# Specification – Certified Reference Material

# Certipur® GF AAS Multi element standard solution XVIII

**Accreditation:**

ilac-MRA DAkkS 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:** GF AAS Multi element standard solution XVIII
**Ord. No.:** 1.04487.0100
**Expiry date:** 3 years
**Storage:** +15°C to +25°C tightly closed in the original container
**Matrix:** $HNO_3$ 5%

| Element | Specification | Associated uncertainty, $U=k\cdot u$ ($k=2$) as mass concentration | Traceable to NIST SRM® |
|---|---|---|---|
| Ag | 9 - 11 mg/l | ±0.5 mg/l | SRM 3151 |
| Al | 90 - 110 mg/l | ±2 mg/l | SRM 3101a |
| As | 90 - 110 mg/l | ±2 mg/l | SRM 3103a |
| Ba | 45 - 55 mg/l | ±2 mg/l | SRM 3104a |
| Be | 4.5 - 5.5 mg/l | ±0.5 mg/l | SRM 3105a |
| Cd | 4.5 - 5.5 mg/l | ±0.5 mg/l | SRM 3108 |
| Co | 45 - 55 mg/l | ±2 mg/l | SRM 3113 |
| Cr | 18 - 22 mg/l | ±1 mg/l | SRM 3112a |
| Cu | 45 - 55 mg/l | ±2 mg/l | SRM 3114 |
| Fe | 18 - 22 mg/l | ±1 mg/l | SRM 3126a |
| Mn | 18 - 22 mg/l | ±1 mg/l | SRM 3132 |
| Ni | 45 - 55 mg/l | ±2 mg/l | SRM 3136 |
| Pb | 90 - 110 mg/l | ±2 mg/l | SRM 3128 |
| Sb | 90 - 110 mg/l | ±2 mg/l | SRM 3102a |
| Se | 90 - 110 mg/l | ±2 mg/l | SRM 3149 |
| Tl | 90 - 110 mg/l | ±2 mg/l | SRM 3158 |

**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 **graphite furnace AAS 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 $U_{CRM}=k \cdot u_{CRM}$ 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:

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

**$u_{characterisation}$:** 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.

**$u_{homogeneity}$:** 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.**