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- We reserve the right to change the design in order to improve the quality or expand the application or comply to manufacturing workmanship.
- We will not bear any responsibility for losses and accidents caused by wrong operation or improper handling of our products.
- Dismantling of product will lose all warranty claims excluding the normal replacement of worn parts and components required for maintenance or commissioning operations.
- Unauthorized modification of products or use of non-original spare parts will directly lead to the invalidation of warranty and liability exemption.
- It is recommended to only use the spare parts provided by us or submit them to us or the designated professional team for installation.

- Ensure that the product is used in a dry environment.
- Ensure that the product is used in the environment required by EMC standards.
- The product is only allowed to run within the parameters specified in the technical data.

- Be familiar with the basic provisions of work safety & accident prevention and have received equipment operation guidance.
- Read and understand basic safety instructions and operations.
- You must have studied the relevant regulations and safety instructions and understand the possible hazards.
- Comply with relevant regulations and implement corresponding protective measures.


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- Parts of the laser head such as nozzle, sensor, sensor interface and attached fasteners may not be fully protected by the ground wire due to function fault. These parts may have low voltage. When installing electrical equipment, please pay attention to taking anti electric shock measures for relevant personnel.

- Note that the equipment shall be grounded as specified.

- Never put your hands or other body under the laser head.
- Repair and maintenance work can only be carried out after the power is turned off.
- Do not exceed the specified maximum pressure.
- It must be ensured that the laser head is in normal condition at all times.
- All fasteners such as bolts and nuts must be tightened.

- Avoid direct laser radiation or scattering to the skin.
- Do not stare at the laser beam even when wearing optical equipment.
- Use special laser protective eyeglasses that meet the requirements of safety standards IEC 60825-1.

- In order to avoid corrosion, use the specified coolant and comply with relevant requirements and specified maintenance intervals.

- The corresponding measures shall be specified or explained and observed in order to prevent personnel from being harmed by noise when the cutting air pressure is high.


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This manual includes basic installation, factory settings, operation and maintenance services and other details about BD04K SERIES products. But only the main parts will be introduced here, as there are too many types of optical and mechanical customization configurations.

Released by RAYTOOLS in 2021, BD04K SERIES auto focus tube cutting heads are equipped with servo motor outside and drive units inside, supporting to move focus lens within 30mm automatically through the linear mechanism. And users can set program to do continuous adjustment of the focus position, so as to perforate thick sheets and auto cut sheets with different thickness and material.

BD04K SERIES products adopt D30 compound lens assembly for beam integration while applying QBH interface with fiber laser. Based on optimized optical and water-cooled design, laser heads can run stably with high power for a long time.


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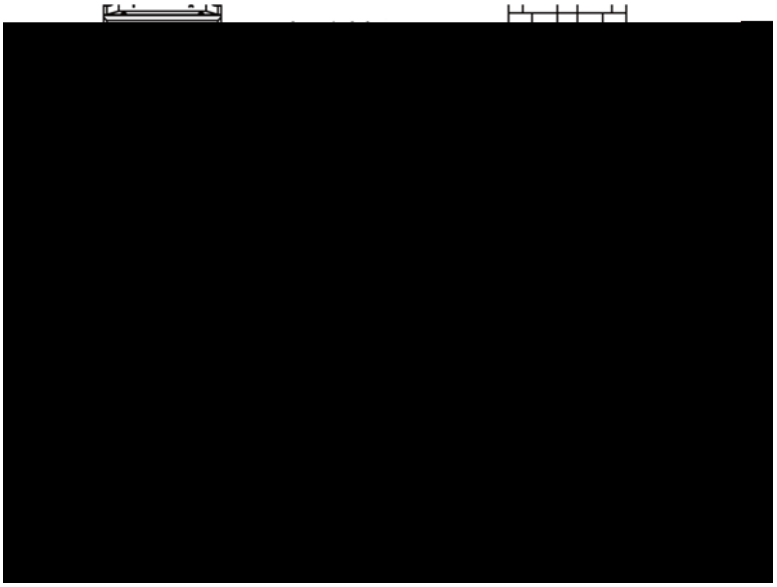
The mounting of laser cutting head to machine tool is shown as below. Customers are advised to install the laser head perpendicular to the bed surface as requested and make sure the laser head is locked, which is one of the premises to ensure the stable cutting.



The Z-axis motor slide plate for fixing the laser cutting head should be connected with machine and make sure there is a good earthing.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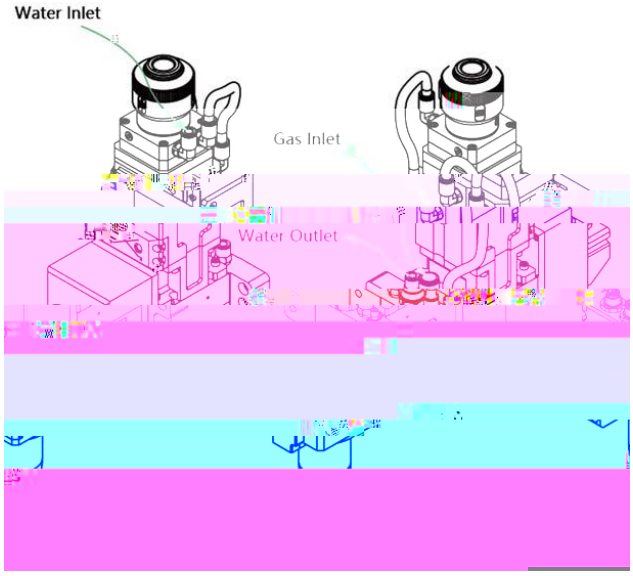


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The recommended water flow is suggested below.

The water cooling interface, with closed loop system design, can work in external free water supply if meeting above requirements of water flow.

The impurities in cutting gas such as hydrocarbons and water vapor can damage the lens and cause laser power fluctuation as well as inconsistencies between the sections of the work piece. The following table is the recommended cutting gas specifications. The higher the purity of the gas, the better the quality of the cutting section.

Impurities can be filtered out in gas supply tube, but Oxygen and water vapor can permeate light path through non-metallic materials, which is the source of the appearance of dust and hydrocarbons. Stainless steel fittings are recommended, at the same time customers must use filters which can remove a minimum of 0.01micron particle to purify.

A pressure gauge with a stainless steel diaphragm is recommended. Industrial pressure gauges suck in the air. Rubber diaphragm produce hydrocarbon by aging or other factors.

| Gas | Purity | Maximum content of water vapor | Maximum content of hydrocarbon |
|---|---|---|---|
| oxygen | 99.95% | <5 ppm | <1 ppm |
| nitrogen | 99.99% | <5 ppm | <1 ppm |
| argon | 99.998% | <5 ppm | <1 ppm |
| helium | 99.998% | <5 ppm | <1 ppm |
| Diameter of cutting gas pipe (Outer diameter) | | | 10mm |

Gas interface cannot be replaced arbitrarily especially do not use PTFE TAPE. Otherwise, the gas path will be blocked and cannot do normal cutting which will damage cutting head at the same time.


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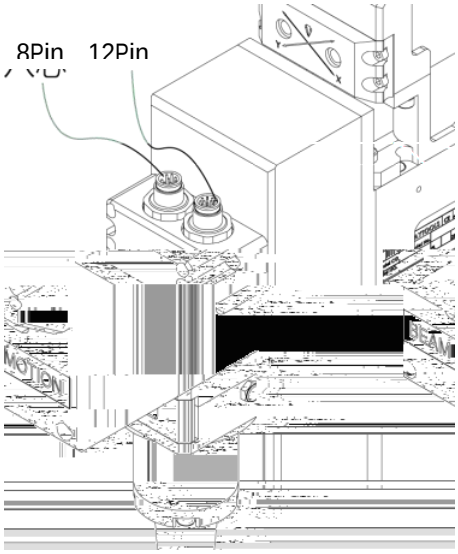
Connect the 8-pin power limit cable and the 12-pin encoding cable to the corresponding connectors on the cutting head, as shown below. Then thread the cables into the machine's cable track grooves and fix cables after reserving a proper length.




Connect the 8-pin power limit cable and the 12-pin encoding cable to the corresponding connectors on the driver. For detailed wiring of driver and limit sensor, please refer to attachment. E } š The output mode of limit sensor is NC and NPN active (outputs NPN signal when don't trigger the sensor);
Please install a relay for conversion according to actual need.

h d / K. The wiring must be done when the power is off.

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BD04K SERIES products, with collimating lens assembly, can work with most of fiber lasers in the market.

Fiber interface means the connection between the tip of the fiber and the cutting head. Common fiber interface includes QBH type, and every fiber interface is different to fix. Please refer to corresponding instruction of fiber interface.

The optical components must be dust free and all dusts must be cleaned before use. The fiber shall be horizontally inserted into fiber interface to prevent dust from entering the interface and falling on the surface of the lens. Upper limit in the fiber before fixing the laser head.

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- Align the red point at the end of the QBH interface to the red point of the handwheel.
- Remove QBH dustproof cover.
- Align the red mark of male fiber end to red mark on female QBH of cutting head when you insert the fiber end straightly to bottom of QBH interface of cutting head.
-

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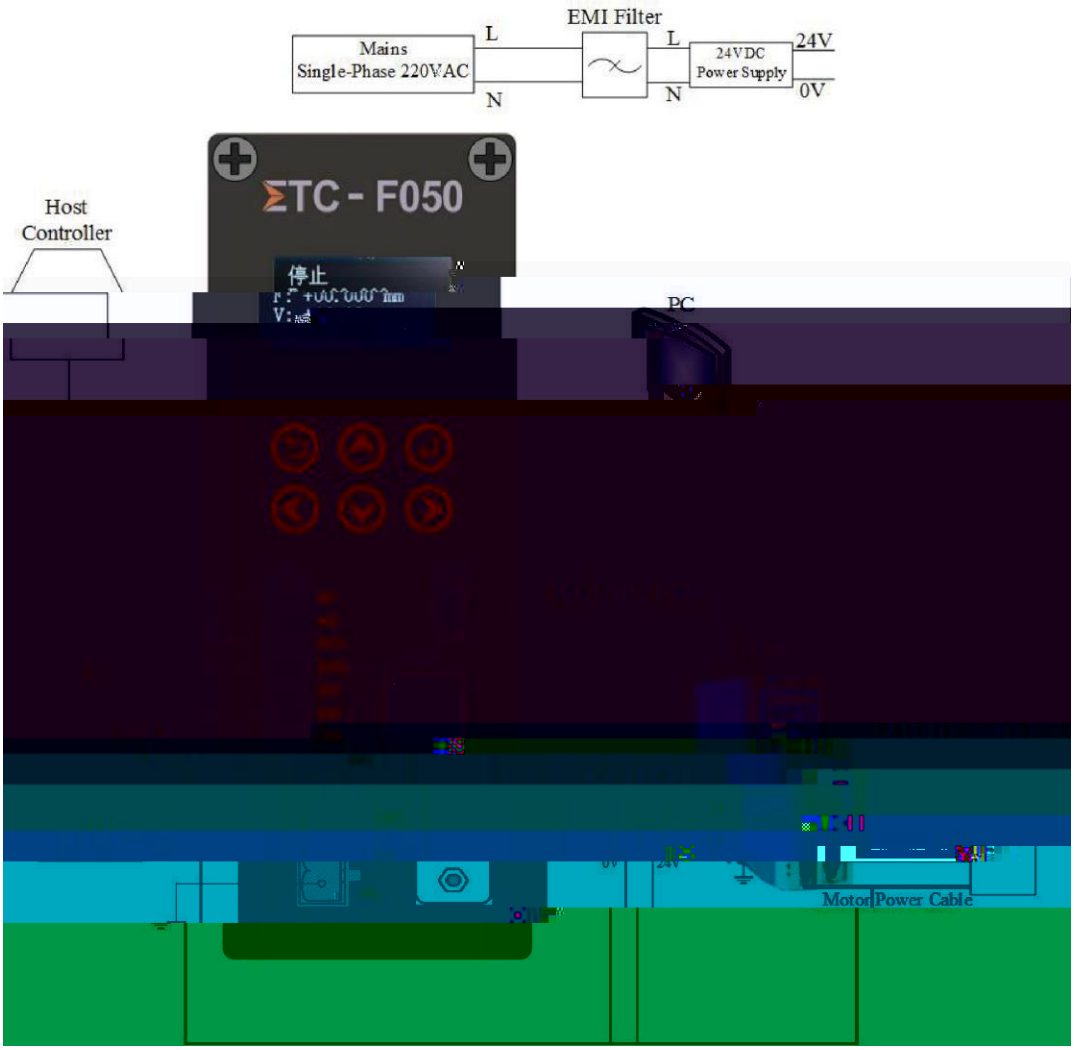
| Connector | Function | Pin | Description | Remark |
|---|---|---|---|---|
| CON1 | I/O signal interface | VF | Focus setting | 0~10V, input voltage of focus position |
| | | AG | Analog ground | Analog signal earthing |
| | | ALM | Alarm output | 0V - normal 24V-abnormal |
| | | INP | Focusing in place | 0V - not reaching the position of focus setting;<br>24V - reaching the position of focus setting |
| | | EN | Focusing enable | 0V –focusing OFF 24V –focusing ON |
| | | HOME | Return to zero point | 0V – invalid input of home signal;<br>24V - valid input of home signal |
| | | L-UP | Upper limit | 0V- trigger upper limit signal;<br>24V - untrigger upper limit signal |
| | | L-DW | Lower limit | 0V- trigger lower limit signal;<br>24V - untrigger lower limit signal |
| CON2 | 24V DC power interface | 24V | | Power input 24V |
| | | 0V | | Power input 0V |
| | | PE | | Earthing |
| CON3 | For firmware upgrade | | | |
| CON4 | Driver interface | | | |

ETC-F050 is available for CNC systems with analog control. For system with focus control, the controller is not necessary.

Graphic here is only for reference, and more information can be found in ETC-F050 User Manual.



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- Use hybrid step motor.
- The Vdc, GND and PE shall be connected to 24V, 0V and earthing respectively.
- A+, A-, B+ and B- are power cables of step motor, and should be wired as below:
- 24V power supply should be customer-provided.

Limit signal:

| White | Red | Pink | Blue |
|---|---|---|---|
| +24V | 0V | Upper | |


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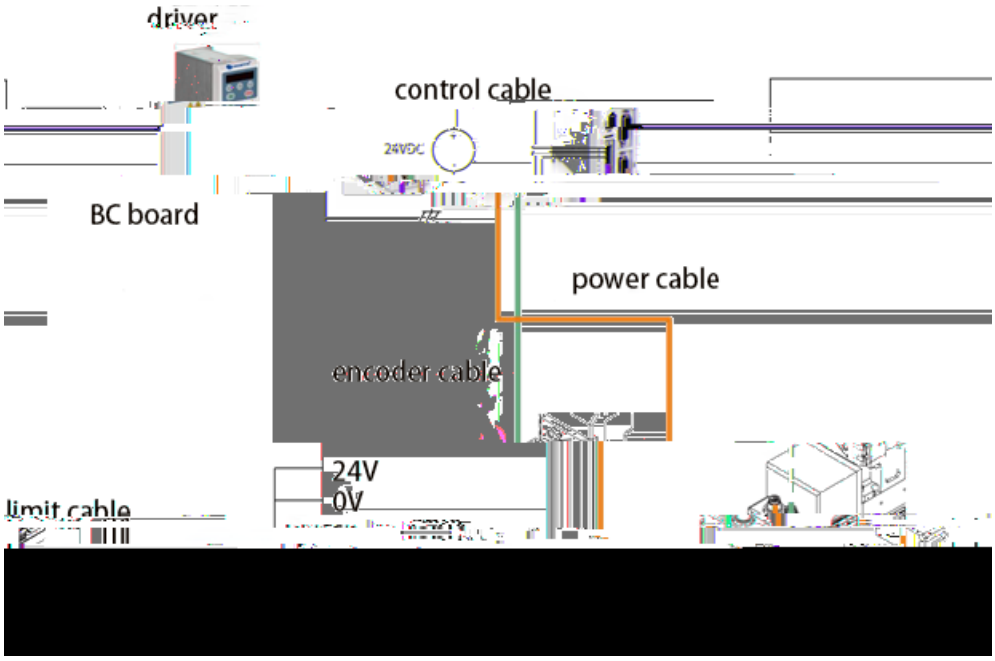


Limit signal:

| White | Red | Pink | Blue |
|---|---|---|---|
| +24V | 0V | Upper limit | Lower limit |

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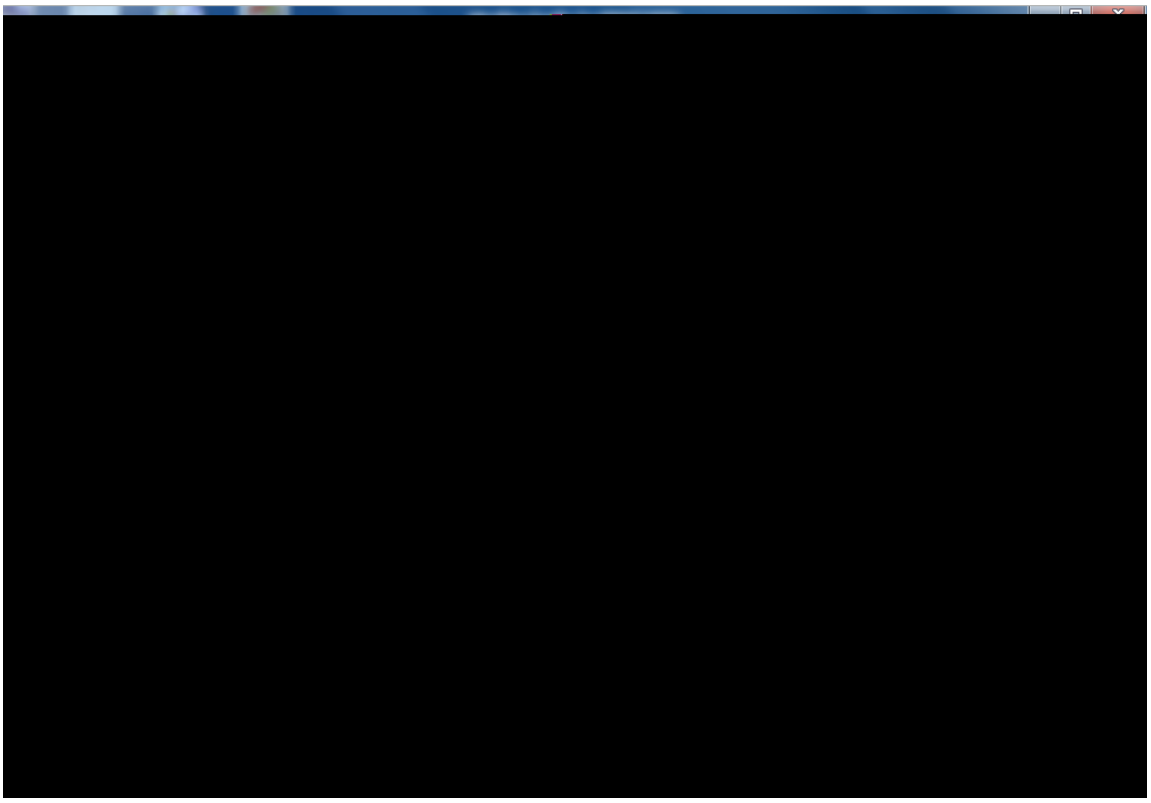
Open Machine Config. Tool and input following parameters:



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Cutting quality in a great extent depends on whether the beam spot is in the center of nozzle or not. If the beam spot is not in the center, the laser beam may hit the nozzle or inner wall of the laser head, that leads to produce high temperature deformation. Beam center position adjustment should be considered when nozzle is replaced or the cutting quality is decreased.

Beam center position adjustment of the laser cutting head can be finished by adjusting Collimating lens, X-Y direction. The adjusting screws are located on the top of the cutting head as shown below. By using inner hexagon spanner users can loosen or tighten the adjusting screw until the beam spo Beam

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Laser cutting head is equipped with automated focusing system. But it is required to dot manually to redefine the zero focus position when it is initially set or lenses and lasers are replaced. For details about operating system parameters, please refer to the system instructions. Manual dot can refer to the following steps:

1. Attach one textured tape on nozzle tip. Set laser power to 80-100W.
2. While moving each 0.5mm focus (as small as possible), shot a hole on the textured tape.
3. Dotting several times to find out the focus corresponding to the smallest hole which is supposed to be real zero focus. The zero focus is just at the tip of the nozzle.


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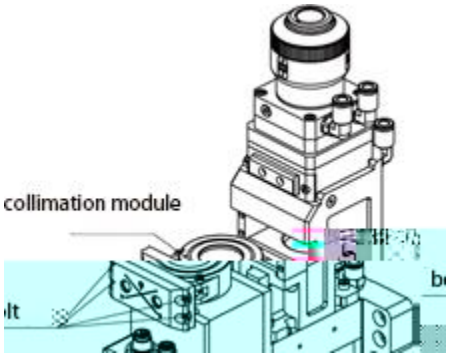


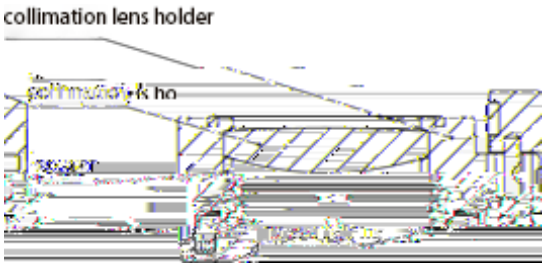


- Remove the laser head and move to a dust free room.
- Clean all dusts on the laser head surface.
- Loose the bolts to pull out whole assembly.
- Seal the mounting openings by textured tape immediately.
- Move the assembly. Remove the pressing ring and collimation lenses with lens tool.
- Replace or clean the collimation lenses.
- Mount the assembly back to the cutting head and tighten the bolts.

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- Clean all dusts on the laser head surface.
- Loose the 2 bolts as above to pull out focus lens holder.
- Seal the focus lens and mounting openings by textured tape immediately.
-


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The nozzle is required to be replaced if it gets crash or damaged by laser beam. The dirt on ceramic body is required to be cleaned or to replace the ceramic body if it gets crash.

- Unscrew the nozzle.
- Press the ceramic body upward by hand to make it fixed without deflection and then unscrew the retaining ring.
- Align the pin hole of the new ceramic body with the locating pin. * Щ dam sh Φ eo ž Ď w ᵀ


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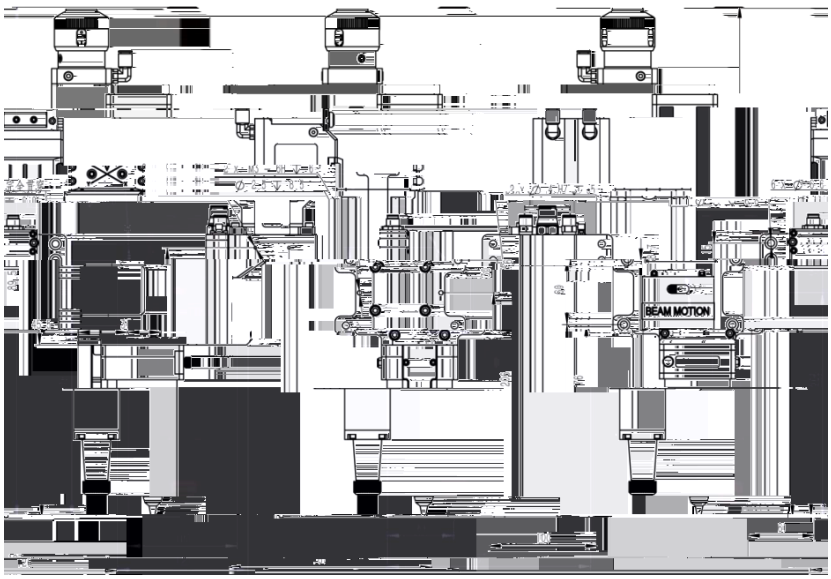


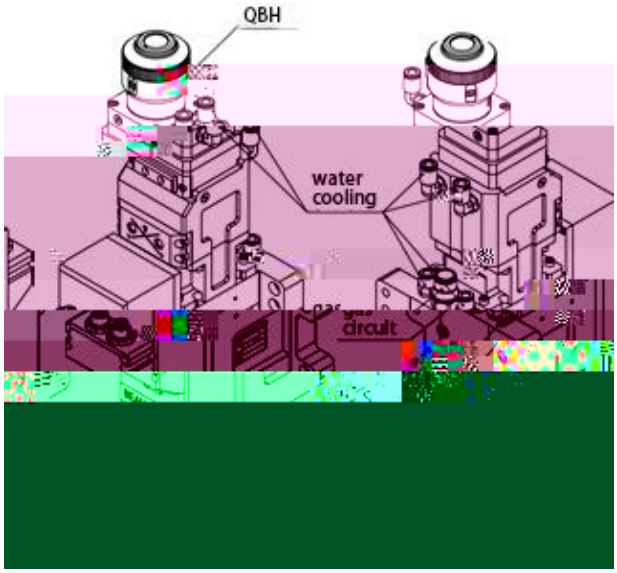


| CL/mm | | 100 | | | 75 | |
|---|---|---|---|---|---|---|
| FL/mm | | - | - | 200 | - | - |
| H/mm | | | | 468.7 | | |

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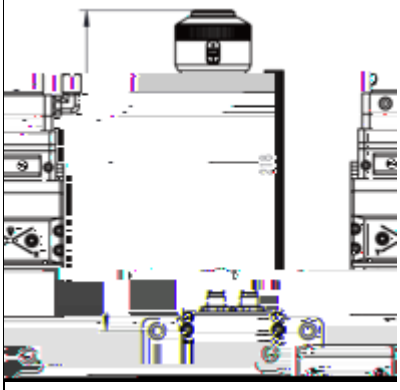
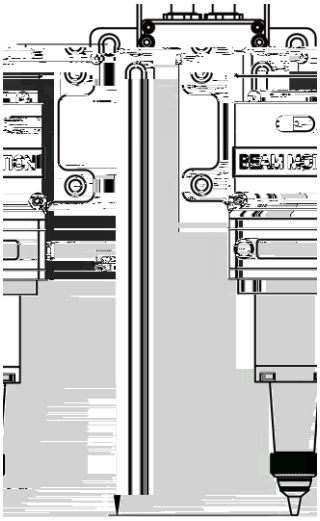
| | | |
|---|---|---|
| Collimation Length | QBH-100 | |
| |  | |

| | | |
|---|---|---|
| Focus Length | | 200mm.FL |
| | |  |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| Fiber Interface | Product ID |
|---|---|
| QBH standard | 211FIA3003 |

| Item | Product ID |
|---|---|
| F100 meniscus lens | 110255AAFBHE0232 |
| F100 biconvex lens | 110255AACBHE0231 |
| F200 meniscus lens | 110255AAFBHE0234 |
| F200 biconvex lens | 110255AACBHE0233 |

| Specification | P |
|---|---|


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| | | |
|---|---|---|
| Nozzle | 3D Single layer M11-Φ1.2 | 120GJT1112 |
| | 3D Single layer M11-Φ1.3 | 120GJT1113 |
| | 3D Single layer M11-Φ1.4 | 120GJT1114 |
| | 3D Single layer M11-Φ1.6 | 120GJT1116 |
| | 3D Single layer M11-Φ1.8 | 120GJT1118 |
| | 3D Single layer M11-Φ2.0 | 120GJT1120 |
| | 3D Single layer M11-Φ3.0 | 120GJT1130 |
| | 3D Single layer M11-Φ4.0 | 120GJT1140 |
| | 3D Single layer M11-Φ5.0 | 120GJT1150 |
| | 3D Double layers M11-Φ1.2 | 120GJT1412 |
| | 3D Double layers M11-Φ1.3 | 120GJT1413 |
| | 3D Double layers M11-Φ1.4 | 120GJT1414 |
| | 3D Double layers M11-Φ1.6 | 120GJT1416 |
| | 3D Single layer M11-Φ1.8 | 120GJT1418 |
| | 3D Single layer M8-Φ1.2 | 120GJT0112 |
| | 3D Single layer M8-Φ1.3 | 120GJT0113 |
| | 3D Single layer M8-Φ1.4 | 120GJT0114 |
| | 3D Single layer M8-Φ1.6 | 120GJT0116 |
| | 3D Single layer M8-Φ1.8 | 120GJT0118 |
| | 3D Single layer M8-Φ2.0 | 120GJT0120 |
| | 3D Single layer M8-Φ3.0 | 120GJT0130 |
| | 3D Single layer M8-Φ4.0 | 120GJT0140 |
| | 3D Single layer M8-Φ5.0 | 120GJT0150 |
| Ceramic Body | M8 | 120515093A |
| | M11 | 120515092A |


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