50kV MAGNUM Monoblock X-ray Source

Operation Manual

Figure 1: TUB00082

Figure 2: TUB00083

Introduction

The Moxtek® 50kV X-ray Source is a small, low power device used for a variety of applications including handheld, portable, and bench top instrumentation. 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.

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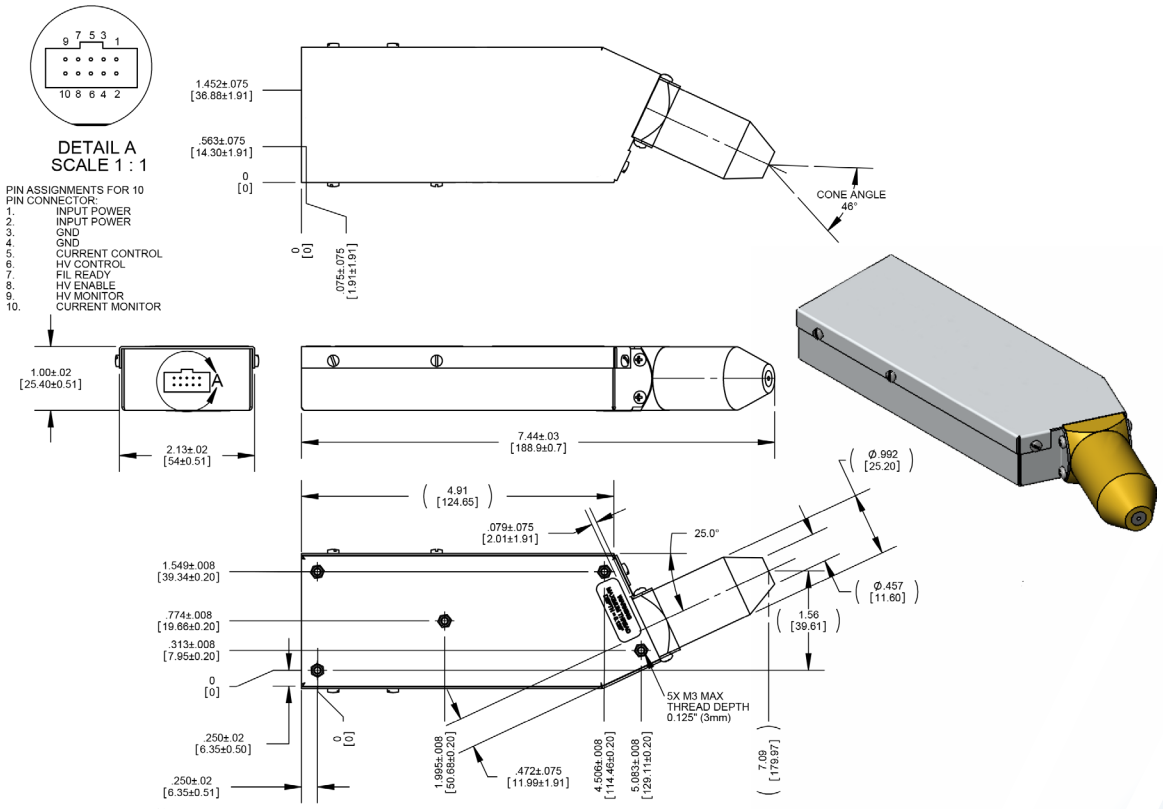
Mechanical Specifications

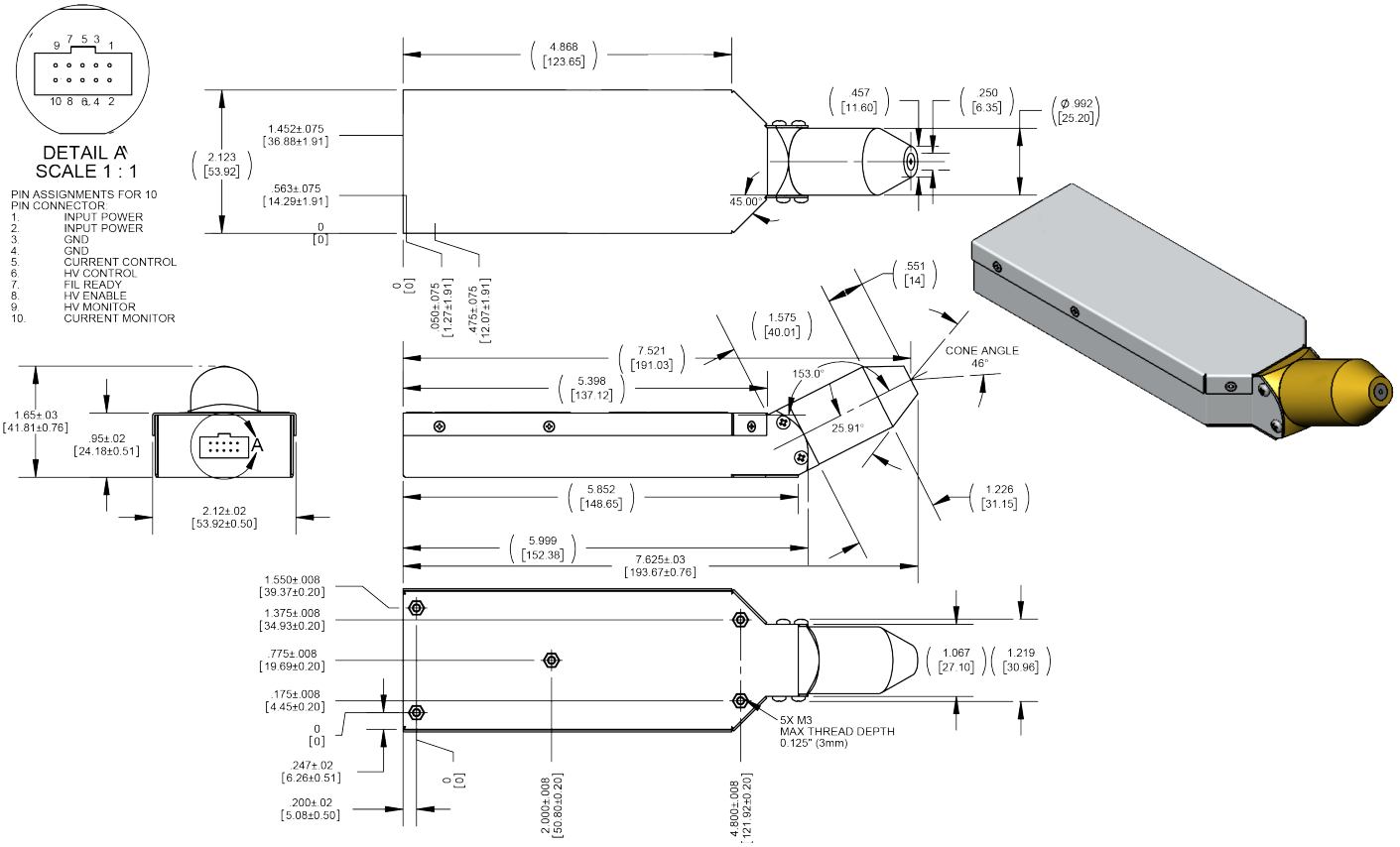
Tube type: Metal-ceramic
Cathode Type: Tungsten Filament
Operating Temperature: -10º to +50º C (for more details see Figure 2, Pg. 3)
Storage Temperature: -30º to +85º C
Cooling: Air
HV Insulation: Silicone potting
Nominal Weight: 0.7 lb, (350g)
Available Targets: Ag, Au, Cr, Cu, Mo, Pd, Rh, Ta, W
High Voltage Polarity: Grounded Anode
High Voltage: -4 to -50kV
Beam Current: 5 to 200uA
Maximum Power: 4W
Window: Beryllium, 0.125mm or 0.25mm
Input Power: 15W Max 96-12 VDC (4W avg. operating power)
Warranty: 1 year or 2000 operating hours, whichever occurs first

TUB00082 Mechanical Drawing



Drawing 1: TUB00082

TUB00083 Mechanical Drawing



Drawing 2: TUB00083

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.

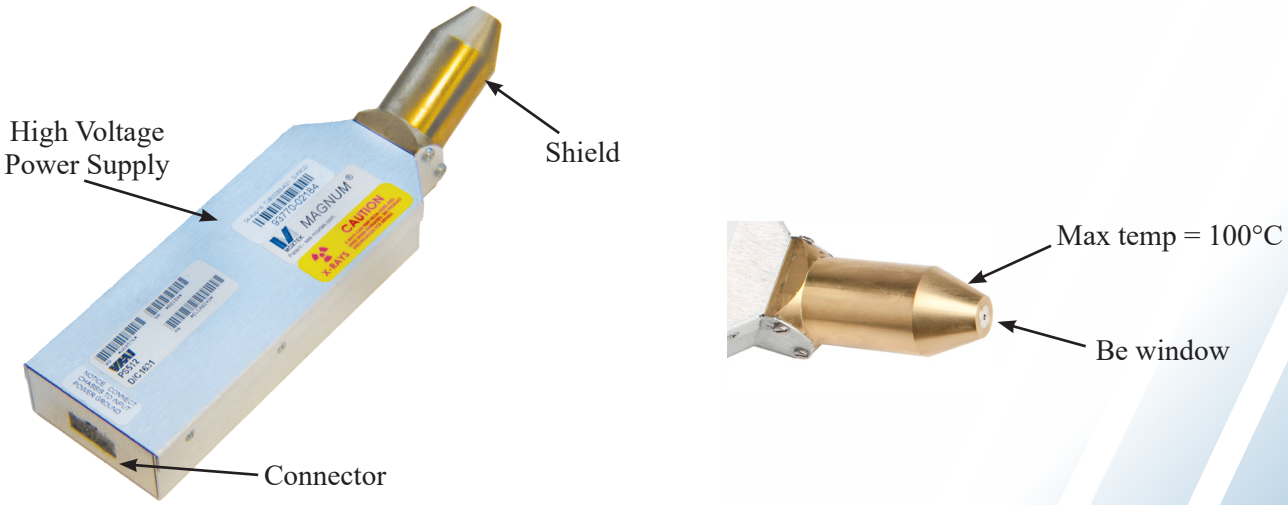


Figure 3: Inspection information

Handling

Care must be taken not to touch or damage the beryllium window at the end of the tube shield (Figure 3).

Source 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).

Electrical

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 2).

Safety

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.

Table 1 and 2 Pin Assignment

Tube Pin Assignment for 10 Pin IDC Connector

Function	Pin #	I/O Value	Response
Input Power	**1**	+6 to +12V Input	Input Power
Input Power	**2**	+6 to +12V Input	Input Power
Ground	**3**	Ground	Ground
Ground	**4**	Ground	Ground
Current Control	**5**	0.0V to +4.0V Input	0.0µA to 200µA
HV Control	**6**	0.32V to +4.0V Input	-4kV to -50kV
Filament Ready	**7**	0.0V or +5 VTTL Output	0 Not Ready +5 Ready
HV Enable	**8**	0.0V or +5 VTTL Output	0 Not Ready +5 Enabled
HV Monitor	**9**	0.32V to +4.0V Output	Proportional to -4 kV to -50kV
Current Monitor	**10**	0.32V to +4.0V Output	Proportional to 0 to 200µA

Figure 4: Tube Pin Assignment

Pin Assignment for 9 Pin DB-9 Port

Function	Pin #	I/O Value	Response
Input Power	**N/A**	+6 to +12V	Input Power
Input Power	**1**	+6 to +12V	Input Power
Ground	**2**	Ground	Ground
HV Set Voltage	**3**	0.32V to +4.0V Input	-4kV to -50kV
Tube Enable	**4**	0.0V or +5 VTTL Output	0 Not Ready +5 Enabled
Emission Current Monitor Voltage	**5**	0.32V to +4.0V Output	Proportional to 0 to 200µA
Signal Reference Ground	**6**	Ground	Ground
Emission Current Set Voltage	**7**	0.0V to +4.0V Input	0.0µA to 200µA
Filament Ready	**8**	0.0V or +5 VTTL Output	0 Not Ready +5 Ready
HV Monitor Volatge	**9**	0.32V to +4.0V Output	Proportional to -4 kV to -50kV

Figure 5: Pin Assignment

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.

Operating 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

The high voltage power supply uses DC voltages and signals to operate the tube.

Please use timing diagram below

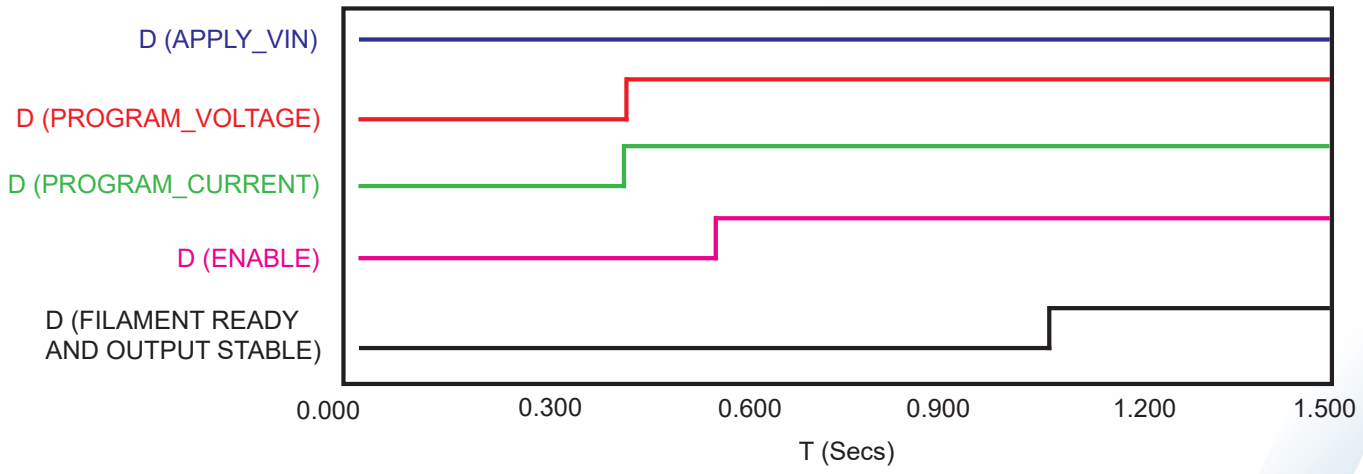


Figure 6: Timing diagram