

# Deutsche Akkreditierungsstelle GmbH

## Annex to the Accreditation Certificate D-K-15185-01-00 according to DIN EN ISO/IEC 17025:2005

Period of validity: 2014-11-19 to 2019-11-18

Date of issue: 2014-11-19

Holder of certificate:

**Merck KGaA**  
**Frankfurter Straße 250, 64293 Darmstadt**

Calibration laboratory:

**Merck KGaA**  
**Kalibrierlaboratorium für chemische Messgrößen**  
**Frankfurter Straße 250, 64293 Darmstadt**

Head: Ayfer Yildirim  
Deputy: Dr. Stefan Frey  
Dr. Matthias Marth

Accredited as calibration laboratory since: 1994-12-13

Calibrations in the fields:

**Chemical analysis, reference materials**

- **pH value**
- **Electrolytic conductivity**
- **Mass fraction of elements in standard solutions**
- **Mass fraction of titrimetric standards**

Abbreviations used: see last page

**Annex to the Accreditation Certificate D-K-15185-01-00**
**Permanent laboratory**

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability <sup>1)</sup>	Remarks
pH value pH reference material	1 to 11	differential potentiometry	0.003	Specified are the absolute measurement uncertainties. These depend on the deployed primary reference material.
pH value pH reference buffer solutions	1 to 11	differential potentiometry	0.003	
pH value pH buffer solutions	0 to < 10	multipoint calibration by means of glass electrode	0.01	
pH value pH buffer solutions	10 to 14	multipoint calibration by means of glass electrode	0.02	
Electrolytic conductivity reference material	1 mS m <sup>-1</sup> to < 100 mS m <sup>-1</sup>	conductivity measuring instrument with 4-pole cells	0.4 %	Specified are the relative measurement uncertainties. These depend on the deployed primary reference material.
	100 mS m <sup>-1</sup> to 12 000 mS m <sup>-1</sup>		0.24 %	
Mass fraction of titrimetric standards	≥ 95.00 %	titrimetry		Specified are the absolute measurement uncertainties. These depend on the deployed primary reference material.
Tris(hydroxymethyl)-aminomethane		acidimetry	0.04 %	
Sodium carbonate		acidimetry	0.05 %	
Potassium hydrogen phthalate		alkalimetry	0.02 %	
Benzoic acid		alkalimetry	0.05 %	
Sodium chloride		argentometry	0.02 %	
Zinc		complexometry	0.02 %	
Calcium carbonate		complexometry	0.03 %	
Potassium dichromate		redox titration	0.04 %	
Disodium oxalate		redox titration	0.05 %	
Iron(II) ethylene diammonium sulphate		redox titration	0.05 %	
Potassium iodate		iodometry	0.02 %	
Mass fraction of elements in standard solutions		10 mg/kg to 10 000 mg/kg	inductively coupled plasma optical emission spectrometry ICP-OES	
Aluminium Al	0.3 %			
Antimony Sb	0.4 %			
Arsenic As	0.3 %			
Barium Ba	0.5 %			
Beryllium Be	0.5 %			
Bismuth Bi	0.3 %			
Lead Pb	0.3 %			
Boron B	0.3 %			
Cadmium Cd	0.3 %			

<sup>1)</sup> The best measurement capabilities are stated according to EA-4/02 M: 2013. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability <sup>1)</sup>	Remarks
Mass fraction of elements in standard solutions	10 mg/kg to 10 000 mg/kg	inductively coupled plasma optical emission spectrometry ICP-OES		
Calcium Ca			0.3 %	
Caesium Cs			0.4 %	
Cerium Ce			0.3 %	
Chromium Cr			0.3 %	
Cobalt Co			0.4 %	
Dysprosium Dy			0.4 %	
Iron Fe			0.4 %	
Erbium Er			0.4 %	
Europium Eu			0.4 %	
Gadolinium Gd			0.4 %	
Gallium Ga			0.5 %	
Germanium Ge			0.4 %	
Gold Au			0.3 %	
Hafnium Hf			0.4 %	
Holmium Ho			0.4 %	
Indium In			0.4 %	
Potassium K			0.4 %	
Copper Cu			0.3 %	
Lanthanum La			0.3 %	
Lithium Li			0.5 %	
Lutetium Lu			0.4 %	
Magnesium Mg			0.3 %	
Manganese Mn			0.3 %	
Molybdenum Mo			0.4 %	
Sodium Na			0.3 %	
Neodymium Nd			0.5 %	
Nickel Ni			0.4 %	
Niobium Nb			0.5 %	
Palladium Pd			0.3 %	
Phosphorus P			0.5 %	
Platinum Pt			0.4 %	
Praseodymium Pr			0.8 %	
Mercury Hg			0.6 %	
Rhenium Re			0.5 %	
Rhodium Rh			0.5 %	
Rubidium Rb			0.7 %	
Samarium Sm			0.4 %	
Scandium Sc			0.4 %	
Sulphur S			0.4 %	
Selenium Se			0.6 %	
Silver Ag			0.4 %	
Silicon Si			0.5 %	
Strontium Sr			0.4 %	
Tantalum Ta			0.4 %	
Tellurium Te			0.4 %	

<sup>1)</sup> The best measurement capabilities are stated according to EA-4/02 M: 2013. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

**Annex to the Accreditation Certificate D-K-15185-01-00**

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability <sup>1)</sup>	Remarks
Mass fraction of elements in standard solutions	10 mg/kg to 10 000 mg/kg	inductively coupled plasma optical emission spectrometry ICP-OES		
Terbium Tb			0.4 %	
Thallium Tl			0.3 %	
Thorium Th			0.5 %	
Thulium Tm			0.5 %	
Titanium Ti			0.3 %	
Uranium U			0.3 %	
Vanadium V			0.3 %	
Wolfram W			0.4 %	
Ytterbium Yb			0.3 %	
Yttrium Y			0.3 %	
Zinc Zn			0.4 %	
Tin Sn			0.4 %	
Zirconium Zr			0.3 %	

**Abbreviations used:**

EA-4/02 M: 2013 Evaluation of the uncertainty of measurement in calibration, September 2013, European co-operation for Accreditation

<sup>1)</sup> The best measurement capabilities are stated according to EA-4/02 M: 2013. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.