lens shall be done in dust-free room by wearing dust-proof gloves or fingertip after the laser head is disassembled from machine tool.

Attention: In case of lens dropping, the lens holder must be vertically held.

Uninstall the locking screws in sequence.

Unscrew the screw locking the pressing plate under the body assembly. Remove the pressing plate and take out the focus lens assembly by lens tool.

Move the focus lens assembly to a clean place. Unscrew the elastic pressing ring by lens tool and take out the focus lens from lens holder.

Install the new focusing lens into the lens holder. Screw the focus lens assembly into the assembly and tighten the fixing screws.

Mount them back into the laser head.

3.4 Cleaning of Lens

Tools

- Dust-proof gloves or fingertip, polyester swab, absolute ethanol, rubber gas blow (purely

compressed air)

Cleaning Instruction

- To put dust-proof gloves or fingertip onto left thumb and index finger.
- Spray absolute ethanol onto the polyester swab.
- Hold the edge of the lens with left thumb and index finger gently. (note: avoid touching the surface of the lens by fingertip in case of trace).
- Hold the lens to face eyes by left hand and hold the polyester swab by right hand. Wipe the lens gently in single direction, from bottom to top or from left to right (Should not wipe back and forth in case of secondary pollution to lens) and use rubber blow (purely compressed air) to blow the surface of the lens. Both surfaces should be cleaned. After cleaning, make sure that there is no residual like detergent, floating ash, foreign matters and impurities.