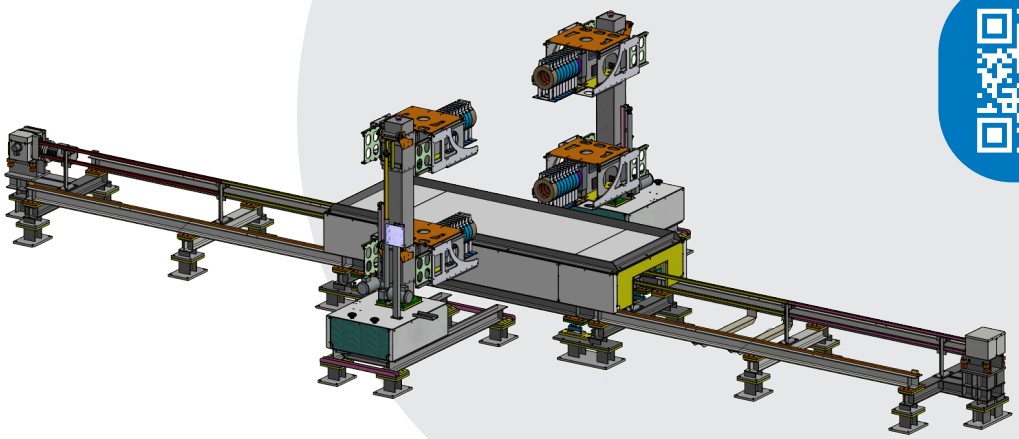
AURAS 3000

FREE RELEASE WASTE ASSAY COUNTER



Versatile scanning geometry

Worldwide standard system for waste characterisation

Sub-sections scanning procedure

- Detectors: up to four HPGe
- Free release assay of large waste containers up to 3 m^3
- Max payload 3000 kg
- Quantitative assay of gamma emitters, and correlated scaling factors
- Activity and MDA reporting
- MDA (Cs-137): 0.0037 Bq/g (40 min)

AURAS 3000 is an automated system designed to scan and characterise waste materials inside bags, boxes, drums, and B25 containers (density range: 100 - 2000 kg/m^3). The system is equipped with up to four electro- or nitrogen-cooled HPGe detectors.
The main components of **AURAS 3000** are:

- Main rail with moving platform
- Cross rail with movable detector towers (up to 2 HPGe each); the towers position can be adjusted to best fit the container size, and each detector can be independently moved along the vertical direction
- Remote PC control station and local PLC interface

Analysis of spectra is performed through a waste assay algorithm operating under the control of a proprietary software. The container is first positioned by crane or forklift onto the heavy-duty platform. The operator starts the procedure through the user interface, selecting the container type from a pre-set table. This results in an automated adjustment of the detector height as required by the counting geometry. The platform is then pulled towards the measurement area, where the volume of the container is scanned through a sequence of steps (sub-sections).
The system work cycle is managed by the control software, which sends commands to the PLC.
AURAS 3000 systems implement the “safety by design” principle to prevent any harm to operators and the system itself.

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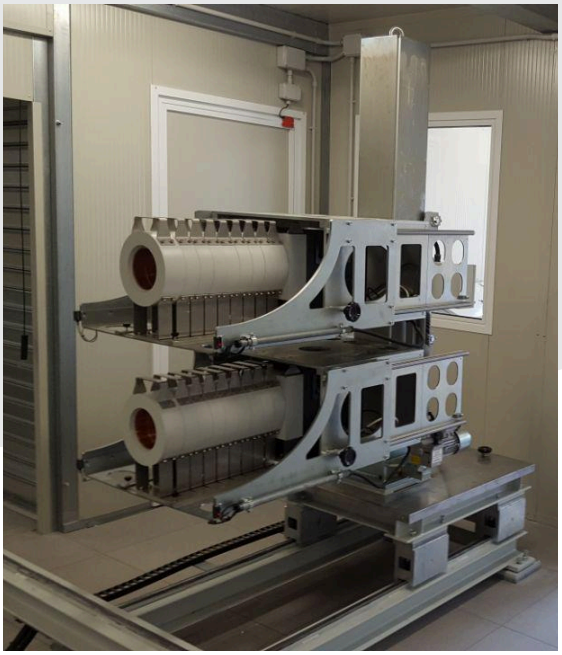
At the end of the measurement process, the system provides the following results:

- Spectra from each detector/position combination, individually saved and analysed
- Activity value of the container calculated by each detector (individual) and all detectors (average)
- “Hot spots” identification and analysis
- Individual and averaged MDA values

MECHANICAL STRUCTURE

The platform design is suitable for heavy-duty work: containers as big as B-25 ISO (3 m^3) can be easily loaded on its surface, and the maximum payload is 3000 kg. A 1-kg-resolution weighting system is also included. The computer-controlled automatic sequence moves the platform towards three different positions corresponding to the foreseen steps: loading, weighting/measurement and unloading.
The two detector towers at the sides of the measurement area can be manually positioned according to the recommended detector-to-container distance.
The vertical positioning of the detectors is automatically managed by the control software with a resolution of 1 mm, according to each container size.



AURAS detector column example

Mechanical specifications

- Typical dimensions: 8.8 x 5.5 x 2.5 m (LxWxH)
- Typical total weight: 5000 kg

Operator console

All the system moving parts are managed by a PLC, and can be manually activated through a built-in touch-screen operator panel during calibration or maintenance activities. System set-up and check functions (e.g. test of the scale accuracy) are also available. The positioning of the moving parts can be performed either through visual feedback or by numerical input of coordinates.
The local interface is locked when the PLC is executing remote procedures, to avoid conflicts with PC-commanded automatic operations. The PLC firmware also manages all the system safety devices (barriers, anti-collision sensors, etc.), immediately stopping any running motor if a security input is triggered. Diagnostic messages are issued and archived by the PLC whenever anomaly conditions occur.

AURAS local operator console

DETECTION EQUIPMENT

The spectroscopy system is based on HPGe detectors, consisting of HPGe crystal, Stirling or nitrogen cooler, Digital Signal Processing MCA, high voltage supply, and high-speed USB communication.
HPGe detectors are designed for long, reliable service, and they are also interchangeable, resulting in high system availability and minimum down time. Hardened cryostats are designed for long operational life and can be temperature cycled at any time, even from partial warm-up, eliminating the problems associated with loss of electrical power. In case of power loss, they will automatically restart when the power is turned back on.

AURAS electro-cooled HPGe example

HPGe specifications

- Energy range: from 30 keV to 7 MeV
- FWHM for Co-60 (1332.5 keV): ⩽ 2.3 keV
- Efficiency: from 15% to 150% (Nitrogen-cooled), from 50% to 150% (electro-cooled)
- Cooling type: electro-cooling or Nitrogen-cooling

MANAGEMENT SOFTWARE

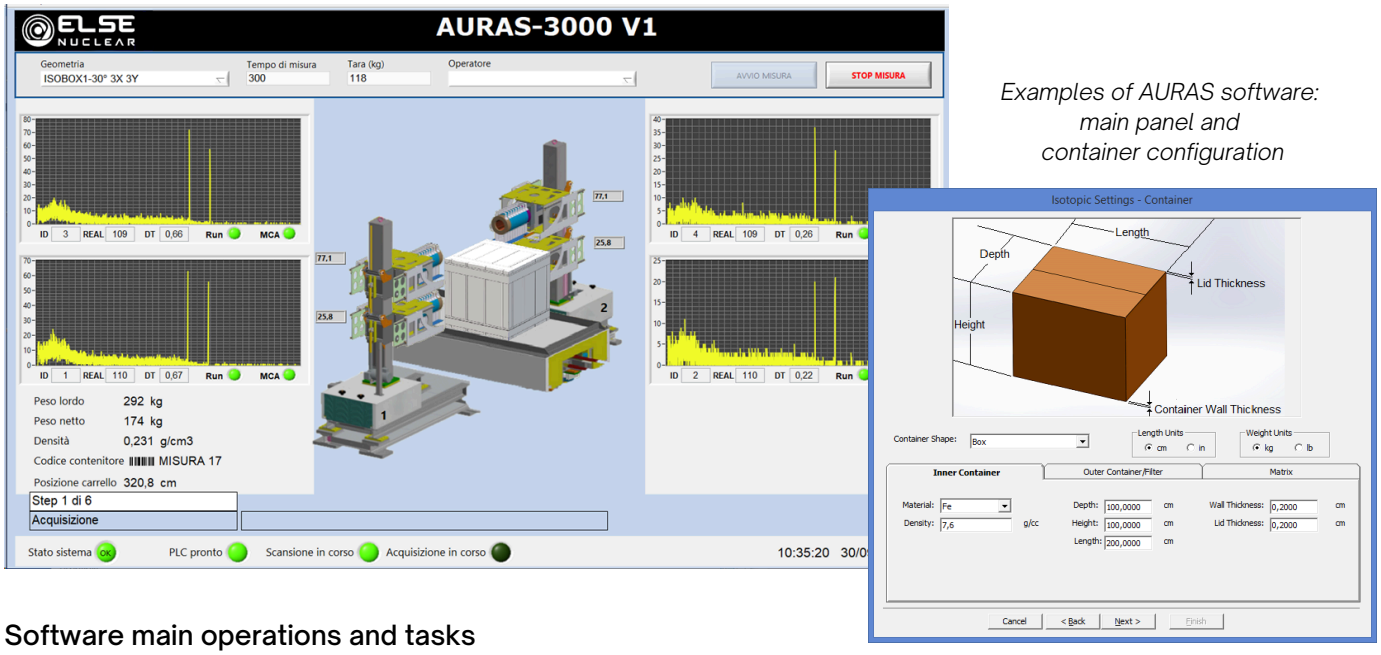
In routine operation, the system is managed through the software installed on the host PC.
The operator can interact with the system through the user-friendly graphical interface, which provides hardware control, analysis set-up, and measurement process management.

Routine measurement process

To start a routine scan, only five inputs are required from the operator:

- Measurement geometry (container type and number of counting positions)
- Material (chosen from a drop-down list of database materials)
- Correlation factor table (which may vary depending on the waste material type and origin)
- Concentration limit table (which may vary depending on the material type: metal, concrete, etc.)
- Preset time for the spectrometric measurement in each position

The measurement positions are automatically calculated depending on the number of counting positions required. Every position generates one entry in the scan configuration for each detector. Vertical detector positions can be computed, set manually, or learned by moving the detector to the desired height using the operator console. The program warns the user if the computed detector coordinates are out of range or would lead to a detector collision.
Multiple limit tables can be edited and saved depending on waste material type. No user intervention is required once the measurement sequence is started.



Examples of AURAS software: main panel and container configuration

Software main operations and tasks

- Records the container weight
- Moves the platform and the detectors to the target positions
- Performs post-processing analysis to produce a set of release indexes for each nuclide, based on a customizable isotope release concentration limit table
- Using a customizable correlation scaling factor table, adds to the spectrometric results low or non-gamma emitting nuclides that cannot be seen directly, but are known to be present. Scaling factors can be referred to a given date to consider the isotope decay. Multiple scaling factor tables can be edited and saved, depending on the type and origin of the waste material. It is also possible to specify a list of unrelated isotopes known to be present in a given (fixed) concentration
- Compares analysis results to a table of release limits (if desired, multiple tables may be used)
- Produces a final report of the scanning procedure. Different sections of the sample are compared graphically in order to display hot-spots. A final release index value is shown that marks the item as releasable or not depending on a user defined level. The report can be saved and printed
- If the user accepts the report, all relevant data are saved and can be later retrieved for re-analysis. Multiple scans of a single item are supported with no overwriting

TYPICAL PERFORMANCE

The table below presents typical MDA values (expressed in Bq/g) for uniform waste and matrices. No special measures were taken to enhance these values.

	MDA on Single Spectrum (1 m^3 container)		MDA Averaged on Multiple Spectra (1 m^3 container)	
Radionuclide	**0.4 g/cc, 40 min**	**1.8 g/cc, 4 hr**	**0.4 g/cc, 40 min**	**1.8 g/cc, 4 hr**
Mn-54	0.0030	0.0004	0.0011	0.0003
Co-60	0.0019	0.0003	0.0007	0.0002
Sb-125	0.0102	0.0013	0.0039	0.0009
Cs-134	0.0032	0.0005	0.0013	0.0003
Cs-137	0.0037	0.0005	0.0014	0.0004
Eu-152	0.0131	0.0019	0.0049	0.0013
Eu-154	0.0080	0.0013	0.0028	0.0007
Am-241	0.0655	0.0066	0.0270	0.0037

AURAS 3000 example

OPTIONS

AURAS 3000 stations can be adapted to specific requirements through a customization of the basic configuration here described. The customisation can be applied to the mechanical layout of the rails and/or to the measurement equipment.

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