

# 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

- 50 kV / 80  $\mu$ A
- Ag or Au target
- USB controlled
- Stable output
- Fast
- Low power
- Small

## Applications

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

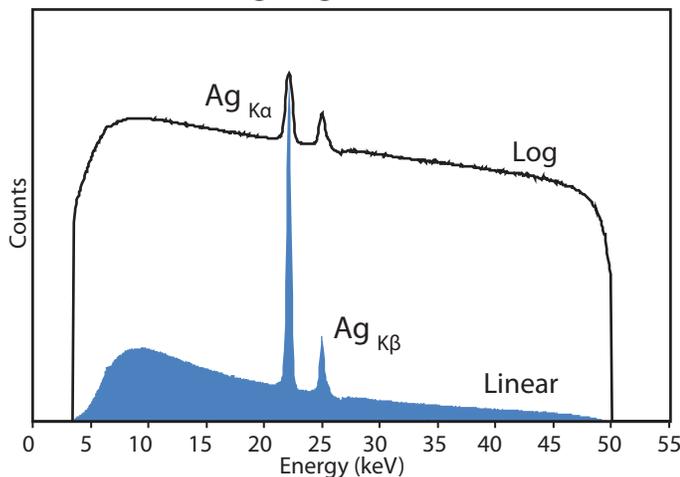
Mini-X is the first of its kind; a self-contained, packaged, miniature X-ray tube system, which includes the X-ray tube, the power supply, the control electronics and the USB communication to the computer. It is designed to replace radioisotopes in X-ray fluorescence analysis applications.

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 50 kV/80  $\mu$ A power supply, a gold (Au) or silver (Ag) transmission target, and a beryllium end window. It is designed for continuous operation in industrial environments.

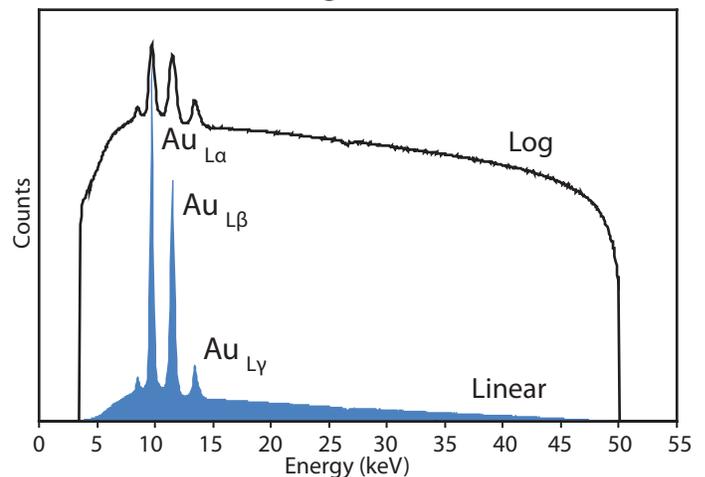
To further simplify the use of Mini-X an AC adaptor is provided to supply the 12 VDC needed to power the system. The only connections needed to operate the tube are a USB cable and AC adaptor. A flashing red LED and a beeper warns the user when x-rays are present.

## Mini-X Output X-Ray Spectra

Ag Target @ 50 kV



Au Target @ 50 kV



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

## Mini-X Specifications

Target Material	Silver (Ag)	Gold (Au)
Target Thickness	0.75 $\mu\text{m}$ ( $\pm 0.1 \mu\text{m}$ )	1 $\mu\text{m}$ ( $\pm 0.1 \mu\text{m}$ )
Tube Voltage	10 to 50 kV	10 to 50 kV
Tube Current	5 $\mu\text{A}$ min. / 200 $\mu\text{A}$ max.	5 $\mu\text{A}$ min. / 200 $\mu\text{A}$ max.
Approximate Dose Rate	1 Sv/h @ 30 cm on axis, 50 kV and 80 $\mu\text{A}$	1.3 Sv/h @ 30 cm on axis, 50 kV and 80 $\mu\text{A}$
Approximate Flux	$10^6$ counts per second/ $\text{mm}^2$ on the axis at a distance of 30 cm (50 keV/1 $\mu\text{A}$ )	$1.3 \times 10^6$ counts per second/ $\text{mm}^2$ on the axis at a distance of 30 cm (50 keV/1 $\mu\text{A}$ )
Continuous Output Power	4 W max. @ 100% duty cycle	4 W max. @ 100% duty cycle
Window Material	Beryllium (Be); window at ground	Beryllium (Be); window at ground
Window Thickness	127 $\mu\text{m}$	127 $\mu\text{m}$
Focal Spot Size	Approximately 2 mm	Approximately 2 mm
Output Cone Angle	120°	120°
Cooling	Air cooled	Air cooled
High Voltage Stability	< 0.1%	< 0.1%
Leakage Radiation	<5 $\mu\text{Sv/h}$ (0.5 mrem/h) at 5 cm with safety plug installed	<5 $\mu\text{Sv/h}$ (0.5 mrem/h) at 5 cm with safety plug installed
Power Consumption	9 W at 50 kV and 80 $\mu\text{A}$	9 W at 50 kV and 80 $\mu\text{A}$
Input Voltage	12 VDC (AC adapter included)	12 VDC (AC adapter included)
Control	USB, mini-USB connector (cable included)	USB, mini-USB connector (cable included)
Setting Time	Typical < 1 s	Typical < 1 s
Weight	360 g	360 g
Humidity	30 to 90% non condensing	30 to 90% non condensing
Operating Temperature	-10 °C to +50 °C	-10 °C to +50 °C
Storage Temperature	-25 °C to +60 °C	-25 °C to +60 °C
Safety Controls and Indicators	1) External hardware interlock 2) Flashing LED 3) Beeper	1) External hardware interlock 2) Flashing LED 3) Beeper
Software	Control Software controls voltage and current. Mini-X API for custom programming applications	Control Software controls voltage and current Mini-X API for custom programming applications
Warranty	One year or 2000 hours, whichever comes first	One year or 2000 hours, whichever comes first

### 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.

**Radiation Levels** external to the X-ray tube housing with the brass safety plug ON do not exceed 25  $\mu\text{Sv/h}$  (2.5 mrem/h) measured 5 cm from the surface of the housing in accordance with Requirements 5.2.2.2.2 of the National Bureau of Standards (NBS) Handbook for Radiation Safety for X-Ray Diffraction and Fluorescence Analysis Equipment.

#### Examples of Shielding (that comply with the above standard)

1 mm (0.040 inch) of Pb will result in radiation levels of 0.5 mrem/h.

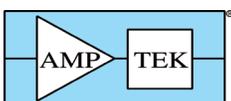
6.35 mm (0.250 inch) of Fe will result in radiation levels of 0.5 mrem/h.

3.18 mm (0.125 inch) of Brass will result in radiation levels of 2.5 mrem/h.

The inside of the housing can also be lined with 3.18 mm (0.125 inch) of aluminum (Al) in order to absorb the XRF from the shielding material.

### Caution

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



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