

AMETEK

X123 SiPIN Specs

X123 SiPIN Specs -B2

Complete X-ray Spectrometer

Includes

- X-Ray Detector and Preamplifier
- Digital Pulse Processor and MCA
- Power Supply and Interface with PC

Features

- Compact integrated system
- Small size (2.7 x 3.9 x 1 in or 7 x 10 x 2.5 cm)
- Low power (2.5 W)
- Light weight (6.3 oz or 180 g)
- USB, Ethernet, and RS232 Communication
- Easy to operate

Applications

- X-Ray Fluorescence Instrumentation
- RoHS / WEEE Compliance
- Process Control
- Art and Archaeology

Detector

- Si-PIN for X-ray detection
- 2-Stage thermoelectrical cooler
- Area: 6mm², 13mm² to 25 mm²
- Thickness: 500 µm or 1000µm
- Accommodates all types of Amptek detectors

Typical Performance

- Resolution: 139 to 225 eV FWHM at 5.9 keV
- Optimum energy range: 1 keV to 40 keV
- Max count rate: Up to 2 x 10⁵ cps

Detailed performance depends on detector and configuration, which can be optimized for specific applications.

Overview

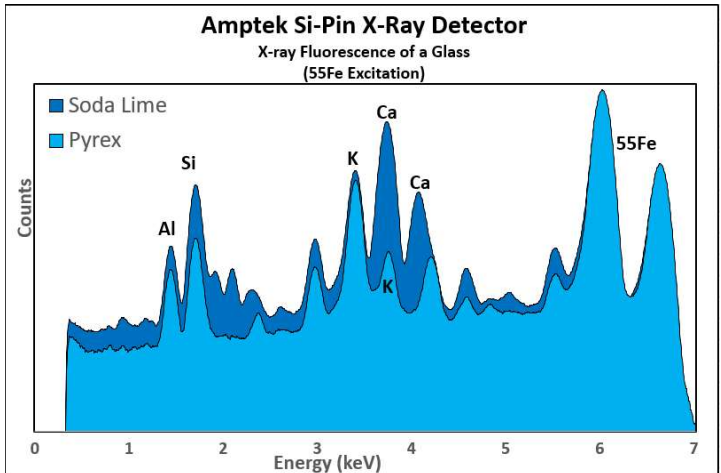
The X-123 represents the culmination of 14 years of X-ray detector development at Amptek. Our philosophy has always been to create small, low power, high performance instruments while keeping them simple to operate. The X-123 exemplifies this philosophy by providing in a single package the XR-100 X-Ray Detector and its Charge Sensitive Preamplifier; the DP5 Digital Pulse Processor with pulse shaper, MCA, and interface; and the PC5 Power Supply. *All that is needed is a +5 Volts DC input and a USB, Ethernet or RS232 connection to your computer.*



OEM's #1 Choice



The X-123 is typically used in detecting X-rays with energies from a few keV to 30kV.



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X-123 SiPIN Specifications


SYSTEM PERFORMANCE				
Energy Resolution @ 5.9 keV, 55Fe	145 to 260 eV FWHM @ 5.9 keV. Depends on detector, peaking time, and temperature.			
Energy Range	1-30 keV. May be used at higher energy with lower efficiency, contact Amptek.			
Maximum Recommended Count Rate	Maximum Count Rate Depends on peaking time. Recommended maxima for 50% dead time with pile-up rejection enabled are shown below			
	DP5 Peaking Time (μs)	2.4 μ s	6.4 μ s	25.6 μ s
	Shaping Time (μs)	1.0 μ s	2.9 μ s	11.6 μ s
	Recommended Max Rate (s^{-1})	1.2 x 10 ⁵	4.6 x 10 ⁴	1.2 x 10 ⁴
DETECTOR AND PREAMPLIFIER				
Detector Type	SiPIN			
Detector Area	6mm ² , 13mm ² , and 25 mm ²			
Detector Thickness	500um typical, 1000um also available			
Window Options	1 mil Be (25 μ m) or 0.5 mil Be (12.5 μ m)			
Thermoelectric Cooler	2-stage			
Preamplifier Type	Amptek custom design with reset through HV connection.			
PULSE PROCESSOR				
Gain	Combination of coarse and fine gain yields overall gain continuously adjustable from 0.84 to 127.5			
Coarse Gain	Software selectable settings from 1.12 to 102 in 16 log steps. 1.12, 2.49, 3.78, 5.26, 6.56, 8.39, 10.10, 11.31, 14.56, 17.77, 22.42, 30.83, 38.18, 47.47, 66.26, 102.0			
Fine Gain	Software selectable, 0.75 to 1.25, 10 bit resolution			
Gain Stability	<20 ppm / °C (typical)			
Pulse Shape	Trapezoidal			
Peaking Time	24 software selectable peaking times between 0.8 and 102 μ s, approximately log spaced, corresponding to semi-gaussian shaping times of 0.4 to 45 μ s.			
Dead Time	Total dead time is 1.05 times the peaking time. No conversion time.			

Fast Channel Pulse Pair Resolving Time	120 ns
MCA Number of Channels	Software selectable to 8k, 4k, 2k, 1k, 512, or 256 channels
Presets	Time, total counts, counts in an ROI, counts in a channel

POWER

Nominal Input	+5 VDC at 500 mA (2.5 W) (typical). Current depends strongly on detector Δ T. Ranges from 300 to 800 mA at 5 VDC. AC adapter provided.
Input Range	4 V to 6 V (300 to 200 mA, 500 mA max))
High Voltage Supply	Internal multiplier, set to 180 V, adjustable
Cooler Supply	Closed loop controller with Δ Tmax = 85°C

GENERAL and ENVIRONMENTAL

Operating Temperature	-20 °C to +50 °C
Warranty Period	1 year
Typical Device Lifetime	5 to 10 years, depending on use
Storage and Shipping	Typical: -20 °C to +50 °C, 10 to 90% humidity noncondensing Long-term storage: 10+ years in dry environment
Compliance	RoHS Compliant
	TUV Certification Certificate #: CU 72101153 01 Tested to: UL 61010-1: 2009 R10.08 CAN/CSA-C22.2 61010-1-04+G11

CONNECTORS

USB	Standard USB Mini 1.1 Jack
RS232	Standard 2.5mm Stereo Audio Jack
Ethernet	Standard Ethernet connector (RJ-45)
Power	Hirose MQ172-3PA(55), Mating plug: MQ172-3SA-CV

COMMUNICATIONS

USB	2.0 full-speed (12 Mbps)
Serial	Standard RS232 at 115.2 k or 57.6 Kbaud
Ethernet	10 base-T

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X-123SiPIN Description

Amptek's specialty is X-ray spectrometers, which are small, low power, high performance, and simple to operate. The X-123 combines in a single package Amptek's standard, high performance X-ray spectroscopy components: the XR100 detector and preamplifier, DP5 digital pulse processor and MCA, and PC5 power supply. The result is a complete integrated system which can fit in your hand. In many commercially available systems, the preamplifier alone has more size, mass, and power than this integrated system. It requires only 2 connections to run: +5 VDC power and either USB, Ethernet or RS-232 connection. With the X-123, anyone can rapidly obtain high quality X-ray spectra.

X-rays interact with Si atoms to create an average of one electron/hole pair for every 3.6 eV of energy lost in the Silicon. Depending on the energy of the incoming radiation, this energy loss is dominated by either the photoelectric effect or Compton scattering. The probability or efficiency of the detector to "stop" the incoming radiation and create electron/hole pairs increases with the thickness of Si.

The detector is mounted on a thermoelectric cooler along with the input FET and coupled to a custom charge sensitive preamplifier. The thermoelectric cooler reduces the electronic noise in the detector and preamplifier, but the cooling is transparent to the user: it operates like a room temperature system.

The pulse processor is the DP5, a digital pulse processor which replaces both the shaping amplifier and multichannel analyzer (MCA) found in most analog systems. The use of digital technology improves several key parameters: (1) better performance, specifically better resolution and operation at higher Count-rates; (2) greater

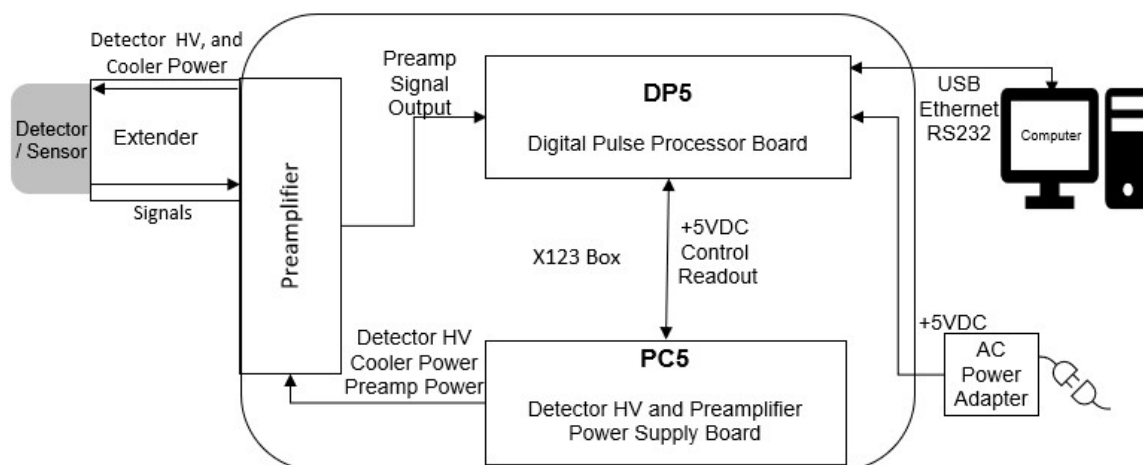
flexibility since more configuration options are available and they are selected by software, and (3) improved stability and reproducibility.

The DP5 digitizes the preamplifier output, applies real-time digital processing to the signal, detects the peak amplitude (digitally), and bins this value in its histogramming memory, generating an energy spectrum. The spectrum is then transmitted over the DP5's interface to the user's computer. The Amptek DP5 has 6 main function blocks to implement these functions: (1) an analog prefilter; (2) an ADC; (3) a digital pulse shaper; (4) pulse selection logic; (5) histogram logic, and (6) interfacing hardware (which includes a microcontroller) and software.

The power supply is Amptek's PC5, a single board. The input is approximately +5 VDC with a current of about 250 mA. The PC5 uses switching supplies to produce all the low voltages required for the digital processor and the preamplifier. It also includes a high voltage multiplier to produce the detector bias voltage, typically +180V for 0.5 mm thick Si, but is variable. And also includes the supply for the thermoelectric cooler which provides closed loop control with a maximum temperature differential of 85 °C.

The complete system is packaged in 7 x 10 x 2.5 cm³ aluminum box, with the detector mounted on an extender. In its standard configuration, only two connections are required: power (+5 VDC) and serial (either USB or RS232). The DP5 board supports several additional inputs and outputs if the X-123 will be integrated with other equipment. This includes an MCA gate, a memory buffer select signal, timing outputs, and SCA outputs.

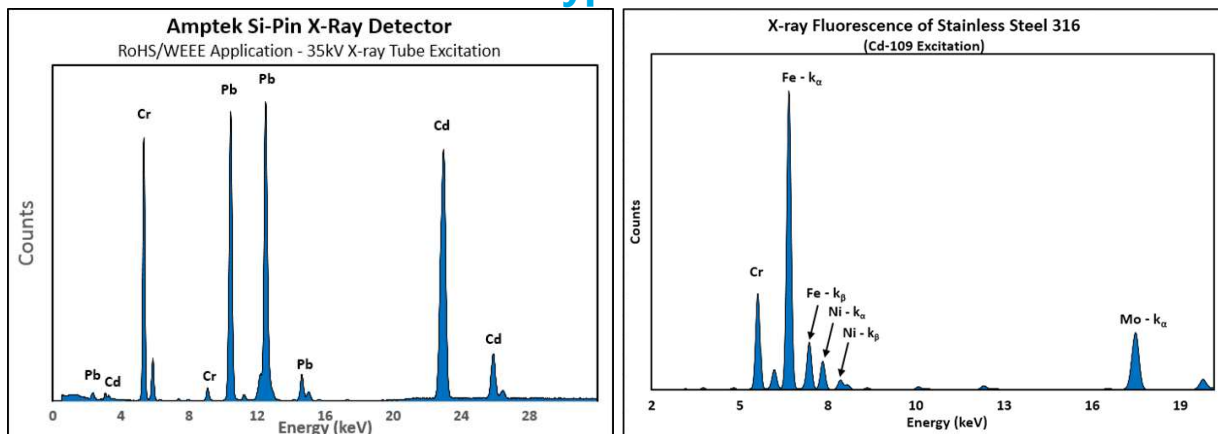
X-123 Architecture and Connection Diagram



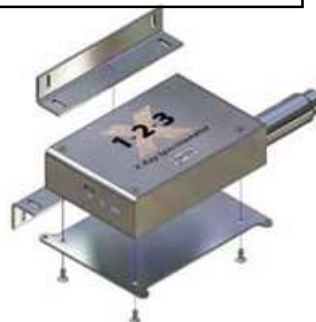
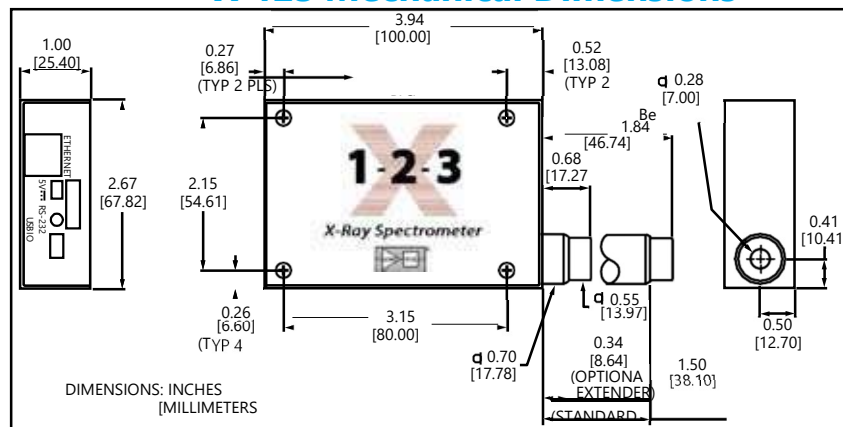
DPPMCA: Amptek's X-123 Interface Software

The X-123 can be controlled by the Amptek display and acquisition software "DPPMCA". This software completely controls and configures the X-123, and also downloads and displays the data. It and supports regions of interest (ROI), calibrations, peak searching, and so on. The DPPMCA software runs under all modern versions of Windows. For your convenience, Amptek also offer several software development kits for customers who would like to write their own programming controls. The user can use these software libraries to easily write custom code to control the X-123 for custom applications or to interface it to a larger system. Examples are provided in VB, VC++, etc. on how to use the API. If interested, ask for additional information on what software is available or download anytime. Non-windows platform software also available.

X-123 Typical Results



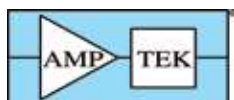
X-123 Mechanical Dimensions



X-123 with PA-230 Pre-amplifier

For full system specifications, please see <http://www.amptek.com>

Mounting Kit



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