Miniature X- Ray Source

Mini–X

Mini–X is a self-contained, miniature X-ray tube system, which includes the X-ray tube, high voltage power supply and USB controller. Designed for X-ray fluorescence analysis applications - XRF.

Features

- 40 kV / 100 µA
- Ag or W target
- USB controlled
- Stable output
- Fast
- Low power
- Small

Mini-X is the first of its kind; a self-contained, packaged, miniature X-ray tube system, which includes the X-ray tube, the power supply, the control electronics and the USB communication to the computer. It is designed to replace radioisotopes in X-ray fluorescence analysis applications.

Mini-X has been designed to simplify the XRF process by providing a grounded anode, variable current and voltage controlled via USB and ease of operation. It features a 40 kV/100 µA power supply, a tungsten (W) or silver (Ag) transmission target, and a beryllium end window. It is designed for continuous operation in industrial environments.

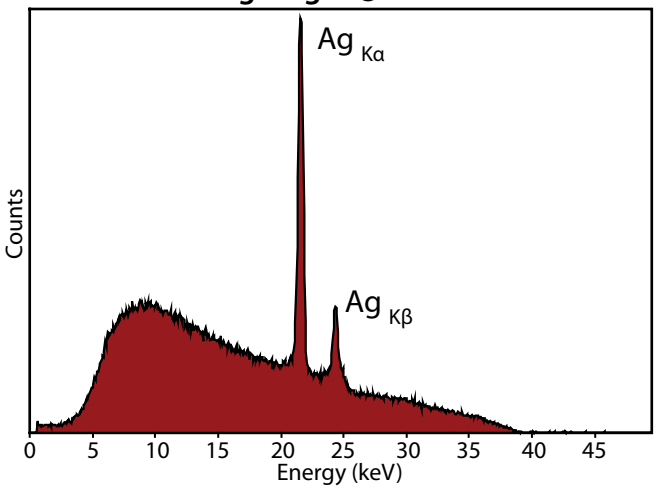
To further simplify the use of Mini-X an AC adaptor is provided to supply the 9 VDC needed to power the system. The only connections needed to operate the tube are a USB cable and AC adaptor. A flashing red LED and a beeper warns the user when x-rays are present.

Applications

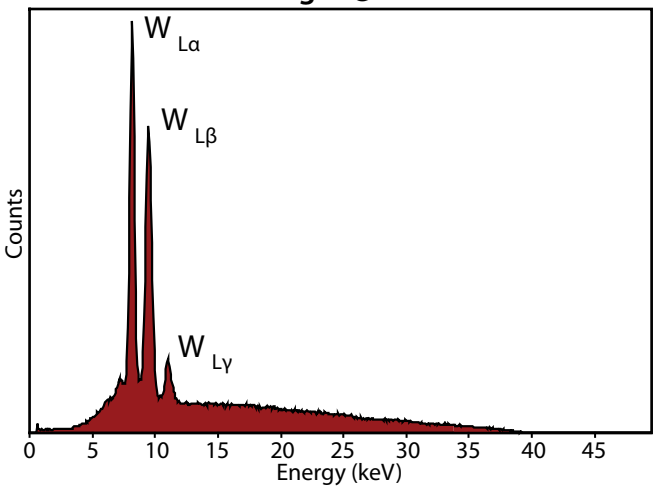
- X-Ray Fluorescence (XRF) analysis
- Portable systems
- OEM
- Process Control
- Research
- Teaching

Mini–X Output X-Ray Spectra

Ag Target @ 40 kV



W Target @ 40 kV



The Mini–X is based on the Newton Scientific Inc. miniature X-ray source.

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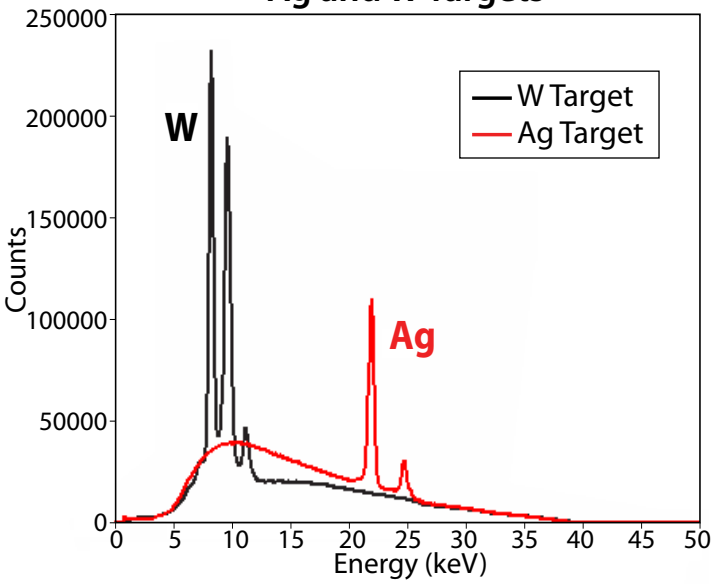
Mini–X Specifications

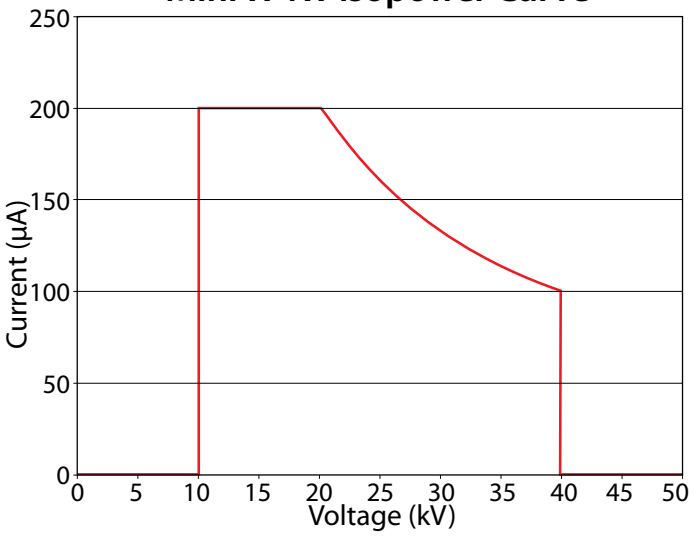
Target Material	Silver (Ag) or Tungsten (W)
Target Thickness	1.5 µm
Tube Voltage	10 to 40 kV
Tube Current	5 µA min. / 200 µA max.
Approximate Dose Rate	800 µGy/h @ 40 kV, 50 µA (W target) @ 30 cm
Approximate Flux	10^6 cps @ 40 cm through 1 mm diameter collimator (40 keV, 100 µA)
Continuous Power	4 W max. 100% duty cycle
Window Material	Beryllium (Be); window at ground
Window Thickness	500 µm
Focal Spot Size	Approximately 2 mm
Output Cone Angle	120°
Cooling	Air cooled
High Voltage Stability	< 0.03% RSD
Leakage Radiation	< 100 nSv/h
Power Consumption	8.5 W @ 40 kV and 100 µA (9 VDC input voltage)
Input Voltage	9 VDC (AC adapter included), connector
Control	USB, mini-USB connector (cable included)
Setting Time	Typical < 1 second
Weight	280 g
Humidity	30 to 90% (non condensing)
Operating Temperature Range	-10 °C to +50 °C
Storage Temperature Range	-25 °C to +60 °C
Safety Controls and Indicators	1) External hardware interlock 2) Flashing LED 3) Beeper
Software	Mini-X Control Software to control voltage and current Mini-X API for custom programming applications
Warranty	One year or 2000 hours, whichever comes first

Relative Output Spectra Ag and W Targets

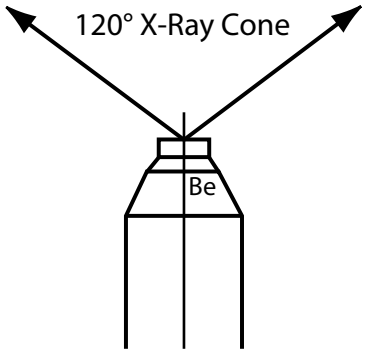


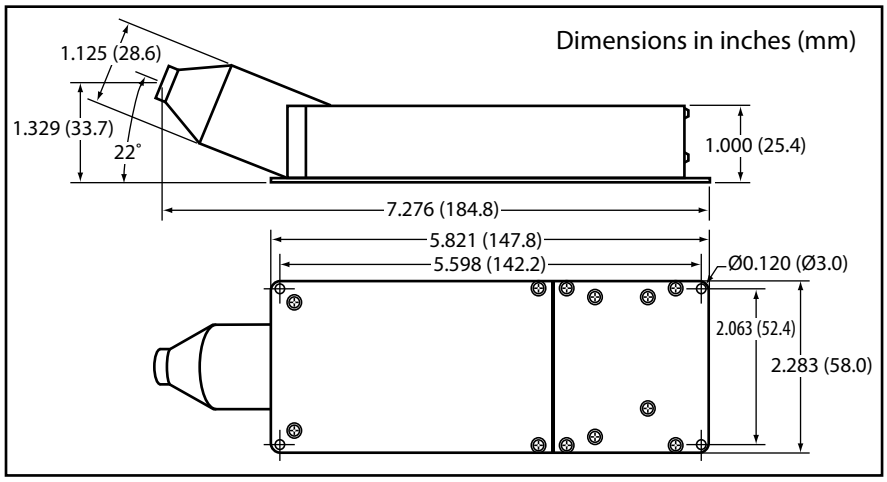
Spectra were taken at a distance of 18" (45.7 cm) with a 1 mm diameter collimator at 40 kV/2 µA and 30k counts per second.

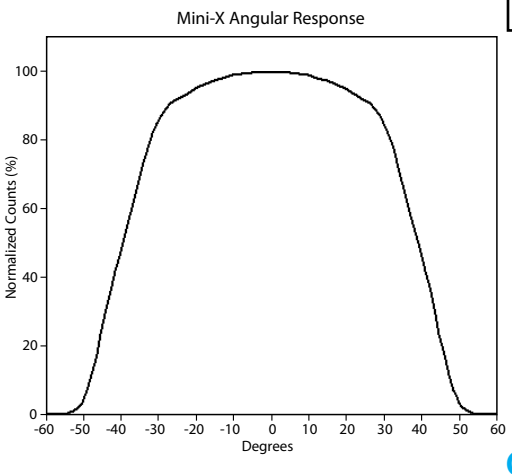
Mini-X 4W Isopower Curve

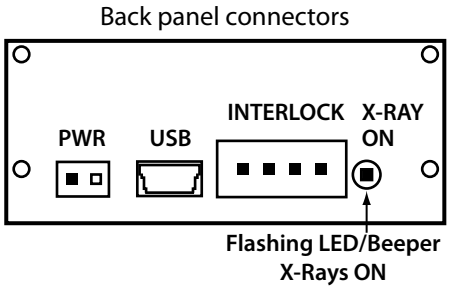


Mini–X Mechanical Dimensions



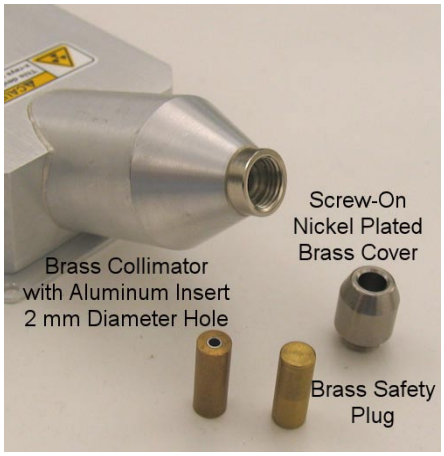


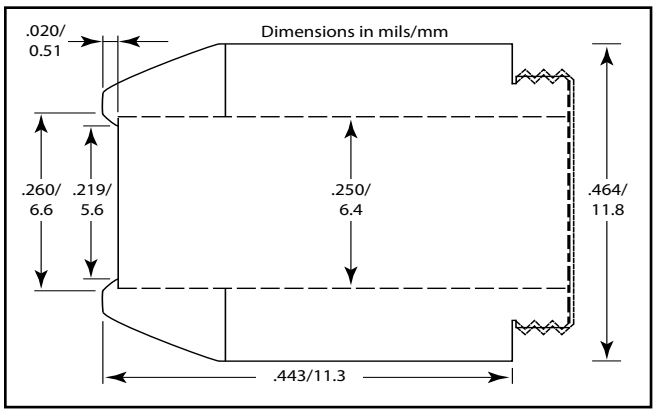




Collimator and Safety Plug

The Mini-X is provided with a collimator to facilitate its use in XRF applications. It consists of a brass collimator with an aluminum (Al) insert and a cover that screws into the Mini-X. The collimator has a 2 mm diameter hole. The brass safety plug when installed, reduces the flux from an operating tube to less than 2.5 mrem/h at 5 cm away in accordance with Requirements 5.2.2.1.1 and 5.2.2.2.2 of the NBS Handbook for Radiation Safety for X-Ray Diffraction and Fluorescence Analysis Equipment.





Collimator cover mechanical dimensions (mils/mm).

Filters

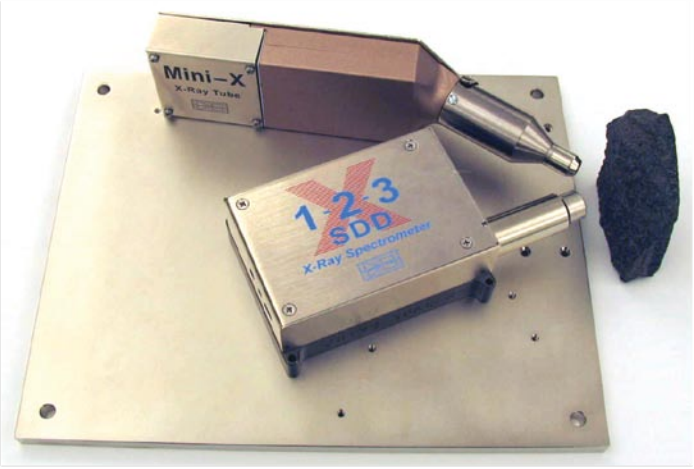
There are many reasons to use filters on the x-ray tube. They can help eliminate low energy photons to create a clean background and they can filter the characteristic lines of the tube's target. Keep in mind that when any filter is used it reduces the flux coming out of the tube. An Al filter reduces the flux much less than a Mo or Ag filter. The higher the Z of the filter or the thicker the filter, the less flux will be available. It is therefore necessary to raise the current of the x-ray tube to compensate.

Please see http://www.amptek.com/minix.html for output spectra with various filters.

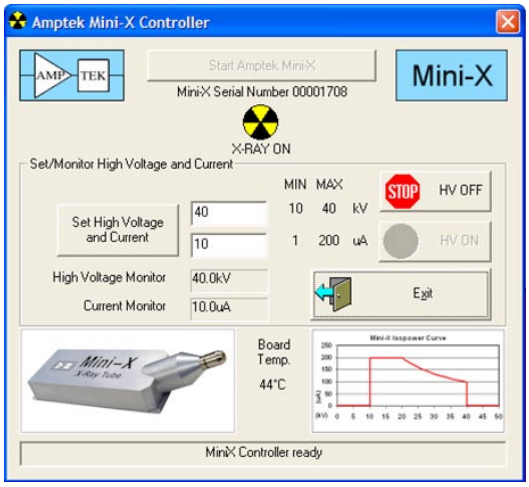
Filters Provided		
Material	**Thickness (μm/mils)**	**# Provided**
Al	1016 / 40	5
Al	254 / 10	5
Cu	25.4 / 1	3
Mo	25.4 / 1	2
Ag	25.4 / 1	1
W	25.4 / 1	1

The Mini–X shown with the Amptek XR-100CR X-Ray Detector and PX4 Digital Pulse Processor.

The Mini–X shown and XR-100CR with vacuum couplings.



The Mini–X mounted on MP1 with X-123SDD.



USB Software Interface. Allows the user to set the voltage and current as well as monitor both parameters.

Radiation Precautions

The Mini–X Is intended to generate x-ray radiation during normal operation. The Mini–X has been designed to focus radiation in the designated output direction, however radiation in other directions is possible and should be addressed with shielding and/or monitoring in the final application.

Caution

The Mini-X is only one component of an X-ray instrument. It is the responsibility of the user, the OEM customer, or experimenter to provide a fail safe metal enclosure to prevent escaping radiation while using this product. The final product (turn-key system) must comply with local government regulations to protect personnel from exposure to radiation. Amptek Inc., bears no responsibility for the incorrect use of this product.

Caution

This device produces X-Rays when energized. To be operated only by qualified personnel.

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