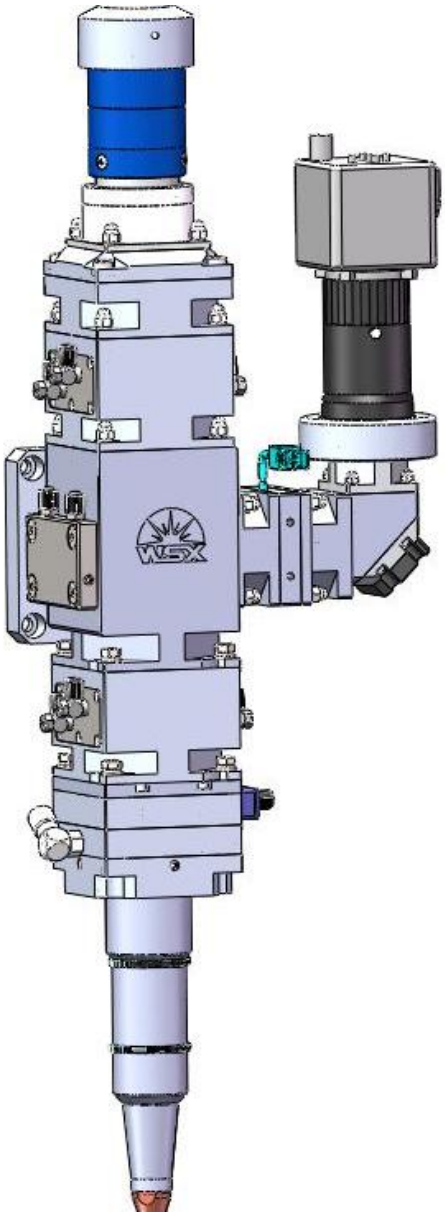
High Power Welding Head
HP41



User Manual

Shenzhen Worthing Technology Co., Ltd.

Kind Reminder

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 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 welding.

Precision products. Do not strike it.

Product: High Welding Head

Model: HP41

Product Features:

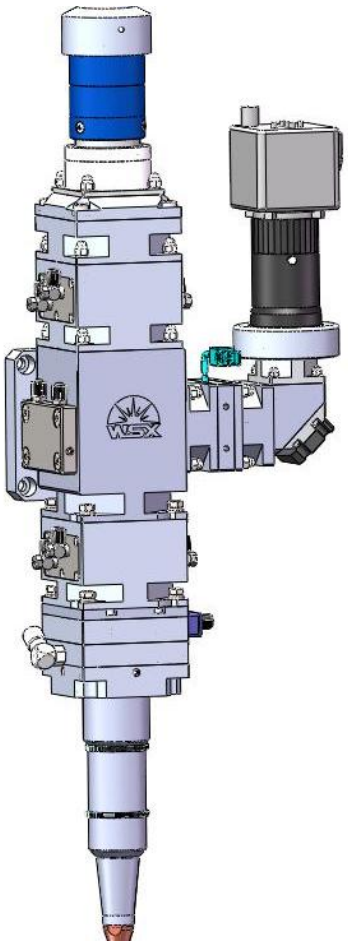
- This weld head has strong advantages in welding of medium and thick plates, and in welding applications of large parts.

- The internal structure of the weld head is completely sealed to avoid contamination of the optics by dust.

- It is equipped with an air curtain/coaxial nozzle to minimise contamination of the lens by welding fumes and spatter residues.

- The protective lenses are of drawer-type construction and can be easily replaced.

- It can be equipped with various lasers with QBH interface.

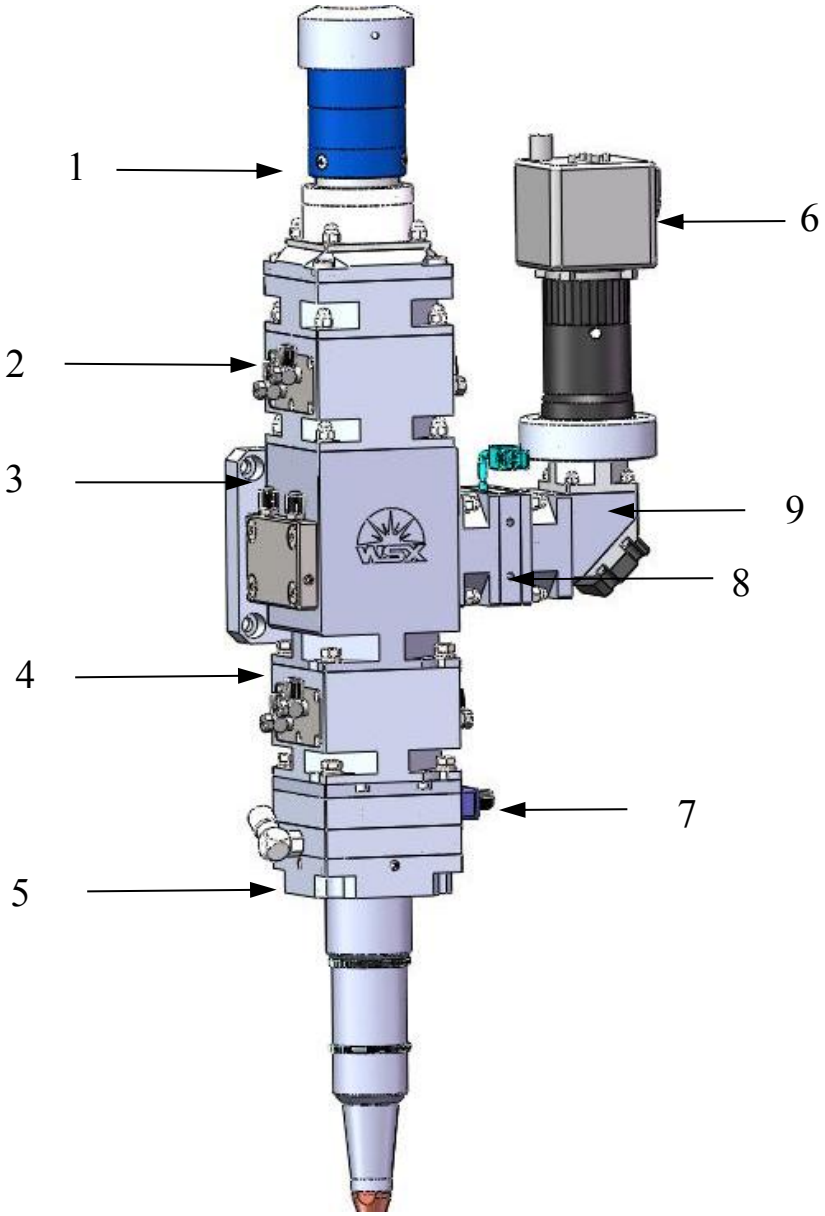


Contents

1. Product Description

1.1 Structure Diagram

No.	Parts
1	QBH Component
2	Collimating Component
3	Beam Splitter Base
4	Focusing Component
5	Adjustable Coaxial Nozzle
6	CCD Component
7	Protective Window
8	Coaxial Blue Light Component
9	Reflector Component



1.2 Main Function

1.2.1 Components Introduction

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

※Collimator Lens Component
Collimator lens component is assembled inside the laser head; it contains collimator lens cavity and collimator lens group.

※Beam Splitter Component
Provide filter light source for CCD.

※Focusing Component
Focusing component is assembled inside the laser head. It contains adjustment device, locking device, focusing lens group, focusing lens cavity and water cooling system.
The focusing adopts the cam structure, which is accurate and convenient to adjust.

※Gas Curtain Component
Blow away the bouncing welding slag, provide protection to the protective window.

※Reflector Component
Reflex the real-time status of the welding seam to CCD components and monitors during welding.

※CCD Component
Provide filtering, focusing function; provide safe, reliable and real light source to CCD.

※Protective Window Component
Prevent slag from spilling over the focusing lens to provide protection for the focusing lens.

1.2.2 Design & Function

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

All media connections are built inside the laser head.

1.2.3 Auxiliary Medium

※Inert gas

◎ In order to protect the welding position from oxidation, the protective gas should not have any harmful chemical reaction with welding material.

◎ The quality of the protective gas must be in accordance with ISO8573-1:2010, Class 2.4.3 and must not contain impurity particles, water or oil. The higher the purity of the protective gas, the longer the life of the protective lens.

1 Technical Specification

	Parameter
Power W（max）	4000
Collimating Length/mm	125
Focal Length/mm	250
Clear Aperture/mm	38
Gross Weight/kg	4.1

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

Danger - High Pressure !

The gas pressure inside some laser head component 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 scattered by laser.

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

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

3.3 Preparation for Installation

※Tools

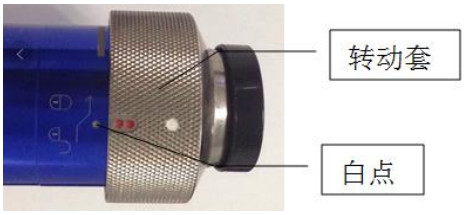
1.A set of metric hexagonal handle;
2.One bag of clean rod, one bottle of anhydrous ethanol(500ml), one package of clean gloves.
3.Clean and dust-free working environment.

※Preparation of installation personel

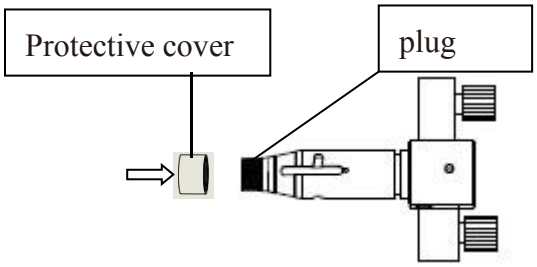
1.Read this manual carefully;
2.Wash hands with soap;
3.Wear dust-free gloves;
4.Wear a mask if necessary.(Note - Dust removal is of utmost importance)

3.4 QBH and Fiber Connection

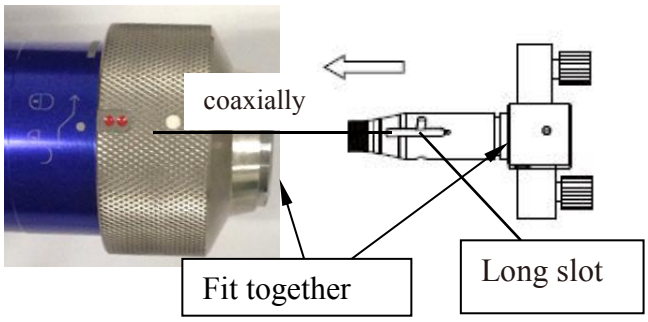
Step one： Before turning the rim as below, make sure the red marks are aligned to the white marks.



Step two： Remove the dust cover of fiber rod, clean the fiber rod with anhydrous ethanol. Before installing, check the protective cover of fiber plug to see if it is locked, avoid the cover from loosening and effecting the welding performance or burning the fiber and welding head.

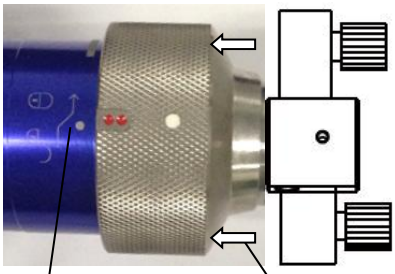


Step three： Remove the dust cover from QBH, place the clean fiber rod and the QBH coaxially, make sure the white mark on the QBH is aligned with the locating slot (long slot on fiber rod), insert the fiber rod into QBH gently, until the fiber rod joints the QBH contact surface.

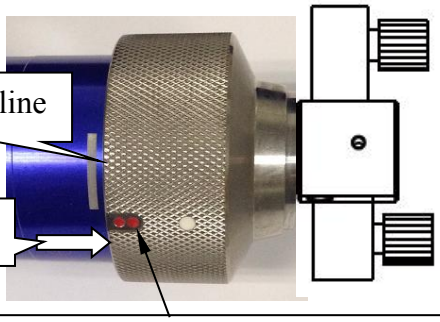


Step four： After inserting the fiber rod into QBH, press the rim gently and turn it about 15 degree along the arrow on the rim. Then pull the rim until its underside is parallel with the top of QBH, turn the rim at the same direction till the limit.

A

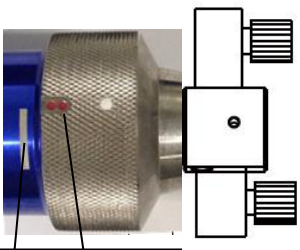


B



Turn the rim 15 degree, the red dot should be close to white line, pull the rim towards the right.

C



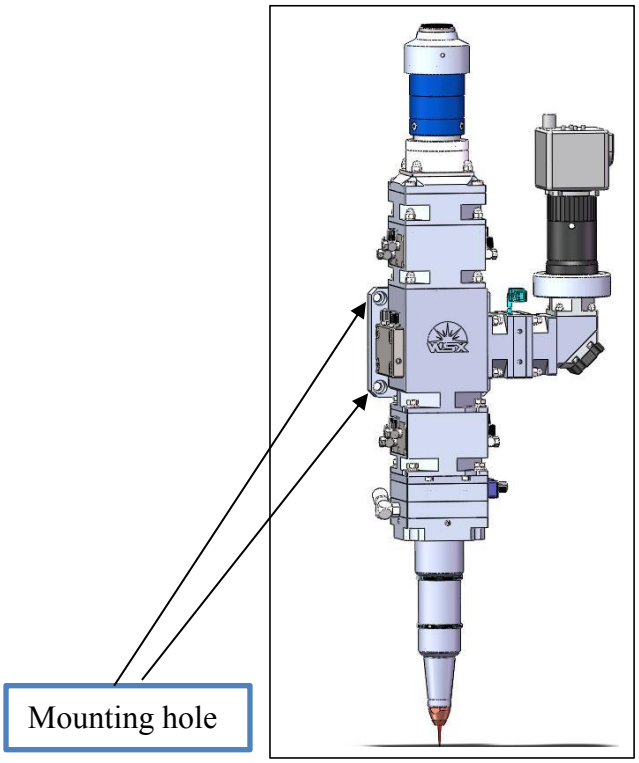
Pull the rim and continue turning, the red dot should be in the scope of the white line or close to the end of white line. The underside of rim should be parallel with the top of QBH.

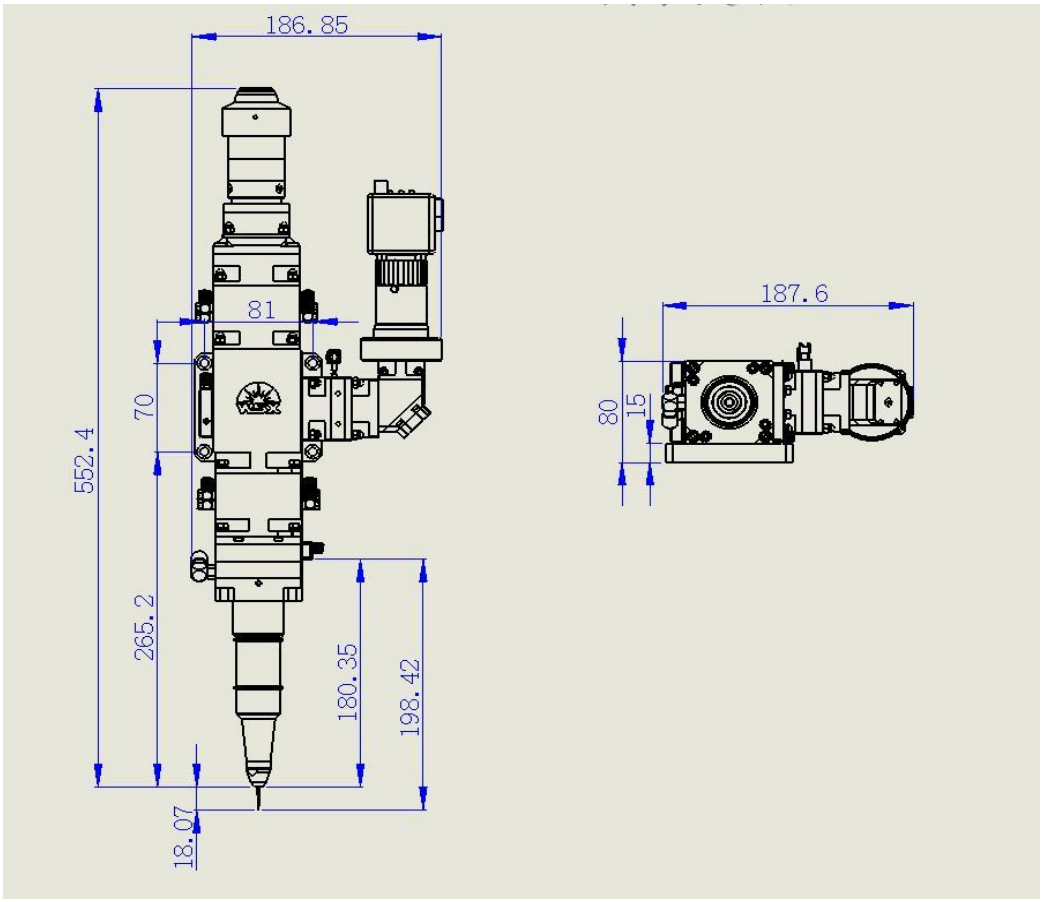
Note：1. Insert or pull out the fiber rod gently;

2. When inserting or pulling out, QBH and fiber rod should be coaxially;

3. The operation should be kept as dust-free as possible.

3.5 Installation and outside drawing

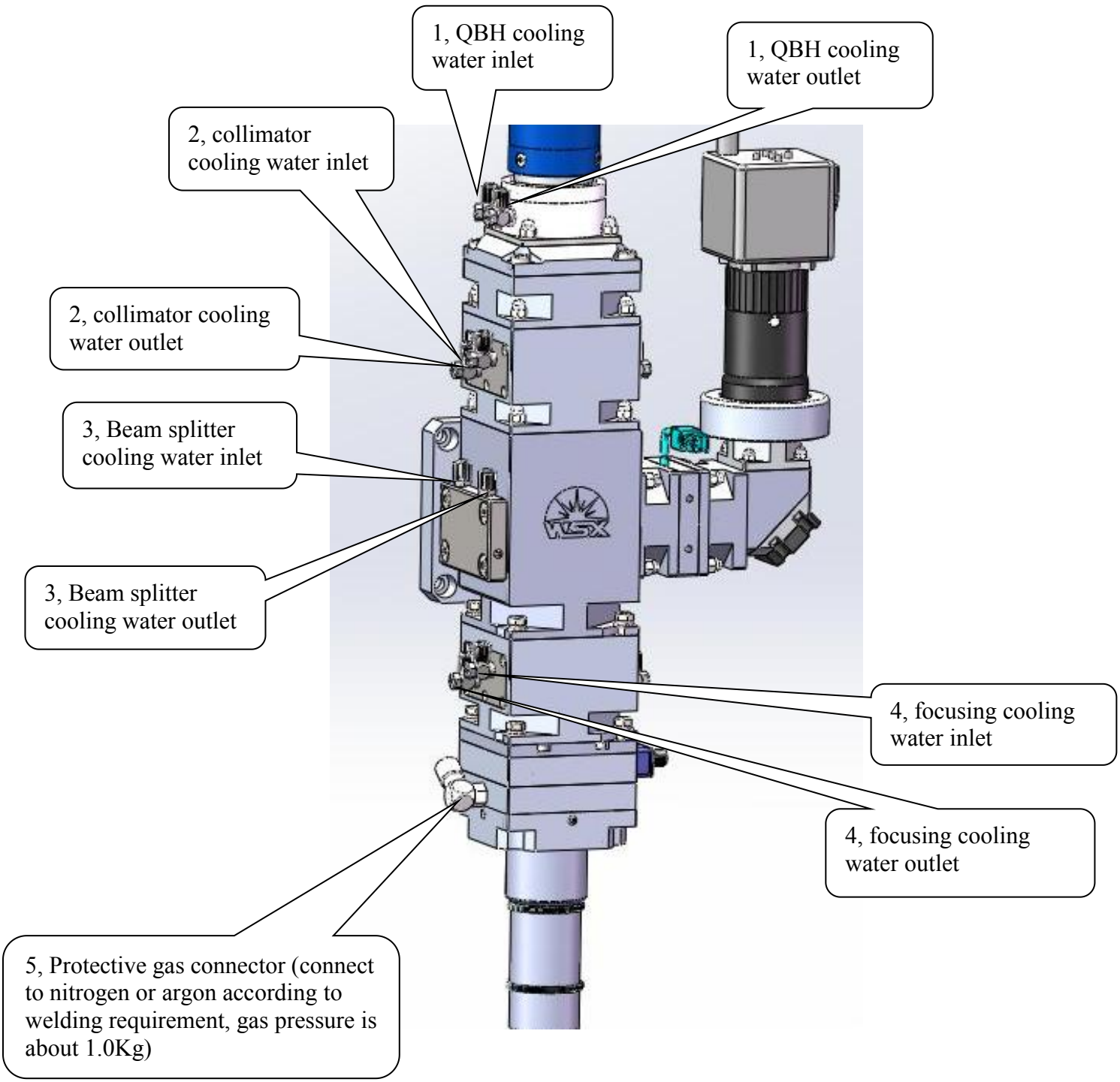




Installation of laser head should be solid and reliable.
The angle of laser head in the vertical direction can be set according to customer requirement.

3.6 Connection of water and gas

Water cooling connector & gas connector diagram



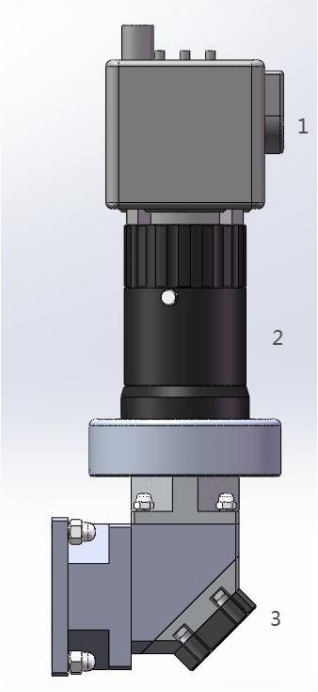
Note:

1） 1~4 and are Φ6 water pipe connector，when using must ensure the water quantity is sufficient, the water pressure is above 0.4MPa;

2） 5 is Φ8 gas pipe connector;

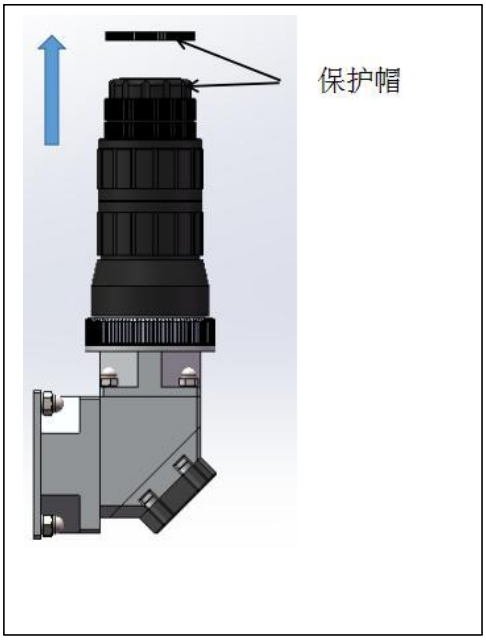
3） Please keep the bending radius of the connected pipeline not less than 30mm.

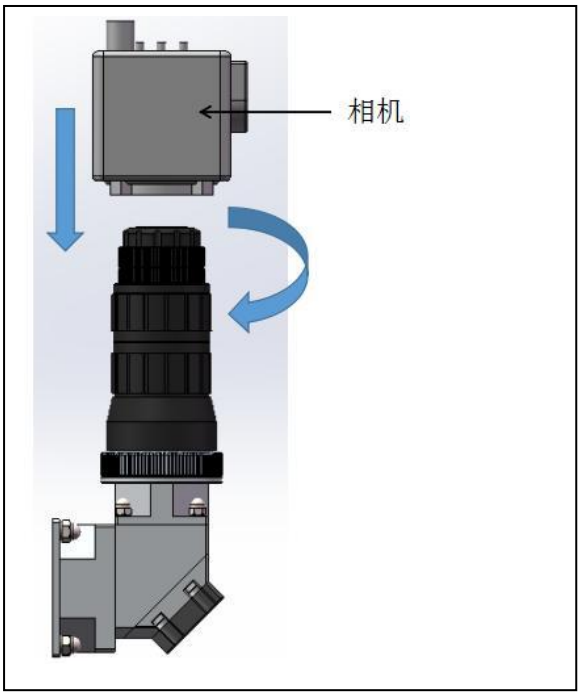
3.7 CCD component connection



1. CCD camera
2. CCD connector
3. CCD adjusting base

Installation steps of CCD Camera：
Step 1：Remove the protective cover as shown below;
Step 2：Tighten the camera to the lens after removing the cover, keep the camera and lens close.
Note：Tighten in moderate intensity, avoid loose or damage caused by improper force.



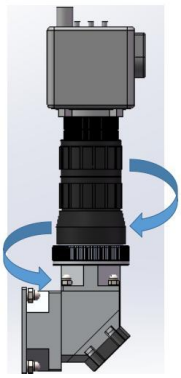


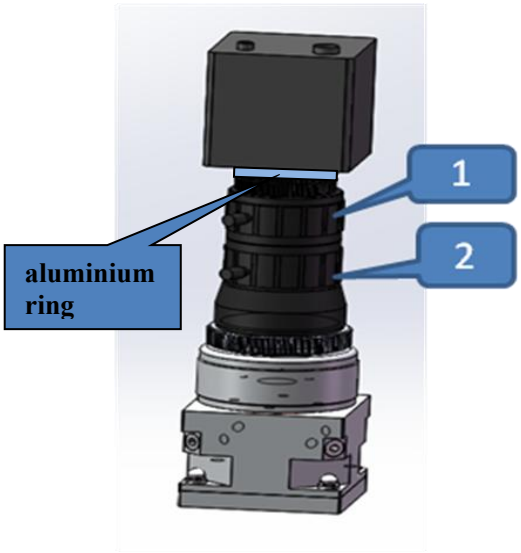
4. Debugging

4.1 CCD Definition Debugging

Camera angular adjustment:

If the camera is tightened at an angle to the mounting seat, loosen the compaction cover as the left picture, turn the lower part of the camera clockwise, make one of the vertical planes of the camera parallel to the mounting seat.（As shown on the right）





CCD definition debugging

Purpose：To make the image clear on the display, adjust as following steps. Adjustment steps（left picture）：

1 、Install industrial camera to the lens properly;

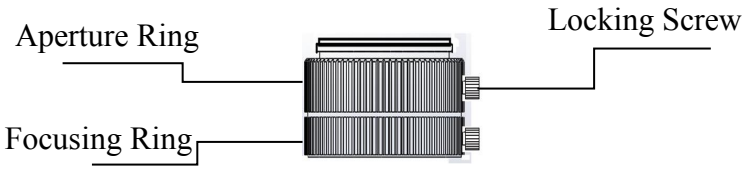
2 、Loosen locking screws on Aperture Ring(1) and Focusing Ring(2);

3 、Adjust Aperture Ring(1) to get a certain brightness;(image is clearly visible on the screen)

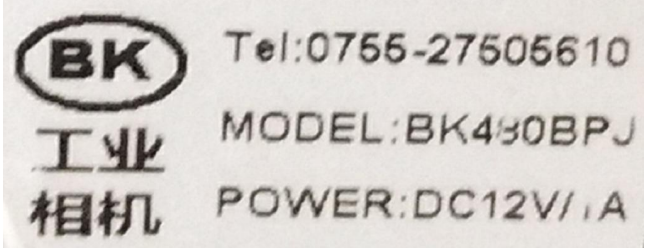
4 、Adjust image distance with Focusing Ring(2) to make the image clear;

If the image is not clear enough, repeat the above step 1,2,3, then tighten the locking screws on Aperture Ring and Focusing Ring.

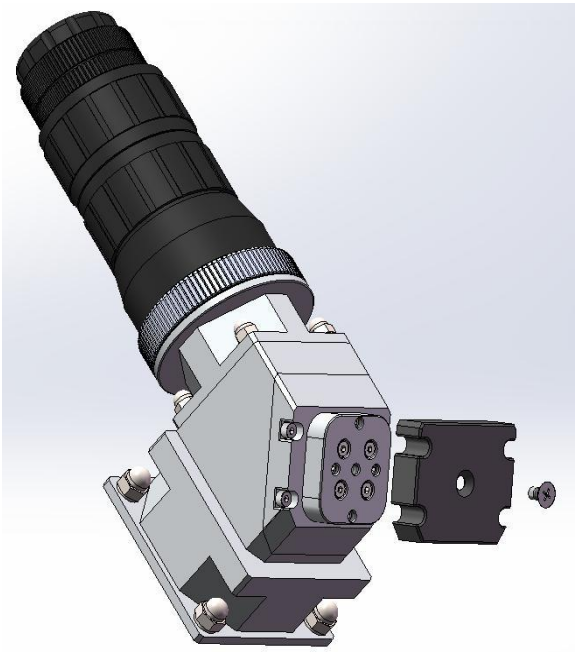
Note：This welding head is equipped with aluminium ring in two different specifications(5mm / 10mm). These are used to increase/decrease image distance. User can assemble or unassemble the aluminium rings to adjust the CCD focusing range according to actual screen display.

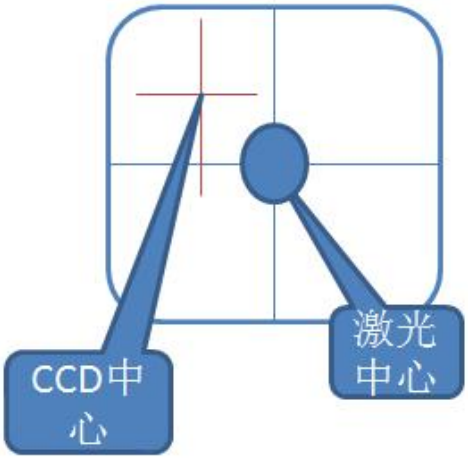


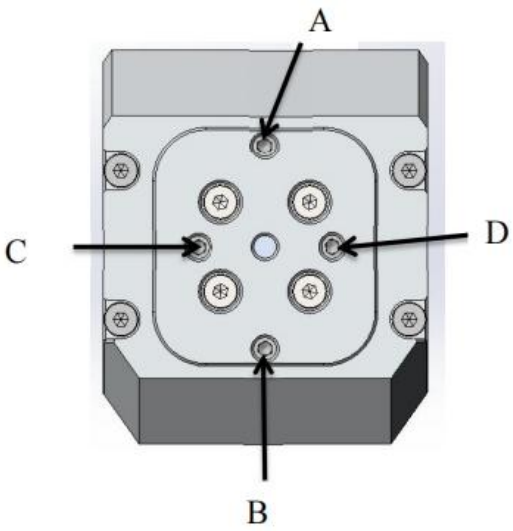
Note： It is recommended to use the CCC digital camera as shown below to make screen images clearer



4.2 CCD image and laser center coincidence adjustment







Special attention: before using the adjustment screw, the diagonal screw must be released to make room for CCD component movement. Avoid blindly tightening adjustment screws and damage CCD component**s.**

In the process of welding, the CCD image center (cross intersection) must coincide with the laser center.

Adjustment method as follow：

As shown above, the cross point of the CCD on the screen is on the upper left of the laser center and can be adjusted with four adjustment screws mounted on the quadrangle of the seat in the left image.

1, Release D screw properly with hexagonal wrench to make room for CCD to move right down；

2, Tighten the A screw with a hexagonal wrench, forcing CCD to move right down until the intersection of the CCD cross coincides with the center of the laser；

3, If the above two steps fail to adjust the CCD cross intersection to the laser center point or the CCD cross crossing point to move below the laser center position, then use a hexagonal wrench to properly loosen the B screw to make room for the CCD cross crossing point to move up to the right, Then tighten the C screw with a hexagonal wrench, forcing the cross point of the CCD cross to move up to the right until the intersection of the CCD cross coincides with the center of the laser.。

4, When the cross crossing of CCD deviates from other positions in the center of the laser, use the hexagonal wrench to adjust the cross point of the CCD cross by loosing the diagonal screw first and then tightening the adjusting screw to adjust the cross point of the CCD cross.

5.Maintenance

5.1 Maintenance of QBH and Fiber

Clean and dust-free working environment is required!

Any laser circuit equipment fitted with a laser head must be carefully dedusted!

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

Prepare new lens component before removing the old one!

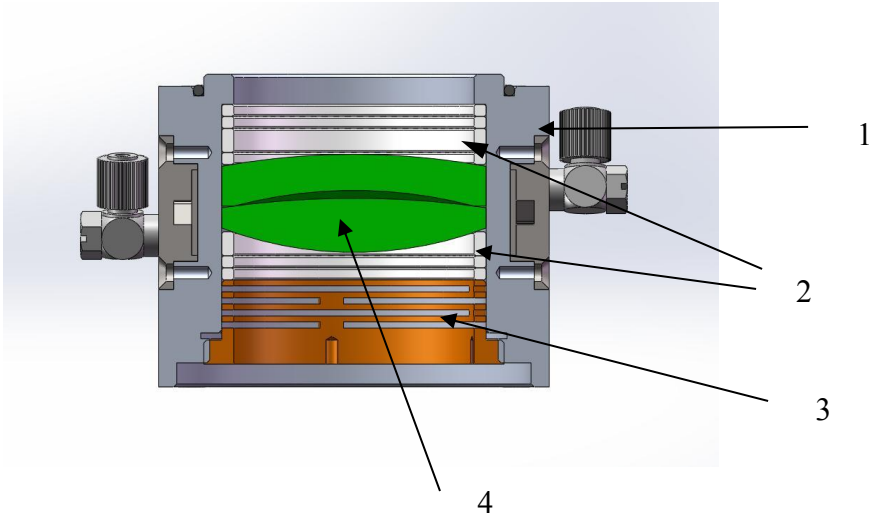
Users could purchase spare lens components from us!

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.

Maintenance of QBH and Fiber Connector

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

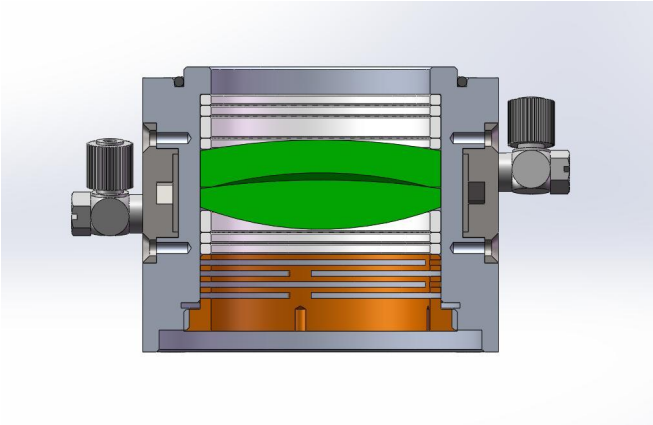


1 Collimating Lens Base 2 Gasket 3 Pressing Ring 4 Collimating Lens

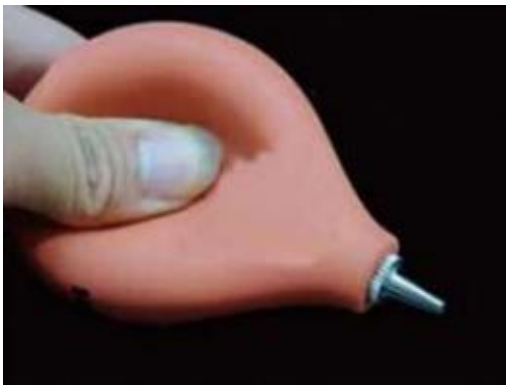
The disassembly process is as follows:

1. Twist the pressing ring (3) with the special tool (5) until the pressing ring nut is completely disengaged
2. Loosen the entire collimating spring pressing ring after loosening the pressing ring down on a clean plane (in this process, the spring pressure ring should be kept in the collimating base), and the collimating base (1) is gently pulled upwards. Be careful not to drop the lens.
3 After removing the ring (2) placed on the lens and removing the lens, the lens can be replaced or Maintained.
4 After repairing or replacing the lens, please reverse the installation in the order of disassembly, and lock the spring pressure ring to be lighter to avoid damage to the lens.
5 After the spring pressure ring is turned to the end, please retract 1/5 times to ensure that the spring pressing ring (3) has a gap (0.1~0.15mm).

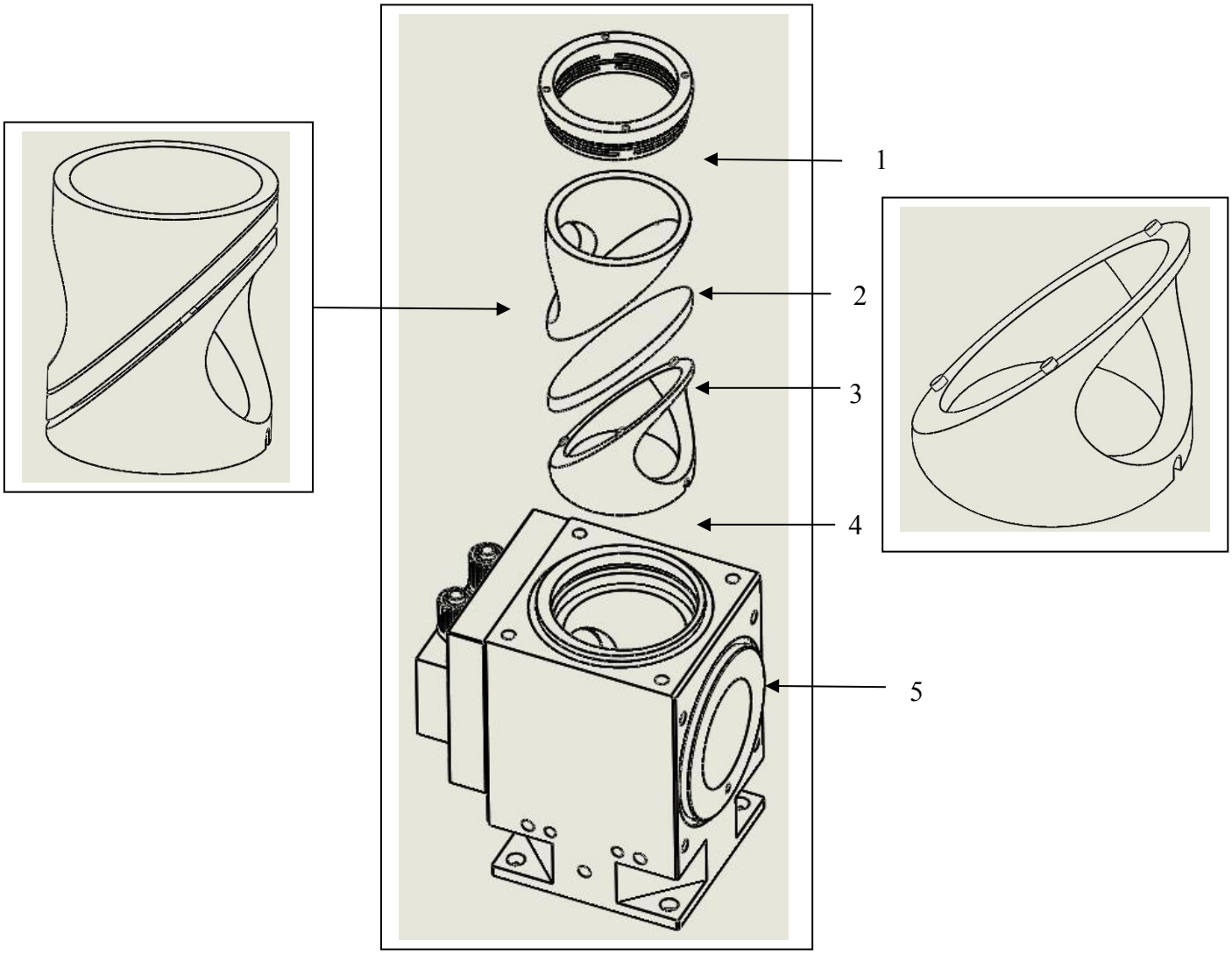
Note: Keep the original order between the parts, the lens should be the same direction as the original!



1. Use a dust-free clean rod dipped in isopropyl alcohol solvent to clean the lens;
2. Use a hand bellows to draw clean air and blow the attached granules or other foreign matters off the lens;
3. Repeat the above steps several times, until the lens is clean;
4. If the protective window can not be cleaned or it is damaged, user must change a new one.



5.3 Maintenance of Beam Splitter



1, Locking spring; 2, Washer； 3, Beam splitter; 4, Washer; 5, Holder;

Beam splitter disassembly and installation process

1、Use a special tool to loosen the locking spring and remove it;

2、Gently lift the 2, 3 and 4 beam splitter lens assembly out of the beam splitter holder as a whole, preventing the lenses from slipping during the lifting out process;

3, Lay the splitter lens assembly on a table or flat workbench, then remove the upper washer and remove the lens from the lower washer to replace or clean the lens;

4, After the maintenance or replacement of the lens is completed, install the beam splitter lens assembly in the reverse direction according to the above disassembly method. Be careful to use moderate force when locking the spring ring to prevent damage to the lens.;

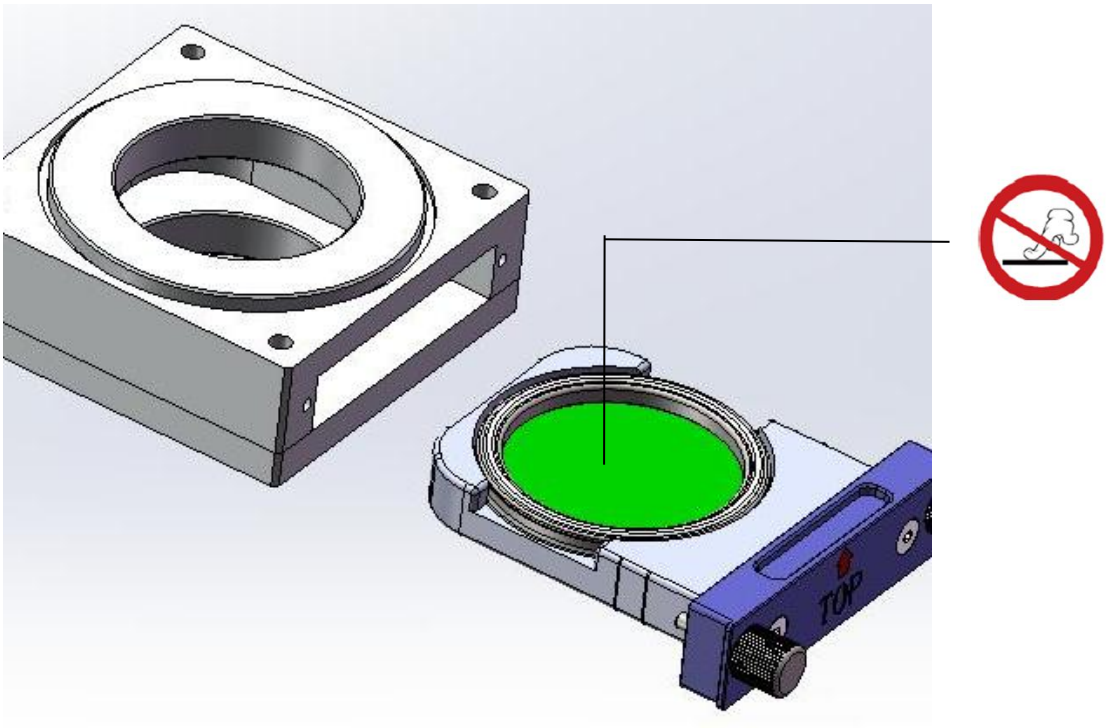
5, After screwing the locking spring to the bottom, it is necessary to rotate 1/5 turn, so that the locking spring ring and the upper washer has 0.1~0.15 clearance.

6, When mounting the beam splitter assembly consisting of 2, 3 and 4, the anti-dumbing socket of the lower washer must be aligned with the locating pin inside the beam splitter holder.

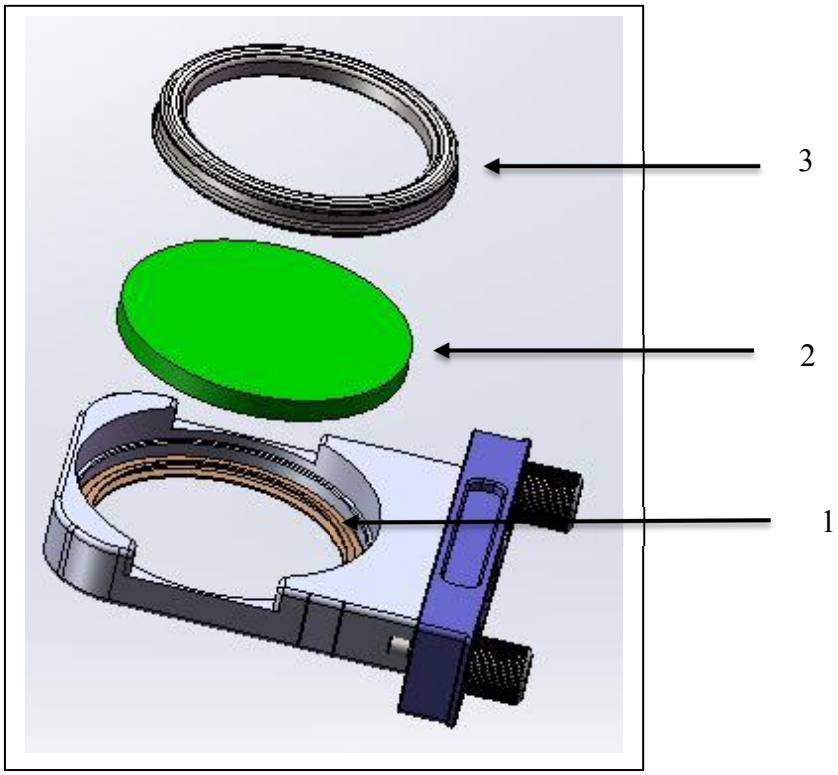
7, Before installing the beam splitter, it is necessary to identify the correct orientation of the beam splitter: the coated side (R470 side) is facing down, the non-coated side (T1064) is facing up.

6. Cleaning of Protective Window

1. Use a dust-free clean rod dipped in isopropyl alcohol solvent to clean the lens;
2. Use a hand bellows to draw clean air and blow the attached granules or other foreign matters off the lens;
3. Repeat the above steps several times, until the lens is clean;
4. If the protective window can not be cleaned or it is damaged, user must change a new one.



1. Loosen the two locking screws and pull out the protective window drawer;
2. Note: use non-stick protective film to seal the opening after the removing of the lens immediately;
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 screws by hand.



Installation of Protective Window

1. Seal ring 2. Protective lens 3. Pressing ring

Replacing the protective lens:
1.Take the protective lens drawer assembly out of the welding head.The protective lens pressing ring 3 has grooves for easy removal; Then take out the protective lens 2 and put it into a clean container without contact with non-gaseous substances.
2、Check the elastic sealing ring 1 whether there is deformation or gap, if defective, need to be replaced.
3、Ensure that the components are clean, install the protective lens 2 in the original direction after installing the sealing ring, and press on the protective lens pressing ring 3.

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