

**Certificate of the Reference Material**

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**Name of the Material** : Certified pH 4 Buffer

**Material Code** : UME CRM 1401

**Issue Date** : 11.12.2015

**Revision Date** : 16.12.2025 (Revision history can be found on the last page)

**Validity Period of the Certificate** : 1 year from the sales date

**Certified Values** :

Temperature <sup>[1]</sup>	pH <sup>[2,3]</sup>	Uncertainty <sup>[4]</sup>
20 °C	4.034	0.014
25 °C	4.041	0.014

[1] Temperature is monitored continuously throughout the measurements with 0.03 °C uncertainty.

[2] The certified value is determined by Primary Level pH Measurement System.

[3] The certified values are traceable to International System of Units (SI).

[4] The expanded uncertainty of certified value includes characterization, homogeneity, stability components and is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with GUM "Guide to the Expression of Uncertainty in Measurement".

**TÜBİTAK UME has been accredited by TÜRKAK as a reference material producer under the accreditation number AB-0001-RM in accordance with the TS EN ISO 17034:2018 standard.**

**Turkish Accreditation Agency (TÜRKAK) is a signatory to the European Cooperation for Accreditation (EA) Multilateral Agreement (MLA) and the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for the recognition of reference material certificates.**

**Sales Date**



**Assoc. Prof. Mustafa ÇETİNTAŞ**  
Director

Page 2 / 3	<b>TÜBİTAK</b> <b>ULUSAL METROLOJİ ENSTİTÜSÜ</b> NATIONAL METROLOGY INSTITUTE	<b>UME CRM</b> <b>1401</b>
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### Description

The material is a mixture of approximately 500 mL ultrapure water and potassium hydrogen phthalate ( $\text{HOOC}\text{C}_6\text{H}_4\text{COOK}$ ) in high density polyethylene (HDPE). Additional information is given in the certification report.

### Intended Use

This material can be used for calibration and control of working level pH meter calibration in place of measurement.

### Instructions for Use

All precautions should be taken to prevent contamination of the material and evaporation losses after opening the bottle. The bottle should be shaken before opening to take the drops visible on the top of the bottle into solution to eliminate the evaporation effect. In measurements, the minimum material amount is defined as the solution level that is above the diaphragm of the pH electrode. This amount can differ for different types of electrodes, and is generally around 25 mL. Calibration must be performed at a temperature corresponding to the relevant pH value and evaluation of pH value of the sample solution must be measured at the same temperature. During the measurement electrode or any other material should not be immersed in the sample bottle. Bottles should not be left open. Measurement should be conducted with sufficient amount of sample, transferred from the bottle to a convenient beaker. At the end of calibration, electrode's zero point ( $E^\circ$ ) ( $\leq 30$  mV) and slope (90% - 102%) of the combined glass electrode should be evaluated and if acceptable pass to the sample measurement. Minimum sample intake is 25 mL for all analytes. The material can be safely dispatched at ambient temperature where the temperature does not exceed 50 °C and the transportation period of 4 weeks.

### Storage Conditions

The material should be stored at  $(+18 \pm 5)$  °C temperature range. TÜBİTAK UME cannot be held responsible for changes that might happen to the material at customer's premises due to noncompliance of the instructions for use, and the storage conditions given in the certificate.

### Safety Information

Usual laboratory precautions apply. It is strongly recommended that the material must be handled and disposed according to the safety guidelines where applicable. Please refer to the Safety Datasheet before any use of the material.

## Participants

Information about the laboratory participated in the characterization study is given in the table below.

Laboratory	Address
TÜBİTAK UME	TÜBİTAK Gebze Yerleşkesi, Barış Mahallesi, Dr. Zeki Acar Caddesi No.1, 41470 Gebze - Kocaeli / Türkiye

## Methods and/or Techniques Used for the Determination of the Certified Values

The characterization of the material is conducted using Primary Level pH Measurement System which is a primary method.

The molal concentration of approximately 0.01 mol/kg hydrochloric acid solution was determined using Primary Level Constant Current Coulometry System with 1/10.000.000 resolution. This acid is used in Primary Level pH Measurement System equip with a platinum electrode coated with palladium and Ag/AgCl electrode to determine standard potential ( $E^0$ ) of Ag/AgCl electrodes. Gravimetrically prepared pH 4 buffer is analyzed with this system and acidity function of this buffer is determined. Finally activities of chloride ion are determined at corresponding temperatures and the sum of these two values gives the pH value of the buffer sample. The characterization study was performed at  $(20.00 \pm 0.03) ^\circ\text{C}$  and  $(25.00 ^\circ\text{C} \pm 0.03) ^\circ\text{C}$ . All solutions used in the characterization study were prepared gravimetrically and the balances were controlled before each use with the mass set traceable to TÜBİTAK UME.

Method/Technique	Parameter
Primary Level pH Measurement System	pH
Primary Level Constant Current Coulometry System	Molality

## Revision History

Date	Remarks
11.12.2015	First issue.
25.03.2015	The uncertainty value is revised and the certificate is updated.
22.10.2018	Certificate is updated due to format change of the document.
26.09.2019	Information about shipping conditions is added. Certificate is updated due to changes in the format of certificate for reference materials.
16.12.2025	Certificate is updated due to corporate identity (logo) change of TÜBİTAK UME.