



Multigamma (9ML01), Ba133 & Eu152 standard solutions



Multigamma ray standard solutions are characterized in terms of photon flux per unit mass within 4π sr (expressed in $s^{-1}\cdot g^{-1}$). The energies of the gamma lines used as reference are also certified. The specific activity is stated.

For energy and efficiency calibration of NaI(Tl) or Ge detectors, LEA recommends the following radionuclides or radionuclide mixtures:

- europium-152 in the 122 - 1.408 keV energy range,
- baryum-133 in the 30 - 400 keV range,
- mixture of radionuclides (^{241}Am , ^{109}Cd , ^{57}Co , ^{139}Ce , ^{51}Cr , ^{113}Sn , ^{85}Sr , ^{137}Cs , ^{60}Co , ^{88}Y) in the 60 - 1.836 keV range.

The solutions are supplied in sealed ampoules or 50 and 500 ml plastic vials. Solutions with high specific activities are supplied in capped vials for best handling.

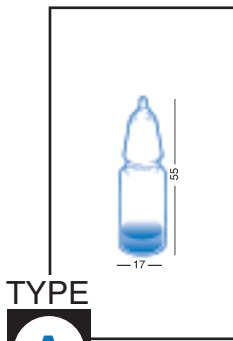
Multigamma ray standard solutions for environmental monitoring offer the following features:

- low activity concentrations in large volumes, approximating experimental conditions,
- packaging enabling the standard to be used without opening the container for calibration of NaI(Tl), Ge(Li) and Ge-HP detectors.

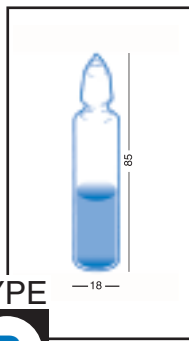
• Available products

Radionuclide Half-life	Chemical composition	Product code	γ mass flux	Specific activity		Package		Measurement uncertainty
			$s^{-1}\cdot g^{-1}$	$kBq\cdot g^{-1}$	$\mu Ci\cdot g^{-1}$	Volume cm^3	Type	%
^{133}Ba $1,05 \times 10^1$ years	HCl 1 N	BA133ELMA85	$3,2 \times 10^4$ to $7,2 \times 10^6$	8×10^3	$2,2 \times 10^2$	1	A	3 to 5
		BA133ELMB75	$3,2 \times 10^3$ to $7,2 \times 10^5$	8×10^2	$2,2 \times 10^1$	5	B	3 to 5
		BA133ELMB50	$1,6 \times 10^2$ to $3,6 \times 10^4$	4×10^1	1,1	5	B	3 to 5
		BA133ELME25	$1,6$ to $3,6 \times 10^2$	4×10^{-1}	$1,1 \times 10^{-2}$	50	E	3 to 5
		BA133ELMF25	$1,6$ to $3,6 \times 10^2$	4×10^{-1}	$1,1 \times 10^{-2}$	50	F	3 to 5
		BA133ELMG10	$1,6 \times 10^{-1}$ to $3,6 \times 10^1$	4×10^{-2}	$1,1 \times 10^{-3}$	500	G	3 to 5
		BA133ELMH10	$1,6 \times 10^{-1}$ to $3,6 \times 10^1$	4×10^{-2}	$1,1 \times 10^{-3}$	500	H	3 to 5
^{152}Eu $1,35 \times 10^1$ years	HCl 1N	EU152ELMD95	$1,7 \times 10^5$ to $1,7 \times 10^7$	4×10^4	$1,1 \times 10^3$	1	D	3 to 5
		EU152ELMB90	$3,4 \times 10^4$ to $3,4 \times 10^6$	8×10^3	$2,2 \times 10^2$	5	B	3 to 5
		EU152ELMB80	$3,4 \times 10^3$ to $3,4 \times 10^5$	8×10^2	$2,2 \times 10^1$	5	B	3 to 5
		EU152ELMB55	$1,7 \times 10^2$ to $1,7 \times 10^4$	4×10^1	1,1	5	B	3 to 5
		EU152ELME30	$1,7$ to $1,7 \times 10^2$	4×10^{-1}	$1,1 \times 10^{-2}$	50	E	3 to 5
		EU152ELMF30	$1,7$ to $1,7 \times 10^2$	4×10^{-1}	$1,1 \times 10^{-2}$	50	F	3 to 5
		EU152ELMG15	$1,7 \times 10^{-1}$ to $1,7 \times 10^1$	4×10^{-2}	$1,1 \times 10^{-3}$	500	G	3 to 5
		EU152ELMH15	$1,7 \times 10^{-1}$ to $1,7 \times 10^1$	4×10^{-2}	$1,1 \times 10^{-3}$	500	H	3 to 5
Mixture ^{241}Am , ^{109}Cd , ^{57}Co , ^{139}Ce , ^{51}Cr , ^{113}Sn , ^{85}Sr , ^{137}Cs , ^{60}Co , ^{88}Y	HCl 1N	9ML01ELMA60 ⁽¹⁾	1×10^3 to 6×10^4	8×10^2	$2,2 \times 10^1$	1	A	3 to 5
		9ML01ELMB45 ⁽¹⁾	5×10^1 to 3×10^3	4×10^1	1,1	5	B	3 to 5
		9ML01ELME20 ⁽¹⁾	1 to 6×10^1	8×10^{-1}	$2,2 \times 10^{-2}$	50	E	3 to 5
		9ML01ELMF20 ⁽¹⁾	1 to 6×10^1	8×10^{-1}	$2,2 \times 10^{-2}$	50	F	3 to 5
		9ML01ELMG05 ⁽¹⁾	1×10^{-1} to 6	8×10^{-2}	$2,2 \times 10^{-3}$	500	G	3 to 5
		9ML01ELMH05 ⁽¹⁾	1×10^{-1} to 6	8×10^{-2}	$2,2 \times 10^{-3}$	500	H	3 to 5
Complex mixture in capped vial		9ACETEQ				10		

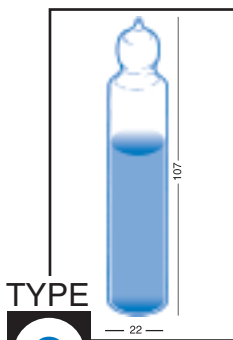
Legend: (1) Manufacturing campaign, see production schedule at the last page of the catalogue.



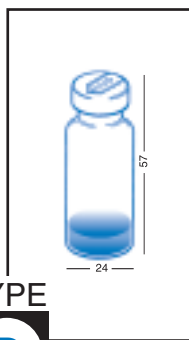
TYPE A Glass ampoule containing 1 cm³ of standard solution



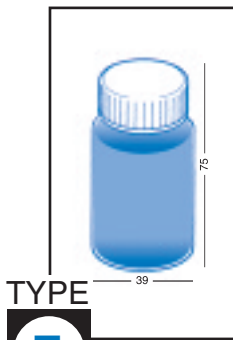
TYPE B Glass ampoule containing 5 cm³ of standard solution



TYPE C Glass ampoule containing 20 cm³ of standard solution



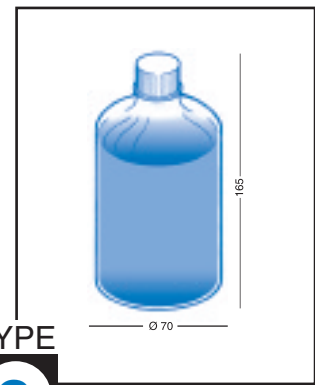
TYPE D Standardized capped glass vial containing 1 cm³ of standard solution



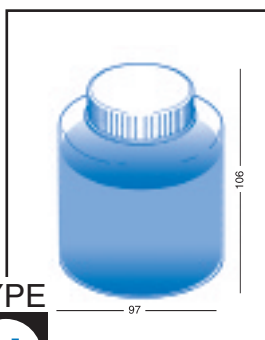
TYPE E Plastic vial containing 50 cm³ of standard solution



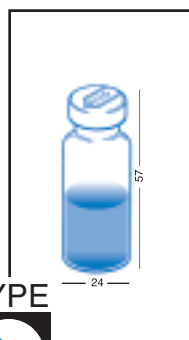
TYPE F Plastic vial containing 50 cm³ of standard solution



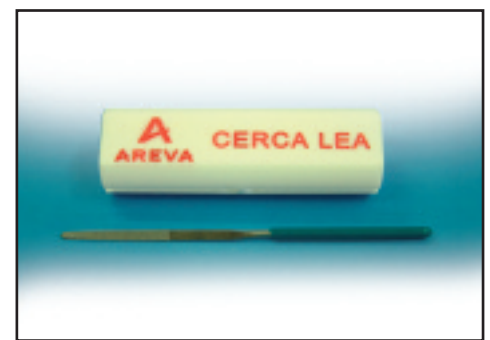
TYPE G Plastic vial containing 500 cm³ of standard solution



TYPE H Plastic vial containing 500 cm³ of standard solution



TYPE L Standardized capped glass vial containing 5 cm³ of standard solution



Glass ampoule broken tool
Reference 9ACETLCA

• Available packaging

- Radioactive standard solutions are usually supplied in sealed **glass ampoules**.
- High-activity solutions are supplied in **capped vials** for ease of handling.
- Packaging is designed to **prevent evaporation** during transport and storage.
- Large-volume solutions for environmental measurements are supplied in **plastic vials**.