

## Specification – Certified Reference Material

### Element ICP Standard Solution 10 000 mg/l

#### 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:** Element ICP Standard Solution 10 000 mg/l  
**Expiry date:** 4 years  
**Storage:** +15°C to +25°C tightly closed in the original container  
**Specification:** 9086 – 9948 mg/kg

| Article | Analyte | Description of CRM      | Associated uncertainty*,<br>$U=k \cdot u$ ( $k=2$ )<br>as mass fraction |
|---------|---------|-------------------------|-------------------------------------------------------------------------|
| 1.70371 | Al      | Aluminium ICP Standard  | ± 60 mg/kg                                                              |
| 1.70373 | Ca      | Calcium ICP Standard    | ± 60 mg/kg                                                              |
| 1.70374 | Cr      | Chromium ICP Standard   | ± 60 mg/kg                                                              |
| 1.70375 | Co      | Cobalt ICP Standard     | ± 60 mg/kg                                                              |
| 1.70378 | Cu      | Copper ICP Standard     | ± 60 mg/kg                                                              |
| 1.70376 | Fe      | Iron ICP Standard       | ± 70 mg/kg                                                              |
| 1.70372 | Pb      | Lead ICP Standard       | ± 60 mg/kg                                                              |
| 1.70379 | Mg      | Magnesium ICP Standard  | ± 60 mg/kg                                                              |
| 1.70380 | Mn      | Manganese ICP Standard  | ± 60 mg/kg                                                              |
| 1.70384 | Hg      | Mercury ICP Standard    | ± 80 mg/kg                                                              |
| 1.70382 | Ni      | Nickel ICP Standard     | ± 70 mg/kg                                                              |
| 1.70383 | P       | Phosphorus ICP Standard | ± 70 mg/kg                                                              |
| 1.70377 | K       | Potassium ICP Standard  | ± 60 mg/kg                                                              |
| 1.70386 | Si      | Silicon ICP Standard    | ± 60 mg/kg                                                              |
| 1.70381 | Na      | Sodium ICP Standard     | ± 60 mg/kg                                                              |
| 1.70385 | S       | Sulfur ICP Standard     | ± 70 mg/kg                                                              |
| 1.70388 | V       | Vanadium ICP Standard   | ± 60 mg/kg                                                              |
| 1.70389 | Zn      | Zinc ICP Standard       | ± 60 mg/kg                                                              |
| 1.70390 | Zr      | Zirconium ICP Standard  | ± 60 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 certified reference material is intended for use as a calibration standard in element analysis.

**Associated uncertainty:**

The associated uncertainty  $U_{\text{CRM}}$  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  $u_{\text{CRM}}$  is derived from combination of the squared uncertainty contributions:

$$u_{\text{CRM}} = \sqrt{u_{\text{characterisation}}^2 + u_{\text{homogeneity}}^2 + u_{\text{stability}}^2}$$

**$u_{\text{characterisation}}$ :** 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 reference material for the unopened bottle.

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

