

Specification – Certified Reference Material

Certipur® di-Sodium tetraborate decahydrate

Certified secondary standard reference material pH(S)=9.18₀ (25°C)

Accreditation:



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
Product no.:	1.01964.0025
Description of CRM:	Certipur® di-Sodium tetraborate decahydrate Certified secondary standard reference material for pH measurement directly traceable to primary SRM from NIST/PTB pH(S)=9.18 ₀ (25°C)
Expiry date:	4 years
Storage:	+15°C to +25°C tightly closed in the original container
Composition:	di-Sodium tetraborate decahydrate Formulation in compliance with DIN 19266, IUPAC, NIST, EP (Ph. Eur.) and USP

Temperature [°C]	Specification as pH (Na ₂ B ₄ O ₇ * 10 H ₂ O 0.01 mol/kg)	Associated uncertainty $U_{CRM} = k \cdot u_{CRM}$ (k=2) as pH
5.0	9.379 – 9.399	± 0.010
10.0	9.318 – 9.338	± 0.010
15.0	9.264 – 9.284	± 0.010
20.0	9.215 – 9.235	± 0.010
25.0	9.171 – 9.191	± 0.010
30.0	9.131 – 9.151	± 0.010
37.0	9.083 – 9.103	± 0.010
40.0	9.064 – 9.084	± 0.011
45.0	9.034 – 9.054	± 0.011
50.0	9.007 – 9.027	± 0.011

Metrological traceability: This certified secondary standard reference material is directly traceable to primary certified reference material di-sodium tetraborate decahydrate characterised by PTB-BO-xxx/xxxxx/xx and NIST xxxx.

PTB: Physikalisch Technische Bundesanstalt, Braunschweig, Germany

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



Method of analysis:	The pH value is directly measured by differential potentiometry with the aid of two platinum hydrogen electrodes “quasi without transference” according to IUPAC ¹ recommendations against solutions prepared from primary reference materials characterised by PTB and NIST.
Intended use:	This certified reference material is intended for use as a calibration standard for pH instruments or pH electrodes or as a control sample for measuring the pH value.
Instructions for handling and correct use:	The formulation is compliant to DIN 19266, IUPAC ¹ , NIST ² and Ph. Eur. chapter 2.2.3 and USP chapter <791>.
Health and safety information:	Please refer to the Safety Data Sheet for detailed information about the nature of any hazard and appropriate precautions to be taken.

Details on correct use:

Preparation of di-sodium tetraborate decahydrate 0.01 mol/kg (pH(S)=9.180):

Dissolve 3.814 g disodium tetraborate decahydrate in 800 ml of water and make up to 1000 ml at 25°C. This solution is stable for approximately 6 weeks. Do not use any solution that shows signs of fungal contamination within this period.

Through within-bottle homogeneity a minimum sample volume of 30 ml was determined. The weigh-in quantity depends on the buffer substance and has to be calculated.

This certified reference material is intended for use as a calibration standard for pH instruments and pH electrodes. The pH value strongly depends on the temperature. Therefore it is necessary to keep the temperature constant during the measurement. Details concerning the nature of any hazard and appropriate precautions are provided in the material safety data sheet.

Associated uncertainty:

The expanded uncertainty U_{CRM} is calculated as $U_{CRM}=k \cdot u_{CRM}$, where $k=2$ is the coverage factor for a 95% coverage probability and u_{CRM} is the combined standard uncertainty in accordance to ISO 17034.

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 reference material for the unopened bottle.

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

¹ R.P. Buck, et al.: The Measurement of pH – **Definition, Standards and Procedures (IUPAC Recommendations 2002)**, Pure Appl. Chem, Vol 74, No. 11, pp. 2169-2200, 2002

² Y. Ch. Wu, W. F. Koch, R. A. Durst: **Standardization of pH Measurements**, NBS Special Publication 260-53, 1988

