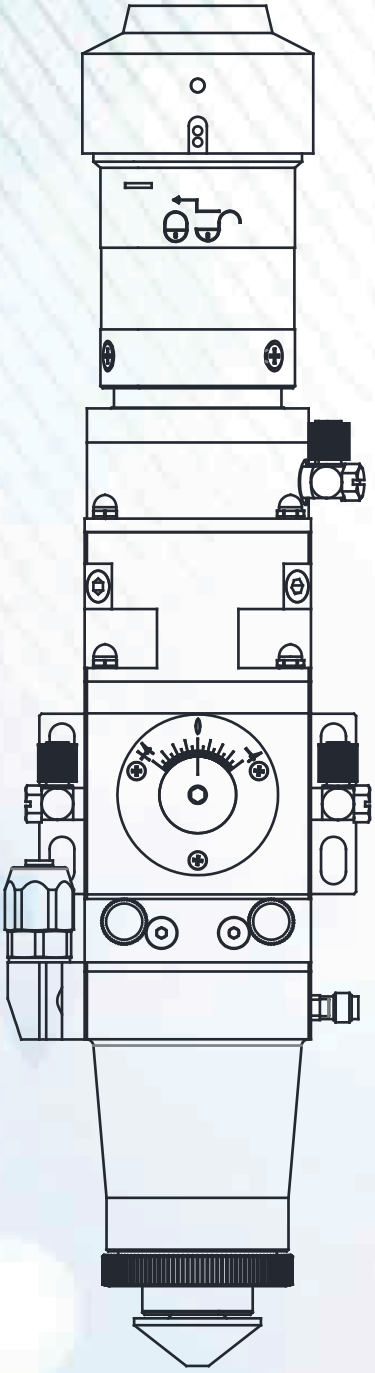
Fiber Laser Cutting Head
MN15



User Manual

Shenzhen Worthing Technology Co., Ltd.

Please read this manual carefully and make sure you understand its contents before using the laser head.
Please keep this manual for future operation and maintenance.

Do not stare into the beam! Please wear goggles of DIN EN 207 and BGV B2 standard!

Do not touch the laser head with any body parts when it works!

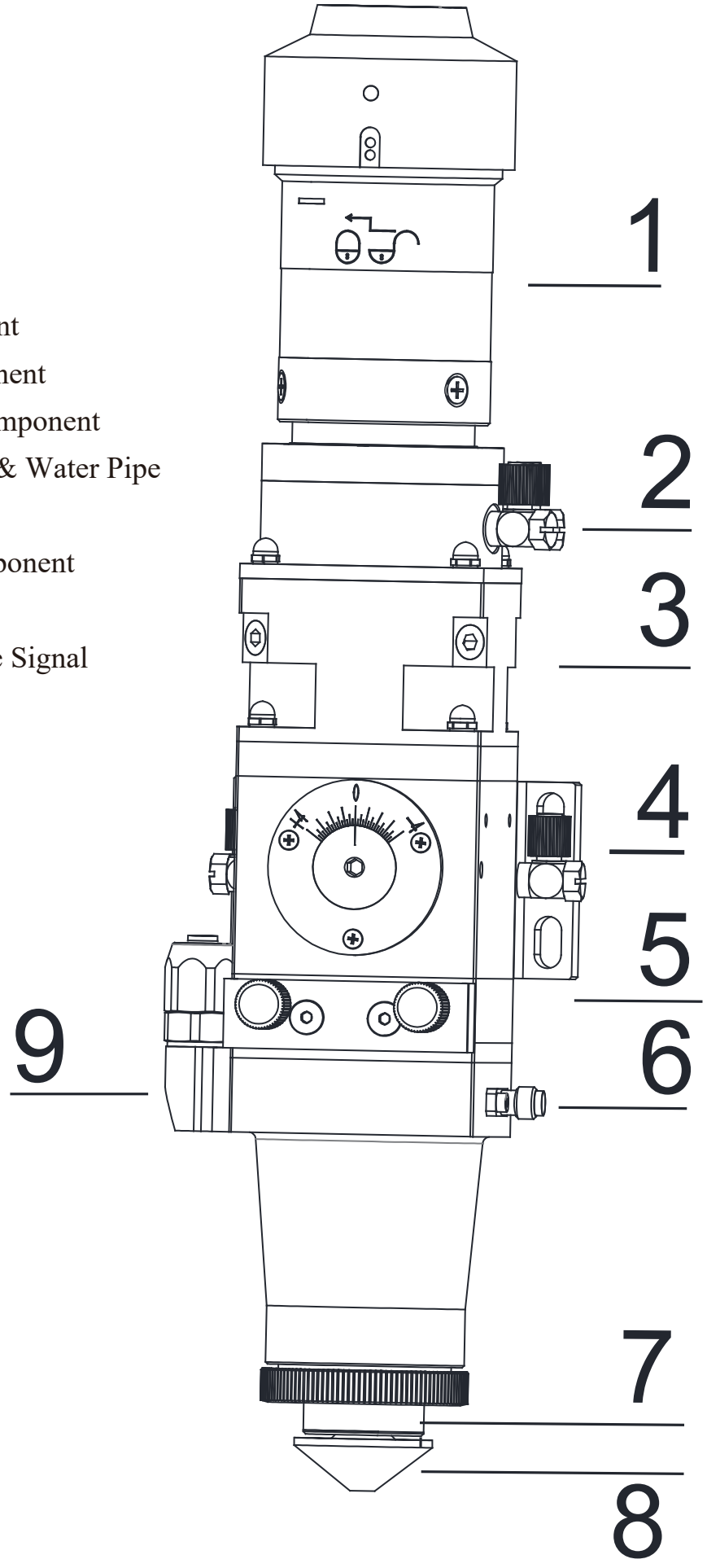
Take care not to be burned by the remaining heat after cutting!

Precision products. Do not strike it!

Contents

1. Product Description

1.1Product Structure



1 QBH Plug
2 Water Cooling Component
3 Beam Expansion Component
4 Focusing Adjustment Component (including Mounting Base & Water Pipe Connector)
5 Protective Window Component
6 Sensor Component (Height Adjustment Device Signal Access)
7 Ceramic Ring
8 Nozzle
9 Φ8 Gas Pipe Connector

1.2Main Function
1.2.1 Structure & Components

※QBH Component
It is the core connector which connects to fiber laser and provides standard fiber access.

※Water Cooling Component
All the Water Cooling Parts are made of stainless steel, and equipped with M5*Φ6 water pipe connector to provide enough cooling water for cooling down the inner wall and QBH component which are heated by the scattered laser light.

※Beam Expansion Component
Beam expansion component is set inside the laser head which contains beam expander cavity, collimator lens, horizontal adjustment system.
Horizontal adjustment device： the beam center adjustment device is inside the beam expander. The beam center can be adjusted by adjusting two screws in front of the beam expansion component with hexagon socket key.

※Focusing Component
Focusing component is set inside the laser head and contains adjustment structure, locking device, focal lens, focusing cavity and water cooling system of lens.
Focusing can be adjusted with cam structure precisely and conveniently.

※Protective Window Component
The protective window are installed in drawer-style. It can be exchanged easily.
It's fixed under the focusing unit with 4-M6 screw.
The protective window is designed to withstand the impact of high gas pressure.

※Sensor Component
The sensor component is at the bottom of the laser head and connected by 4-M4 screws.
It can provide capacitance signal to the height adjustment system.

※Ceramic and Nozzle
The high-precision manufactured ceramic ring and nozzle could guarantee the concentricity deviation at the lowest level, thus they require fewer adjustments or even no adjustments when user replaces them.
They match with the sensor unit to meet adjusting demands of capacitance signal acquisition and different cutting needs.

1.2.2 Design & Function

This laser head uses fiber laser machine as light source and cut the metal on plain machine table in controlled distance. It features high cutting precision, outstanding durability, ease maintenance and adjustment.

All media connections are built inside the laser head.

The distance sensor unit inside the laser head can keep a set distance between the nozzle and the workpiece by continuous monitoring.

The electronic system provide linear drive to the robotic arm by receiving sensor signal.

We can provide a variety of fiber plugs (QBH, QCS).

1.2.3 Distance Sensor System

※Distance Sensor System

◎ To ensure the distance between laser head and metal plate, this laser head has capacitive distance sensing system interface to provide capacitance signal collection.

◎ When using the sensor system, keep a certain distance between the nozzle and the workpiece to ensure the position of focus.

1.2.4 Protective System

※Collision Protection

◎When the distance sensor system is working, if the nozzle or the sensor hits the machine tool or metal plate, the system will get an electronic signal feedback from the laser head, thus the laser head will stop moving or move backward.

1.2.5 Auxiliary Medium

※Cutting Gas

◎ With the preinstalled gas source connector, the laser head can work under 25 Bar (2.5Mpa) cutting gas pressure. The cutting gas can also help to cool down the protective window.

◎ The protective gas must meet the standard of ISO 8573-1:2010, Class 2.4.3 without impurity particles, water and oil. High purity cutting gas will prolong the lifespan of protective window.

2. Technical Specification

2.1Parameters of Laser Head with QBH:

Max Laser Power: 1000W

Can be connected with QBH plug

Collimator Focal Length: 75mm,100mm

Focal Length:100mm,125mm,150mm

Vertical Adjustment Range:±4mm

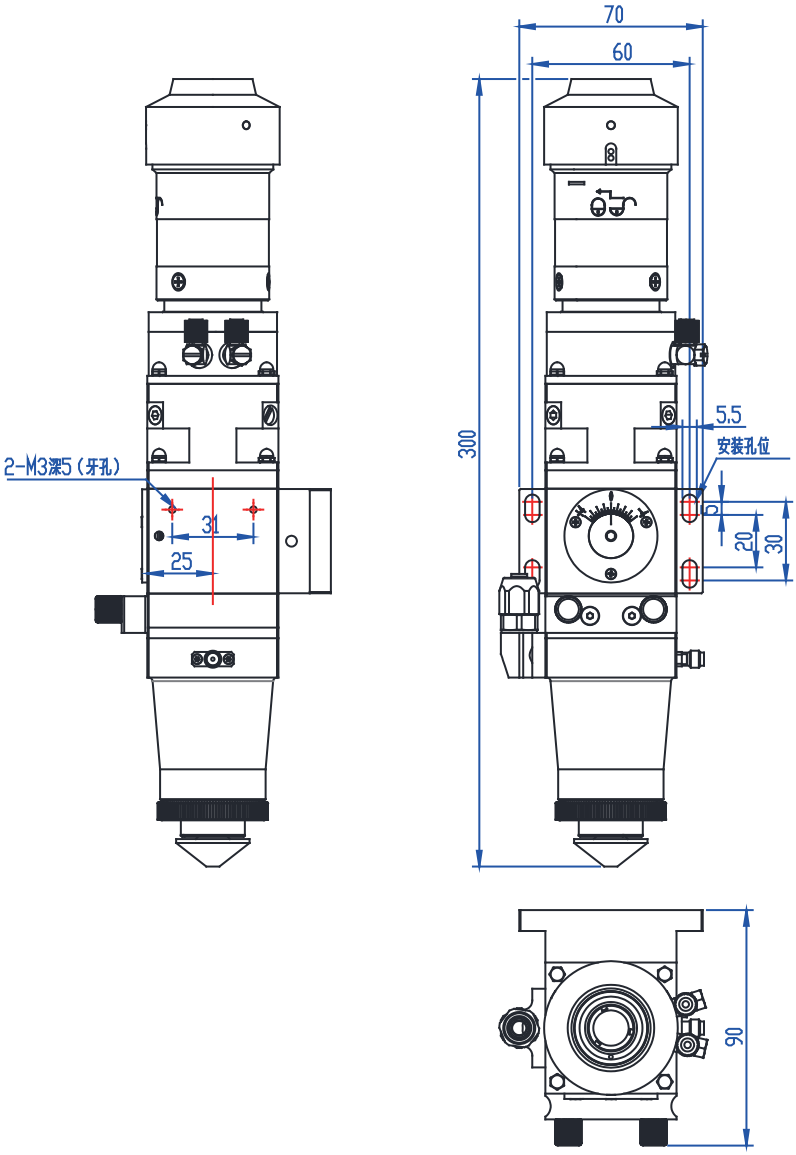
Horizontal Adjustment Range:±1.5mm

Clear Aperture:20mm

Max Cutting Gas Pressure:25 Bar

Gross Weight:1.7 kg

2.2 Connected Flange Parameters



3. Installation & Connection

3.1 Safety Instructions

Any maintenance or fault survey should be conducted by professional trained personnel who must have got safety training and be aware of the possible danger and safety measure. Users not only should obey to the safety requirements stipulated by laws and regulations, but also obey to the safety instructions mentioned by manufacturers.

Users should learn the related safety knowledges and prepare necessary safety devices before using.

Danger – High Pressure!

The gas pressure inside some laser head components can reach to 2.5Mpa.

Danger –High Voltage!

Keep the power off during the maintenance and repair.

Danger – Pinching Hand!

During maintenance and repair, do not put hands or any other body parts under the laser head or forward direction of the moving axis.

Danger – Laser!

Keep the power off during the maintenance and repair. The laser machine will generate level 4 laser while working.

Keep the eyes or skins from being directly shot or scaterred by laser.

Do not look directly into the laser beam even if wearing eye protecting equipments.

Wear the goggles which meet the standard of DIN EN 207 & BGV B2.

Caution – High Cleanliness Optical Lens

Do not touch the high cleanliness area of optical lens inside the laser head with bare hands. Dust or dirt attached on the lens may cause scorch damage.

It is allowed to touch the nonsensitive area of lens only if wearing protective gloves.

3.2 Unpacking Check

※Unpacking Check

1.Intact box;

2.The signage should be clear with conformity mark and accord with the purchased models;

3.The upper and lower opening tear-proof seals are not broken or disassembled;

4.If the above does not match, contact the seller.

※Open the box

1.The signage surface points to opening surface.

2.Open the box with a knife; and the depth of knifepoint cutting into the box shall not exceed 2mm.

※Check after opening

1.A packing list inside;

2.Check the products with list;

3.Please contact us immediately if there are anything unqualified.

3.3 Preparation for Installation

※Tools

1.A set of metric hexagonal handle;

2.One bag of clean rods,one bottle of anhydrous ethanol(500ml),one package of clean gloves.

3.Clean and dust-free working environment.

※Preparation of installation personnel

1.Read this manual carefully;

2.Wash hands with Soap;

3.Wear dust-free gloves;

4.Wear a mask if necessary.

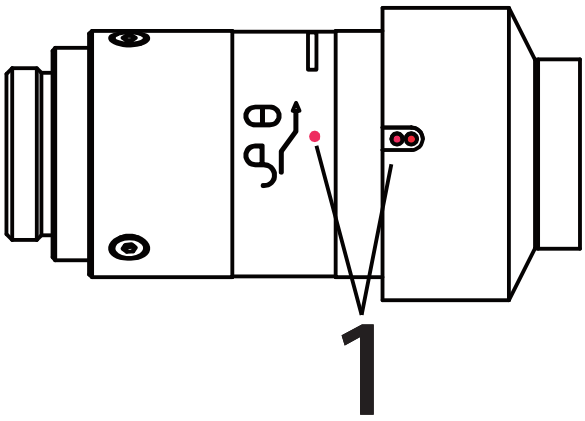
Note - Dust removal is of utmost importance.

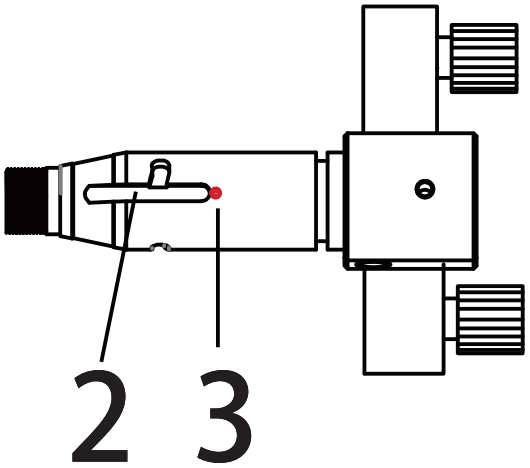
3.4 Connect with Fiber

Caution! a dust-free working environment is required!
Assembly and replacement of the laser head should be carried on only in clean working environment.
Do not let dust and dirt to enter the expanding beam component. Dust and dirt adhering to the beam expander may cause an accident.

※QBH Laser Fiber Access

1. Place the laser head and optical fiber connector in a horizontal state;
2. Do not remove the black protective cover;
3. Check the QBH and fiber connector, if there is dust on them, clean them with clean rods and anhydrous ethanol.
4.Remove the protective cover as Picture below; align Part 1,2,3



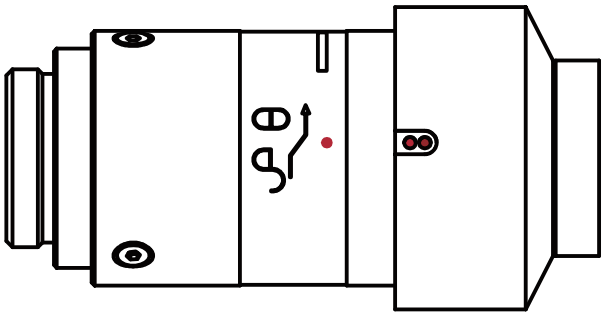


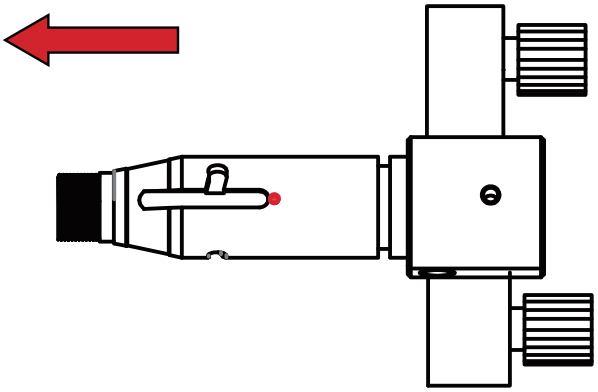
1 QBH Red Direction Mark (Turning Rim)

2 The longest straight slot on fiber connectors

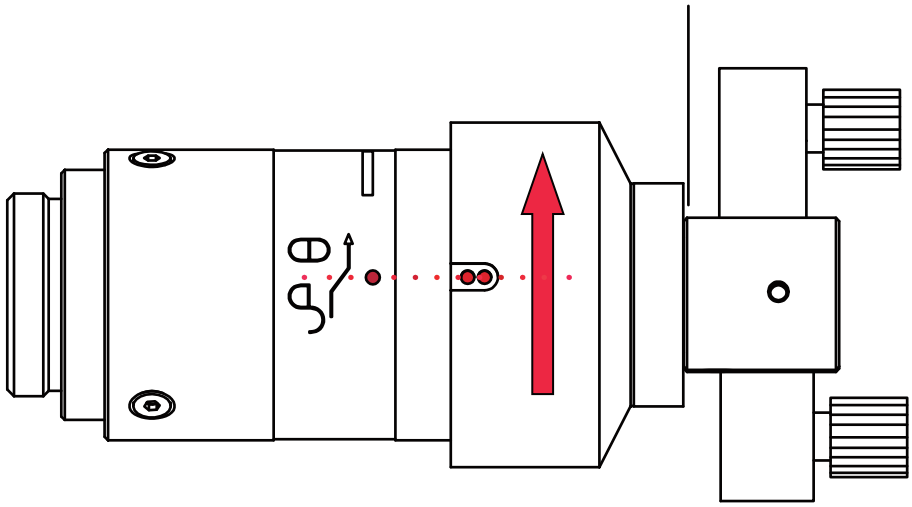
3 Fiber connector red direction mark

5. Insert the fiber connector into QBH gently;

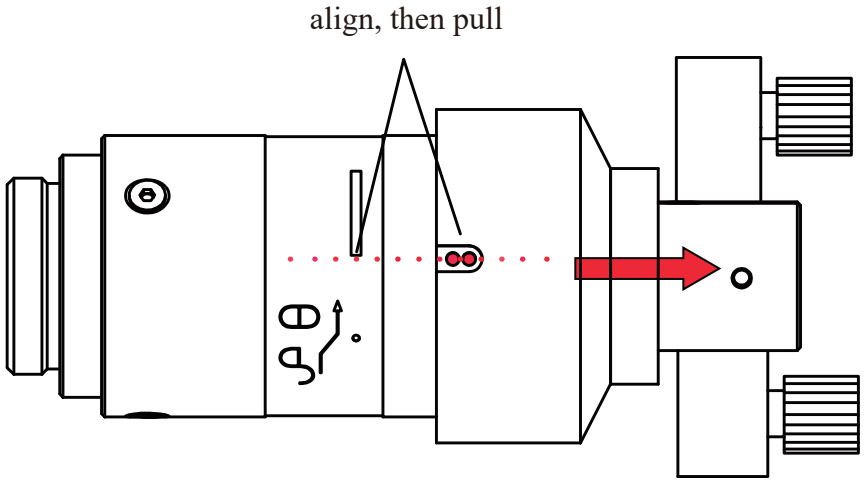




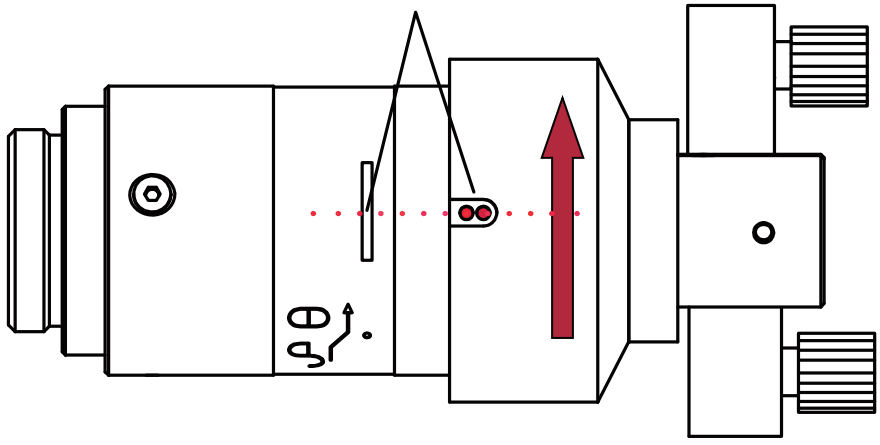
6. After inserting, turn the turning rim in the direction as Picture 8 until the two red marks are aligned to the white mark.



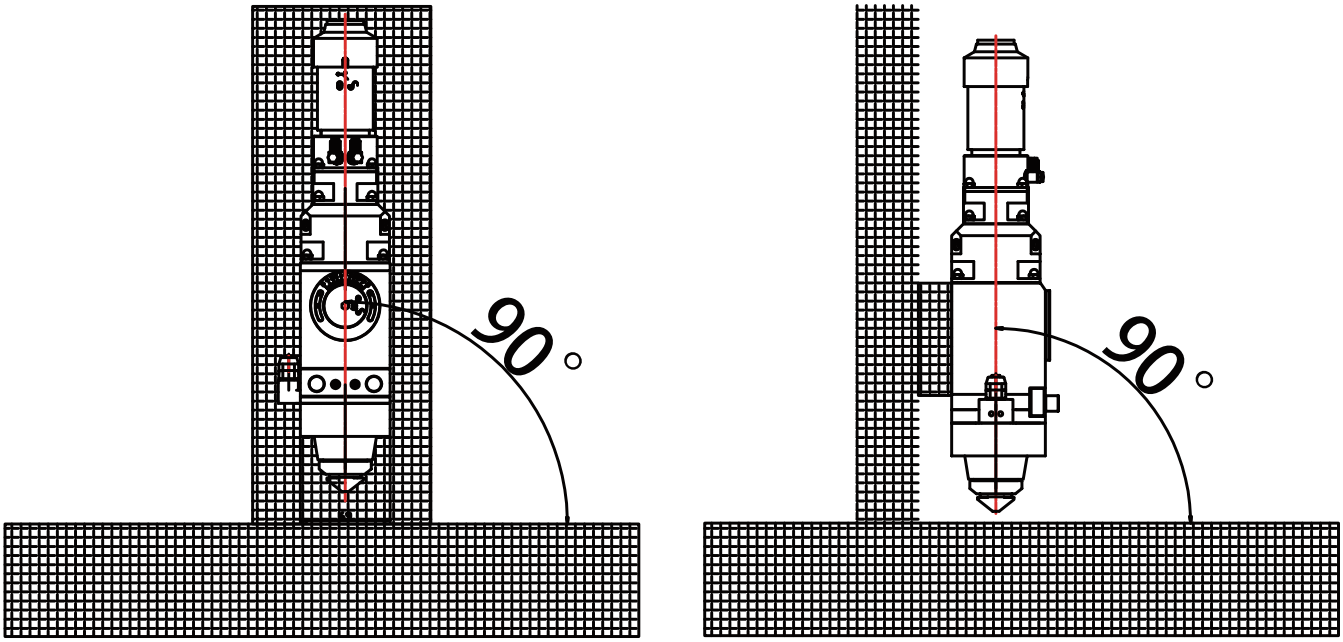
7.Then pull the turning rim as Picture 9;



8.Turn the rim in the direction as Picture 10 at moderate intensity to make it tight.
The red marks can be aligned to or over the middle of the white bar, but do not twist any more when it is in the right position.

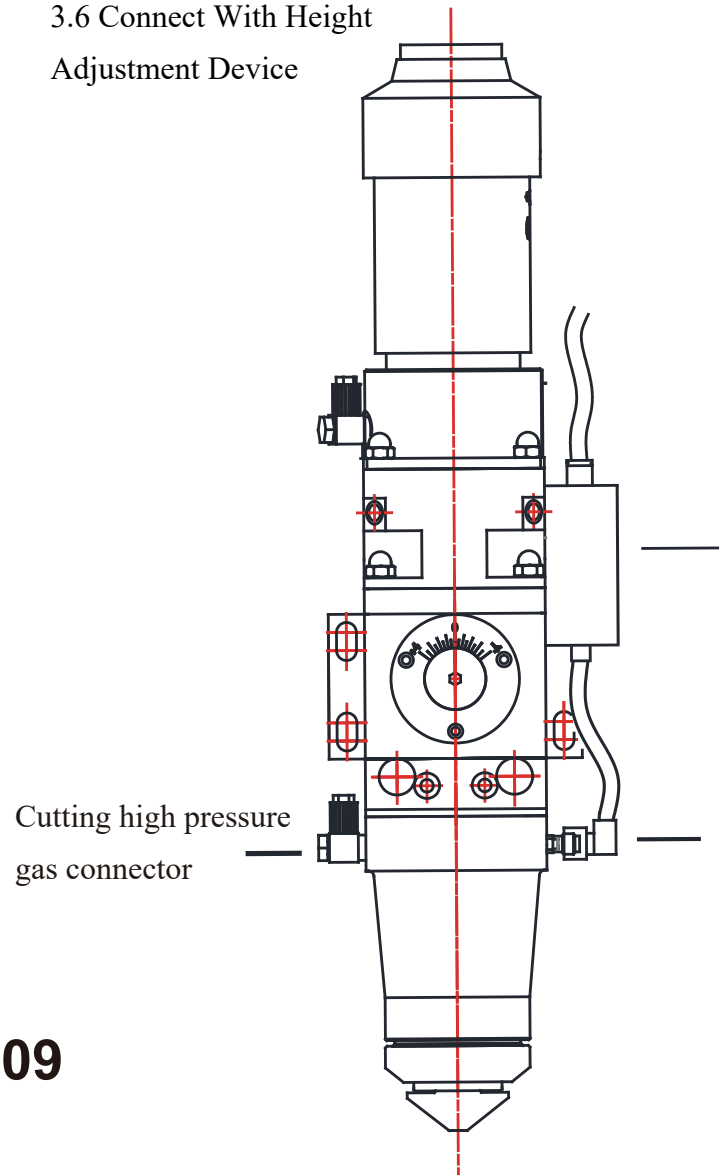


3.5 Connect With Machine Tools



1. Ensure that the axis of the laser head is perpendicular to the cutting plane of the machine when installing.
2. With 4-M4 eyelets in front and back of laser head, use M4 screw and spring washer to connect the laser head and machine tools to ensure stability.

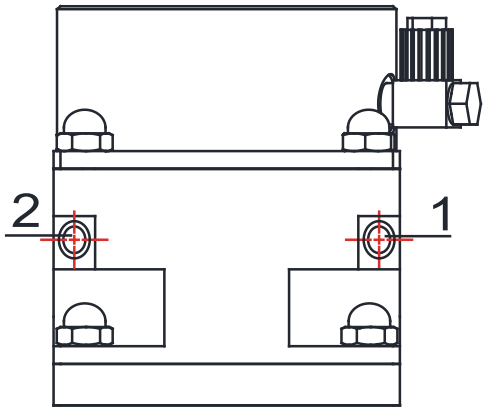
3.6 Connect With Height Adjustment Device



1. Ensure that the height adjustment device connector (golden yellow) and sensor connector (golden yellow) is in good contact.
2. Tighten the screws at moderate intensity.
3. Ensure the breakover between the nozzle and the height adjustment device, and it can not short□circuit.

4. Debugging

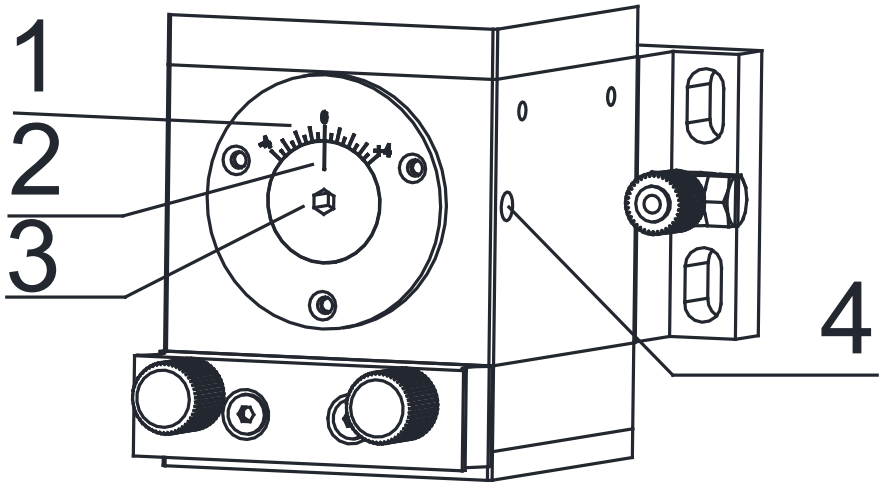
4.1Center Adjustment



1 Y-Direction Horizontally Adjusting Screw

2 X-Direction Horizontally Adjusting Screw

4.2 Focusing Adjustment



1 Focus Dial 2 Focus Pointer 3 Focus Adjustment Hexagonal hole

4 Focus Locking Device(clockwise to Lock; anticlockwise to loosen)

1. Adjust at the direction of "+4", the focus will move upward; adjust at the direction of "-4", the focus will move downward;

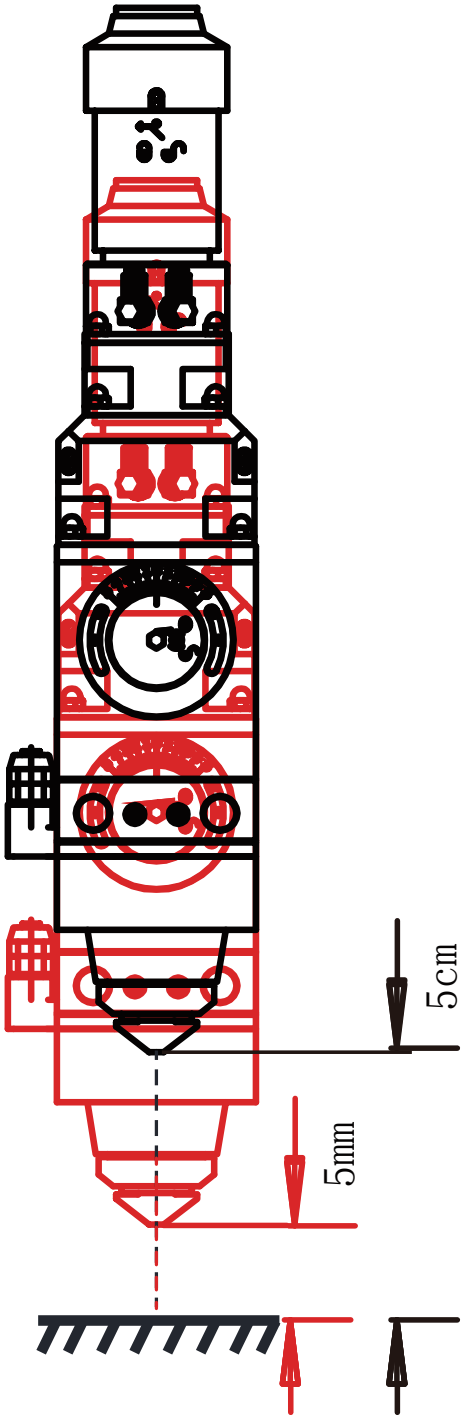
2. Loosen the Focus Locking Device (Part 4);

3. Insert a hexagon wrench into the Focus Adjustment Hexagonal Hole (Part3), turn clockwise or anticlockwise to make the Focus Pointer (Part 2) point to the appropriate scale;

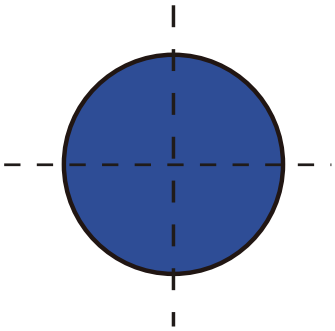
4. Tighten the Focus Locking Device after adjusting the focus, otherwise the focus may change;

5. Tighten the Focus Locking Device (Part 4);

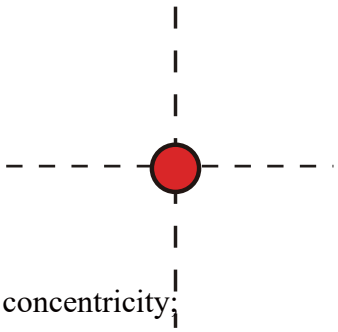
6.The focus is unlocked in the factory default setting.



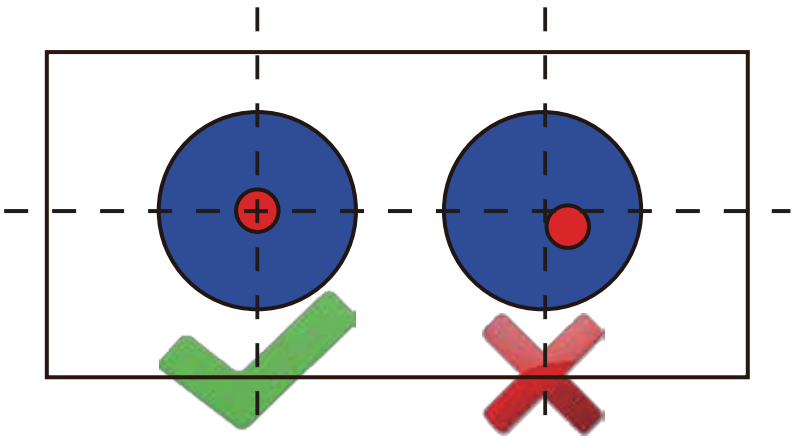
Step 1: set the laser power to 500W, make a short burst at the height of 5cm from the plate to burn a round scorch on the plate;



Step 2: set the laser power to 100W, make a short burst at the height of 1~5 cm from the plate to burn a round scorched spot on the plate;



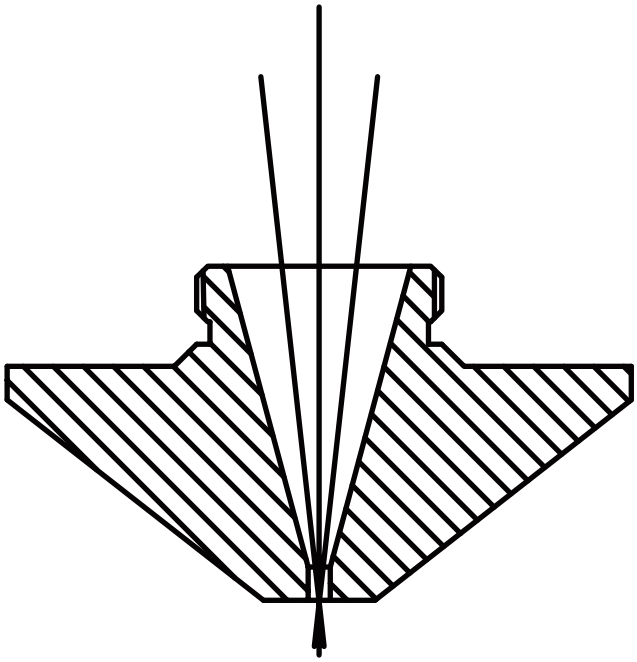
Step 3: compare the concentricity;



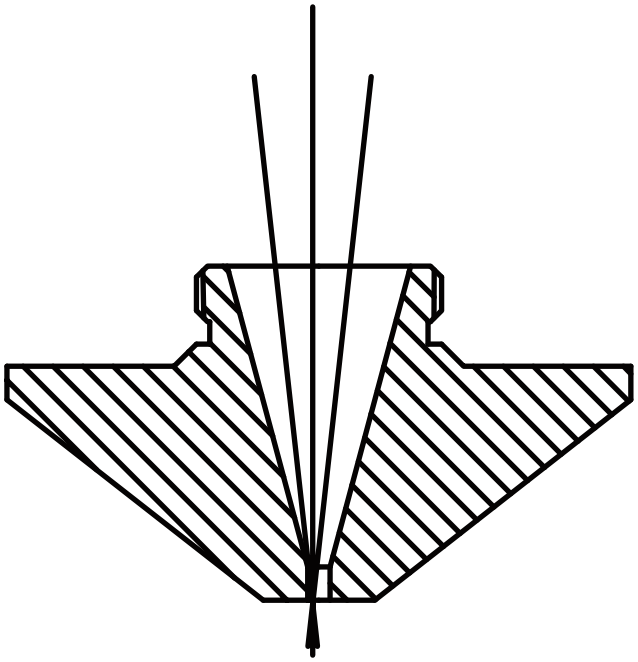
1.Adjust the X/Y screw by allen wrench and make the beam pass through the center of nozzle;

2.The cutting effect is perfect when the beam pass through the center of nozzle;

3.If the beam does not pass through the center of nozzle, it may cause the beam could not be emitted out or bad cutting effect and so on.



beam passes through the center (correct)



beam does not pass through the center (incorrect)

Methods of testing whether the beam pass through the center of nozzle:

1.Paste the transparent tape on the outlet of the nozzle (prefer to a new or undeformed nozzle);

2.Set the power of laser machine to 50W(take 500W for example,adjust the short burst power for 10%);

3.Take off the transparent tape after the beam has been emitted for 1 – 2 seconds;

4. Face the tape to light source and observe the round mark of nozzle on the tape and burning spot of laser passing through the tape;

5.If they are concentric, the testing result is good, but if not, please keep adjusting.

4.3 Moving Adjustment

Make the adjusting according to the instructions of the actual cutting system installed.

5.Maintenance

Note: clean and dust-free working environment is required.

Any laser optical path equipment incorporated into the laser head must be taken dust removal process.

Assembly or replacement of lens or other components must be conducted in clean working environment.

Prepare new lens component before removing the old one.

Users could purchase spare lens components from us.

In case that user could not meet the above requirements, it is advised to use nonstick protective film to seal the opening after the removing of the lens immediately.

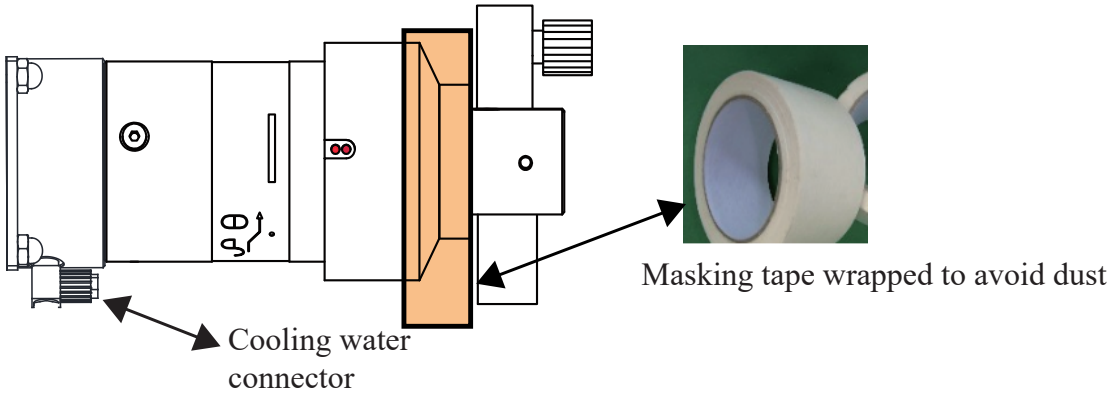
Minimize the time of laser path being exposed to the air to prevent the dust and dirt entering into the laser head.

If any safety or protection device has been removed, it must be reinstalled before the equipment being operated or debuged and checked whether the device could run well.

5.1 QBH and Fiber

1. Use self-adhesive paper to cover the junction of QBH and fiber connector to prevent dust from entering the gap.

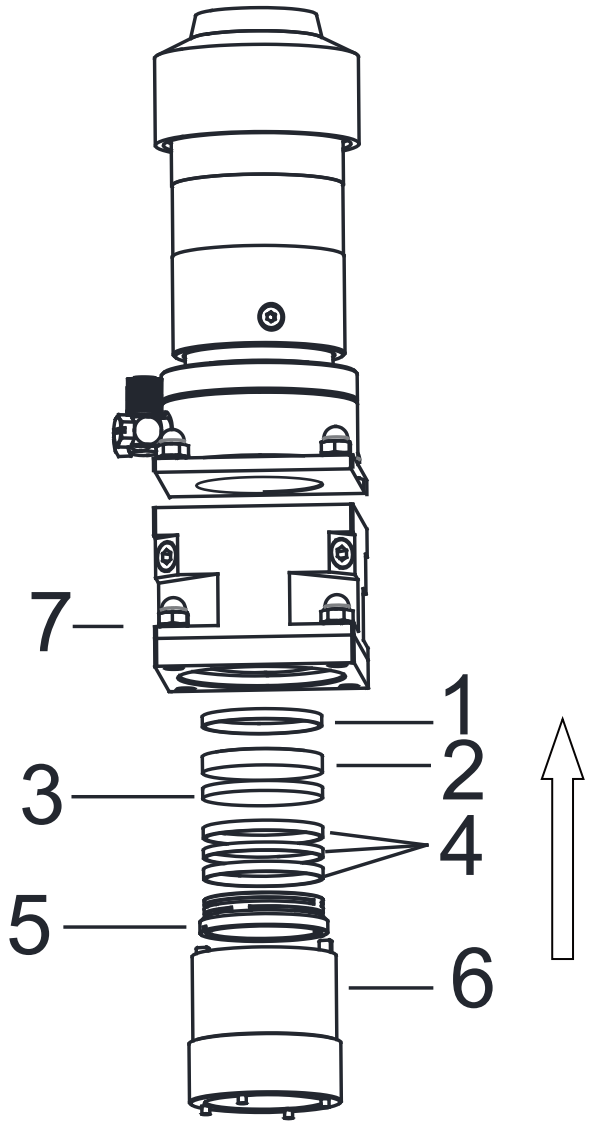
2. Fiber connector water cooling pipe must be connected well to prevent leaking. If QBH has water inside accidentally, please stop using immediately and send it to the factory to handle with.



5.2 Beam Expansion Component

When disassembling, please remember the relative position of the parts in order to facilitate the correct installation after maintenance.

Clean the laser head with anhydrous ethanol at first;
Loosen the four nuts;
Remove the collimator lens
Component with the special tools.



1 Gasket 2 Concave-convex Lens 3 Bi-convex Lens
4 Gasket 5 Locking Coil Spring 6 Special Tool 7 Beam Expansion Component

Disassembly process:

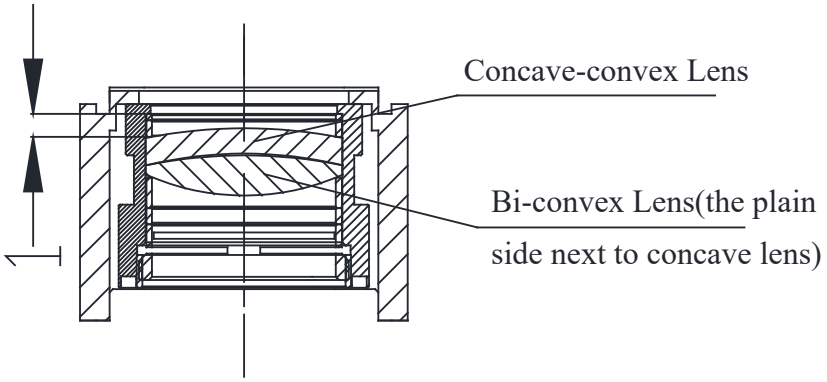
1.Use Special Tool (Part 6) to turn Locking Coil Spring (Part 5), until it is completely loose;

2.Draw out Beam Expansion Component (Part 7) upward gently, avoid dropping the lens;

3.Remove Gasket (Part 1), then change or maintain the lens;

4.When the maintenance of the lens is finished, assemble in reverse disassembly sequence; tighten at moderate intensity to avoid lens damage;

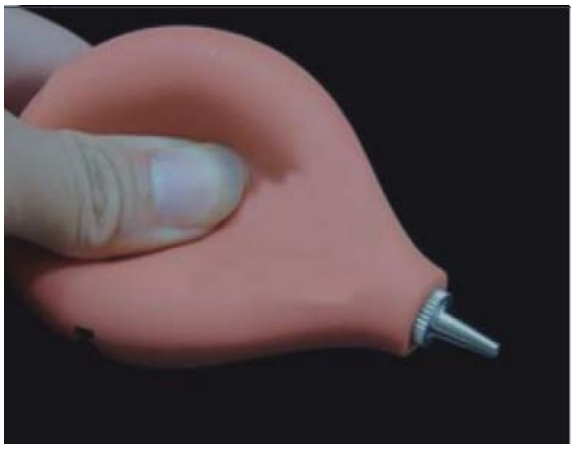
5.Twist to the end and then turn backward 1/5 circle to make a gap for Locking Coil Spring (Part 5).



installation picture of collimator lens

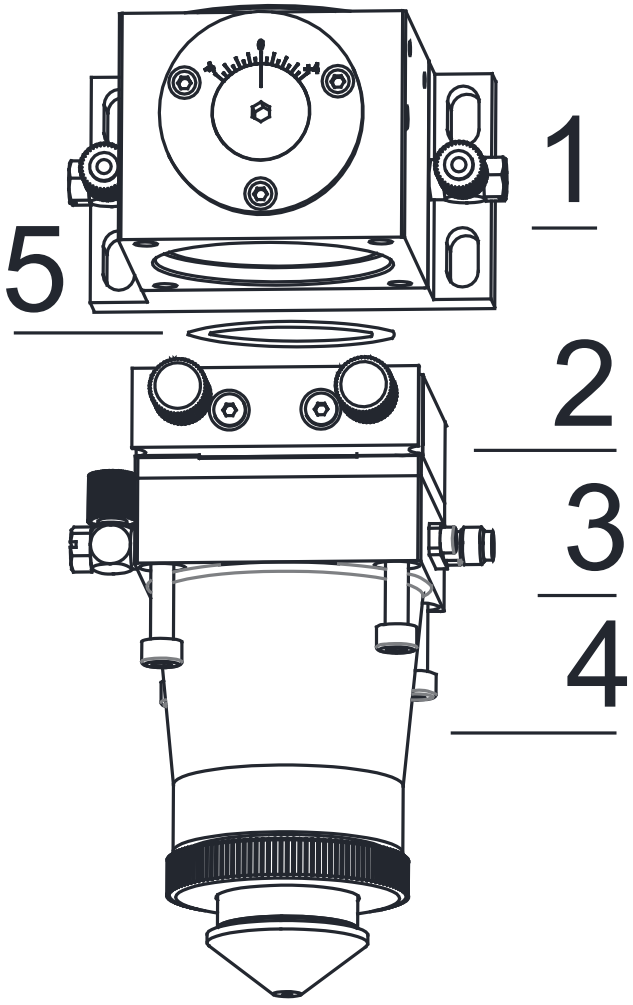
※Clean the lens

1. Use a dust-free clean rod dipped in isopropyl alcohol solvent to clean the lens; then use a hand bellows (Picture 20) to draw clean air and blow the attached granules or other foreign matters off the lens;
2. Repeat the above steps several times, until the lens is clean;
3. The focusing lens component is a combination of two piece of lenses, please note the orientation of the lens;
4. If the protective window can not be cleaned or it is damaged, user must change a new one.



5.3 Focusing Lens Component

When disassembling, please remember the relative position of the parts in order to facilitate the correct installation after maintenance.

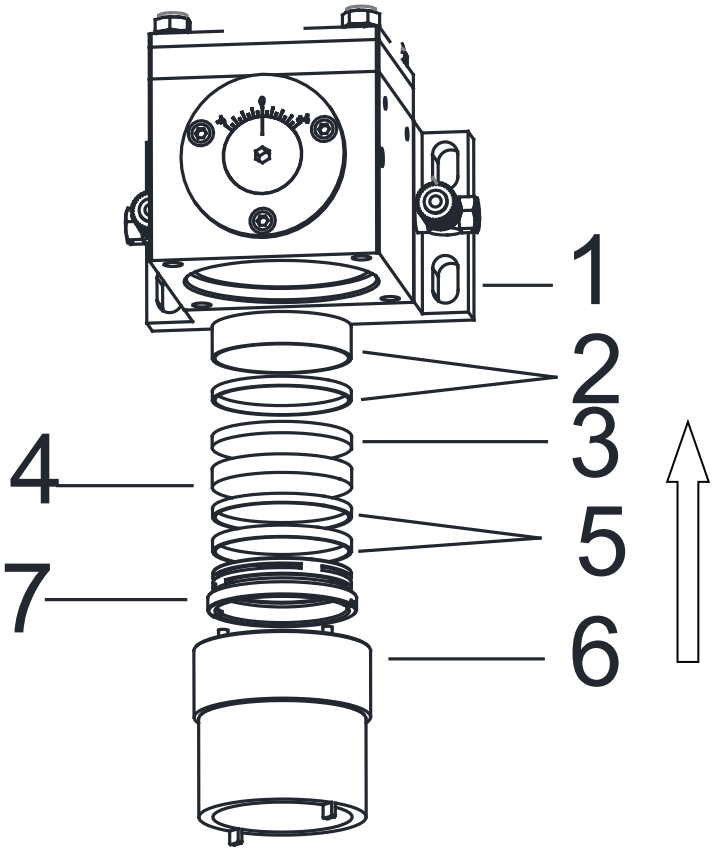


※Focal lens removal and installation

1 Focusing Lens Component
2 Protective Window Component
3 Sensor Component
4 4-M4 Screw
5 O-tyle Spring

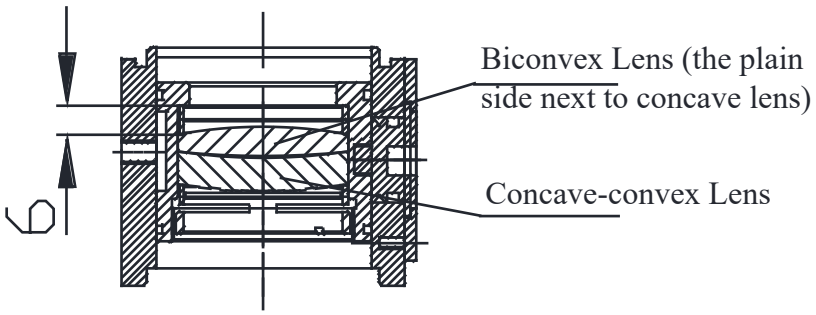
Disassembly process:

1.Remove 4-M4 Screw (Part 4);
2.Remove Protective Window Component (Part 2) & Sensor Component (Part 3);
3.Remove O-type Spring (Part 5);



1 Focusing Component
2 Gasket
3 Biconvex Lens
4 Concave-convex Lens
5 Gasket
6 Special Tool
7 Locking Coil Spring

4. Use Special Tool (Part 6) to turn Locking Coil Spring (Part 7), until it is completely loose;
5. Draw out Focusing Component (Part 1) upward gently, avoid dropping the lens;
6. Remove Gasket (Part 2), then change or maintain the lens;
7. When the maintenance of the lens is finished, assemble the lens in reverse disassembly sequence; tighten at moderate intensity to avoid lens damage;
8. Twist to the end and then turn backward 1/5 circle to make a gap for Locking Coil Spring (Part 7).



installation picture of focal lens

※Clean the lens

1.Use a dust-free clean rod dipped in isopropyl alcohol solvent to clean the lens; then use a hand bellows to draw clean air and blow the attached granules or other foreign matters off the lens;

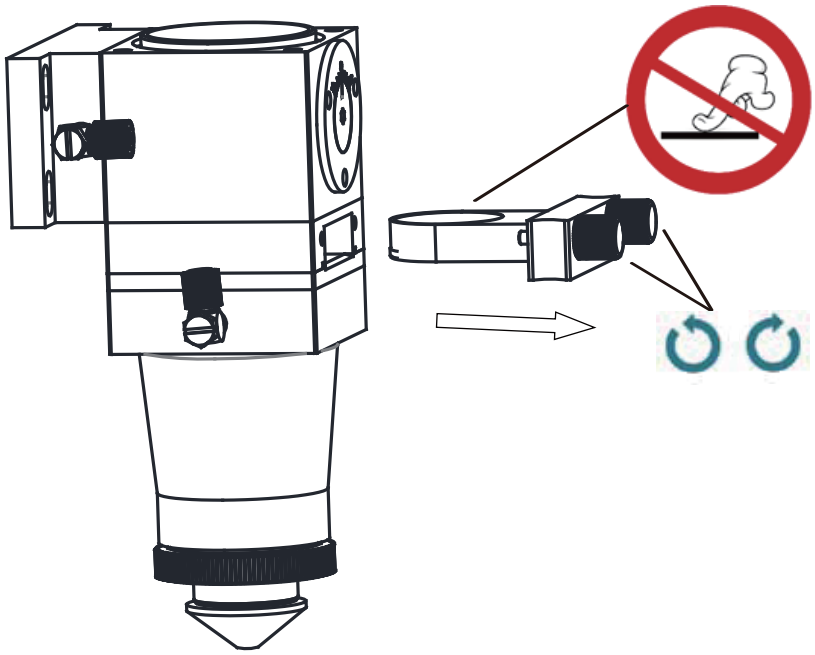
2.Repeat the above steps several times, until the lens is clean;

3.The focusing lens component is a combination of two piece of lenses, please note the orientation of the lens;

4.If the protective window can not be cleaned or it is damaged, user must change a new one.

5.4 Protective Lens Component

※Remove and insert protective lens drawer



1.Loosen the two locking nuts on the protective lens component by hand and remove the protective window drawer;

2.Note: use non-stick protective film to seal the opening after the removing of the lens imediately;

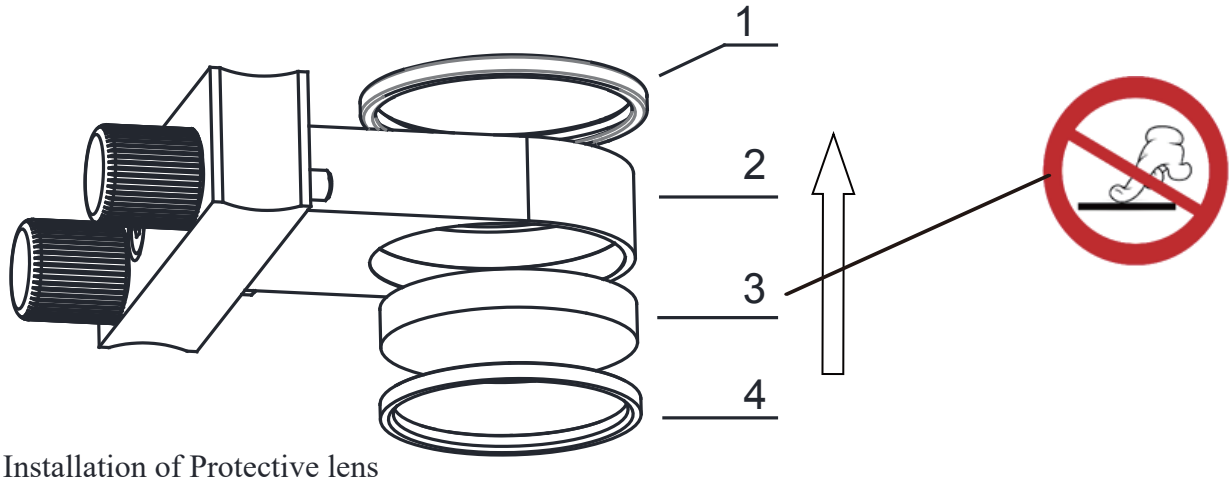
3.Maintain the protective window drawer (including protective lens) in clean environment;

4.When the maintenance is finished, take off the protective film on the laser head, insert the protective window component (including the lens) into the laser head horizontally, and lock it;

5.Note the orientation of the protective window component, it can not be inserted at the wrong orientation;

6.Tighten the two locking nuts on the protective lens component by hand at moderate intensity.

DO NOT operate with wrench or iron plier.



Installation of Protective lens

1 Sliding Gasket 2 Pedestal 3 Protective Lens 4 Seal Ring

Note: Part 3 & 4 must be removed in the direction of the arrow, otherwise it may cause damages. In normal conditions, it is unnecessary to remove the Sliding Gasket (Part 1), just check it every time in maintenance.

※Removal of Protective Lens

1.Remove the Seal Ring (Part 4) gently, then remove Protective Lens (Part 3);

2.Put Protective Lens (Part 3) in clean container, the lens surface can not touch any non-gaseous materials.

※Clean the Protective Window

1.Use a dust-free clean rod dipped in isopropyl alcohol solvent to clean the lens; then use a hand bellows to draw clean air and blow the attached granules or other foreign matters off the lens;

2.Repeat the above steps several times, until the lens is clean;

3.If the protective window can not be cleaned or it is damaged, user must change a new one.

※Check the seal ring

1.Check for deformation or defect which may cause gas leaking;

2.The seal ring should not drop onto ground or any other dirty environment.

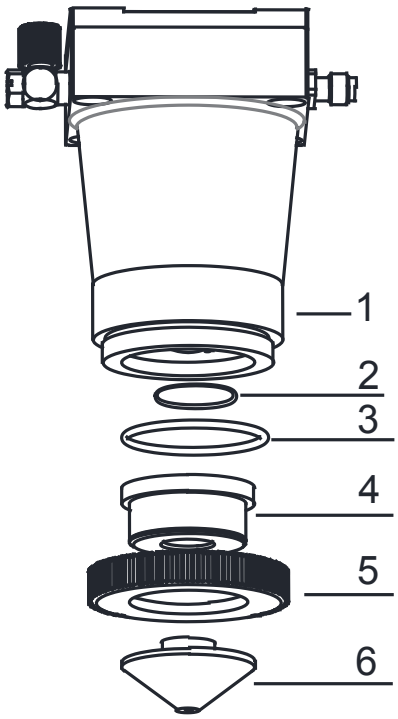
※Installation of the protective window

1.Install the clean Protective Lens (Part 3) into Pedestal (Part 2) carefully;

2.Install the Seal Ring (Part 4), and check whether the Seal Ring (Part 4) is below the protective lens.

5.5 Maintenance of Nozzle and Ceramic Ring

The nozzle and the ceramic ring are vulnerable part, please operate carefully.



ceramic Parts and Nozzle

1 Sensor 2 16*1 O-Type Spring

3 28*1.5 O-Type Spring 4 Ceramic Ring

5 Locking Coil Spring 6 Nozzle

※Removal and installation of the ceramic parts

1.Remove Nozzle (Part 6);

3.Remove Locking Coil Spring (Part 5);

3.Remove Ceramic Ring (Part 4), Note the Orientation of the pins;

4.Check Ceramic Ring (part 4) and Nozzle (part 6), clean them with ethyl alcohol;

5.Check O-Type Spring (Part 2 & 3), clean them with ethyl alcohol;

6.Reinstall the parts after maintenance.

Install the ceramic ring according to the corresponding orientation of the pins; otherwise it may cause accidents.

6.Malfunction Analysis and Measure

Malfunction	Reason	Measure
The cutting gas pressure does not match the demand	Cutting gas pipeline connection failure	Connect the cutting gas pipeline correctly
	Protective window component is loose or damaged	Replace or tighten the protective lens cover
	Ceramic ring and sensor unit gasket are loose	Replace the worn gasket
	Sensor cable is broken or connecting is loose	Replace the sensor cable or tighten the connector
	Cutting gas leaks out from other parts	Send back to factory for repair
	Low gas pressure in nozzle	Check whether it is blocked
The nozzle is overheated	Laser is blocked (focusing incorrectly)	Check the focusing
Cutting gas or liquid can not reach the cutting point	Cutting gas or liquid pipeline connection failure	Connect the related pipeline correctly
	Cutting gas or liquid leaked out	Send back to factory for repair
Horizontally adjusting screw is hard to twist	The screw is damaged or dirty	Send back to factory for repair
Focusing vertical adjusting screw is hard to twist	Machanical adjusting component is damaged or dirty	Send back to factory for repair
Focusing can not be found in vertical adjusting range	Incorrect focal length; or focusing lens is damaged	Replace the inner gasket; Send back to factory for repair
Poor cutting quality	Focus diameter is oversize; Incorrect focusing lens assembly; Focusing lens is damaged; Incorrect focusing	Replace the cutting head; Send back to factory for repair
	Incorrect focusing position	Check the focusing position / focus, correct the setting
	Protective lens is dirty	Clean or replace the protective window
Incorrect distance display which keeps changing with the cutting head moving	Sensor cable is damaged; or connecting is loose	Replace the sensor cable or tighten the connection

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