

Specification – Certified Reference Material

Certipur® ICP Multi element standard solution X

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 X
Ord. No.: 1.04482.0100
Expiry date: 3 years
Storage: +15°C to +25°C tightly closed in the original container
Matrix: HNO₃ 6%

Element	Specification	Associated uncertainty, $U=k \cdot u$ ($k=2$) as mass concentration	Traceable to NIST SRM®
As	45 - 55 µ/l	±10 µ/l	SRM 3103a
B	90 - 110 µ/l	±25 µ/l	SRM 3107
Ba	45 - 55 µ/l	±10 µ/l	SRM 3104a
Be	18 - 22 µ/l	±10 µ/l	SRM 3105a
Bi	7 - 13 µ/l	±5 µ/l	SRM 3106
Ca	31 500 - 38 500 µ/l	±1 200 µ/l	SRM 3109a
Cd	18 - 22 µ/l	±10 µ/l	SRM 3108
Cr	18 - 22 µ/l	±10 µ/l	SRM 3112a
Co	22.5 - 27.5 µ/l	±10 µ/l	SRM 3113
Cu	18 - 22 µ/l	±10 µ/l	SRM 3114
Fe	90 - 110 µ/l	±20 µ/l	SRM 3126a
K	2 700 - 3 300 µ/l	±500 µ/l	SRM 3141a
Mg	13 500 - 16 500 µ/l	±800 µ/l	SRM 3131a
Mn	27 - 33 µ/l	±10 µ/l	SRM 3132
Mo	90 - 110 µ/l	±20 µ/l	SRM 3134
Na	7 200 - 8 800 µ/l	±500 µ/l	SRM 3152a
Ni	45 - 55 µ/l	±10 µ/l	SRM 3136
Pb	22.5 - 27.5 µ/l	±10 µ/l	SRM 3128
Se	7 - 13 µ/l	±5 µ/l	SRM 3149
Sr	90 - 110 µ/l	±20 µ/l	SRM 3153a
Tl	7 - 13 µ/l	±5 µ/l	SRM 3158
V	45 - 55 µ/l	±10 µ/l	SRM 3165
Zn	45 - 55 µ/l	±10 µ/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 **verification solution for surface water testing** 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 $U_{CRM}=k \cdot u_{CRM}$ 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:

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

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

