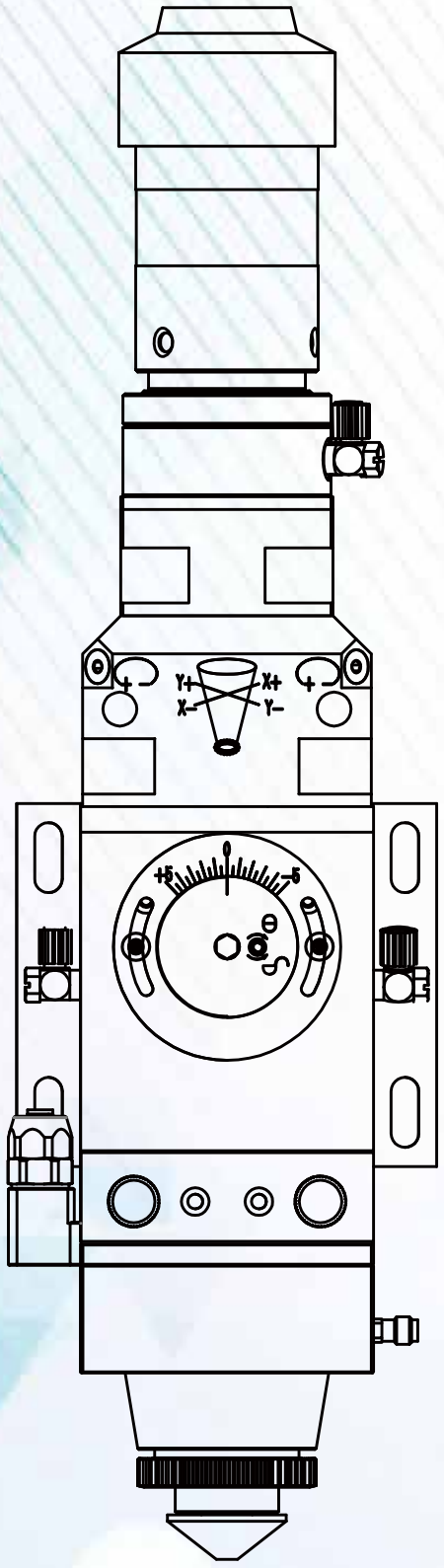
Fiber Laser Cutting Head

WSX-GQ-001A-OFY



User Manual

Shenzhen Worthing Technology Co.,Ltd.

Attention

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.

Laser in use. Do not stare into 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!

Product: Fiber Laser Cutting Head

Model: WSX-GQ-001A

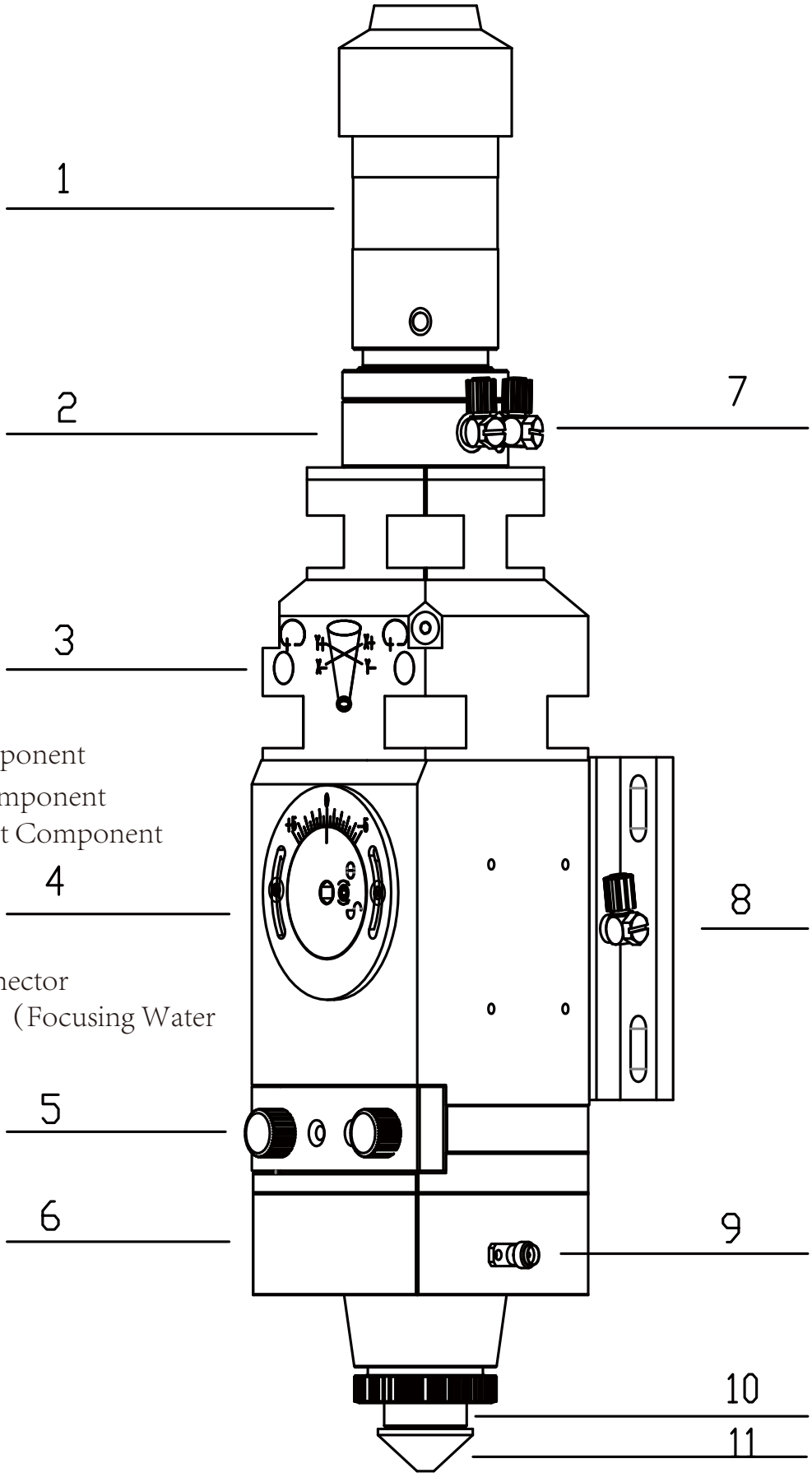
Product Features:

This laser head has a great advantage in medium power large processing area fiber laser cutting application.
Completely sealed internal structure of laser head can avoid optical part from dust pollution.
Two-point centering adjustment of laser head, and cam structure focusing, make it easy to control precisely.
Protective window is installed in drawerstyle to be exchanged easily.
Can be equipped with various kind of QBH connectors laser source.

Contents

1. Product Description

1.1Product Structure



1 QBH Plug
2 Water Cooling Component
3 Beam Expansion Component
4 Focusing Adjustment Component
5 Protective Window Component
6 Sensor Component
7 Water Cooling Connector
8 Water Cooling Plate（Focusing Water Cooling Connector）
9 Height Sensor Signal Interface
10 Ceramic Ring
11 Nozzle

Picture 1

1.2 Main 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 module 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 Ring & 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 replace 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 continious 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

※Lens Cooling

◎ For laser power over 1000w, focusing pedestal must be equipped with water cooling structure.

※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

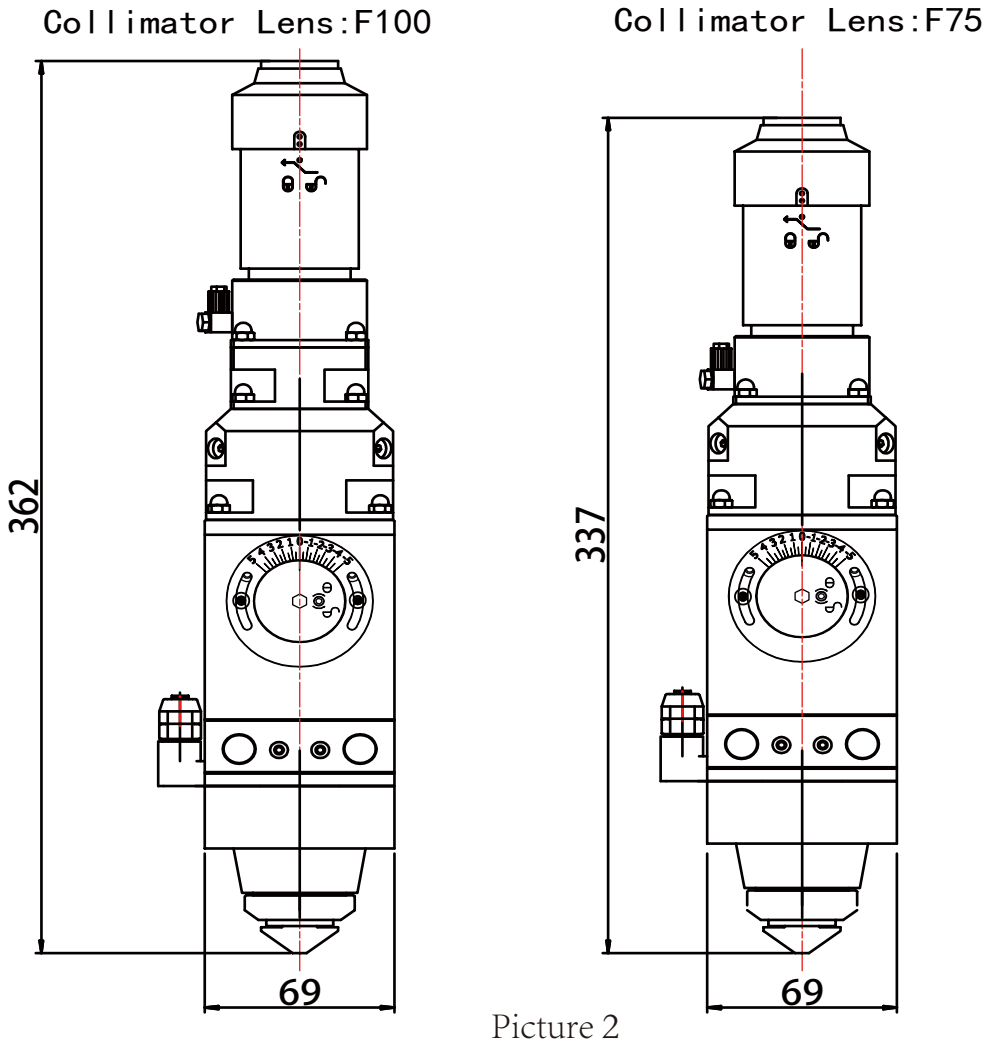
※Cutting Gas

◎ With the preinstalled gas source connector, the laser head can work under 25Bar (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.

1.3Changeable Product

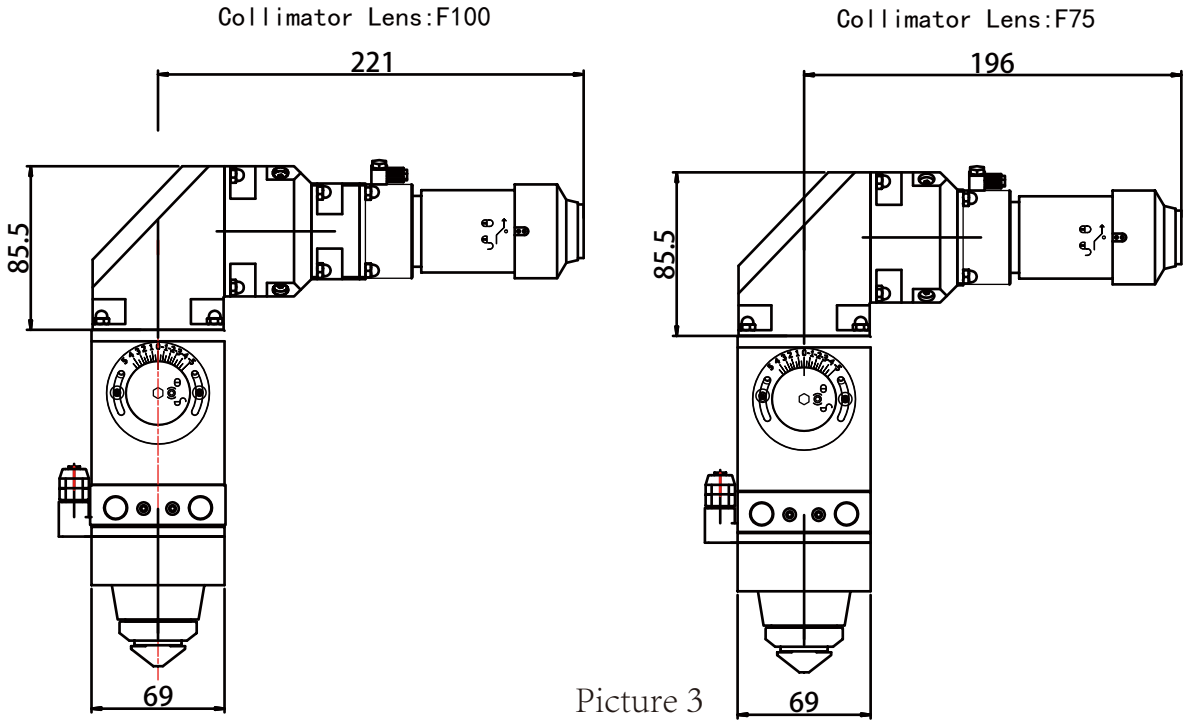
1.3.1Straight Version



Picture 2

1.3.2Elbow Version

Total length is different due to different focal length



Picture 3

2. Technical Specification

2.1 Laser Head Parameters:

Max Laser Power: 2000W

Fit for Laser Machine IPG, SPI, Rofin, nLight, Coherent, Raycus and Max etc.

Can be connected with QBH plug

Collimator Focal Length: 75mm, 100mm

Focal Length: 125mm, 150mm, 200mm

Vertical Adjustment Range: ±5mm

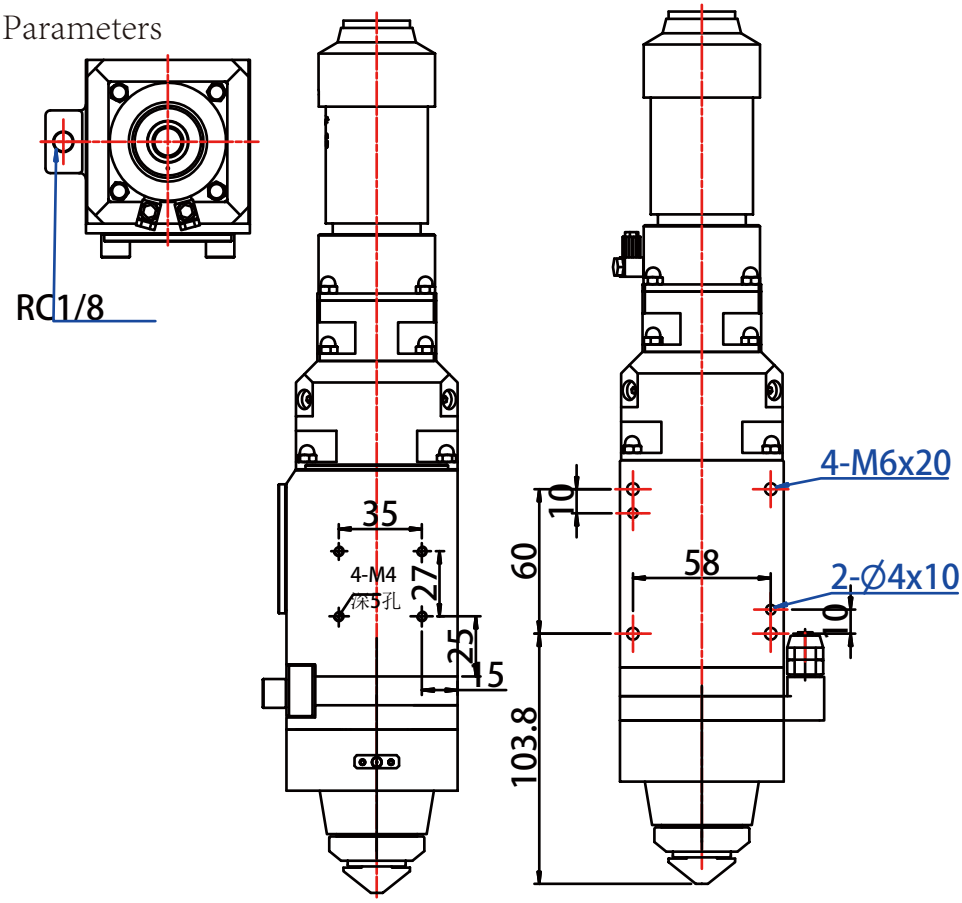
Horizontal Adjustment Range: ±1.5mm

Clear Aperture: 25mm

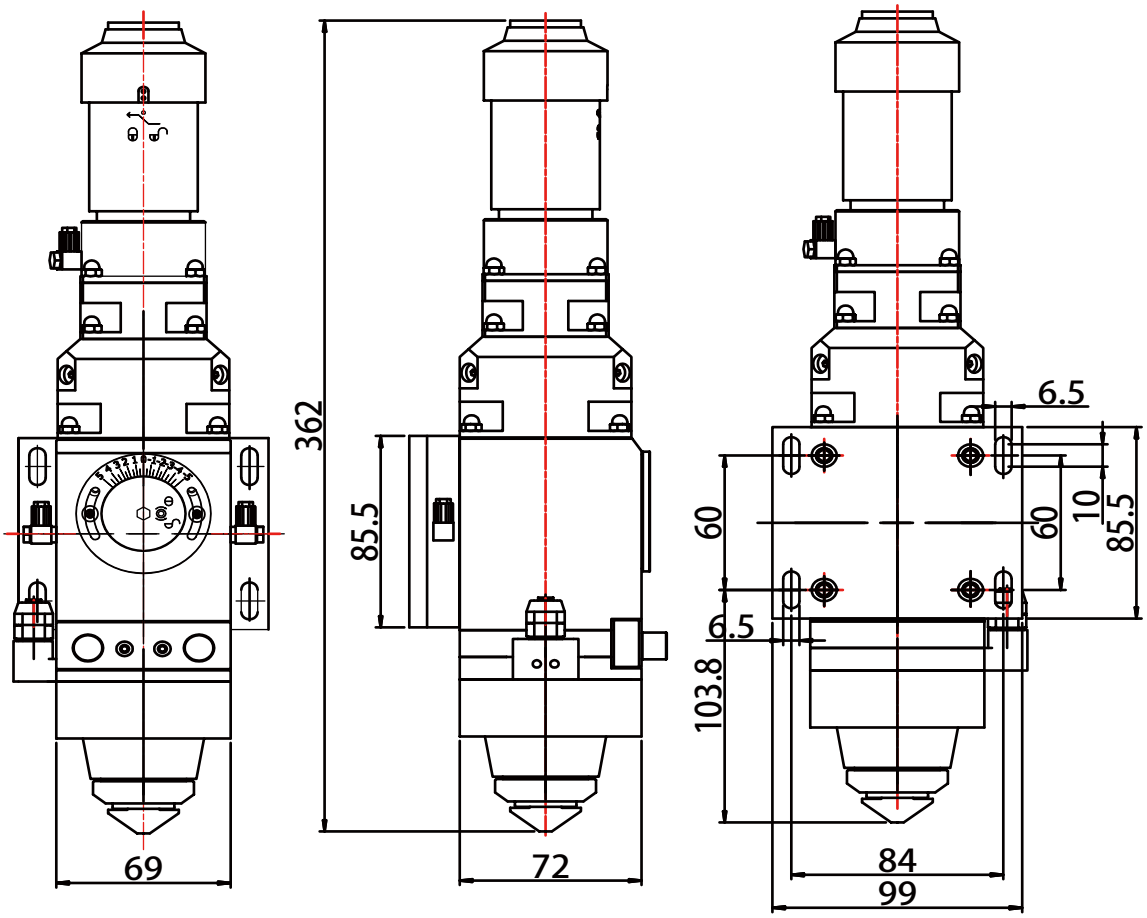
Max Cutting Gas Pressure: 25 Bar

Gross Weight: 3.3 kg

2.2 Connected Flange Parameters



Picture 4



Picture 5

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

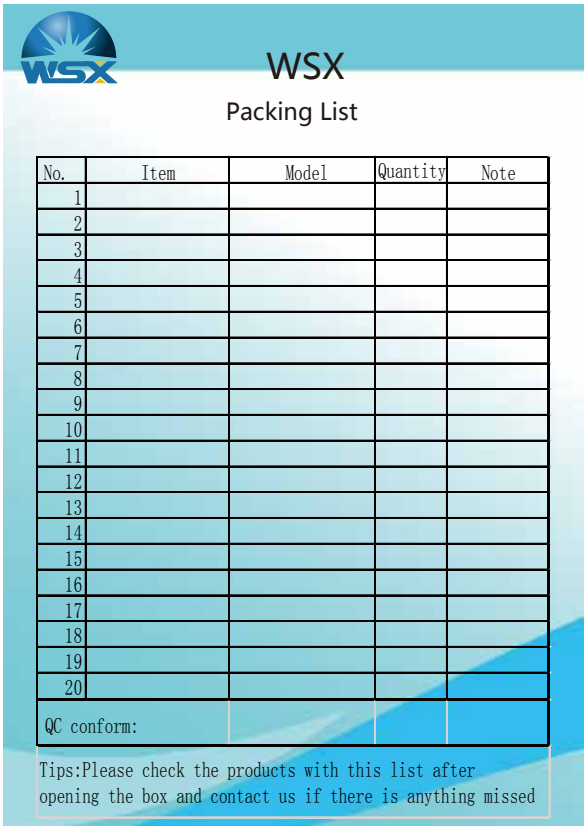
1.Intact box;
2.The signage should be clear with conformity mark and accord with the purchased models;
3.The upper and lower opening tear-proof seals are not broken or disassembled;
4.If the above does not match, contact the seller.

※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.


WSX
Packing List

No.	Item	Model	Quantity	Note
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
QC conform:				

Tips:Please check the products with this list after opening the box and contact us if there is anything missed

Picture 6

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 personel

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.

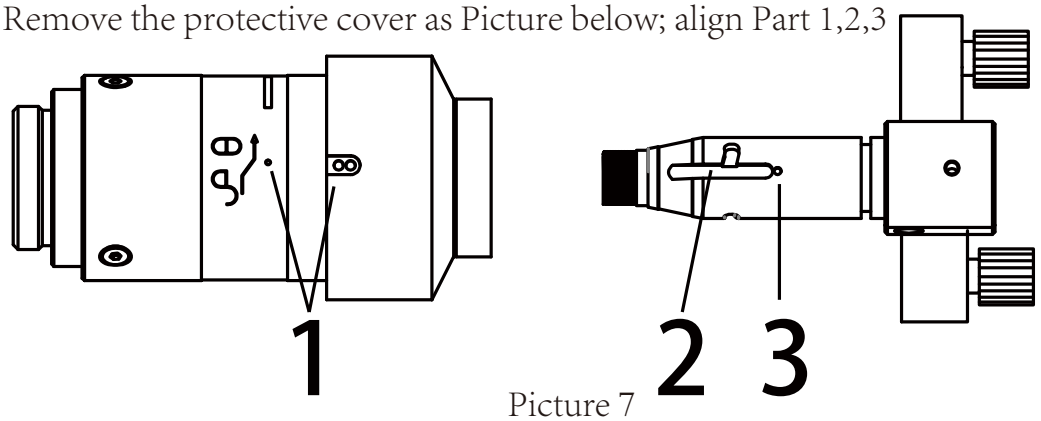
3.4 Connect with Fiber

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.

※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.Chenck 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

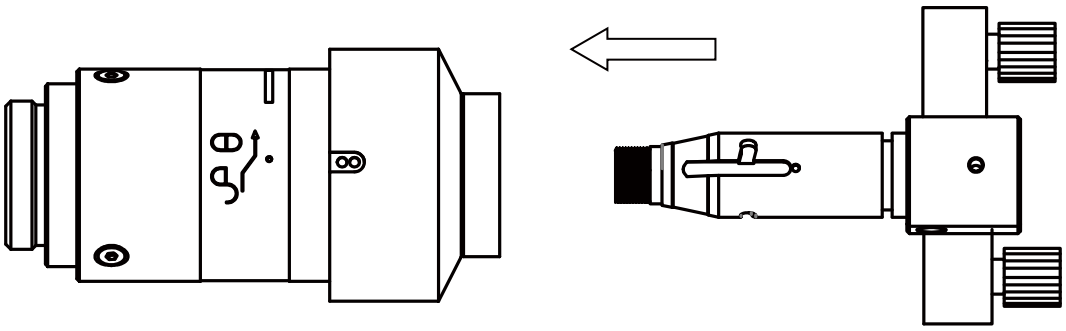


Picture 7

1 QBH Red Direction Mark (Turning Rim) 2 The longest straight slot on fiber connectors

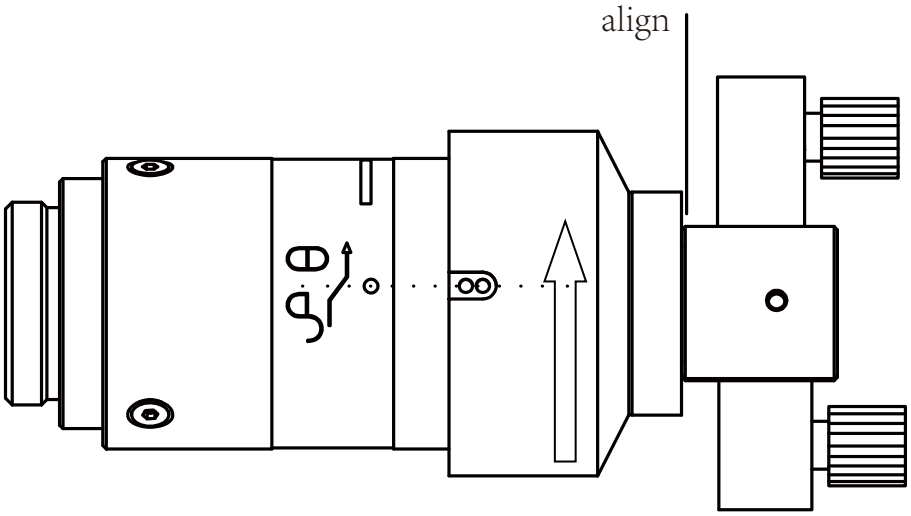
3 Fiber connector red direction mark

5.Insert the fiber connector into QBH gently;



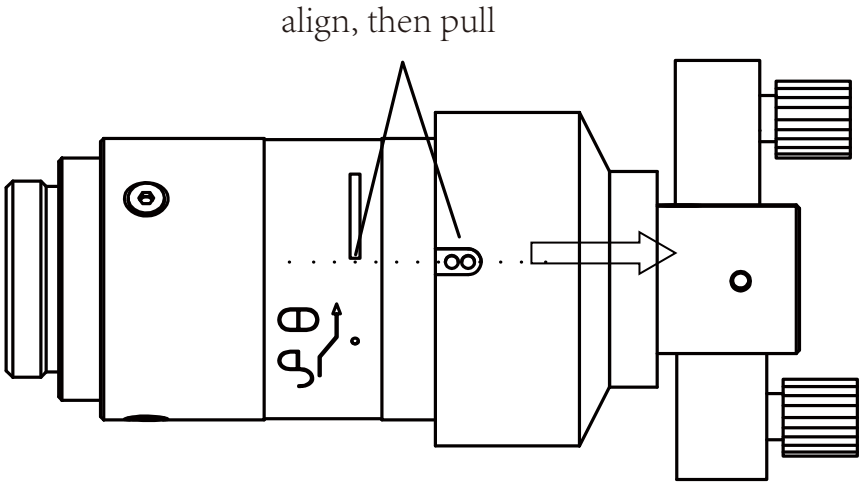
Picture 8

6.After inserting, turn the turning rim in the direction as Picture 9 untill the two red marks are aligned to the white mark



Picture 9

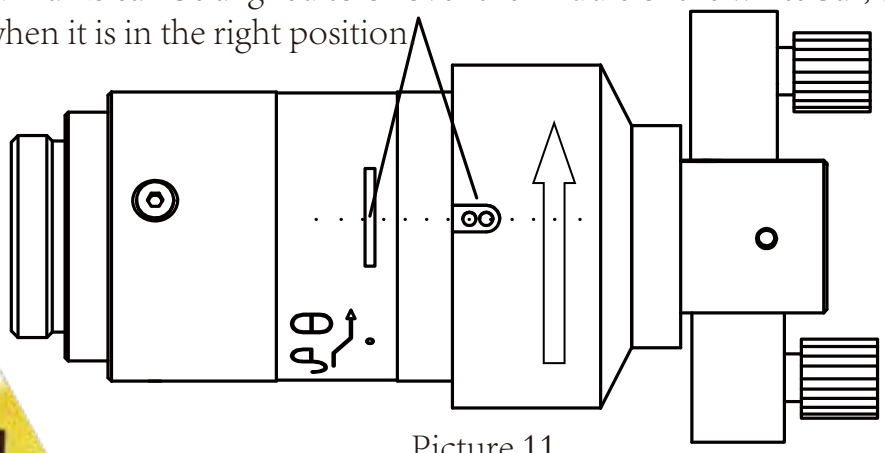
7.Then pull the turning rim as Picture 10;



Picture 10

8.Turn the rim in the direction as Picture 11 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.

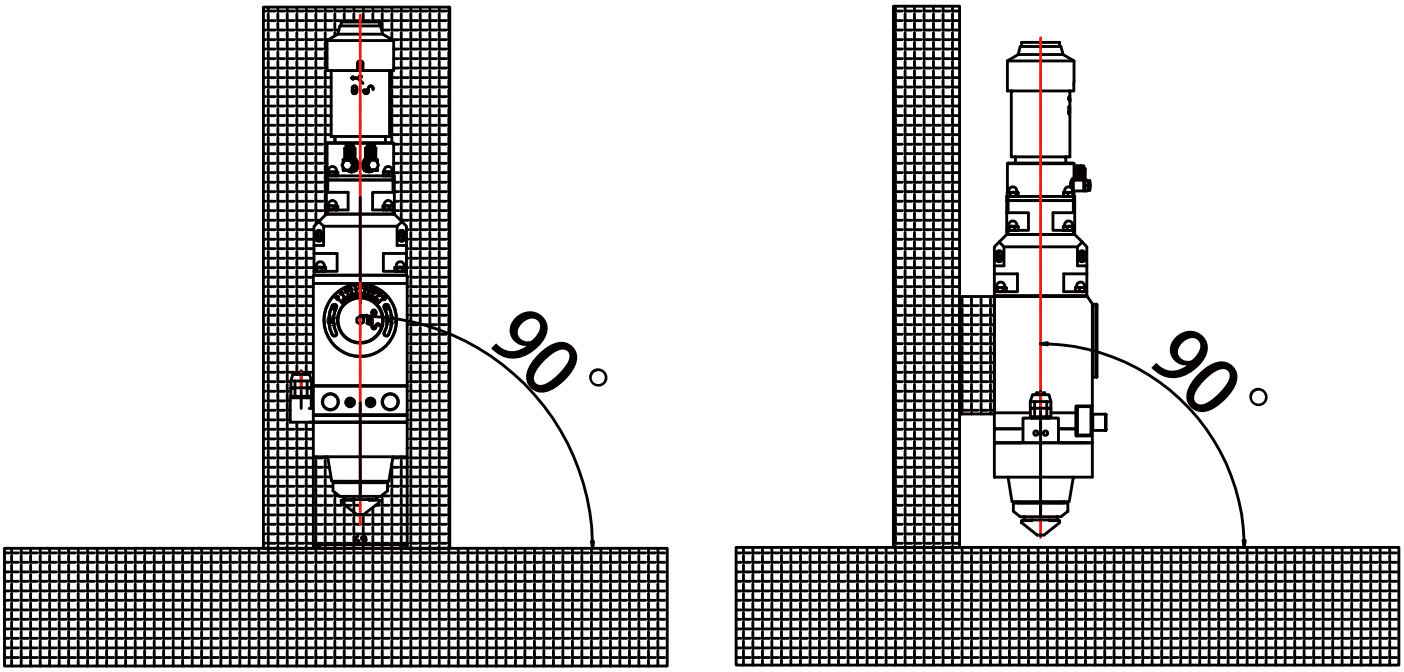


Picture 11

Note: Do not twist vigorously , it may cause damage to precision machinery.

To avoid dust or dirt entering into the fiber optic connector by accident, please clean the fiber rod first. Insert the fiber plug with the laser head in a horizontal position.

3.5 Connect With Machine Tools



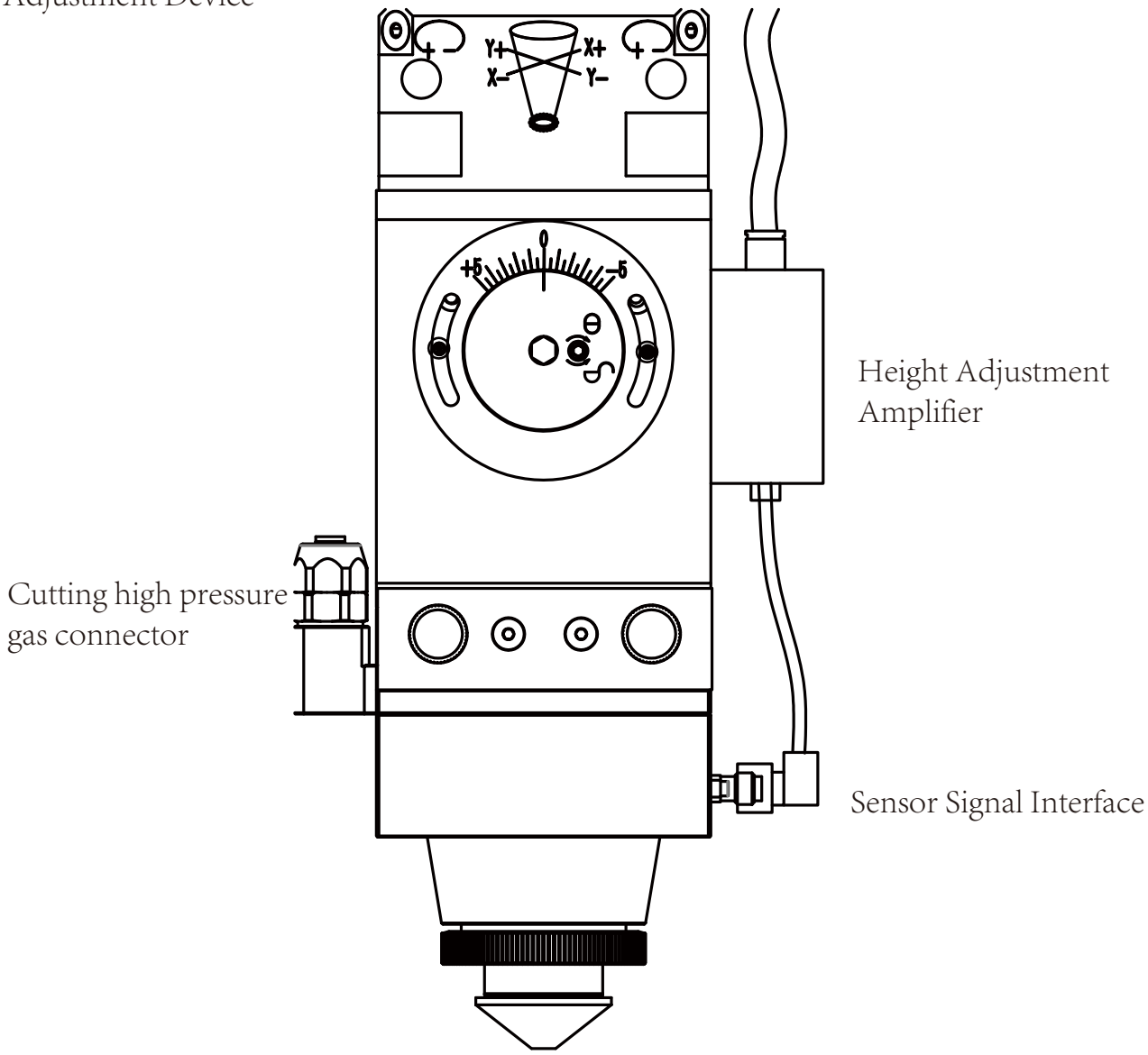
Picture 12

1.Ensure that the axis of the laser head is perpendicular to the cutting plane of the machine when installing.

2.With 4-M6 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.See the installation inspection method in attached sheet 1.

3.6 Connect With Height Adjustment Device

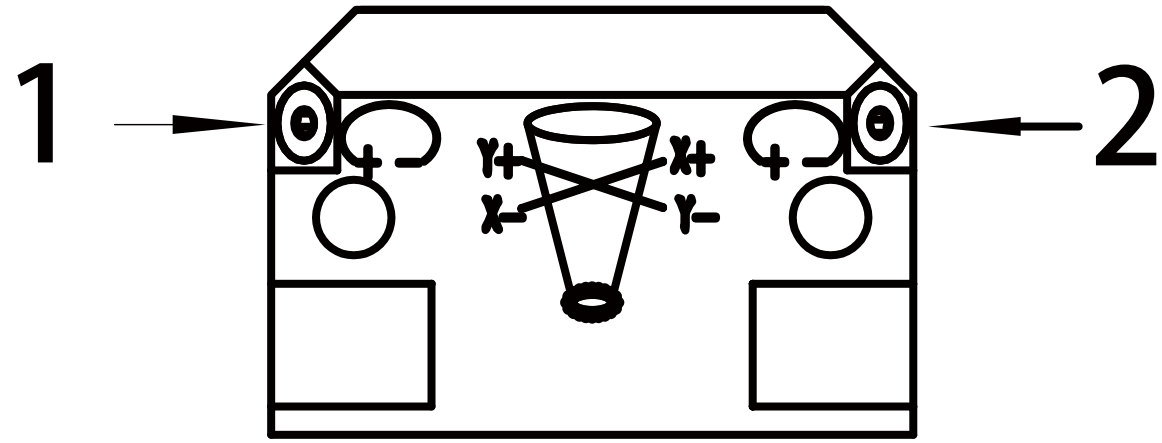


Picture 13

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

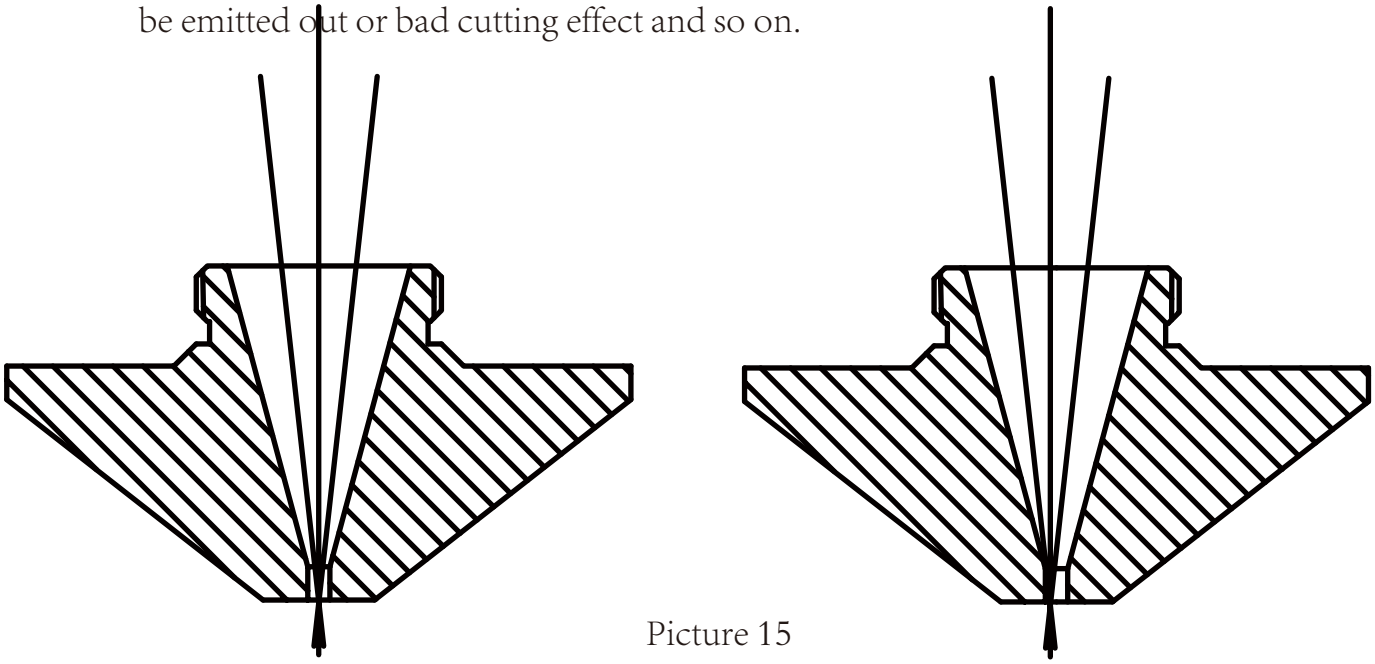
4.1Center Adjustment



Picture 14

1 Y-Direction Horizontally Adjusting Screw 2 X-Direction Horizontally Adjusting Screw

1. Adjust the X/Y screw as Picture 14 by allen wrench and make the beam pass through the center of nozzle;
2. The cutting effect is best 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.



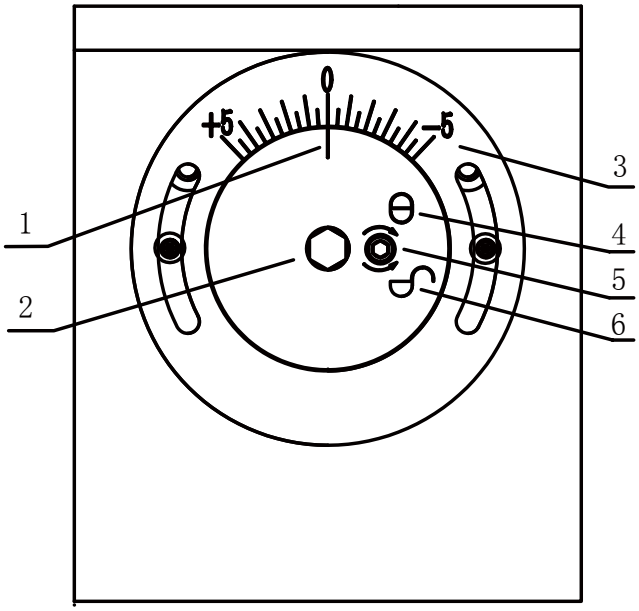
Picture 15

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 emited 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.

4.2Focusing Adjustment



Picture 16

1 Focus Pointer 2 Focus Adjustment Hexagonal hole 3 Focus Dial
4 Clockwise to Lock 5 Focus Locking Device 6 Anticlockwise to Loosen

1. Adjust at the direction of “+5”, the focus will move upward; adjust at the direction of “-5”, the focus will move downward;
2. Loosen the Focus Locking Device (Part 5);
3. Insert a hexagon wrench into the Focus Adjustment Hexagonal Hole (Part 2), turn clockwise or anticlockwise to make the Focus Pointer (Part 1) 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 5);
6. The focus is unlocked in the factory default setting.

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 debugged and checked whether the device could run well.

5.1 QBH and Fiber

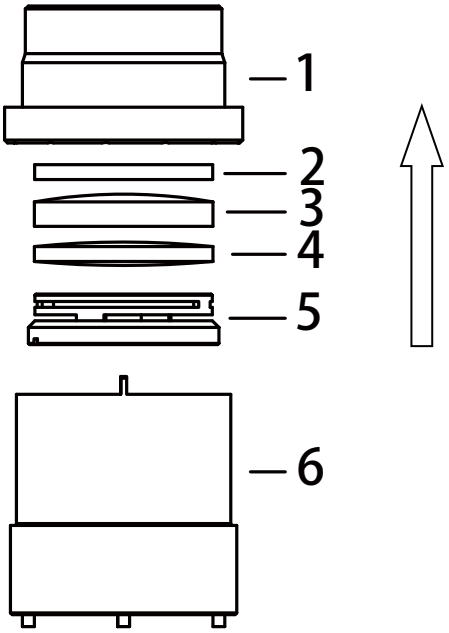
1. Use self-adhesive paper to cover the junction of QBH and fiber connector to prevent dust from entering the gap.
2. Fiber connector water cooling pipe must be connected well to prevent leaking. If QBH has water inside accidently, please stop using immediately and send it to the factory to handle with.

5.2 Beam Expansion Component

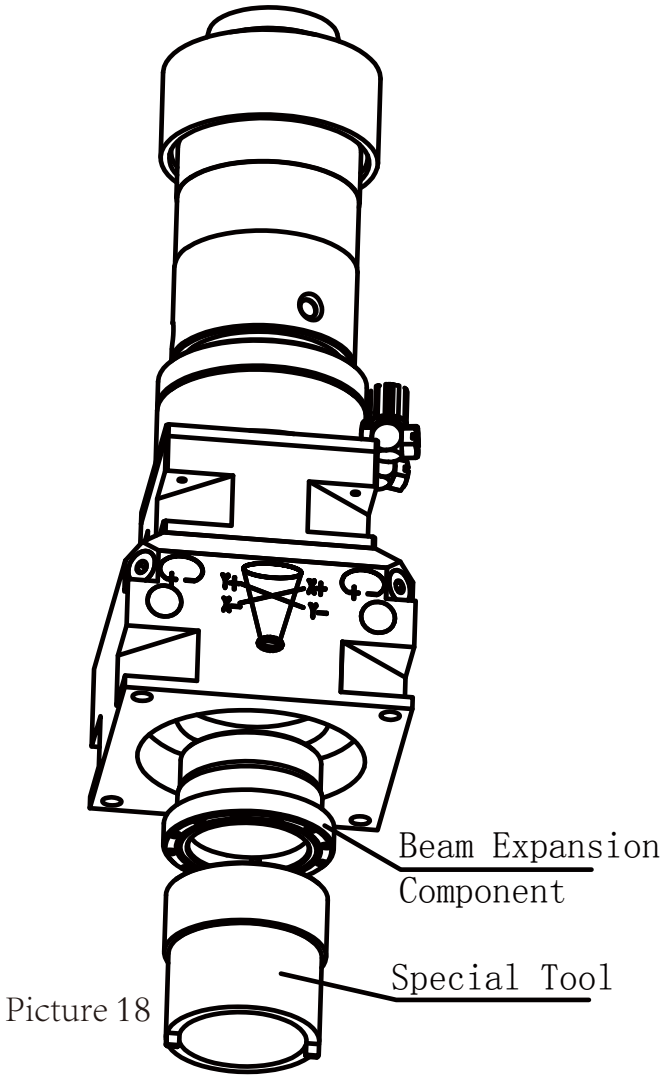
When disassembling, please remember the relative position of the parts in order to facilitate the correct installation after maintenance.

※Lens removal and installation

Clean the laser head with anhydrous ethanol at first;
Loosen the four nuts;
Remove the collimator lens Component with the special tools as Picture 18:



Picture 17

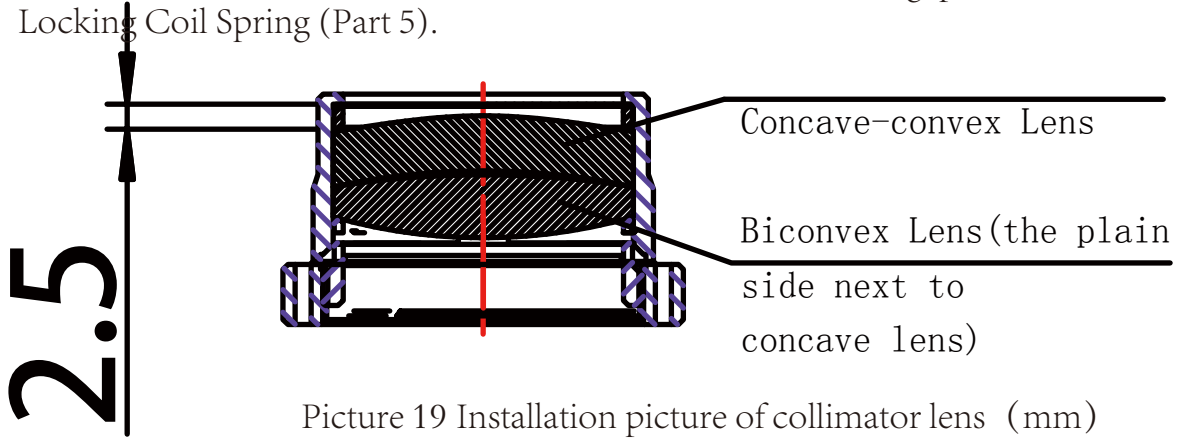


Picture 18

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

Disassembly process as Picture17:

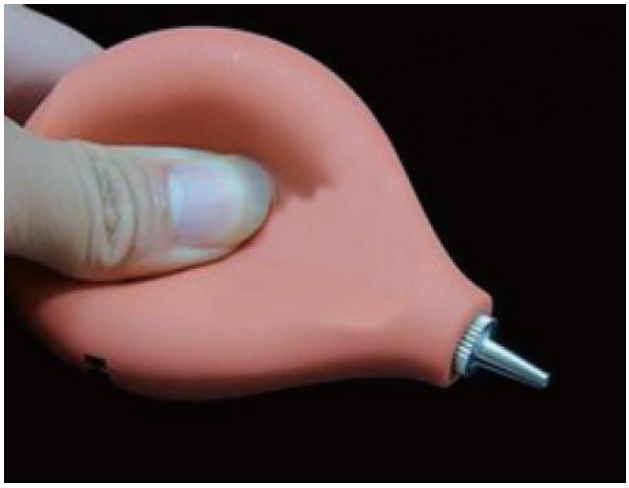
1.Use Special Tool (Part 6) to turn Locking Coil Spring (Part 5), until it is completely loose;
2.Draw out Beam Expansion Component (Part 1) upward gently, avoid dropping the lens;
3.Remove Gasket (Part 2), then change or maintain the lens;
4.When the maintenance of the lens is finished, assemble in 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 (0.1~0.15mm) for Locking Coil Spring (Part 5).



Picture 19 Installation picture of collimator lens (mm)

※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.



Picture 20

5.3 Focusing Lens Component

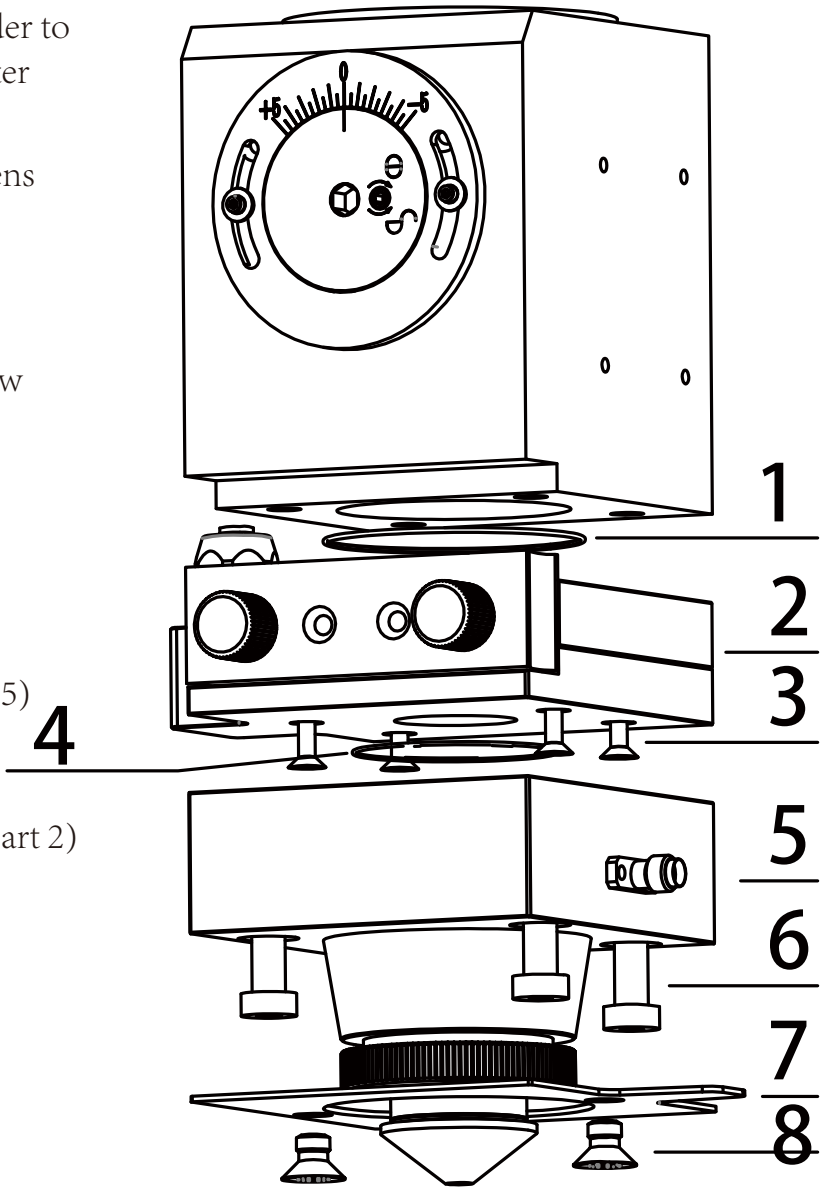
When disassembling, please remember the relative position of the parts in order to facilitate the correct installation after maintenance.

※Removal and installation of focal lens

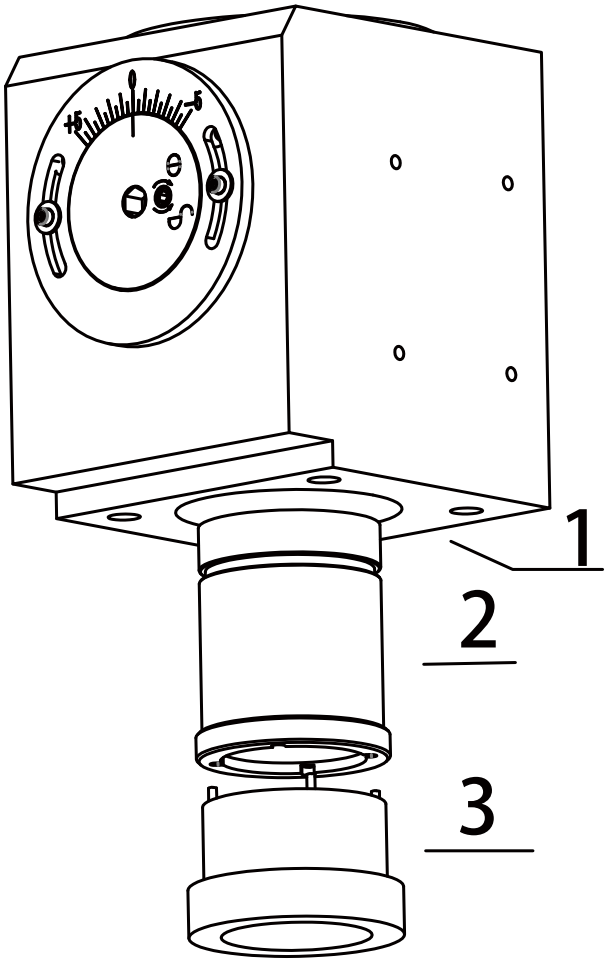
1. O-tyle Spring
2. Protective Window Component
3. 4 -M3 Screw 4. O-tyle Spring
5. Sensor Component 6. 4-M6 Screw
7. Baffle 8. 2-M3 Screw

Disassembly process:

1. Remove 2-M3 Screw (part 8);
2. Remove Baffle (Part 7);
3. Remove 4-M6(Part 6);
4. Remove Sensor Component(Part 5) & O-Type Spring (part 4);
5. Remove 4-M3 Screw(Part 3);
6. Remove Protective Component(Part 2) & O-Type (Part 1).



Picture 21



Picture 22

Picture 22 Focal lens removal and installation

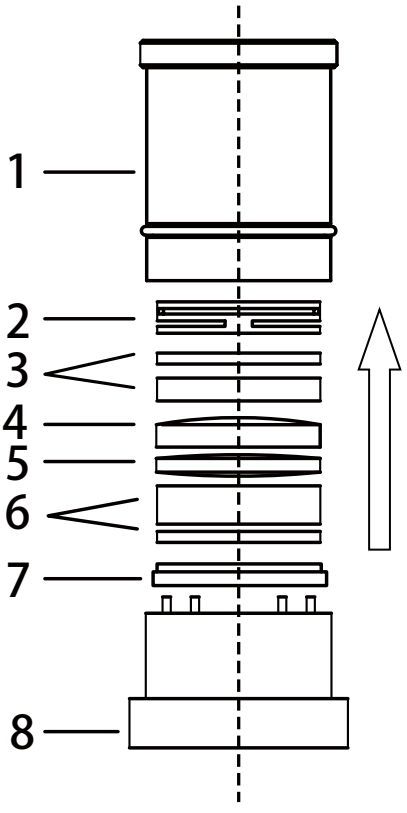
1 Focusing Component

2 Focal Lens Barrel

3 Special Tool

7. Remove Focal Lens Barrel (Part 2) with Special Tool (Part 3);

8. Use Special Tool (Part 8) to turn Locking Coil Spring(Part 7), until it is completely loose;
9. Draw out Focal Lens Barrel (Part 1) upward gently, avoid dropping the lens;
10. Remove Coil Spring(Part 2) & Gasket (Part 3), then change or maintain the lens;
11. When the maintenance of the lens is finished, assemble the lens in reverse disassembly sequence; tighten at moderate intensity to avoid lens damage;
12. Twist to the end and then turn backward 1/5 circle to make a gap (0.1~0.15mm) for Locking Coil Spring (Part 2).



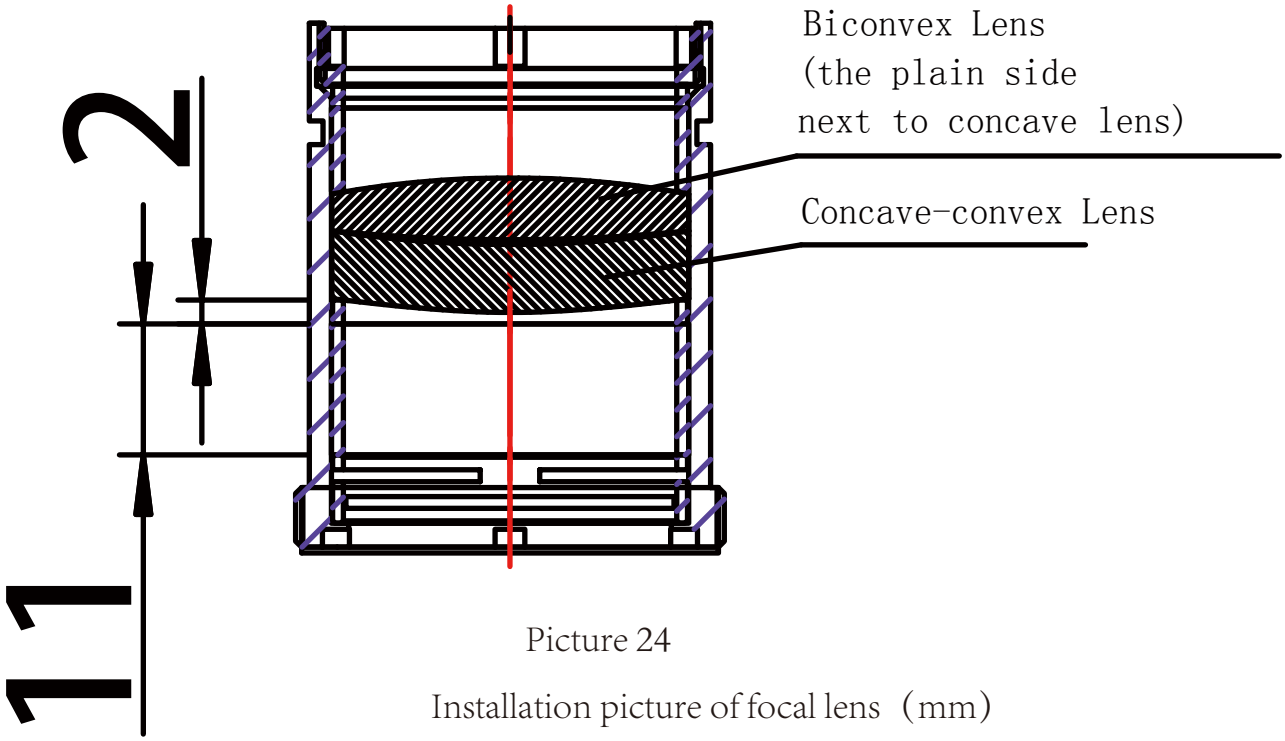
Picture 23

Picture 23 Installation picture of focal lens

1 Focal Lens Barrel 2 Coil Spring 3 Gasket

4 Concave-convex Lens 5 Biconvex Lens

6 Gasket 7 Locking Coil Spring 8 Special Tool



Picture 24

Installation picture of focal lens（mm）

※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;

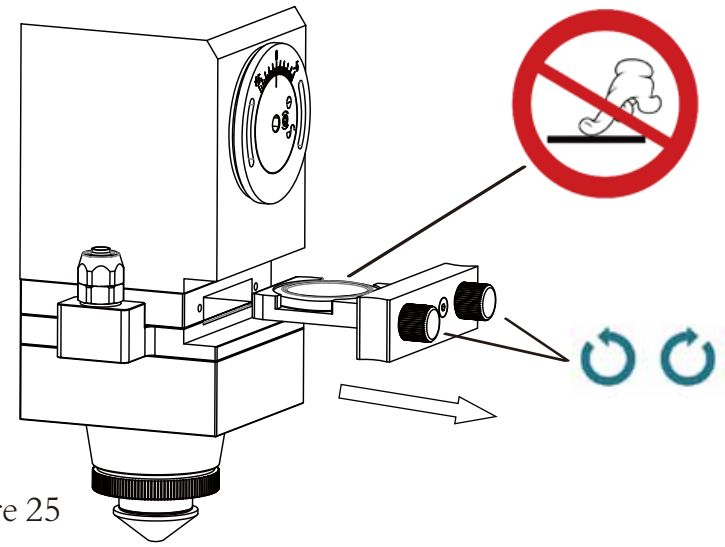
2.Repeat the above steps several times, until the lens is clean;

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

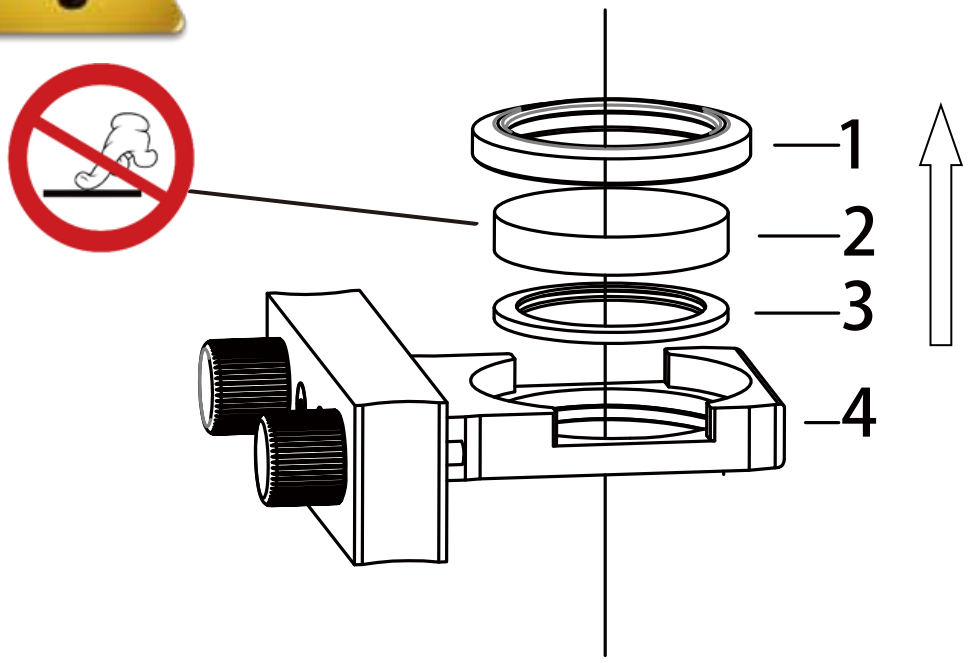
※Remove and insert protective lens drawer



Picture 25

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 proctetive 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.



Picture 26 Installation of Protective Window

1 Fixing Ring 2 Protective Window 3 Seal Ring 4 Pedestal

Note: Part 1 ~ 3 must be removed in the direction of the arrow, otherwise it may cause damages.

※Removal of Protective Window

1.Remove the Seal Ring (Part 3) gently, then remove Protective Window (Part 2);

2.Put Protective Window (Part 2) in clean container, the window surface can not touch any nongaseous 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;

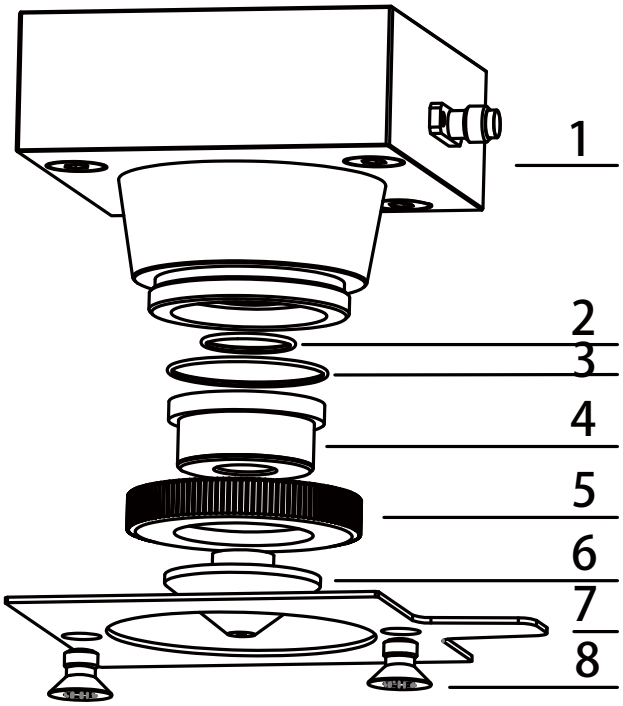
2.The seal ring should not drop onto ground or any other dirty environment.

※Installation of the protective window

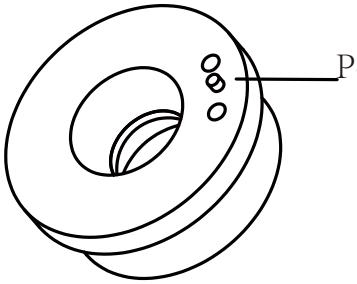
1.Install the clean Protective Window (Part 2) into Pedestal (Part 4) carefully;
2.Install the Seal Ring (Part 3), and check whether the Seal Ring (Part 3) is below the Protective Window.

5.5 Ceramic Ring and Nozzle

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



Picture 27 Ceramic parts & Nozzle



Picture 28 Orientation of Pin on Ceramic Ring

1 Sensor 2 Outer 16*1 O-Type Ring 3 Inner 28*1.5 O-Type Ring
4 Ceramic Ring 5 Locking Coil Spring 6 Nozzle 7 Baffle 8 2-M3 Screw

※Removal and installation of the ceramic parts

1.Remove 2-M3 Screw(Part 8), remove Baffle(Part 7);
2.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.

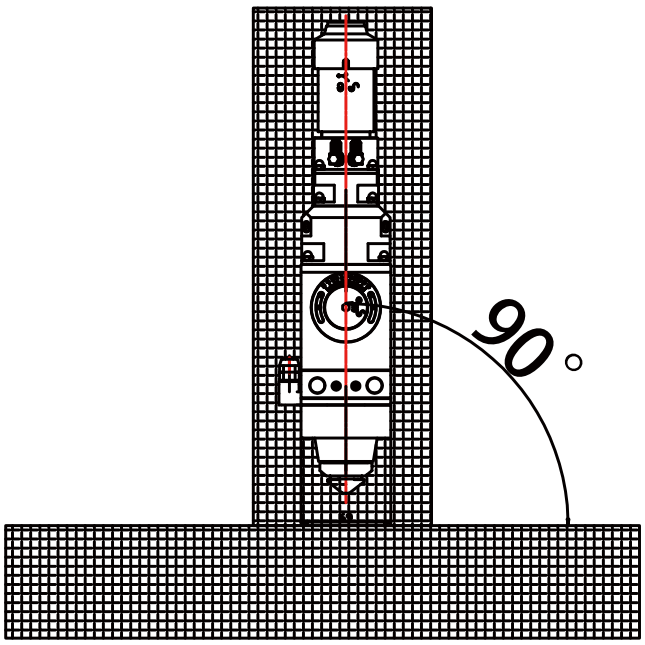
1.Clean the Ceramic Ring, if it is damaged, replace it with a new one;
2.Check the O-Type Spring, if it is aged or damaged, replace it with a new one;
3.Check the Nozzle, if it is deformed due to crashing or blocking, replace it with a new one;
4.Tighten the Nozzle and the Ring by hand, otherwise it may cause damage;
5.Besides, all the contacting surface must be clean.

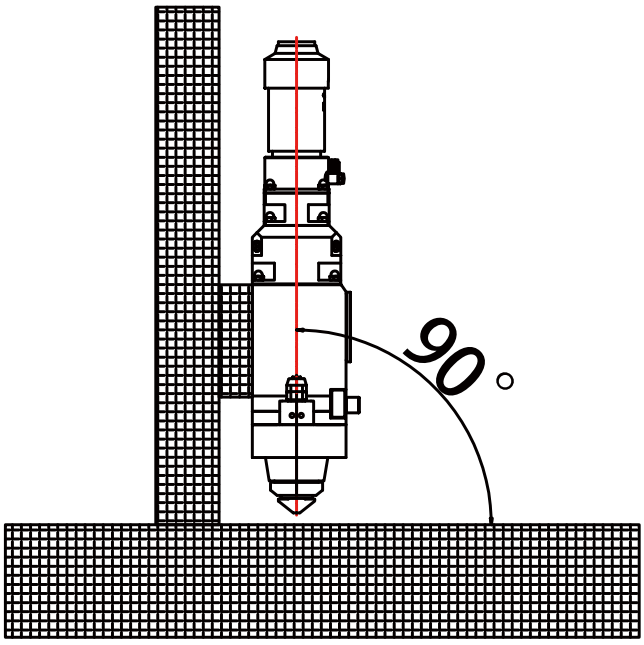
DO NOT operate with wrench or iron plier.

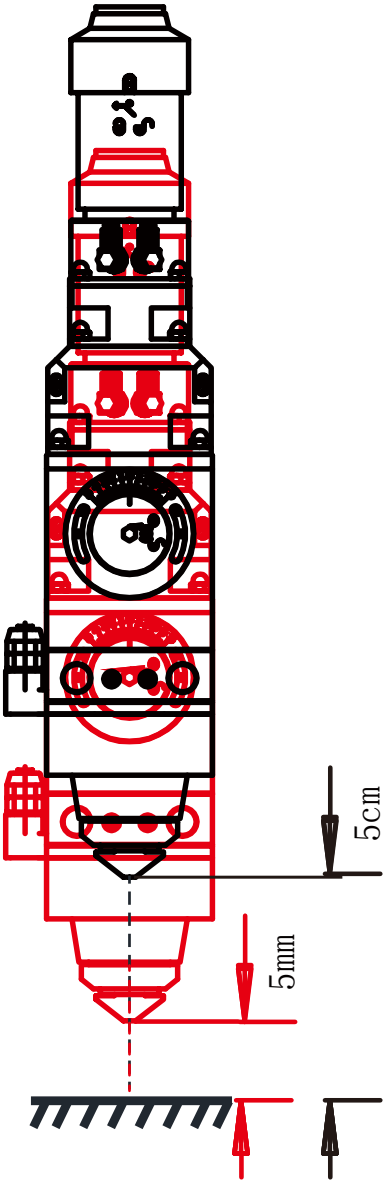
6.Malfunction Analysis and Measure

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

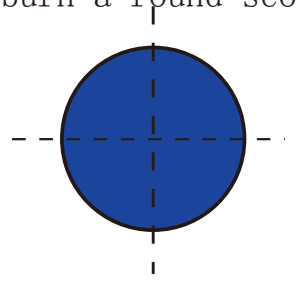
Attched Sheet1: Checking Installation perpendicularity



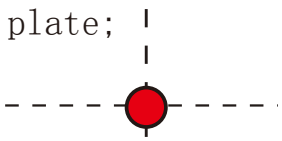




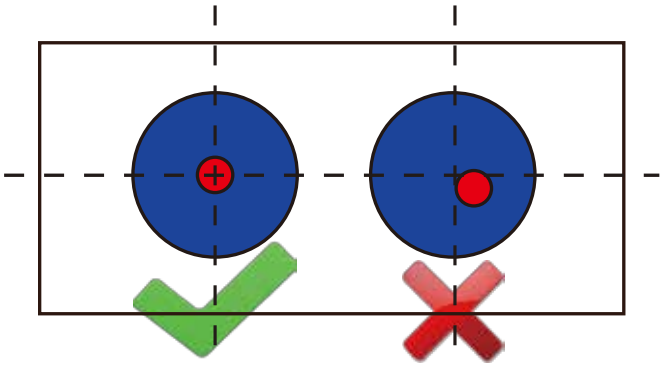
Step 1: set the laser power to 500W, make a short burst at the height of 5cm from the plate, burn a round scorch on the plate;



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



Step 3: compare the concentricity;



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