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› DMK Raytools BS06K-CAT-2D 6KW Smart Automatic Focusing Laser Cutting Head User Manual

DMK BS06K-CAT-2D

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Model: **BS06K-CAT-2D** | Brand: **DMK**

1. INTRODUCTION

This manual provides essential information for the safe and efficient operation, installation, and maintenance of the DMK Raytools BS06K-CAT-2D 6KW Smart Automatic Focusing Laser Cutting Head. This device is designed for integration into compatible laser cutting machines and requires a separate laser source and cooling system for operation.

The BS06K-CAT-2D features advanced capabilities including dual optical protection, flexible control methods for focal position adjustment, and an optimized mechanical and water circuit design for simplified maintenance. It incorporates standard pressure and protective lens temperature monitoring sensors, along with stray light detection, to ensure precise control and prevent contamination-related issues.

Product Advantages:

Note: This cutting head cannot be used alone and requires a laser and cooling system.

- 1、Dual optical protection: 4 sets of protective lenses, extending the lifespan of the lenses, and multiple protections enhancing the sealing level within the cavity;
- 2、Flexible control method: It supports both analog/pulse control of the focusing unit and EtherCAT bus communication and bus control of the focusing unit. Users can achieve continuous and rapid adjustment of the focal position through program settings
- 3、Optimized mechanical/water circuit design: Simplifies lens installation, reducing the difficulty and cost of maintenance; incorporates a collision-resistant structure to minimize losses caused by misoperations; BS series comes standard with anti-corrosion technology to prevent water leakage due to corrosion in long-term water cooling use;
- 4、Stray light detection: Equipped with a high-response protective lens stray light detection module as standard, effectively preventing lens bursting due to contamination



BS06K-CAT

Figure 1: DMK Raytools BS06K-CAT-2D Laser Cutting Head highlighting its main advantages and the note that it requires a separate laser and cooling system.

2. SAFETY INFORMATION

WARNING: This laser cutting head is a Class II laser product. Laser emission power is less than 4mW. However, when integrated into a laser cutting system, the overall system may operate at significantly higher power levels (up to 6000W). Always adhere to the safety guidelines provided by the laser system manufacturer.

- Always wear appropriate laser safety eyewear when operating or maintaining the laser cutting system.
- Ensure the laser cutting head is properly grounded to prevent electrical hazards.
- Never look directly into the laser beam or at reflections from shiny surfaces.
- Ensure all protective covers and interlocks are in place and functioning correctly before operation.
- Disconnect power before performing any maintenance or inspection.
- The cutting head cannot emit laser light independently; it requires a complete laser and cooling system.
- Ensure adequate ventilation in the work area to remove fumes and debris generated during cutting.

3. PRODUCT COMPONENTS AND STRUCTURE

The BS06K-CAT-2D laser cutting head consists of several key components designed for precision and durability. Understanding these components is crucial for proper installation and maintenance.



Figure 2: Key components of the BS06K-CAT-2D Laser Cutting Head.

1. Fiber optic interface (QBH)
2. Collimation protection lens group
3. Focusing lens group (centering module)
4. Focus protection lens groups
5. Status display (LED)
6. Sensor (TRA)
7. Cooling water connector (6)
8. I/O interface
9. Cooling water connection (6)
10. Cutting gas connector (10)
11. Cooling gas interface (8)
12. Cooling water connector (6)
13. Ceramic body and nozzle
14. Amplifier interface (SMA)

15. Ceramic body lock nut

An exploded view provides further detail on the internal optical and protective components:



Figure 3: Exploded view of the cutting head, detailing optical and protective components.

- **Optical Interface:** QBH, G5
- **Upper Protective Lens:** D24.9 x 1.5mm
- **Collimation Protective Lens:** D24.9 x 1.5mm
- **Focusing Protective Lens:** D27.9 x 4.1mm
- **Lower Protective Lens:** D27.9 x 4.1mm
- **Sensor:** Flat TRA
- **Ceramic Body/Ring:** Outer diameter 28mm, M11 thread
- **Nozzle:** Flat M11, H15mm
- **Seal:** 42.2 x 34.2 x 3.2mm

4. TECHNICAL SPECIFICATIONS

The following table outlines the technical specifications for the BS06K-CAT-2D laser cutting head:

光纤接口	QBH G5
适用波长	1080nm
激光功率	6kW
NA	0.13
光学配比	
-准直焦距 (fC)	100
-聚焦焦距 (fF)	150 200
焦点调节范围	
-水平	-1.5+1.5mm
-垂直	-17.6...+17.6mm -32...+32mm
安装	
-背板安装孔螺丝数量/尺寸	4×M6
-放大器安装孔螺丝数量/尺寸	4×M3
管路接口	
-切割气	Φ10 接头, 最大值 25bar
-喷嘴冷却气	Φ8 接头, 最大值 5bar
-水冷 (顺流和逆流)	Φ6 接头, 最大值 5bar, 体积流量最小 1.5L/min
工作电压	24V±10%, 最小 3A
I/O 接口 (插口, 8 针)	开关输出端电流限制在 30mA 以内
工作温度	5°C~55°C
湿度	30%~95%, 无凝霜
重量	约 5kg

Figure 4: Detailed technical specifications.

Parameter	Value
Product Name	BS06K-CAT Cutting Head
Model	BT240S (BS06K-CAT-2D variant)
Optical Interface	QBH, G5
Wavelength Range	1064nm
Max Laser Power	≤6000W
Numerical Aperture (NA)	0.13
Collimation Focal Length (fC)	F100mm
Focusing Focal Length (fF)	F150mm / F200mm
Focus Adjustment Range (Horizontal)	-1.5mm ~ +1.5mm
Focus Adjustment Range (Vertical)	-17.6mm ~ +17.6mm (for F150/F200)

Parameter	Value
Max Speed	≤200mm/s
Backplate Mounting Screws	4 x M6
Amplifier Mounting Screws	4 x M3
Cutting Gas Connector	Φ10, Max 25 bar
Nozzle Cooling Gas Connector	Φ8, Max 5 bar
Water Cooling Connectors	Φ6, Max 5 bar, Min flow 1.5 L/min
Operating Voltage	24V ±10%, Min 3A
I/O Interface Current Limit	Within 30mA
Operating Temperature	5°C ~ 55°C
Humidity	30% ~ 95% (non-condensing)
Weight	Approx. 5kg
Manufacturer	DMK
Material	Copper
Item Weight (Package)	0.97 ounces <i>(Note: This refers to package weight, not product weight)</i>
Package Dimensions	3 x 0.6 x 0.6 inches

Dimensional drawing for installation planning:

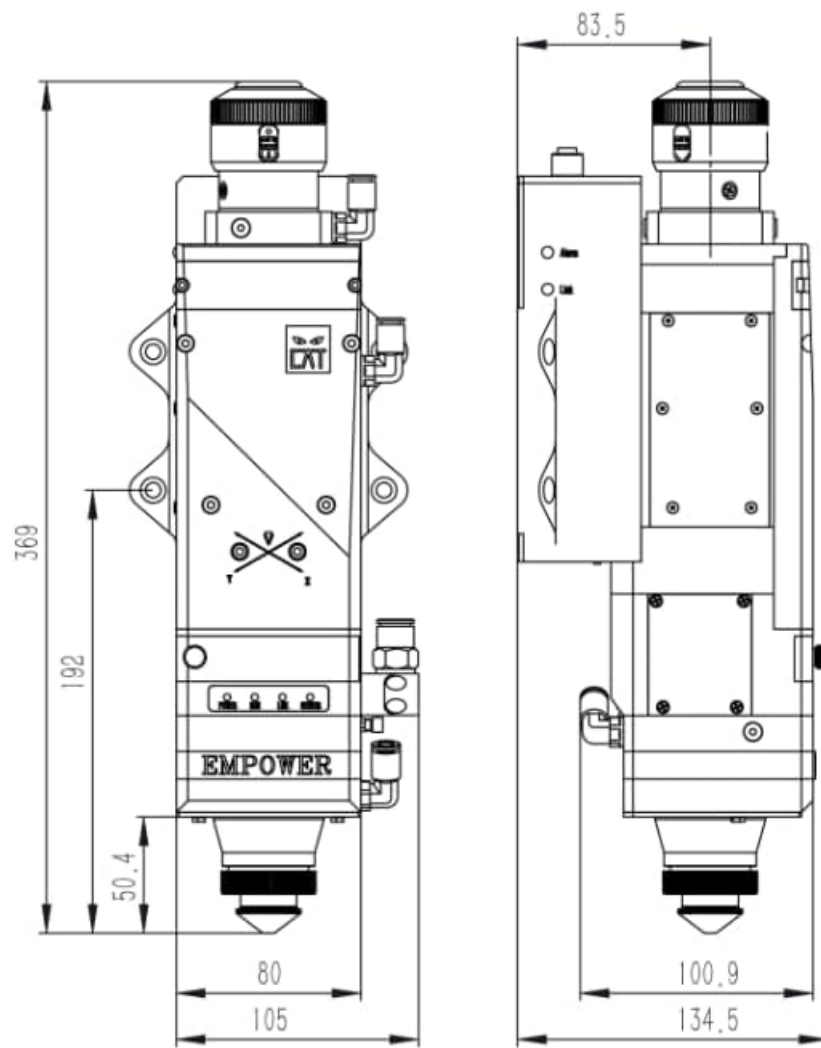


Figure 5: Dimensional drawing (all measurements in millimeters).

5. SETUP AND INSTALLATION

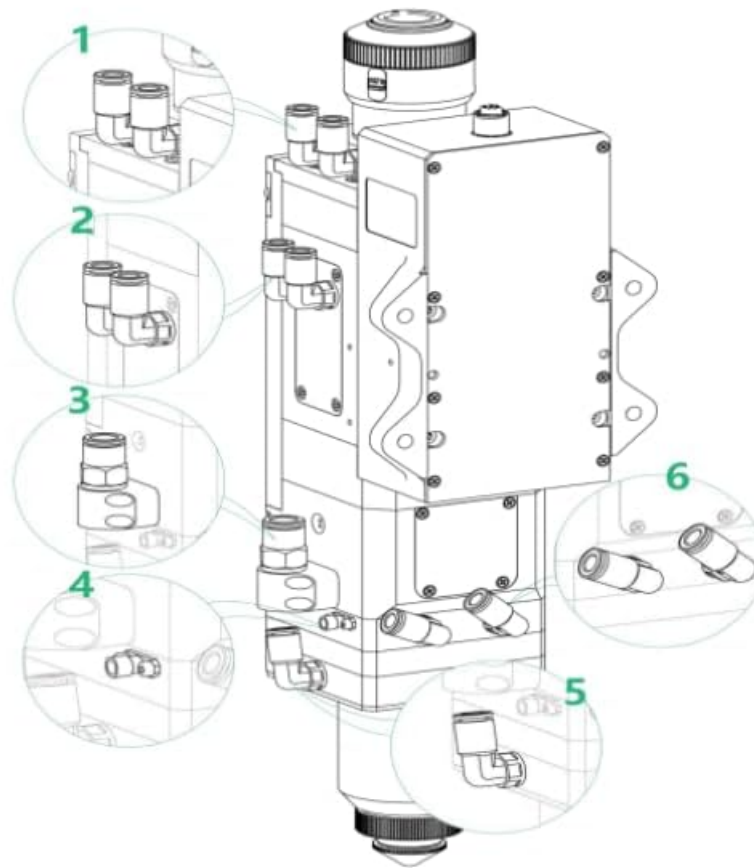
Proper installation is critical for the performance and safety of the laser cutting head. Ensure all connections are secure and meet the specified requirements.

5.1 Mounting the Cutting Head

- Mount the cutting head securely to the laser machine's Z-axis using the designated mounting points.
- Use 4 x M6 screws for backplate mounting and 4 x M3 screws for amplifier mounting, as specified.
- Ensure the cutting head is aligned correctly with the laser beam path.

5.2 Connecting Utilities

Connect the necessary gas and water lines as illustrated below. Ensure all connections are leak-free.



- | | |
|----------------------------|------------------------------|
| 1. Cooling water (6) | 2. Cooling water (6) |
| 3. Cutting gas (medium 10) | 4. Amplifier interface (SMA) |
| 5. Cooling gas (medium 8) | 6. Cooling water (6) |

Figure 6: Utility connection points.

1. Connect cooling water lines ($\Phi 6$ connectors). Ensure a minimum flow rate of 1.5 L/min and maximum pressure of 5 bar.
2. Connect cutting gas line ($\Phi 10$ connector), maximum 25 bar.
3. Connect nozzle cooling gas line ($\Phi 8$ connector), maximum 5 bar.
4. Connect the amplifier interface (SMA).
5. Connect the I/O interface, ensuring the switch output port current limit is within 30mA.

5.3 Electrical Connections

- Provide a stable 24V $\pm 10\%$ power supply with a minimum current of 3A to the cutting head.
- Ensure proper grounding of the cutting head and the entire laser system.

6. OPERATING INSTRUCTIONS

The BS06K-CAT-2D laser cutting head is designed for integration into a larger laser cutting system. Refer to your laser system's main operating manual for overall system startup and operation procedures.

6.1 Pre-Operation Checks

- Verify all gas and water connections are secure and pressures are within specified limits.

- Check the protective lenses for cleanliness and damage. Replace if necessary.
- Ensure the nozzle is clean and correctly installed.
- Confirm the laser source and cooling system are operational.

6.2 Focusing Unit Control

The cutting head supports analog/pulse control or EtherCAT bus communication for continuous and rapid adjustment of the focal position. Consult your laser system's software manual for specific programming and control methods.

- Utilize the system's software to set the desired focal length (F150mm or F200mm) and adjust the focus position within the specified range (-17.6mm to +17.6mm for vertical adjustment).
- The built-in capacitive amplifier model allows for precise and stable tuning follow-up.

6.3 Intelligent Calibration

The cutting head features one-click intelligent calibration of air pressure, simplifying nozzle replacement and process adjustments. Refer to your system's interface for initiating this calibration.

7. MAINTENANCE

Regular maintenance ensures optimal performance and extends the lifespan of your laser cutting head. Always disconnect power before performing any maintenance.

7.1 Protective Lens Cleaning and Replacement

- The cutting head features dual optical protection with 4 sets of protective lenses. Regularly inspect all protective lenses (upper, collimation, focusing, lower) for contamination or damage.
- Clean lenses using only approved optical cleaning solutions and lint-free wipes. Avoid touching the lens surfaces directly.
- Replace damaged or heavily contaminated lenses immediately to prevent damage to internal optics and ensure cutting quality.
- The protective lens temperature monitoring sensor helps detect contamination; if high temperatures are indicated, inspect and clean/replace lenses.

7.2 Nozzle Inspection and Replacement

- Inspect the nozzle and ceramic body for wear, damage, or debris before each operation.
- Replace worn nozzles to maintain cutting precision and gas flow.
- Utilize the one-click intelligent calibration after nozzle replacement for optimal air pressure settings.

7.3 Water Cooling System

- Ensure the cooling water system maintains the specified flow rate (min 1.5 L/min) and pressure (max 5 bar).
- The BS series comes standard with anti-corrosion technology to prevent water leakage due to long-term water cooling corrosion. However, regular checks for leaks and proper coolant quality are recommended.

7.4 Stray Light Detection

- The integrated high-response protective lens stray light detection module helps prevent lens bursting due to contamination. If an alert is triggered, immediately inspect and address the cause of stray light, typically lens contamination.

8. TROUBLESHOOTING

This section provides basic troubleshooting steps for common issues. For complex problems, contact technical support.

Problem	Possible Cause	Solution
Poor Cutting Quality	Contaminated or damaged protective lenses; incorrect focus position; worn nozzle; incorrect gas pressure.	Inspect and clean/replace lenses; adjust focus; replace nozzle; verify gas pressures.
Stray Light Detection Alert	Contamination on protective lenses.	Immediately inspect and clean/replace protective lenses.
Protective Lens Overheating	Contaminated lenses; insufficient cooling.	Clean/replace lenses; check cooling water flow and temperature.
Water Leakage	Loose connections; damaged O-rings or seals.	Check all water connections; inspect and replace seals if necessary.
No Laser Output (from system)	Cutting head not properly integrated; laser source issue; interlock engaged.	Ensure cutting head is correctly installed and connected; consult laser system manual; check safety interlocks.

9. WARRANTY INFORMATION

Specific warranty details for the DMK Raytools BS06K-CAT-2D laser cutting head are not provided in this document. Please refer to the warranty card included with your product or contact DMK customer support for detailed warranty terms and conditions.

10. CUSTOMER SUPPORT

For technical assistance, spare parts, or further inquiries regarding your DMK Raytools BS06K-CAT-2D laser cutting head, please contact DMK customer support through their official channels. You may find contact information on the manufacturer's website or on the product packaging.

DMK Laser Official Store: [Visit DMK Laser Store on Amazon](#)

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