

Specification – Certified Reference Material

Certipur® Certified secondary standard reference buffer solution pH(S)=4.00₅ (25°C)

Certified Reference Material for pH measurement

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
Product no.:	1.07200.0105
Description of CRM:	Certipur® Certified secondary standard reference buffer solution pH(S)=4.00 ₅ (25°C) Certified reference material for pH measurement
Expiry date:	3 years
Storage:	+15°C to +25°C tightly closed in the original container
Composition:	Potassium hydrogen phthalate in water Formulation in compliance with DIN 19266, IUPAC, NIST, Ph. Eur; USP Molality: 0.05 mol/kg

Temperature [°C]	Specification as pH	Associated uncertainty $U_{CRM}=k \cdot u_{CRM}$ ($k=2$) as pH
5.0	3.993 – 4.013	± 0.008
10.0	3.988 – 4.008	± 0.008
15.0	3.988 – 4.008	± 0.008
20.0	3.992 – 4.012	± 0.008
25.0	3.997 – 4.017	± 0.008
30.0	4.004 – 4.024	± 0.008
37.0	4.017 – 4.037	± 0.008
40.0	4.024 – 4.044	± 0.009
45.0	4.037 – 4.057	± 0.009
50.0	4.050 – 4.070	± 0.009

Metrological traceability: This certified secondary standard reference material is directly traceable to primary certified reference material potassium hydrogen phthalate characterised by PTB-PHT-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.
Preparation:	This certified reference material is prepared gravimetrically from potassium dihydrogen phthalate and high purity water. The formulation is compliant to DIN 19266, IUPAC ¹ , NIST ² , Ph. Eur. chapter 2.2.3. and USP chapter<791>.

Associated uncertainty:

The expanded uncertainty U_{CRM} is calculated as $U_{\text{CRM}} = k \cdot u_{\text{CRM}}$, 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:

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

$u_{\text{characterisation}}$:	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

