ORTEC®

AMETEK®

IDM-200®-V

Interchangeable HPGe Detector Module (IDM)

"Free from liquid nitrogen, free from maintenance, free from integration complexities."

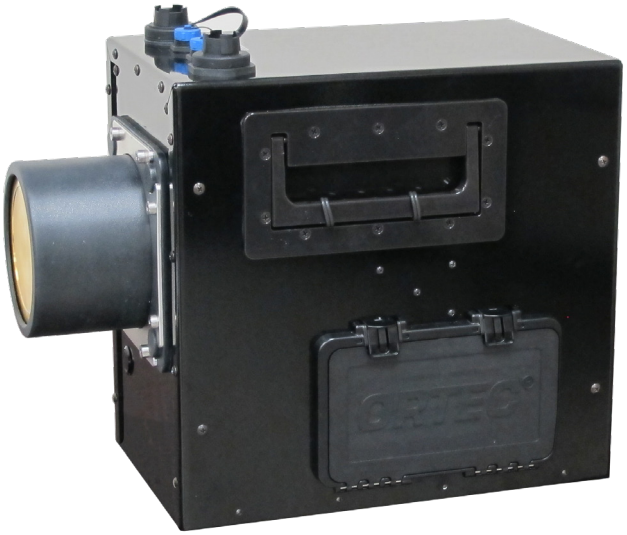


- Convenient-to-mount, all-in-one integrated HPGe detector, cooler, cryostat, and signal processing electronics; requires only AC/DC power and a USB connection.
- Operates in any orientation.
- Standardized large area HPGe crystal dimensions ensures uniform performance unit-to-unit.
- Maintenance free.
- Hardened cryostat eliminates "partial warm up" problem.
- Mains power and DC operation.
- Remains operational from internal battery for ~2.5 hours following power failure. Longer battery life options available with use of external battery.
- Low-power, reliable Stirling-cycle cooler.
- ORTEC CONNECTIONS family member, compatible with ORTEC software applications and developers toolkits.

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The IDM-200-V Interchangeable Detector Module from ORTEC is a high performance gamma-ray spectrometry "building block" for use in multiple applications. It is a completely self-contained package, comprising a single, large-area, mechanically cooled high-purity germanium (HPGe) detector of standardized crystal dimensions and all necessary spectrometry electronics in a RUGGED, low-power configuration. The IDM-200-V includes everything needed for the high resolution spectrometry task, producing either a resultant spectrum in memory or delivering a digitized pulse stream in list mode format to an attached PC for further analysis.



Compatible with ORTEC software applications such as MAESTRO, GammaVision and ISO-Plus, the IDM-200-V may also be controlled from third party developed software via the use of optional ORTEC software tool kits.

These attributes make the IDM-200-V a perfect solution for a wide range of measurements and applications where spectroscopic performance, reliability and convenience are of paramount importance. It is ideally suited for OEM applications as a component within a larger measuring system in applications such as:

- Waste Assay
- Homeland Security
- Continuous Air Particulate Monitoring
- Bio-Assay
- Industrial Process Monitoring
- Aerial Survey

IDM-200-V instruments are designed for long, reliable service, and are interchangeable, one with another. The IDM-200-V is light enough to be installed by one person. The ORTEC CONNECTIONS Programmer's Toolkits are available to assist the systems integrator.

Benefits	Features
• Large area 85 mm x 30 mm HPGe crystal: high sensitivity up to 200% of the surface area of other systems. • High-reliability Stirling-cycle cooler cools rapidly to operating temperature: NO servicing required. • Hardened cryostat designed for long operational life: can be temperature cycled at any time, even from partial warm up without risk to detector performance. • Low power consumption and internal battery: continues counting during power interruptions for ~2.5 hours; longer with external battery option. • High performance, digitally stable signal processing: simpler system integration. • Low Frequency Rejecter (LFR) algorithm improves spectrum resolution in noisy environments. • USB 2.0 data communications: "plug an play". • "Hot swap" of IDM-200-V modules while in operational state: reduced down time. • Continuous data collection: no dead spots, using list mode.	**HPGe Detector** • Excellent low-energy efficiency • Uniform detector size • LN_2 free cooling: low power highly reliable Stirling cooler • Integrated high voltage supply **Integral Dose Rate Monitor** • <0.05 µSv/h to >10000 µSv/h **Digital MCA** • 16k channels • Pulse-Height Analysis (PHA) mode and streaming list mode **USB 2.0 Connection** • High speed connection • Can operate without PC connection if required **External Inputs (2)** • Take count data from other associated devices **Power** • AC/DC power operation • Internal battery back up: keeps on counting

Mechanical

The IDM-200-V has been designed specifically for use in integrated measurement systems which require HPGe spectrometry. All the components are derived from ORTEC technology, proven in the field by hundreds of Detective portable identifiers.

The IDM-200-V is a compact detection instrument subsystem. During operation, approximately 30 watts of power (only) are required to operate the entire system either on DC or AC through a converter (supplied). Minimal waste heat greatly simplifies mounting considerations. Low power consumption means systems configured using the IDM-200-V do not need high levels of cabinet air conditioning.

Custom collimators are available to restrict the forward field of view. A steel collimator, set flush with the detector endcap, is supplied with the standard instrument.

To facilitate mounting of the IDM-200-V, six blind threaded holes are provided in the casing.

Digital Signal Processing Electronics

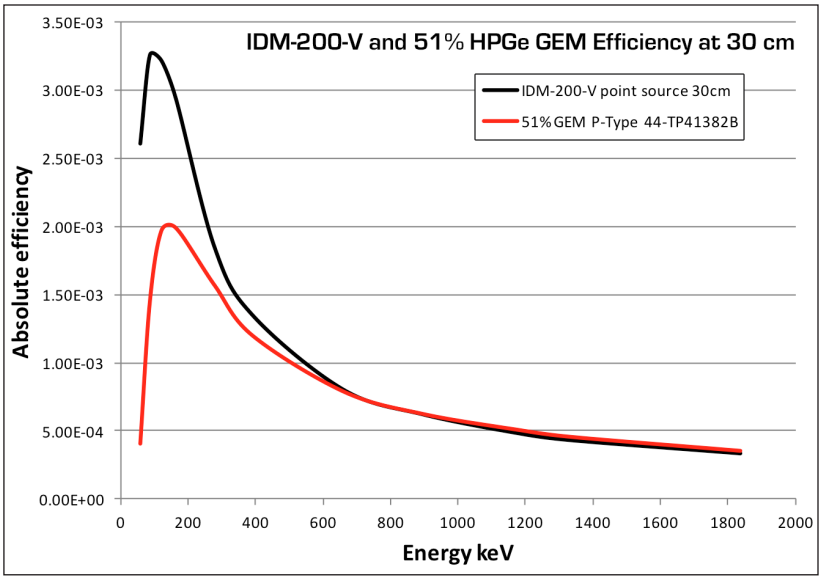
The digital signal processing (DSP) electronics subsystem used in the IDM-200-V is derived from the ORTEC DSPEC and Detective family systems. The low power design has extremely high stability with both count-rate and temperature variation, important in many of the applications which may be encountered by systems integrators.

Operation as part of an integrated measurement system presents new challenges compared to laboratory operation. A common non-laboratory complication that can lead to reduced system performance is mechanical vibration or acoustic noise. The energy resolution of HPGe detectors can be degraded by mechanical vibration or microphonic noise. A special “low frequency reject” feature greatly reduces the possibility of this occurring in noisy non-laboratory environments.

Germanium Detector

The ~50% relative efficiency HPGe detector in the IDM-200-V is of an “over-square” diameter-to-length profile. The large diameter enhances low energy efficiency. The figures below show the point source absolute efficiency curves of an IDM-200-V in comparison with a more conventionally profiled detector of almost the same relative efficiency (51%). The IDM-200-V shows much higher efficiencies at low to medium energies, where container or matrix absorption effects are possible to be problematic to measurements. See detailed specifications below for more information.

Radiation Entrance Window: Excellent transmission is achievable at incident gamma-ray energies of 60 keV and above.

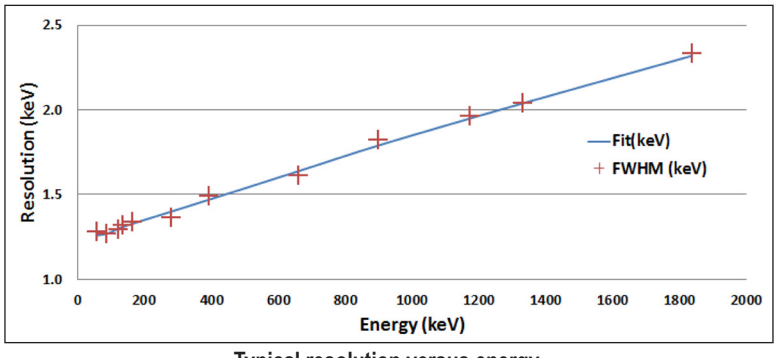


IDM-200-V and 51% relative efficiency HPGe GEM compared: Absolute efficiency, point source 30 cm.

Cryocooler

For more than 20 years, ORTEC has been a leader in the development and deployment of mechanically cooled HPGe detectors.

The IDM-200-V cryostat design evolved from the Detective Hand-Held Identifier, itself a non-traditional design, which does not use molecular sieve as a cryo-pump, but does use all-metal seals and extremely clean construction methods. The all-metal seal construction results in a robust, long-life cryostat which can be temperature cycled, either completely or partially, indefinitely. The cooler can be turned off then on again at any time, with no risk, greatly aiding service operations.



Typical resolution versus energy.

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IDM-200-V Data Collection Modes

Data are usually collected by the IDM-200-V in Pulse Height Analysis (PHA) mode and transferred to a PC for further analysis. There is a small dead time when the data are being transferred during which new data are not collected. If absolutely no loss of data is an essential need, then, a solution exists in the form of List mode acquisition. In the List mode of operation, data are stored directly to computer memory, event by event, with a time stamp (200 nanoseconds). These data can then be reconstructed into separate spectra by time, energy, or position. This feature of the IDM-200-V greatly enhances the detection sensitivity of the system in many applications.

Communications

High speed plug-and-play USB 2.0 communications makes module control and data collection fast and easy.

Service

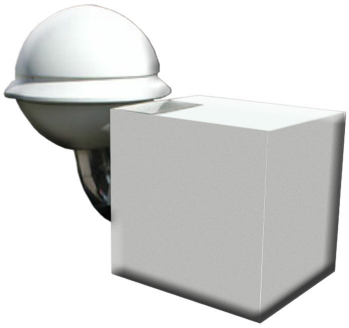
The replacement of an IDM-200-V is particularly fast and straightforward. Only two connections are required, line power and USB.

Mobile Labs



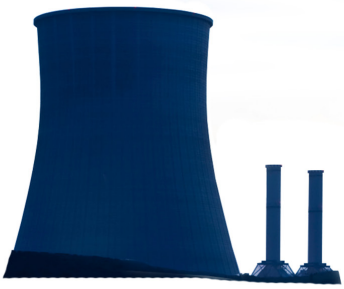
Bioassay





Air Monitoring





NPP Applications



Security



Waste Assay

Specifications

Radiation Detectors

Internal HPGe Detector Crystal	The HPGe crystal geometry is nominally the same in all IDM-200-V instruments, as following: Dimensions: 85 mm diameter x 30 mm length nominal. Coaxial construction. P-type high-purity germanium. Relative Efficiency >50% typical (ANSI/IEEE 325-1996). Energy Resolution ≤1400 eV @ 122 keV and ≤2.3 keV @ 1332 keV (FWHM Warranted at optimum settings). Peak Shape 1.9 typical (FWTM/FWHM).
Cryostat	All metal-sealed, long life cryostat, no molecular sieve.
Detector Endcap Thickness	20 thousands (0.5 mm) aluminum.
Cooler	High reliability, low power Stirling Cooler. Cooler design life >5 years continuous running. Power consumption <30 W at operating temperature.
Cool Down Time	Initial cool down time depends on ambient temperature; typically <15 hours from ambient.
Digital Noise Suppression	"LFR Filter" ORTEC Patent Pending.
Gamma Dose Rate Detector	Two detectors determine the gamma dose rate over a wide range from <0.05 µSv/h to >10000 µSv/h, a dose-rate range of around six decades. For low dose rates, below ~20 µSv/h, the dose rate is determined from the Ge detector spectrum. For dose rates above this value, the internal compensated GM tube is used. Instrument switches between the two automatically. Dose Rate Uncertainty: < (–50% to +100%).

Digital MCA and Data Processor

System Gain Settings	0.45 to 32.
System Conversion Gain	Software controlled from 512 to 16384 channels.
Digital Filter Shaping-Time Constants	Rise Times: 0.8 µs to 23 µs in steps of 0.2 µs. Flat Tops: 0.3 to 2.4 in steps of 0.1 µs.
Dead-Time Correction	Extended live-time correction according to Gedcke-Hale method. Accuracy: Area of reference peak changes <±3% from 0 to 50,000 counts per second.
Low-Frequency Rejecter	When set to ON, removes low-frequency (<3 kHz) input noise from spectrum.
Linearity	Integral Nonlinearity: <±0.025% over top 99.5% of spectrum, measured with a mixed source (55Fe @ 5.9 keV to 88Y @ 1836 keV). Differential Nonlinearity: <±1% (measured with a BNC pulser and ramp generator) over top 99% of range.
Digital Spectrum Stabilizer	Controlled via computer, stabilizes gain and zero errors.
System Temperature Coefficient	Gain: <50 ppm/°C. [Typically <30 ppm/°C.] Offset: <3 ppm/°C of full scale.
Overload Recovery	At maximum gain, recovers to within 2% of rated output from X1000 overload in 2.5 non-overloaded pulse widths. (Measured using the InSight Oscilloscope.)
Maximum System Throughput	>100,000 cps, with LFR off, but may be restricted in software >34,000 cps with LFR on. Depends on shaping parameters and therefore on resolution requirements.
Pulse Pile-Up Rejecter	Automatically set threshold.
Pulse-Pair Resolution	Typically <500 ns.
Automatic Digital Pole-Zero Adjustment	Computer controlled. Can be set automatically or manually. Remote diagnostics via InSight Oscilloscope mode. (Patented.)
Digital Gated Baseline Restorer	Computer controlled adjustment of the restorer rate (High, Low, and Auto). (Patented.)
LLD	Digital lower level discriminator set in channels. Hard cut-off of data in channels below the LLD setting.
ULD	Digital upper level discriminator set in channels. Hard cut-off of data in channels above the ULD setting.
Ratemeter	Count rate display on PC screen (if enabled).

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Physical Specifications

Internal Battery	Rechargeable, nominal 14.4 V lithium-ion battery pack. Charging circuitry and battery management circuitry internal to the instrument. Battery life 3–5 years. The battery is accessible through a SNAP-open battery door making it easy to exchange and exhausted battery if the situation demands it.
Operating time on internal battery	~2.5 hours at 25°C, <4 hour charge time. Operating time may be extended indefinitely by use of external battery or other power source. ORTEC optional external battery packs are available.
Input Power	10 to 17 V DC from battery or DC power supply (universal mains supply included).
Power Usage	100 W nominal. While charging battery: 72 W nominal. Cold with fully charged battery: nominally 30 W.
Ambient Temperature Environment	(without external enclosure) Range: –10°C to +50°C. Relative Humidity: 95%, non-condensing.
Maximum Overall Dimensions	(including Ge detector endcap) 41.3 cm L x 34 cm W x 21.2 cm H (16.26” L x 13.39” W x 8.35” H).
Weight	39 lb. (17.7 kg).
Maximum Shock Tolerance	20 g. An accelerometer inside the instrument tracks the maximum shock to which the unit has been subjected. A shock in excess of 20 g will void the warranty.

Ordering Information

Model	Description
IDM-200-V	IDM-200-V Interchangeable Detector Module. Includes internal backup battery, operating manual, AC/DC power adaptor charger, USB cable, and MAESTRO MCA software.
IDM-200-ACC-PS	AC/DC Power Adapter Charger. (One included with IDM-200-V.)
IDM-200-ACC-USB	IP68 USB Cable. (One included with IDM-200-V.)
EXT-BAT-IDM	Ultra Battery Extender. Includes battery, charger and cable for IDM models.
A11-BW	CONNECTIONS Programmer’s Toolkit with ActiveX Controls.

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Specifications subject to change
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