



VF NUCLEAR



NUCLEAR
POWER PLANTS



WASTE
MANAGEMENT



RESEARCH
CENTRES

WAM series WASTE ASSAY MONITORS



MAIN ADVANTAGES

- Monitor configuration to customer requirements
- Segmented or tomographic analysis of the activity and density distribution in the drum
- Peak attenuation correction
- Integrated waste drum weighing
- Optional Fast-Scan function
- Optional adjustable collimator
- Optional measurement of the density of the material in the waste drum
- Integrated control software

PURPOSE

The WAM series monitors are intended for the quantitative and qualitative characterization of radioactive waste deposited in waste drums with varying height, shape and weight. Typical applications are analyses of low-level and intermediate-level waste to be deposited in a radioactive waste repository.

Three series of WAM monitors are available:

- **WAM-200** series – a segmented gamma scanner (SGS), which evaluates the distribution of activity in drums in up to 9 vertical segments.
- **WAM-300** series – a segmented gamma scanner, which evaluates the distribution of activity and material density in drums in up to 9 vertical segments.
- **WAM-400** series – a tomographic gamma scanner (TGS), which evaluates the distribution of activity and material density in all parts of drums.

Due to the variable customers' requirements for measuring different types and sizes of waste drums, various waste activities, different requirements for handling the drums, etc., the WAM series monitors can be customized.

All WAM series monitors include:

- Rotating platform for measured waste drums with integrated weighing scale
- A spectrometric gamma detector that measures radionuclides in a selected waste drum segment. Two types of detectors are available:
 - HPGe detector with 30% efficiency, cooled by liquid nitrogen
 - CeBr3 scintillation detector
- Fixed collimator of the detector
- Vertical detector lifting mechanism, which ensures measurement of the waste drum over its entire height
- A data processing system, which provides comprehensive waste drum analysis

The **WAM-300** and **WAM-400** series also includes:

- Sealed radionuclide source to correct for non-homogeneous material distribution in the waste drum. Eu-152 is used as standard, in case of need other nuclides can be used, e.g. Se-75.

It is also possible add to the WAM monitors the following options and features:

- HPGe detector with different efficiency corresponding to the activity of the waste in the waste drum.
- Detector cooling: electric or hybrid (combination of liquid nitrogen and electric cooling)
- One to four collimated dose rate detectors for Fast-Scan function
- Collimator with adjustable aperture, for measuring a wide range of activities in drums, with automatic setting of the aperture using the Fast-Scan function
- Manual or automatic waste drum handling system
- Swab wipe system for the measurement of waste drum's surface contamination
- Barcode, QR or RFID reader for waste drum identification
- Area gamma detectors
- Calibration fixtures, check sources

WASTE ASSAY MONITORS

Segmented gamma scanner

The WAM-200 monitor with an HPGe detector and WAM-210 with a CeBr3 detector assume a homogeneous distribution of activity and material density in the drum.

The WAM-300 monitor with an HPGe detector and WAM-310 with a CeBr3 detector assume a homogeneous distribution of activity and material density in the defined vertical segments.

With a homogeneous distribution of activity and density, the WAM-200, WAM-210, WAM-300, and WAM-310 enable measurements with an error of 5-20%.

Tomographic gamma scanner

The WAM-400 with an HPGe detector is suitable for measuring drums with high heterogeneity in the distribution of activity sources and material density in the entire drum volume.

The WAM-400 provides measurement with an error typically in the range of 5-20% (maximum 50%). In addition, it identifies the position, activity and density of hotspots in the measured drum.

Operation

When the waste drum is loaded onto the rotating platform, it is weighed. The operator is then asked to enter the measurement input information and the measurement can be started.

When integrated, the Fast-Scan function performs a quick measurement using dose rate detectors to determine the maximum dose rate at the waste drum surface. Accordingly, the aperture of the collimator is automatically adjusted to achieve the optimal detection efficiency.

Then, the WAM-300 and WAM-400 series monitors perform the drum density measurement with the radionuclide source to determine the average density of the material in the drum. Depending on the measured density, the corresponding peak attenuation correction factor is set for evaluation.

After that, the waste drum is gradually measured by the used detector in individual cylindrical segments over its entire height.

After the measurement, the monitor will provide a user a report with the total and mass activity of the radionuclides present in all measured parts, as well as the total and mass activity of the waste in the waste drum for each radionuclide.

The WAM monitors are controlled by the **WAMIS** software, which has the following functions:

- Starting new waste drum measurements
- Manual WAM control, performing calibrations
- Archiving of waste drum measurements
- Archiving of calibrations performed

- Archiving status and error messages
- Printing measurements reports
- Printing calibration reports

SPECIFICATIONS

WAM-200, WAM-400, WAM-400 detector	HPGe
Typical efficiency for WAM-200, WAM-300	30 %
Typical efficiency for WAM-400	50 %

WAM-210, WAM-310 detector	CeBr3 (∅ 2 x 3)"
Typical efficiency	equivalent HPGe 30%

Measuring range for Cs-137	3 kBq to 3 TBq
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Resolution FWHM (122 keV)

HPGe detector	< 0,85 keV
CeBr3 detector	< 10 keV

Resolution FWHM (1330 keV)

HPGe detector	< 1,85 keV
CeBr3 detector	< 40 keV

Energy range

HPGe detector	40 keV to 2,8 MeV
CeBr3 detector	350 keV to 3 MeV

Temperature	from 5 to 55 °C
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Humidity	max. 80 % non-condensing
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Power supply	220 – 240 VAC
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Fast-Scan detector	collimated CdTe
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Typical weight of the waste drum	< 600 kg
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Typical diameter of the waste drum	610 mm
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Typical volume of the waste drum	200 l
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WAM-200



RELATED PRODUCTS

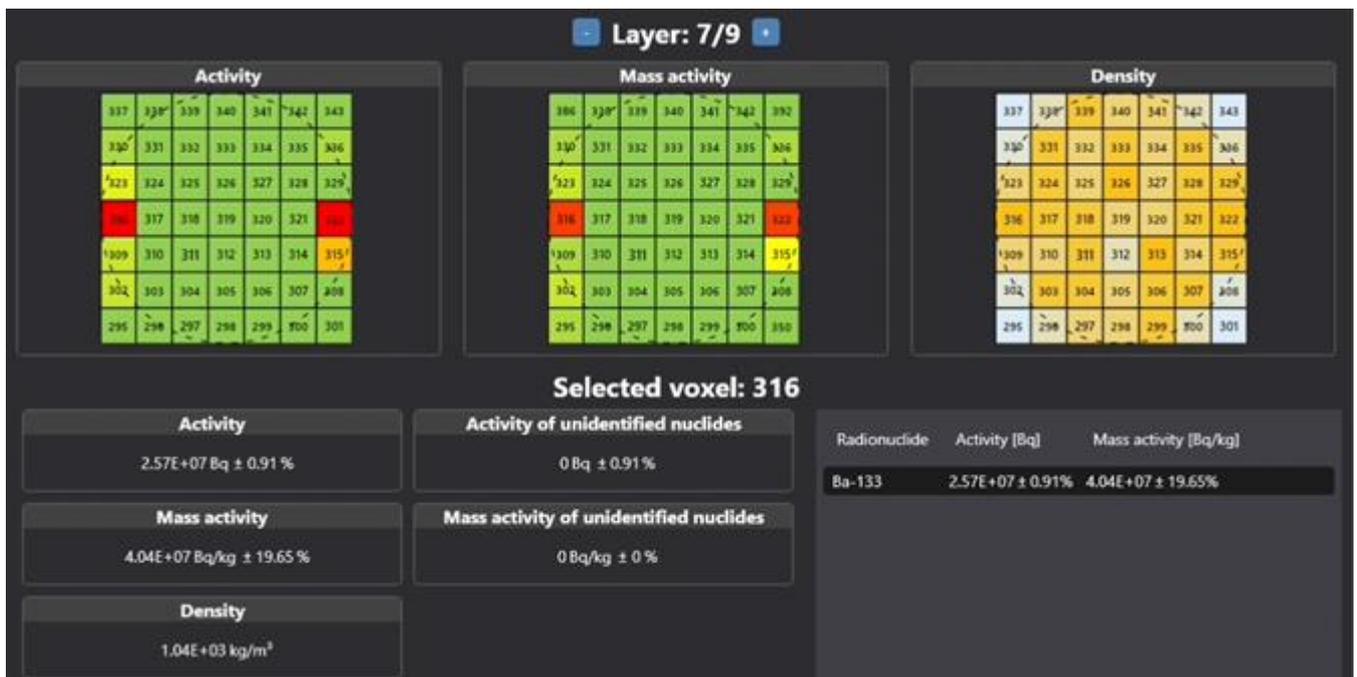
MK-30P	Measuring chamber
PAM-170	Portable Activity Meter
MDG-12S	Smart Directional Dose Rate Meter
MDG-04	Smart Dose Rate Meter



WAM-400 series



Density Transmission Module DTM-01



WAM-400: Tomographic distribution of activities and density in a selected drum layer



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