# 50kV MAGNUM® X-ray Source

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MAGNUM X-ray Tube Characteristics

**Mechanical Specifications**

- **Tube Type:** Metal-ceramic
- **Cathode Type:** Tungsten filament
- **Operating Temperature:** -10°C to +50°C (for more details see Figure 2, page 3)
- **Storage Temperature:** -40°C to +85°C
- **Cooling:** Air
- **HV Insulation:** Silicone potting
- **Weight:** 0.7 lb. (350g)
- **Available Targets:** Ag, W, Au, Pd, Ta, Rh

**X-ray Tube Characteristics**

- **HV Polarity:** Grounded anode
- **High Voltage:** -4 to -50 kV
- **Beam Current:** 0 to 0.20 mA
- **Maximum Power:** 4 watts
- **Focal Spot Size:** Typical ~ 300 µm
- **Windows:** Beryllium, 0.25 mm thick
- **Input Power:** 15W max (6-12 VDC)
- **Warranty:** One year
Drawing 1 Monoblock Source Dimensions

452 WEST 1280 NORTH
OREM, UTAH 84057
PH: (801) 225-0930
FAX: (801) 221-1121

INCH INCH

ENGINEER: JONES

DESCRIPTION: X-RAY TUBE, MOXTEK, 50KV PS, X ANODE

BIL OF MATERIAL

<table>
<thead>
<tr>
<th>ITEM/DQT</th>
<th>Number</th>
<th>DESCRIPTION</th>
<th>MATERIAL</th>
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<tr>
<td>1</td>
<td>1</td>
<td>ASMO0444-X TUBE, POTTED MONOBLOCK</td>
<td>ASMO0444-X</td>
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</tbody>
</table>

NOTES:
1. SECONDARY DIMENSIONS ARE IN MILLIMETERS
2. POWER SUPPLY SPECIFICATIONS ARE SHOWN ON SEPARATE PAGE

DATE: 3/2/2009
FILE: TUB00083-X

Dwg/Prt: TUB00083-X

Subject to technical change without notice

REV DATE DESCRIPTION
A 3/2/2009 INITIAL RELEASE
B 6/17/2010 LABELS UPDATED

TABLE (A)

<table>
<thead>
<tr>
<th>DASH</th>
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<td>ID</td>
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<table>
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<tr>
<th>COATING</th>
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<tr>
<td>Ag</td>
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<tr>
<td>W</td>
<td>ASMO0444-2</td>
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<tr>
<td>Au</td>
<td>ASMO0444-3</td>
</tr>
<tr>
<td>Pd</td>
<td>ASMO0444-4</td>
</tr>
<tr>
<td>Ta</td>
<td>ASMO0444-6</td>
</tr>
<tr>
<td>Rh</td>
<td>ASMO0444-7</td>
</tr>
</tbody>
</table>

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS IN INCH
TOLERANCES:
X .001
X .005
X .010
X .020
X .025
X .050

MATERIALS MUST BE FREE FROM SCRATCHES, BURRS, & SHARP EDGES
BEFORE ALL PROCESSES
EMBEDDING ARE AFTER POLISH

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ANYONE OUTSIDE OF THE PURPOSE FOR WHICH IT WAS INITIALLY TRANSMITTED. BY ANY MEANS, ELECTRONIC OR
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Monoblock X-ray Source:
The Monoblock X-Ray Source is small, lightweight, and can be packaged into custom enclosures. The Monoblock X-Ray Source package includes an x-ray tube and a high voltage power supply that operates at up to 50 kV and 200 μA. The low power consumption Monoblock X-Ray Source is ideal for battery-powered applications. The tube anode is grounded allowing placement close to the sample.

Initial Inspection:
When a Monoblock X-Ray Source is received, it should be unpacked and inspected as soon as possible. A standard Monoblock X-Ray Source consists of a high voltage power supply and an x-ray tube enclosed in a brass shield (Figure 1). Inspect the high voltage power supply and the tube shield assembly for any damage that may have occurred during shipping. If a tube has been damaged, please contact Moxtek immediately. The serial number is located on the sticker on the high voltage power supply.

Handling:
Care must be taken not to touch or damage the beryllium window at the end of the tube shield (Figure 2).

Tube Setup:
(Mechanical)
The Monoblock X-Ray Source assembly may be mounted with the exit collimator facing any direction. The high voltage power supply has five threaded holes M3x3 mm on the bottom side (no stickers) of the metal case. These holes may be used for mounting.

(Cooling)
The Monoblock X-Ray Source does not require forced convection or liquid cooling. The tube should be operated in an environment that allows free air convection or conduction to secondary parts. Please refer to page 2 of this manual for operating and storage temperature specifications. The specified temperature is measured at the surface of the aluminum can containing the high voltage power supply unit.
The maximum recommended operating anode shield temperature is 100 degrees Celsius (see Figure 2).
The high voltage power supply has a 10 pin connector (Figure 1). This connector is used to power, control and monitor the x-ray tube. Table 1 shows the pin-out for the connector.

An optional 10 lead ribbon cable is available from Moxtek (Figure 3). This ribbon cable has a 10 pin IDC connector on one side that connects to the high voltage power supply and a DB9 connector on the other end that connects to the Moxtek FTC-200 controller (Table 3).

<table>
<thead>
<tr>
<th>Pin Assignment for 10 Pin IDC Connector</th>
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<tbody>
<tr>
<td><strong>Function</strong></td>
</tr>
<tr>
<td>Input power 1</td>
</tr>
<tr>
<td>Input power 2</td>
</tr>
<tr>
<td>Ground 3</td>
</tr>
<tr>
<td>Ground 4</td>
</tr>
<tr>
<td>Current control 5</td>
</tr>
<tr>
<td>HV control 6</td>
</tr>
<tr>
<td>Filament ready 7</td>
</tr>
<tr>
<td>HV enable 8</td>
</tr>
<tr>
<td>HV monitor 9</td>
</tr>
<tr>
<td>Current monitor 10</td>
</tr>
</tbody>
</table>

Table 3

Safety Interlock:
To assure safe tube operation, a 5 volt TTL signal is sent to the power supply to enable x-ray generation. Moxtek recommends the use of a safety interlock switch when operating the MAGNUM x-ray tube. Connect the high voltage enable pin (see Table 2) to the customer supplied safety interlock switch.

Manufacturer: 3M
Part Number: 3473

Figure 3: Optional Ribbon Cable (ASM00362)
Operating Conditions:
Monoblock’s anodes are grounded to a metal shield (Figure 1).
When operating the 50kV Monoblock X-Ray Source, adhere to the maximum setting below:
- **50 kV, 0.20 mA max, power limited to 4 Watts**
Failure to adhere to these limits may cause damage the x-ray tube and/or high voltage power supply. Failure to adhere to this parameter will forfeit the tube warranty.
When operating Monoblock X-Ray Source, **wait 2 seconds after the tube has been powered off before powering the tube on again.** Failure to wait 2 seconds may damage the filament. Failure to adhere to this parameter will forfeit the tube warranty.

Operation Precautions and Warnings:
**CAUTION:** Verify that the tube and the high voltage power supply are properly grounded before powering on the FTC-200 tube controller. Also verify that the FTC-200 controller is properly grounded to the power outlet. If you are not using the FTC-200 Controller and using a custom controller, make sure the tube and the high voltage power supply are properly grounded.

**CAUTION:** Monoblock X-Ray Source contains beryllium. Inhaling beryllium dust causes lung disease. Do not touch the beryllium window (Figure 2).

**WARNING:** Monoblock X-Ray Source may become very hot during operation. Temperatures should not exceed 50 degrees Celsius on the power supply box.

**WARNING:** Monoblock X-Ray Source produces x-ray radiation. Monoblock’s tubes are shielded with a metal shield(brass) and high-Z potting materials. Extra shielding may be required depending on the application. **ONLY OPERATE X-RAY TUBES IN PROPERLY SHIELDED ENCLOSURES.** It is the responsibility of the operator to ensure that all applicable safety precautions are taken and observed.

**WARNING:** Monoblock sources operate at high voltages up to 50 kV. Refer to the tube handling instructions on page 4. Precautions should be taken to protect the operator while applying high voltages to avoid serious injury or death.

Operating the Monoblock X-Ray Source without a Moxtek FTC-200 controller:
The high voltage power supply uses DC voltages and signals to operate the tube. To operate the tube without using a Moxtek FTC-200 controller, refer to Table 1 and Table 2 for the 10 pin high voltage power supply connector pins.

Timing Diagram:
If the monoblock source is controlled by a device other than the FTC-200 controller please refer to the timing diagram (Figure 4) for the sequence of the input voltages and currents.

Operating the Monoblock X-Ray Source with a Moxtek FTC-200 Controller:
The FTC-200 controller is designed to power, monitor, and control the Monoblock X-Ray Source. This controller contains all of the necessary electronics to operate the high voltage power supply. The FTC-200 controller provides input power to the high voltage power supply. The FTC-200 controls the high voltage and emission current settings on the x-ray tube. The FTC-200 controller includes built-in meters for convenient monitoring and display of the high voltage and emission current. Refer to the FTC-200 Operation Manual for operating instructions.

**Figure 4**
High Voltage Power Supply Timing

Technical Support:
For product technical support please contact Moxtek at (801)225-0930 or through the web site at www.moxtek.com.