



# GR1 Compact CZT Spectrometer

## Features

- All-in-one detector, electronics, and MCA
- Pre-set Gain, 1 cm<sup>3</sup> CZT solid state detector
- Miniaturized package: 25 x 25 x 63 mm, 60 g
- Optional Generic ISOCS™ characterization available
- USB connection to PC for control and power
- Power consumption: <250 mW
- Optional I/O ports for energy and timing outputs and gate inputs
- Interface to Genie™ 2000 software spectral analysis
- Optimized Genie 2000 analysis algorithms for CZT detectors

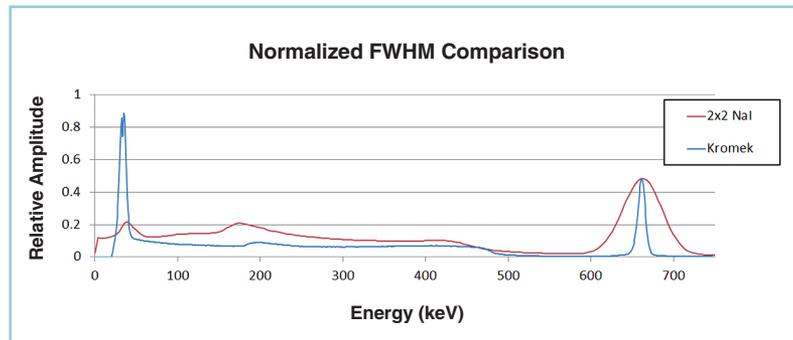
## Description

The GR1 family offers high performance gamma spectroscopy in a compact, fully-integrated package. Designed for both laboratory and field use, this unit contains a preamplifier, shaping amplifier, baseline restorer, HV supply and MCA. The advanced signal electronics requires no cooling and provides ready access to spectroscopy data over the mini-USB port. The power consumption is less than 250 mW, so no external power is required. This makes the GR1 ideal for many portable spectroscopy applications where size, weight and power constraints are very important.

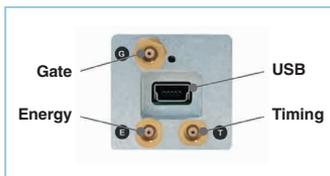
The 1 cm<sup>3</sup> CZT detector provides gamma spectra with significantly improved FWHM resolution as compared to NaI scintillators. This greatly improves the identification capability for many important isotopes (such as Thorium and Radium daughters in the background) with closely spaced gamma lines.



Compact high-resolution gamma ray detection and nuclide identification



The GR1 family includes four models, each with a 1 cm<sup>3</sup> CZT solid state detector. The GR1 and GR1+ are provided in a clean rectangular package, with no external signal connectors (only the mini USB connector). The “+” designation provides an option for a higher performance detector (better FWHM resolution; see chart for details). The GR1-A and GR1-A+ are provided in the same rectangular package as the GR1, except that three MCX connectors are provided to allow access to the energy and timing signals as well as an input gate. These signals allow the units to be tailored for specific applications in nuclear research and academia.



GR1-A with connectors

**Energy Output:** shaped and buffered detector output pulses with amplitude proportional to energy suitable as input to an external multichannel analyzer (MCA).

**Timing Output:** logic pulse triggered by each detected event and coincident with each output pulse.

**Gate Input:** used to suppress pulse height output via the USB interface for anticoincidence. Energy and timing outputs are unaffected.

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The standard models have resolution at 662 keV of <2.5%. The Plus models have enhanced resolution at 662 keV of <2.0%. These options allow you to match your photopeak resolution requirements to your budget. Otherwise, the standard and Plus models are the same.

GR1 Family Variants	Detector Size mm	Resolution at 662 keV	USB	Gate Input	Timing Output	Energy Output
GR1	10 x 10 x 10	<2.5%	✓	-	-	-
GR1+	10 x 10 x 10	<2.0%	✓	-	-	-
GR1-A	10 x 10 x 10	<2.5%	✓	✓	✓	✓
GR1-A+	10 x 10 x 10	<2.0%	✓	✓	✓	✓

## ISOCS/LabSOCS™ Support

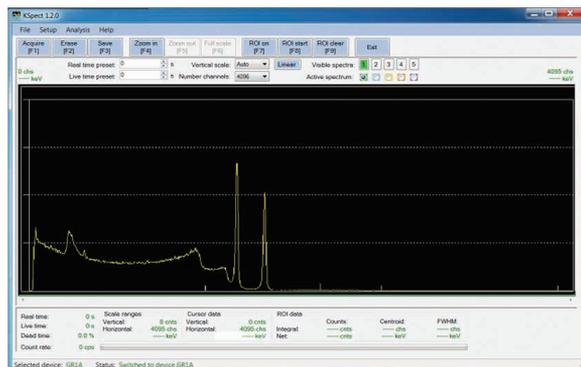
Quantitative measurements can be performed without the use of calibration sources using CANBERRA's mathematical efficiency calibration software ISOCS/LabSOCS. The GR1 family supports ISOCS efficiency calibrations. This characterization permits the user to calculate mathematical efficiencies using either ISOCS or LabSOCS software (sold separately). A unique characterization can be purchased for each specific detector for optimum accuracy or a generic characterization is available with slightly degraded accuracy specification.

## Software Options

There are three software options available to communicate with the GR1 family of sensors.

## K-Spect Software

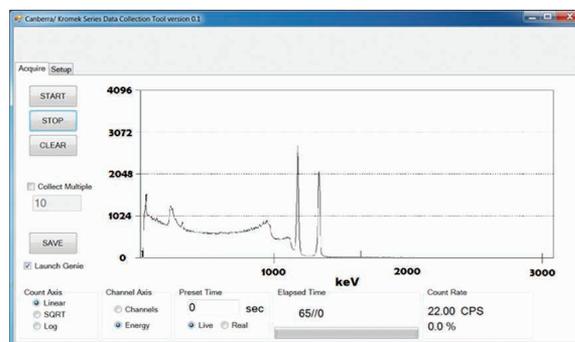
The K-Spect software can be downloaded free of charge from either the CANBERRA or Kromek websites. It establishes communications with the GR1 enabling MCA control functions, spectrum acquisition, display, basic analysis and storage functions. Together, the GR1 and K-Spect software establish a basic gamma-ray spectroscopy system that is suitable for qualitative spectral inspection and ROI based gamma analysis.



## Genie 2000 Analysis

(through Kromek Connection Tool)

Although Genie 2000 cannot directly control the GR1 family of sensors, CANBERRA is providing a simple control application that can be used to collect data and save it to a .CNF format file. The file can be analyzed using the full suite of Genie 2000 tools such as S501 Advanced Analysis and the ISOCS/LabSOCS mathematical efficiency packages. The Kromek Connection Tool is available as a free download from the CANBERRA website and is compatible with all current Genie 2000 analysis versions (Genie 2000 suite sold separately). The GR1, coupled with Genie 2000 analysis is the perfect combination for many portable spectroscopy applications requiring quantitative analysis (activity determination).



## Kromek SDK

The GR1 family of sensors is also supported by a software Kromek development kit (SDK). These software tools can be purchased from CANBERRA to allow end users to develop customized software applications to interact directly with the GR1. The tools provide complete setup and control of the key MCA functional parameters. The SDK supports both Windows® and Linux-based systems. Some programming knowledge is required to implement this product.

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## Specifications

### PERFORMANCE

- DETECTOR VOLUME – 10 x 10 x 10 mm CZT detector.
- ENERGY RANGE – 30 keV to 3.0 MeV.
- ENERGY RESOLUTION – <2.5% FWHM at 662 keV (Standard Models); <2.0% FWHM at 662 keV (Plus Models).
- ELECTRONIC NOISE – < 10 keV.
- MAXIMUM THROUGHPUT (USB) – 30,000 cps.
- NUMBER OF CHANNELS – 4096 (12 bit).
- DIFFERENTIAL NON-LINEARITY – <±1%.
- INTEGRAL NON-LINEARITY – <±0.02%.

### PHYSICAL

- SIZE – 25 x 25 x 63 mm (1 x 1 x 2.5 in.).
- WEIGHT – 60 g (2.1 oz).

### INPUTS/OUTPUTS

- POWER – 250 mW.
- Mini-USB (all models) – Signal and Power (Power consumption: 250 mW).
- MCX Ports (“A” models only).
  - Energy Output – Rise time: 3  $\mu$ s; Decay time: 10  $\mu$ s; Output impedance: < 150 ohms; Maximum throughput (analog): 50,000 cps.
  - Timing Output – Shape: TTL compatible rectangular pulse; Amplitude: 5.0 V; Duration: 8  $\mu$ s; Output impedance: < 150 ohms; Timing Resolution: < 100 ns.
  - Gate Input – Threshold: 3 V; Maximum input voltage: 5 V; Input impedance: 10 kohms; Timing: Input must be above threshold from at least 0.5  $\mu$ s before the energy signal maximum to at least 2  $\mu$ s after it.  
Note: In the absence of any connection the gate input is held low and all pulses are processed normally.

### ENVIRONMENTAL

- OPERATING TEMPERATURE – 0 to 40 °C (32 to 104 °F).

### COMPLIANCE STANDARDS (Tested by the National Physical Laboratory)

- ANSI N42.31 (2003) “Measurement procedures for resolution and efficiency of wide-bandgap semiconductor detectors of ionizing radiation”.
- ANSI N42.34 (2006) Section 7.1 “Performance criteria for hand-held instruments for the detection and identification of radionuclides”.
- BS EN 62327:2011 Section 9.6 “Hand-held instruments for the detection and identification of radionuclides and for the indication of ambient dose equivalent rate from photon radiation”.
- NPL Good Practice Guide No. 14 “The examination, testing and calibration of portable radiation protection instruments”.
- Environmental: meets or exceeds: EN55011:1998 +A1:1999 +A2:2002 (Radiated Emissions), EN61000-4-2:1995 +A1:1998 + A2:2001 (Immunity to ESD), EN61000-4-3:2002 (Radiated Immunity).

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# GR1 Compact CZT Spectrometer

## ORDERING INFORMATION

<b>GR1</b>	Gamma-Ray Spectrometer with – 2.5% FWHM resolution at 662 keV – Without MCX I/O ports
<b>GR1+</b>	Gamma-Ray Spectrometer with – 2.0% FWHM resolution at 662 keV – Without MCX I/O ports
<b>GR1-A</b>	Advanced Gamma-Ray Spectrometer with – 2.5% FWHM resolution at 662 keV – With MCX I/O ports (includes 3x MCX to BNC adaptors)
<b>GR1-A+</b>	Advanced Gamma-Ray Spectrometer with – 2.0% FWHM resolution at 662 keV – With MCX I/O ports (includes 3x MCX to BNC adaptors)

## Other Related Products

### **ISXCZT-GR1**

Generic ISOCS Characterization for the GR1, GR1+, GR1-A or GR1-A+

### **SIGMA25**

USB enabled CsI scintillator (1" x 1" x 1") detector with integrated MCA

### **ISXCSI25**

Generic ISOCS Characterization for the SIGMA25

### **SIGMA50**

USB enabled CsI scintillator (1" x 1" x 2") detector with integrated MCA

### **ISXCSI50**

Generic ISOCS Characterization for the SIGMA50

### **LAB CPG (10 x 10 x 10)**

1 cm<sup>3</sup> CZT detector for use with external MCA electronics

### **ISXCZT-LAB1000**

Generic ISOCS Characterization for the LAB CPG (10 x 10 x 10)

### **TN-15**

USB enabled Thermal Neutron Detector



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