Specification – Certified Reference Material

Element Standard Solution 1000 mg/l

Accreditation:

Merck KGaA, Darmstadt, Germany is accredited by the German accreditation authority as registered reference material producer (D-RM-15185-01-00) in accordance with **ISO 17034**.

Description of CRM: Element Standard Solution 1000 mg/l
Expiry date: 4 years
Storage: +15°C to +25°C tightly closed in the original container
Specification: 956 – 1011 mg/kg

Article	Analyte	Description of CRM	Associated uncertainty*, $U=k\cdot u$ ($k=2$) as mass fraction
119770	Al	Aluminium standard solution	± 5 mg/kg
170204	Sb	Antimony standard solution	± 5 mg/kg
119773	As	Arsenic standard solution	± 5 mg/kg
119774	Ba	Barium standard solution	± 6 mg/kg
170207	Be	Beryllium standard solution	± 6 mg/kg
119804	Bi	Bismuth standard solution	± 5 mg/kg
119500	B	Boron standard solution	± 6 mg/kg
119777	Cd	Cadmium standard solution	± 5 mg/kg
119778	Ca	Calcium standard solution	± 5 mg/kg
170212	Cs	Cesium standard solution	± 5 mg/kg
119779	Cr	Chromium standard solution	± 5 mg/kg
119785	Co	Cobalt standard solution	± 5 mg/kg
119786	Cu	Copper standard solution	± 5 mg/kg
170216	Au	Gold standard solution	± 5 mg/kg
119504	In	Indium standard solution	± 5 mg/kg
119781	Fe	Iron standard solution	± 5 mg/kg
119776	Pb	Lead standard solution	± 5 mg/kg
170223	Li	Lithium standard solution	± 5 mg/kg
119788	Mg	Magnesium standard solution	± 5 mg/kg
119789	Mn	Manganese standard solution	± 5 mg/kg
170226	Hg	Mercury standard solution	± 8 mg/kg
170227	Mo	Molybdenum standard solution	± 5 mg/kg
119792	Ni	Nickel standard solution	± 5 mg/kg

Merck KGaA, 64271 Darmstadt, Germany, Tel. +49(0)6151 72-2440
EMD Millipore Corporation, 400 Summit Drive, Burlington MA 01803, USA, Tel. +1-978-715-4321
Sigma-Aldrich Canada Co. or Millipore (Canada) Ltd. 2149 Winston Park, Dr. Oakville, Ontario, L6H 6J8, Phone: +1 800-565-1400

114282	Pd	Palladium standard solution	± 5 mg/kg
170219	Pt	Platinum standard solution	± 5 mg/kg
170230	K	Potassium standard solution	± 5 mg/kg
119513	Sc	Scandium standard solution	± 5 mg/kg
119796	Se	Selenium standard solution	± 8 mg/kg
170236	Si	Silicon standard solution	± 6 mg/kg
119797	Ag	Silver standard solution	± 5 mg/kg
170238	Na	Sodium standard solution	± 5 mg/kg
119799	Sr	Strontium standard solution	± 5 mg/kg
119514	Te	Tellurium standard solution	± 6 mg/kg
119801	Tl	Thallium standard solution	± 5 mg/kg
170242	Sn	Tin standard solution	± 5 mg/kg
170243	Ti	Titanium standard solution	± 5 mg/kg
170244	W	Tungsten standard solution	± 5 mg/kg
170245	V	Vanadium standard solution	± 5 mg/kg
119809	Y	Yttrium standard solution	± 6 mg/kg
119806	Zn	Zinc standard solution	± 5 mg/kg
170234	Zr	Zirconium standard solution	± 5 mg/kg

* The uncertainty can vary depending on the primary reference material.

Metrological traceability: Directly traceable to the corresponding / suitable primary standard NIST SRM
NIST: National Institute of Standards and Technology, Gaithersburg, USA

Measurement method: Inductively coupled plasma optical emission spectrometry ICP-OES.

Intended use: This reference material is intended for use as a calibration standard in element analysis.

Associated uncertainty:

The associated uncertainty U_{CRM} reported with the certified values is calculated as combined expanded uncertainty $U_{CRM}=k \cdot u_{CRM}$ in accordance with GUM and EA-4/02, with $k=2$ as the coverage factor for a 95% coverage probability.

The combined uncertainty u_{CRM} is derived from combination of the squared uncertainty contributions:

$$\boldsymbol{u}_{CRM} = \sqrt{\boldsymbol{u}^2_{Characterisation} + \boldsymbol{u}^2_{Homogeneity} + \boldsymbol{u}^2_{Stability}}$$

$u_{characterisation}$: is the uncertainty in accordance with DIN EN ISO/IEC 17025 which includes the contributions of the primary reference material and the measuring system. The characterisation measurements have been conducted by our DAkkS accredited calibration laboratory (D-K-15185-01).

$u_{homogeneity}$: is the between-bottle variation in accordance with ISO 17034. The assessment of homogeneity is performed by analysis of a representative number of systematically chosen sample units.

$u_{stability}$: is the uncertainty obtained from short-term and long-term stability in accordance with ISO 17034. The stability studies are the basis for the quantification of the expiry date of this elemental standard for the unopened bottle.

Detailed information is provided by the certificates and the certification report on our website.

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