Previous model number: 3400

# Low Level Waste Segregation and Sentencing System (QED) G3400-220

## Introduction

The G3400-220 Low Level Waste Segregation and Sentencing System, or 'QED' is designed to assist radioactive waste generators and assay specialists with the task of identifying, quantifying, and sorting radioactive wastes. The G3400-220 makes it possible to sort and demonstrate that 'non-radioactive' wastes are free release candidates. The high cost of disposing of low level waste means that the G3400-220 is a highly cost efficient tool. The definition of what waste is non-radioactive varies but for most facilities the G3400-220 can make the determination in a single one minute count.

Generally, smaller containers will result in lower detection limits than larger containers filled with the same material. The G3400-220 handles small paper or plastic bags of waste and carboys containing liquids, as well as standard 55 gallon drums.

Drums are loaded using drum handling equipment on either the optional manual or automatic conveyer and rotated on a platform with integrated weighscale inside the low background shield in order to average out matrix attenuation effects. A special cross-correlation method detects and minimises the effects of vertical inhomogeneity.

The G3400-220 typically employs three ORTEC PROFILE series GEM detectors with SMART-1 option that 'view' the drum in three vertical slices or segments. Unlike conventional High Purity Germanium (HPGe) detectors, which are specified according to the usual IEEE standard that only defines relative efficiency for a point source at 250 mm (9.84 in), PROFILE series GEM detectors have warranted crystal dimensions. This ensures maximum performance of the system.

## Features

- Low background 100 mm (3.94 in) shield, free from $^{60}Co$.
- Water tight stainless steel inner liner.
- ORTEC DSPEC-Jr digital spectroscopy hardware.
- Remote operator console (connected by Ethernet).
- Portable operator console that may be remote from the measurement vicinity.
- Ethernet communications providing an easy interface with other systems (for record keeping or reporting) and enables spectral data and results to be viewed on other network PCs.
- High efficiency, high resolution HPGe detectors that provide reliable nuclide identification.
- Digital spectroscopy electronics that provide ultra stable operation over wide ranges of count rate and temperature.
- In-built weigh scale for automatic weight measurement for the analysis.

## Detector Positioning

The QED features four positions for the HPGe detectors, providing optimised measurement positions for full height 55 Gallon (220 Litre) and for half height/half filled containers. The detectors are easily accessible and can readily be changed from one position to another, with a plug unit being employed to seal the gap in the chamber wall. This makes the QED a versatile and universal system that can produce the optimum results a variety of sample types, enabling the system to sentence waste types as LLW, VLLW and free-release far more accurately than other systems.

## Shielding

The G3400-220 features a unique, modular shield design. The shield is shipped either as individual pieces or partially assembled and can be easily installed in a matter of hours. Each lot of low background steel is individually analysed before fabrication to ensure that there is no extraneous contamination.

## Safety Circuit

The operators of the QED are protected from hazards by an integrated safety circuit. The automated chamber door features safety light curtains, immediately stopping motion in the event anything crossing the threshold of the chamber. Operator accesible emergency stops halt the door motion and rotation of the drum when triggered and the status of the system is indicated by clearly positioned LED beacons. The position of the moving components is reported in the software by limit switches, enabling the Operator to know the status of the system from the remote operator station. These features ensure operator safety throughout the measurement process.

## Benefits

- Identifies and quantifies gamma-ray emitting radionuclides in a variety of containers; non-emitters may be determined by correlation
- Naturally occurring radioactive materials (NORM) activities may be excluded from results
- Corrects for matrix material density and detects inhomogeneity
- Modular shield design allows easy installation-reinstallation, easy decontamination and adaptation to non-ideal situations such as restricted spaces or waste storage areas
- Password protected User software
- Flexible reporting: results stored on Access Database format
- Quantification of nuclides with no gamma emissions by correlation

## Specification

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| **Minimum Detectable Activity** | Less than 370 Bq per cubic meter of low density waste for nearly all nuclides<br>Ultra low (~10 nCi) for 'No Activity'<br>Even lower (~1 nCi) with optional NaI detectors |
| **TRU sorting** | Performs at 100 nCi/g over a wide density range (0.1 to 1.5 g/cc) |
| **Load cell capacity** | 725 kg (1598.35 lb) |