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AXRAYSER Raytools BM110 3D Fiber Laser Cutting Head Instruction Manual

Model: Raytools Laser Cutting Head BM110 3D (F200 Variant)

1. PRODUCT OVERVIEW

The AXRAYSER Raytools BM110 3D Fiber Laser Cutting Head is designed for high-precision metal sheet cutting applications. It features an optimized optical configuration and gas circuit for enhanced cutting quality and efficiency. Key functionalities include an auto-focus system and multiple protective cover glasses for lens longevity.

Key Features:

- **Optimized Design:** Enhanced optical configuration and gas flow for superior cutting performance.
- **Auto-Focus System:** Automatic focus adjustment with a range of -12mm to +10mm and an accuracy of 0.05mm, minimizing manual intervention.
- **Multiple Protective Cover Glasses:** Integrated cover glasses effectively shield the collimation lens from damage.
- **Drawer-Type Lens Holder:** Facilitates quick and easy replacement of cover glasses.
- **High Adaptability:** Compatible with various fiber interfaces, including QBH and QD, for integration with different laser sources.

2. COMPONENT IDENTIFICATION

Familiarize yourself with the main components of the laser cutting head as illustrated below.

Structure Diagram

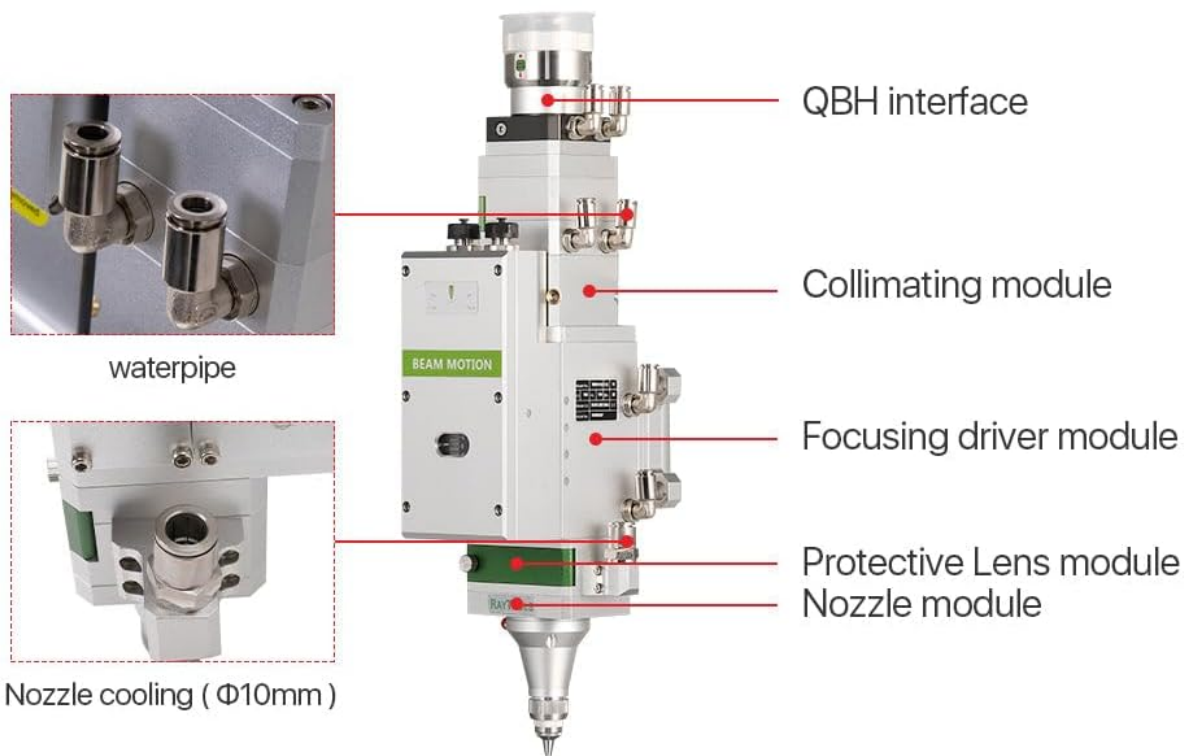


Figure 2.1: Structure Diagram of the Raytools BM110 Laser Cutting Head. This image shows the main modules including the QBH interface, collimating module, focusing driver module, protective lens module, and nozzle module. Detailed views of the water pipe and nozzle cooling connections are also visible.

Power Rating	≤3.3kW
Clear Aperture	25mm
Collimating protective glass	Φ24.9mm*1.5mm
Focusing protective glass	Φ27.9mm*4.1mm
Collimating Lens	D30 F100mm
Focusing Lens	D30mm F125mm / F155mm / F200mm
Auto focus range	+10~-12mm
Assist gas pressure	≤30bar

Figure 2.2: Detailed view of the Raytools BM110 Laser Cutting Head connections. This image highlights the QBH interface, water pipe connections (Φ6mm), assist gas inlet (Φ10mm), ceramics, and nozzles.

Key Components:

- **QBH Interface:** Connection point for the fiber laser cable.
- **Collimating Module:** Contains the collimating lens (D30 F100) to parallel the laser beam.
- **Focusing Driver Module:** Houses the focusing lens and the auto-focus mechanism.
- **Protective Lens Module:** Contains the protective windows (upper: 24.9x1.5mm, lower: 27.9x4.1mm) to shield internal optics.
- **Nozzle Module:** Directs the assist gas and shapes the laser beam for cutting.
- **Water Pipe Connections:** For cooling the laser head.
- **Assist Gas Inlet:** For connecting the assist gas supply.

3. SETUP AND INSTALLATION

Proper installation is critical for the performance and safety of the laser cutting head. Ensure all connections are secure and follow safety guidelines for laser equipment.

1. **Mounting the Laser Head:** Securely attach the BM110 laser cutting head to the designated mounting bracket on your fiber laser cutting machine. Ensure it is stable and correctly aligned.
2. **Connecting the Fiber Laser:** Connect the fiber laser cable to the QBH interface on the top of the laser head. Ensure the connection is clean and tight to prevent power loss or damage.
3. **Water Cooling Connections:** Connect the water cooling pipes to the designated water pipe inlets/outlets on the laser head. Ensure a continuous flow of clean, temperature-controlled cooling water as per machine specifications. Refer to Figure 2.1 for water pipe locations.
4. **Assist Gas Connection:** Connect the assist gas supply line to the assist gas inlet ($\Phi 10\text{mm}$) on the side of the laser head. Ensure the gas pressure is within the recommended range (≤ 30 bar). Refer to Figure 2.2 for assist gas inlet location.
5. **Electrical Connections:** Connect any necessary electrical cables for the auto-focus system and sensors according to your machine's wiring diagram.
6. **Nozzle and Ceramic Installation:** Install the appropriate nozzle and ceramic ring for your cutting application. Ensure they are seated correctly and securely.
7. **Initial Inspection:** After installation, visually inspect all connections for leaks, loose fittings, or damage.

4. OPERATING INSTRUCTIONS

This section provides general guidelines for operating the BM110 laser cutting head. Always refer to your specific laser cutting machine's control software manual for detailed operation procedures.

1. **Power On:** Ensure all cooling systems, assist gas, and the fiber laser source are powered on and functioning correctly before activating the laser head.
2. **Parameter Setting:** Set the cutting parameters (laser power, cutting speed, assist gas type and pressure, focus position) in your machine's control software according to the material and thickness being cut.
3. **Auto-Focus Activation:** The BM110 features an auto-focus system. Activate this function through your machine's control software. The system will automatically adjust the focus position within its range of -12mm to $+10\text{mm}$ with 0.05mm accuracy.
4. **Test Cut:** Perform a test cut on a scrap piece of the material to verify cutting quality and adjust parameters if necessary.
5. **Monitoring:** During operation, monitor the cutting process for any anomalies. Ensure proper assist gas flow and cooling water temperature.
6. **Emergency Stop:** Be familiar with the emergency stop procedures for your laser cutting machine.

Important Considerations:

- Always wear appropriate laser safety eyewear.
- Ensure the work area is well-ventilated to remove fumes.
- Maintain the recommended assist gas pressure for optimal cutting results and to prevent back-splatter damage to optics.

5. MAINTENANCE

Regular maintenance ensures the longevity and optimal performance of your laser cutting head. Perform these tasks with the laser system powered off and locked out.

1. **Protective Window Inspection and Cleaning:**
 - Regularly inspect the protective windows (upper: $24.9 \times 1.5\text{mm}$, lower: $27.9 \times 4.1\text{mm}$) for dust, debris, or damage.

- To clean, use a lint-free optical wipe and optical-grade cleaning solution. Handle with care to avoid scratching.
- Replace protective windows if they are scratched, pitted, or show signs of contamination that cannot be cleaned. The drawer-type lens holder facilitates easy replacement.

2. **Nozzle Inspection and Replacement:**

- Inspect the nozzle tip for wear, deformation, or blockages.
- Clean any accumulated spatter from the nozzle.
- Replace the nozzle if it is damaged or worn, as this affects cutting quality and gas flow.

3. **Ceramic Ring Inspection:**

- Check the ceramic ring for cracks or damage. A damaged ceramic ring can lead to unstable cutting and poor performance.
- Replace if damaged.

4. **Cooling System Check:**

- Ensure the cooling water is clean and free of particles.
- Verify that the water flow rate and temperature are within the manufacturer's specifications.
- Periodically clean or replace water filters if applicable.

5. **General Cleaning:** Keep the exterior of the laser head clean and free of dust and debris.

6. **TROUBLESHOOTING**

This section provides solutions to common issues encountered during the operation of the BM110 laser cutting head. For complex problems, consult a qualified technician or the manufacturer.

Problem	Possible Cause	Solution
Poor Cutting Quality (rough edges, dross)	<ul style="list-style-type: none"> • Incorrect focus position • Contaminated or damaged protective window • Worn or incorrect nozzle • Insufficient or incorrect assist gas pressure • Incorrect cutting parameters (speed, power) 	<ul style="list-style-type: none"> • Verify auto-focus is active and correct. Manually adjust if needed. • Inspect and clean/replace protective windows. • Inspect and replace nozzle if worn or incorrect. • Check assist gas pressure and type. • Adjust cutting parameters in software.
Laser Beam Not Emitting or Weak	<ul style="list-style-type: none"> • Fiber optic cable not properly connected • Damaged fiber optic cable • Internal optics contamination or damage • Laser source issue 	<ul style="list-style-type: none"> • Check QBH interface connection. • Inspect fiber cable for kinks or damage. • Inspect internal optics (requires qualified technician). • Consult laser source manual or technician.
Overheating of Laser Head	<ul style="list-style-type: none"> • Insufficient cooling water flow • High cooling water temperature • Blocked water pipes 	<ul style="list-style-type: none"> • Check water pump and flow rate. • Verify chiller settings and water temperature. • Inspect water pipes for kinks or blockages.
Auto-Focus Malfunction	<ul style="list-style-type: none"> • Sensor contamination • Electrical connection issue • Mechanical obstruction 	<ul style="list-style-type: none"> • Clean any sensors on the focusing module. • Check electrical connections to the focusing driver module. • Inspect for any physical obstructions preventing movement.

7. TECHNICAL SPECIFICATIONS

The following table details the technical specifications for the Raytools BM110 3D Fiber Laser Cutting Head (F200 variant).

Model No.	BMH1100111			H	
CL	100	FL	150	Dia	30
Model CG	24.9X1.5/27.9X4.1			CE	
Serial No.	0060479				

Collimating Lens: D30 F100
Focusing Lens: D30 F150
Protective Windows (Up): 24.9*1.5mm
Protective Windows (Down): 27.9*4.1mm

BM110-FC 2D Cutting Head Configuration

Power Rating	≤3.3kW
Fiber Interface	QBH
Collimator Focal Length	D30-C100
Focusing Lens	D30-F125/F155/F200
Protective Windows	D24.9*1.5 (Upper Protective Windows) D27.9*4.1 (Lower Protective Windows)
Nozzle Styles	Single Layer, Double Layer
Nozzle Caliber	1.0-5.0mm
Ceramics Type	LC03D32R01O3P

BMH110-PC 3D Cutting Head Configuration

Fiber Interface	QBH
Collimating Lens Focal Length	D30-C100
Focusing Lens	D30-F155/F200
Protective Windows	D24.9*1.5 (Upper Protective Windows) D27.9*4.1 (Lower Protective Windows)
Nozzle Specifications	3D Single/Double Layer Nozzle
Nozzle Caliber	1.0-3MM
Serial NO.	LC03D19BT2403D
Zoom	Pulse Zoom

Figure 7.1: General Specifications for Raytools BM110 Laser Cutting Head (0-3.3kW).

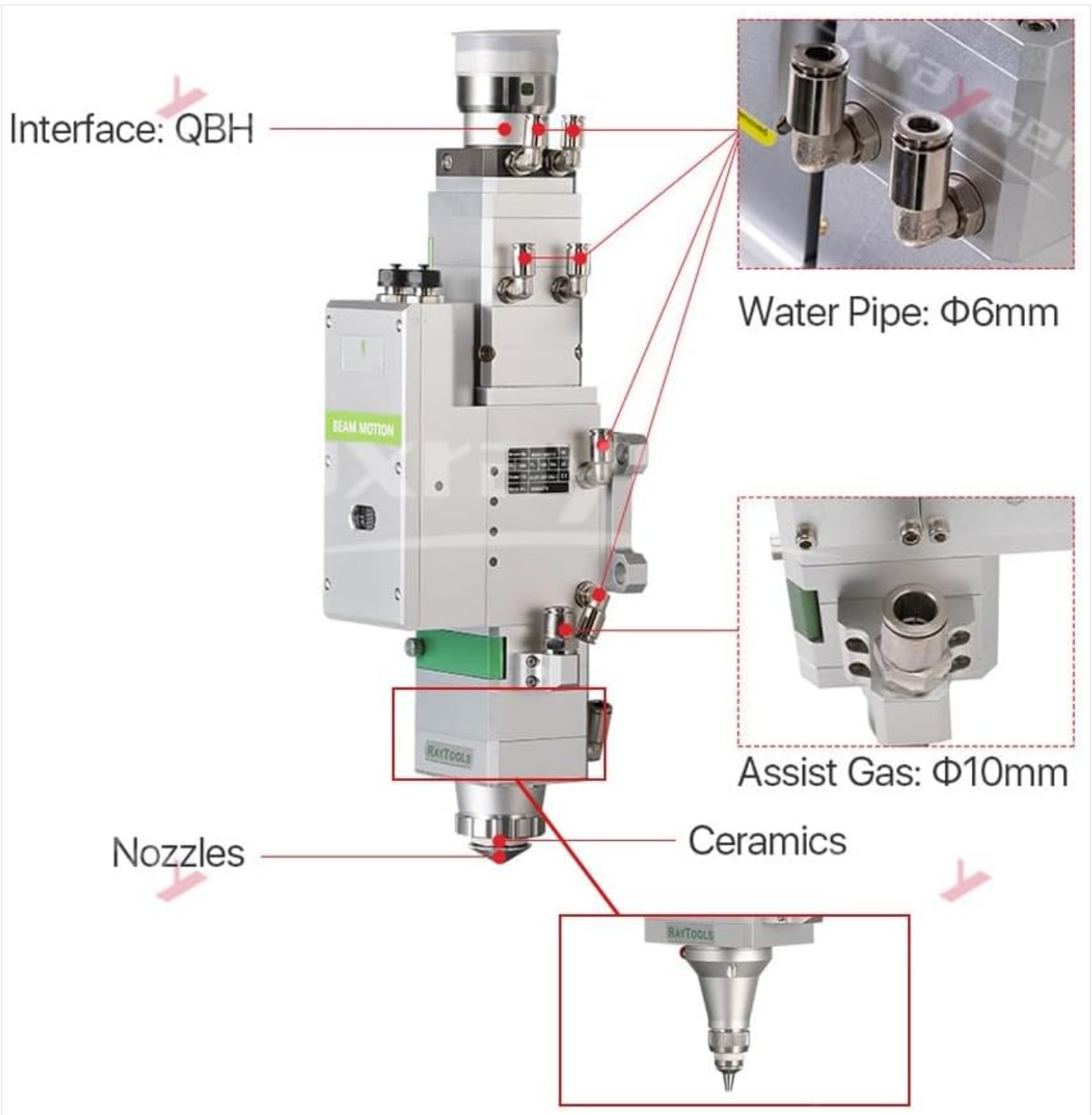


Figure 7.2: Detailed Configuration Specifications for BM110-FC 2D and BM110-PC 3D Cutting Heads.

Parameter	Value
Power Rating	≤ 3.3 kW
Auto Focus Range	-12mm ~ +10mm
Auto Focus Accuracy	0.05mm
Auto Focus Velocity	≤ 170mm/s
Auto Focus Acceleration	≤ 10 m/s ²
Collimation Lens	D30 F100
Focusing Lens (F200 variant)	D30 F200mm
Collimating Protective Glass	Φ24.9 x 1.5 mm
Focusing Protective Glass	Φ27.9 x 4.1 mm
Assist Gas Pressure	≤ 30 bar
Nozzle Styles	Single, Double, Custom (3D Single/Double Layer for PC model)
Nozzle Caliber	0.8mm - 5.0mm (1.0-5.0mm for FC, 1.0-3mm for PC)
Fiber Interface	QBH, QD
Item Weight	Approximately 10 kg (22 pounds)

8. WARRANTY AND SUPPORT

For warranty information, technical support, or service inquiries, please contact your supplier or the manufacturer directly. Keep your purchase receipt and product serial number handy when contacting support.

The product is subject to a return policy of 30 days for refund/replacement as per purchase terms.