

Specification – Certified Reference Material

Certipur® ICP Multi element standard solution XIII

Accreditation:



Deutsche
Akkreditierungsstelle
D-RM-15185-01-00

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**.

Producer: Merck KGaA, Frankfurter Str. 250, 64293 Darmstadt, Germany
Description of CRM: ICP Multi element standard solution XIII
Ord. No.: 1.04451.0100
Expiry date: 3 years
Storage: +15°C to +25°C tightly closed in the original container
Matrix: HNO₃ 5%

Element	Specification	Associated uncertainty, $U=k \cdot u$ ($k=2$) as mass concentration	Traceable to NIST SRM®
Al	445 - 545 mg/l	±25 mg/l	SRM 3101a
As	90 - 110 mg/l	±5 mg/l	SRM 3103a
Be	90 - 110 mg/l	±5 mg/l	SRM 3105a
Cd	22.5 - 27.5 mg/l	±1.5 mg/l	SRM 3108
Co	90 - 110 mg/l	±5 mg/l	SRM 3113
Cr	90 - 110 mg/l	±5 mg/l	SRM 3112a
Cu	90 - 110 mg/l	±5 mg/l	SRM 3114
Fe	90 - 110 mg/l	±5 mg/l	SRM 3126a
Hg	4.5 - 5.5 mg/l	±0.6 mg/l	SRM 3133
Mn	90 - 110 mg/l	±5 mg/l	SRM 3132
Ni	90 - 110 mg/l	±5 mg/l	SRM 3136
Pb	90 - 110 mg/l	±5 mg/l	SRM 3128
Se	22.5 - 27.5 mg/l	±1.5 mg/l	SRM 3149
V	225 - 275 mg/l	±12 mg/l	SRM 3165
Zn	90 - 110 mg/l	±5 mg/l	SRM 3168a



Metrological traceability: This certified reference material has been measured applying high precision ICP-OES and is directly traceable to the corresponding **NIST SRM®** as mentioned on page 1.

NIST: National Institute of Standards and Technology, Gaithersburg, USA.

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

Application and correct use: This certified reference material is intended for use as **calibration standard** for atomic absorption spectrometry, spectrophotometry and other analytical techniques. Shake well before use and never pipet directly from the original container.

Associated uncertainty:

The associated uncertainty U_{CRM} reported with the certified values is calculated as combined expanded uncertainty $U_{\text{CRM}} = k \cdot u_{\text{CRM}}$ 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:

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

$u_{\text{characterisation}}$: 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.

$u_{\text{homogeneity}}$: 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.

$u_{\text{stability}}$: 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.

