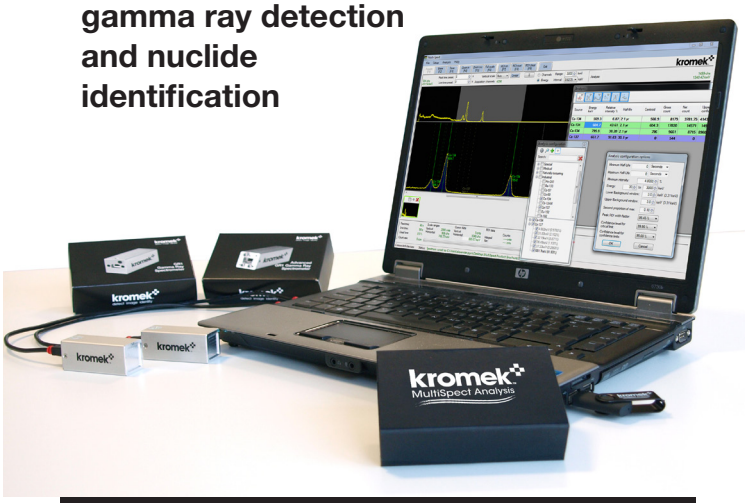
GR1-A™ and GR1™

Now with flexible functionality to meet specialist requirements

Compact high-resolution gamma ray detection and nuclide identification



Main features:

Common to GR1 - GR1-A

- High spectral resolution
- High efficiency
- Compact
- Simple to use
- CZT solid state detector
- USB Powered
- Low power consumption

GR1-A specific

- Operational flexibility
- MCX connectors
- Analogue energy output
- Timing output
- MCA gate input

kromek™
detect image identify

GR1-A™ and GR1™
the World's Smallest and Highest Resolution Room Temperature Gamma-Ray Spectrometers

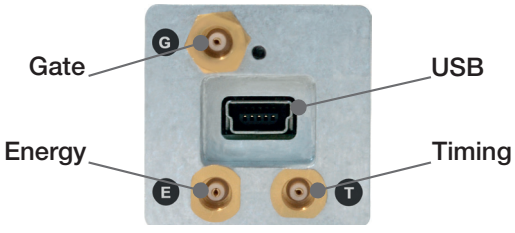
The **GR1™** and **GR1-A™** high-performance gamma-ray spectrometers utilize a 1 cm^3 CZT solid state detector and offer world-leading specification in a compact form.

Both are completely self-contained, with a built-in preamplifier, shaping amplifier, baseline restorer, pulse height digitizer, and HV supply. The digitized pulse heights of detected gamma-ray signals are sent to a PC via the mini-USB which also powers the unit, so no external power supply is required.

The **GR1™** comes with K-Spect, Kromek's entry-level Windows-based (XP/Vista/7/8) software, built for detailed sample and spectral analysis. K-Spect, which is available to download, free of charge, from the Kromek website, provides the spectrum acquisition, display, analysis, and storage functions.

The **GR1-A™** is the advanced model of the GR1™, containing auxiliary input/outputs that greatly increase operational flexibility. These allow the GR1-A™ to be tailored for specific applications in nuclear research and academia. Three MCX connectors provide energy and timing outputs and gate inputs.

The GR1-A™ is supplied with MultiSpect Analysis™ software, a unique application that allows connection of multiple GR1-As to a PC, and has the ability to display multiple spectra; both live and saved, from previous measurements. It provides the spectrum acquisition, display and storage functions, and the export of data for further analysis as well as match spectra to a pre-loaded library of over 400 radionuclides.



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

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

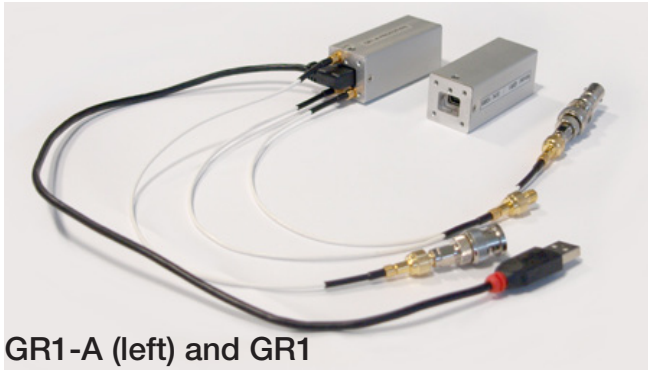
Gate Input: used to suppress pulse height output via the USB interface to K-Spect for anticoincidence. Energy and timing outputs are unaffected.

Health Physics

InSitu Monitoring

Nuclear Spectroscopy

Nuclear Industry



GR1-A (left) and GR1

Specifications

Common to GR1 / GR1-A:	
Detector	10x10x10mm CZT detector
Energy range	30 keV to 3.0 MeV
Energy resolution	<2.5% FWHM @ 662 keV
Electronic noise	<10 keV
Maximum throughput (USB)	30,000 cps
Number of channels	4096 (12 bit)
Differential non-linearity	< ± 1%
Power consumption	250 mW
Dimensions	25mm x 25mm x 63mm
Weight	60 gram
Temperature range	0 - 40°C

Specific to GR1-A:		
Energy Output	Rise time	3 µs
	Decay time	10 µs
	Output impedance	< 150 Ω
	Maximum throughput (analogue)	50,000 cps
Timing Output	Shape	TTL compatible rectangular pulse
	Amplitude	5.0 V
	Duration	8 µs
	Output impedance	< 150 Ω
	Timing Resolution	< 100 ns
Gate Input	Threshold	3 V
	Maximum input voltage	5 V
	Input impedance	10 kΩ
	Timing	Input must be above threshold from at least 0.5µs before the energy signal maximum to at least 2µs after it.

Note: In the absence of any connection the gate input is held low and all pulses are processed normally.

Tested by the National Physical Laboratory in accordance with the conditions in;

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"

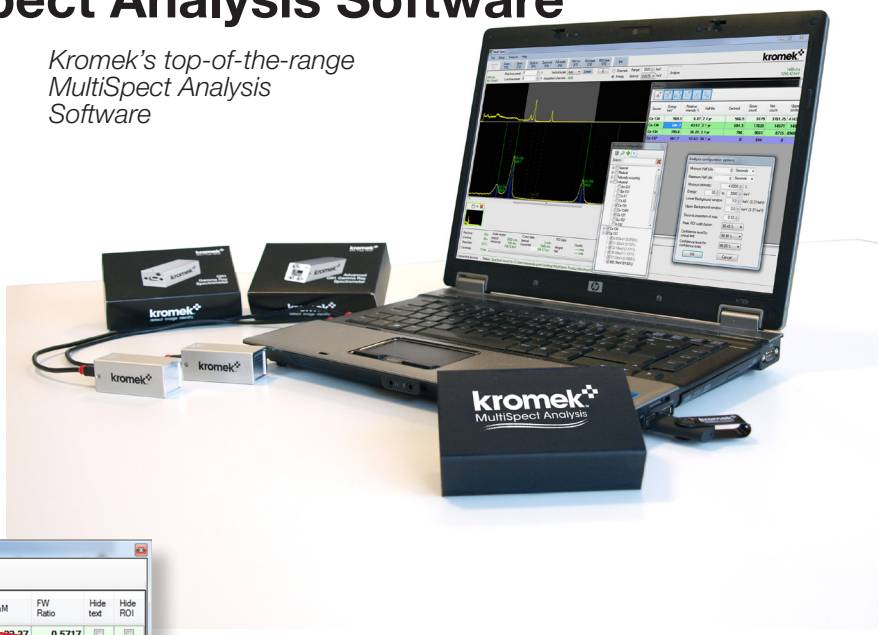
Environmental: meets or exceeds: EN55011:1998 +A1:1999 +A2:2002 (Radiated Emissions), EN61000-4-2:1995 +A1:1998 + A2:2001 (Immunity to ESD), EN61000-4-3:2002 (Radiated Immunity)

K-Spect and MultiSpect Analysis Software

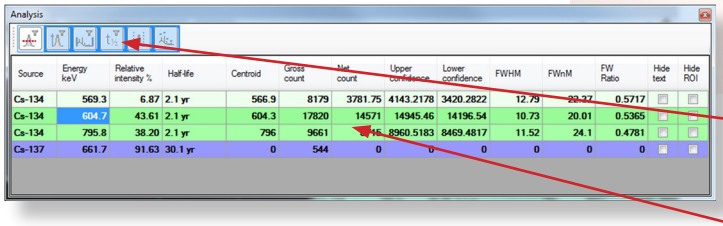
The GR1™ and GR1-A™ can both be used with Kromek's **K-Spect™** and **MultiSpect Analysis™** software running on any Windows-based (7/8) PC.

The GR1™ comes with K-Spect™, Kromek's entry-level software which is available to download, free of charge from: www.kromek.com (click on the downloads tab, and follow the on-screen instructions).

K-Spect™ receives the data and performs the spectrum acquisition, display, analysis and storage functions.

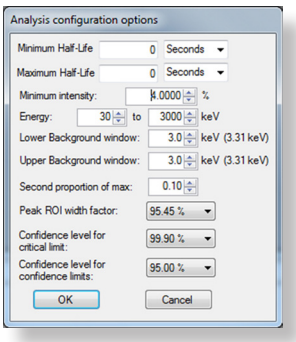


Kromek's top-of-the-range MultiSpect Analysis Software



Filter by critical limit, relative intensity of the emission lines, energy windows and half life.

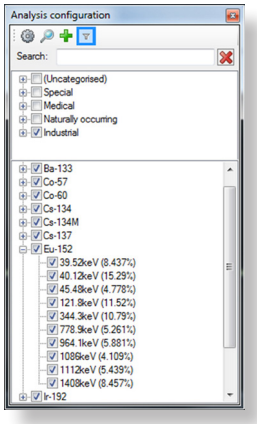
Colour coded results showing which lines are above the critical limit of the information.



Configuration options for the analysis based on statistical significance.

Signals from the CZT solid-state detector are processed and digitized, and the pulse height data is transferred to the computer via the mini-USB.

K-Spect™ users can upgrade to MultiSpect Analysis™, to find out more or apply for an upgrade, contact our commercial team via the Kromek website.



User configurable library of radionuclide emissions

MultiSpect Analysis™ is Kromek's top-of-the-range software and is included on a flash disk with each GR1-A™. In addition to all the K-Spect™ functionality, MultiSpect Analysis™ allows users to acquire and display live spectra from multiple devices simultaneously alongside saved spectra from previous measurements. It also enables grouping and summing of individual spectra plus the ability to match spectra to an on-board library of over 400 nuclides.

Please check the Kromek website regularly for updates.

Feature	K-Spect	MultiSpect Analysis
Spectral acquisition from single unit	✓	✓
Spectral acquisition from multiple units simultaneously (PC dependant 5-20 systems)	-	✓
Energy calibration facility	✓	✓
Display single detector information only + 5 saved Spectra	✓	✓
Display calibrated spectra at the same energy scales to allow comparison	-	✓
Compatible with K102 Multichannel Analyser	✓	✓
Thumbnail indication of loaded spectra	-	✓
Ability to save spectra in SPE or CSV formats	✓	✓
Ability to export data	✓	✓
Ability to save detector calibration information	✓	✓
Association of calibration data with particular detectors by serial number	-	✓
Aggregation of multiple spectra into one spectrum	-	✓
Built in library of 416 isotopes	-	✓
Industry standard categorisation of isotopes	-	✓
User customisable libraries	-	✓
Multiple regions of interest with Spectra	-	✓
Automated peak analysis of Spectra	-	✓

GR1 Family variants	Detector size mm	Resolution at 662 keV	USB	Gate input	Timing output	Energy output	Software included
GR1	10x10x10	<2.5%	✓	-	-	-	
GR1+	10x10x10	<2.0%	✓	-	-	-	
GR1-A	10x10x10	<2.5%	✓	✓	✓	✓	MultiSpect Analysis
GR1-A+	10x10x10	<2.0%	✓	✓	✓	✓	MultiSpect Analysis
GR05	5x5x5	<2.5%	✓	-	-	-	
GR05+	5x5x5	<2.0%	✓	-	-	-	

K-Spect is compatible with all products and is available to download free of charge from the Kromek website

The GR1 is available with Linux driver and can be interfaced with other software packages; driver information can be provided as part of the project deliverables for selected partners.

3x MCX and 3x BNC adaptors included with GR1-A products

Example applications of the GR1 / GR1-A

- **Radionuclide identification:** The GR1 and MultiSpect Analysis provide a powerful platform to perform radionuclide identification in a variety of industrial and health physics applications such as environmental monitoring and sample analysis.
- **Classroom teaching:** The GR1 module is an ideal and portable tool that can be utilised for educational purposes in teaching concepts of radiation as well as for training in the use of radiation sensors.

Example research applications of the GR1-A

- **Particle-gamma coincidence measurements:** The high resolution of the GR1-A allows it to be paired with charged-particle or neutron detectors in order to observe coincidence particle decays with gamma-ray emission.
- **Gamma-gamma coincidence measurements:** Multiple GR1-As can be used in unison in order to identify multiple gamma rays that are emitted in coincidence; because of this, the GR1-A can be used as a tool in studies of nuclear structure.
- **Pulse-shape analysis:** The analogue energy output can be used for studies of charge collection pulse-shapes, which can yield information on interaction points, scattering and charge mobility within the detector crystal. The timing output can also employed as an input for time-to-analogue converters.

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