Buffer Calibration Standards for pH Measurements

ISO 17034 • Accredited as CRM Producer and Calibration Laboratory • DIN EN ISO/IEC 17025

MilliporeSigma is the U.S. and Canada Life Science business of Merck KGaA, Darmstadt, Germany.

Supelco®
Analytical Products

Your trusted partner in Analytical Chemistry

Buffer solutions are essential to maintain proper calibration of pH instruments. Organizations such as the United States Pharmacopeia (USP) and the European Pharmacopoeia (Ph. Eur. 2.2.3) describe preparation of buffer solutions from solid starting material, but this process can be time consuming and error prone.

The accuracy of your pH measurements is directly affected by the buffer reference materials used in calibration. It is important to consider both quality of the raw materials used, as well as the accuracy of the preparation. With ready-to-use ISO 17034 & 17025 compliant Certipur® certified reference buffer solutions from Supelco® analytical products, you benefit from maximum accuracy, reliability and convenience, ensuring consistent results and avoiding costly repeat analyses.

Available in PE bottles, convenient single-use sachets, or award-winning Titripac® formats, there is a pH buffer solution format to suit your unique needs.

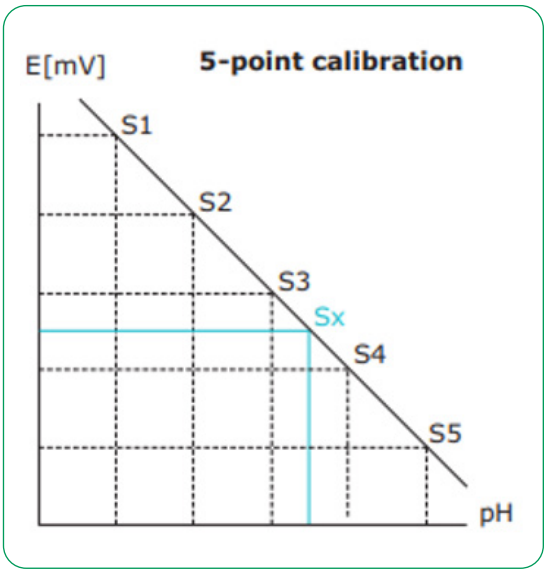
Our high standards match yours

Features & Benefits

- **Secure:** Accredited to ISO 17034 and ISO/IEC 17025
- **Trusted:** Traceable to the SI units via NIST (National Institute of Standards and Technology, USA) and PTB (Physical Technical Institute, National Metrological Institute of Germany)
- **Ready for Audits:** Detailed CoA for every product
- **Always Fresh:** Available single-use sachets
- **Long-Lasting:** Up to 5-year shelf life
- **Innovative & Eco-Friendly Format:** Award winning Titripac® Format

5-point calibration for high-accuracy pH determinations

We use 5-point calibration for accurate certification of each reference buffer solution batch. By using a 5-point calibration, rather than the more traditional 2, or 3-point methods, laboratories are assured that their pH buffers are as accurate as possible. Every time.



We offer different types of ready-to-use pH calibration buffer solutions

- Certified secondary standard reference materials
- Ready-to-use pH buffer solutions
- Certipur® buffer solutions in sachets
- Titrisol® buffer concentrates
- Other buffers - sold only in USA

A. Certified secondary standard reference materials

For the certification of our secondary reference materials, we produce our own primary reference materials, which are certified and characterized by the German Metrological Institute PTB (Physical Technical Institute, Braunschweig, Germany). Additionally our laboratory for pH measurement is not only an accredited accreditation laboratory but also an accredited testing laboratory with the permission to act as an independent authority to test samples and materials.

Our certified secondary reference standards have the following key features:

- Certified in an ISO/IEC 17025 accredited laboratory according to ISO 17034
- Tested with two platinum hydrogen electrodes using differential potentiometry. The uncertainty of this measuring method is +/- 0.003 pH units
- Delivered with a comprehensive, batch-specific Certificate including all information required by ISO Guide 31
- Certified reference material (CRM), offered in two forms: Neat & Solution
- Intended for extremely precise calibration, qualification and monitoring of pH instruments, and for testing other buffer solutions

Table 1: Certipur® certified secondary standard reference buffer solutions [25 °C]

pH value [25 °C]	Designation	Composition	Package (PE bottles)	Format	Cat. No.
1.68	Certified sec. standard reference buffer solution	Potassium tetraoxalate dihydrate	5 x 100 mL	Solution	**1.07204.0105**
4.00	Certified sec. standard reference buffer solution	Potassium hydrogen phthalate	5 x 100 mL	Solution	**1.07200.0105**
6.86	Certified sec. standard reference buffer solution	Potassium dihydrogen phosphate/di-sodium hydrogen phosphate	5 x 100 mL	Solution	**1.07202.0105**
7.41	Certified sec. standard reference buffer solution	Potassium dihydrogen phosphate/di-sodium hydrogen phosphate	5 x 100 mL	Solution	**1.07205.0105**
9.18	Certified sec. standard reference buffer solution	Di-sodium tetraborate decahydrate	5 x 100 mL	Solution	**1.07203.0105**

Table 2: Certipur® certified secondary standard reference buffer substances [25 °C]

pH value [25 °C]	Designation	Composition	Package (Glass bottles)	Format	Cat. No.
1.68	Certified sec. standard reference buffer solution	Potassium tetraoxalate dihydrate	25 g	Neat	**1.01961.0025**
3.64	Certified sec. standard reference buffer solution	Potassium hydrogen tartrate	25 g	Neat	**1.01963.0025**
4.01	Certified sec. standard reference buffer solution	Potassium hydrogen phthalate	25 g	Neat	**1.01965.0025**
6.86/ 7.42	Certified sec. standard reference buffer solution	Potassium dihydrogen phosphate/ di-sodium hydrogen phosphate	2 x 25 g	Neat	**1.01960.0001**
9.18	Certified sec. standard reference buffer solution	Di-Sodium tetraborate decahydrate	25 g	Neat	**1.01964.0025**
10.01	Certified sec. standard reference buffer solution	Sodium hydrogen carbonate/sodium carbonate	2 x 25 g	Neat	**1.01962.0001**

B. Ready-to-use pH buffer solutions

Offered in easy-to-use sachets and bottles, the ready-to-use Certipur® pH buffer solutions with certified pH values at both 20 °C and 25 °C meet your calibration needs while being traceable to standard reference materials from NIST and PTB. Open the pack and calibrate with confidence. pH value of the buffer is standardized with a combined glass electrode after 5-point calibration according to DIN 19268 with reference buffer solutions according to DIN 19266, IUPAC, NIST, Ph. Eur. and USP.

Key Features:

- Compliant: Produced according to EP and USP guidelines
- Secure: Tested in our ISO/IEC 17025 and ISO 17034 accredited calibration laboratories
- Convenient: Simply open the pack for quick, accurate pH calibration
- Certipur® buffer solutions offered in unique packaging format "**Titripac®**": Hermetically-sealed packaging avoids contamination & ensures long-term stability, even after opening.

Table 3: Certipur® buffer solutions [20 °C]

pH value [20 °C]	Designation	Composition	Package	Cat. No.
1.00	Buffer solution	Glycine/sodium chloride/hydrogen chloride	PE (1 L)	**1.09432.1000**
2.00	Buffer solution	Citric acid/sodium hydroxide/hydrogen chloride	PE (1 L)	**1.09433.1000**
			Titripac® (4 L)	**1.09433.4000**
			Titripac® (10 L)	**1.09433.9010**
3.00	Buffer solution	Citric acid/sodium hydroxide/hydrogen chloride	PE (1 L)	**1.09434.1000**
4.00	Buffer solution	Citric acid/sodium hydroxide/hydrogen chloride	PE (1 L)	**1.09435.1000**
			Titripac® (4 L)	**1.09435.4000**
			Titripac® (10 L)	**1.09435.9010**
4.66	Buffer solution	Acetic acid/sodium acetate	PE (1 L)	**1.07827.1000**
5.00	Buffer solution	Citric acid/sodium hydroxide	PE (1 L)	**1.09436.1000**
6.00	Buffer solution	Citric acid/sodium hydroxide	PE (1 L)	**1.09437.1000**
			Titripac® (4 L)	**1.09437.4000**
6.88	Buffer solution	Di-sodium hydrogen phosphate/potassium dihydrogen phosphate	PE (1 L)	**1.07294.1000**
7.00	Buffer solution	Di-sodium hydrogen phosphate/potassium dihydrogen phosphate	PE (1 L)	**1.09439.1000**
			Titripac® (4 L)	**1.09439.4000**
			Titripac® (10 L)	**1.09439.9010**
8.00	Buffer solution	Boric acid/sodium hydroxide/hydrogen chloride	PE (1 L)	**1.09460.1000**
			Titripac® (4 L)	**1.09460.4000**
9.00	Buffer solution	Boric acid/potassium chloride/sodium hydroxide	PE (1 L)	**1.09461.1000**
			Titripac® (4 L)	**1.09461.4000**
			Titripac® (10 L)	**1.09461.9010**
9.22	Buffer solution	Di-sodium tetraborate	PE (1 L)	**1.01645.1000**
10.00	Buffer solution	Boric acid/potassium chloride/sodium hydroxide	PE (1 L)	**1.09438.1000**
			Titripac® (4 L)	**1.09438.4000**
			Titripac® (10 L)	**1.09438.9010**
11.00	Buffer solution	Boric acid/potassium chloride/sodium hydroxide	PE (1 L)	**1.09462.1000**

Table 4: Certipur® buffer solutions [25 °C]

pH value [25 °C]	Designation	Composition	Package	Cat. No.
1.00	Buffer solution	Glycine/sodium chloride/hydrogen chloride	PE (500 mL)	**1.09441.0500**
			Titripac® (4 L)	**1.09441.4000**
1.68	Buffer solution	Potassium tetraoxalate	PE (500 mL)	**1.99015.0500**
2.00	Buffer solution	Citric acid/sodium hydroxide/hydrogen chloride	PE (500 mL)	**1.09442.0500**
			Titripac® (4 L)	**1.09442.4000**
3.00	Buffer solution	Citric acid/sodium hydroxide/hydrogen chloride	PE (500 mL)	**1.09444.0500**
			Titripac® (4 L)	**1.09444.4000**
4.00	Buffer solution	Citric acid/sodium hydroxide/hydrogen chloride	PE (500 mL)	**1.09445.0500**
			Titripac® (4 L)	**1.09445.4000**
4.01	Buffer solution	Potassium hydrogen phthalate	PE (500 mL)	**1.09406.0500**
			PE (1 L)	**1.09406.1000**
			Titripac® (4 L)	**1.09406.4000**
5.00	Buffer solution	Citric acid/sodium hydroxide	PE (500 mL)	**1.09446.0500**
			Titripac® (4 L)	**1.09446.4000**
6.00	Buffer solution	Citric acid/sodium hydroxide	PE (500 mL)	**1.99036.0500**
			Titripac® (4 L)	**1.99036.4000**
6.86	Buffer solution	Di-sodium hydrogen phosphate/potassium dihydrogen phosphate	PE (500 mL)	**1.99068.0500**
7.00	Buffer solution	Potassium dihydrogen phosphate/disodium hydrogen phosphate	PE (500 mL)	**1.09407.0500**
			PE (1 L)	**1.09407.1000**
			Titripac® (4 L)	**1.09407.4000**
8.00	Buffer solution	Boric acid/sodium hydroxide/hydrogen chloride	PE (500 mL)	**1.99038.0500**
			Titripac® (4 L)	**1.99038.4000**
9.00	Buffer solution	Boric acid/potassium chloride/sodium hydroxide	PE (500 mL)	**1.09408.0500**
			PE (1 L)	**1.09408.1000**
			Titripac® (4 L)	**1.09408.4000**
10.00	Buffer solution	Boric acid/potassium chloride/sodium hydroxide	PE (500 mL)	**1.09409.0500**
			PE (1 L)	**1.09409.1000**
			Titripac® (4 L)	**1.09409.4000**
11.00	Buffer solution	Boric acid/potassium chloride/sodium hydroxide	PE (500 mL)	**1.99041.0500**
			Titripac® (4 L)	**1.99041.4000**
12.00	Buffer solution	Di-Sodium hydrogen phosphate/ sodium hydroxide	Titripac® (4 L)	**1.99022.4000**

Table 5: Certipur® buffer solutions [20 °C] – color coded

pH value [20 °C]	Designation	Composition	Package	Cat. No.
4.00 (Red)	Buffer solution	Citric acid/sodium hydroxide/hydrogen chloride	PE (500 mL)	**1.09475.0500**
			Titripac® (4 L)	**1.09475.4000**
			Titripac® (10 L)	**1.09475.9010**
7.00 (Green)	Buffer solution	Di-sodium hydrogen phosphate/potassium dihydrogen phosphate	PE (500 mL)	**1.09477.0500**
			Titripac® (4 L)	**1.09477.4000**
			Titripac® (10 L)	**1.09477.9010**
9.00 (Blue)	Buffer solution	Boric acid/potassium chloride/sodium hydroxide	PE (500 mL)	**1.09476.0500**
			Titripac® (4 L)	**1.09476.4000**
			Titripac® (10 L)	**1.09476.9010**
10.00 (Yellow)	Buffer solution	Boric acid/potassium chloride/sodium hydroxide	PE (500 mL)	**1.09400.0500**
			Titripac® (4 L)	**1.09400.4000**
			Titripac® (10 L)	**1.09400.9010**

Table 6: Certipur® buffer solutions [25 °C] – color coded

pH value [25 °C]	Designation	Composition	Package	Cat. No.
4.00 (Red)	Buffer solution	Citric acid/sodium hydroxide/hydrogen chloride	PE (500 mL)	**1.99054.0500**
			Titripac® (4 L)	**1.99054.4000**
7.00 (Yellow)	Buffer solution	Di-sodium hydrogen phosphate/potassium dihydrogen phosphate	PE (500 mL)	**1.99057.0500**
			Titripac® (4 L)	**1.99057.4000**
10.00 (Blue)	Buffer solution	Boric acid/potassium chloride/sodium hydroxide	PE (500 mL)	**1.99050.0500**
			Titripac® (4 L)	**1.99050.4000**

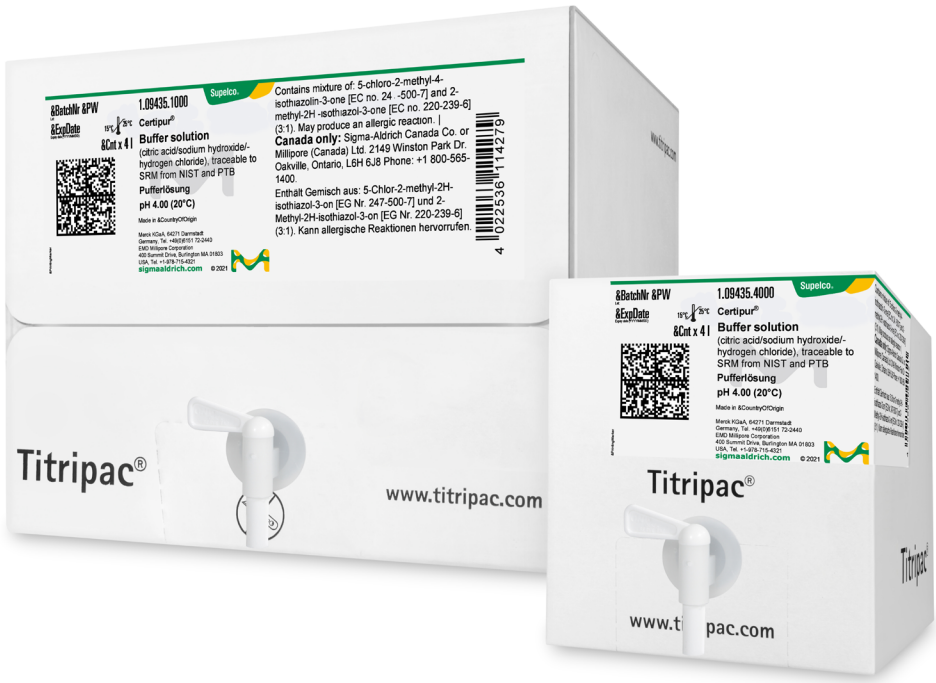
Innovative Titripac® Format

You can save time and reduce environmental impact with our innovative TitriPac® format, available for buffer solutions in 4 L and 10 L sizes.

- Easy-to-use with an integrated tap
- Reliable to the last drop with hermetically sealed packaging
- Minimized packaging waste
- Ensured stability even after opening
- For more information on stability data for Titripac®, click "**Technical Datasheet**"

Technical Features of buffer solution CRMs in Titripac® format:

- Available pH values: 1-12
- Packaging: 10 L & 4 L Titripac®
- Shelf Life: minimum 2 years

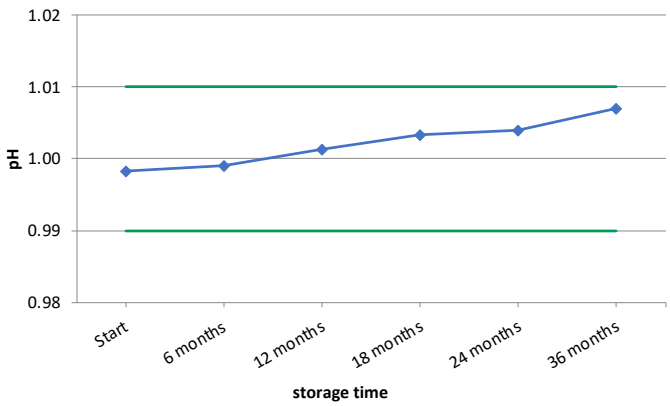


Stability of buffer solution CRMs in Titripac® format:

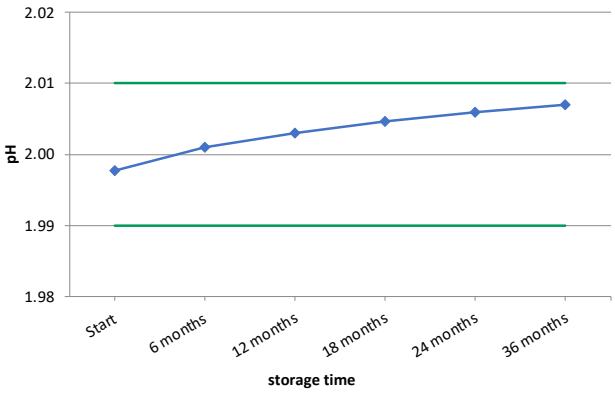
To demonstrate the stability of buffer solution CRMs, the Titripac® buffers were tested under daily routine conditions. Every six months the pH value was measured with a combined glass electrode after 5-point-calibration according to DIN 19268 with reference buffer solutions according to DIN 19266, IUPAC, NIST, Ph. Eur. and USP.

The following diagrams show the measured pH values of the mentioned buffer solution CRMs in the available Titripac® format over the shelf life of each product. All products are stable in the available packaging as shown below.

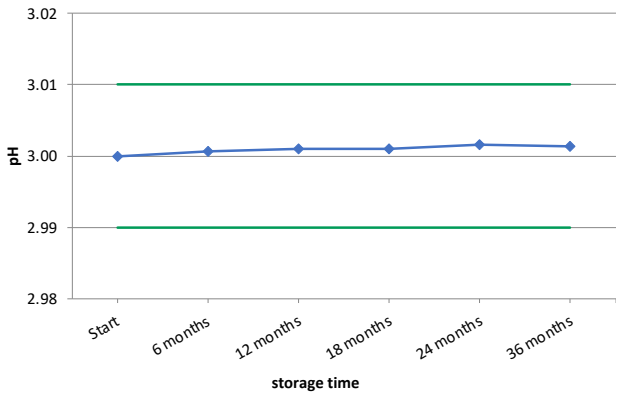
Buffer solution pH 1.00 in 4 L-Titripac® format



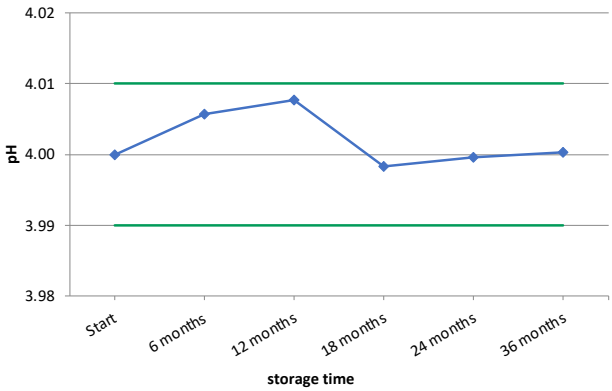
Buffer solution pH 2.00 in 4 L-Titripac® format



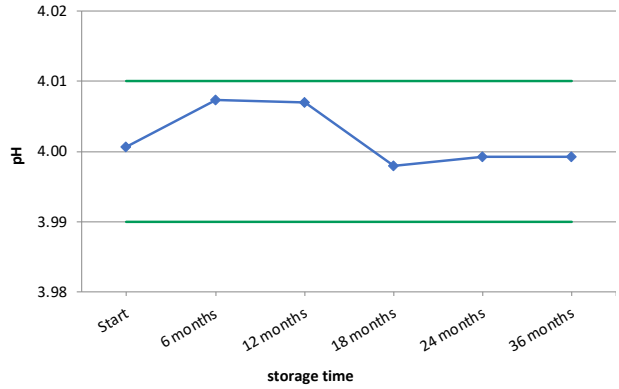
Buffer solution pH 3.00 in 4 L-Titripac® format



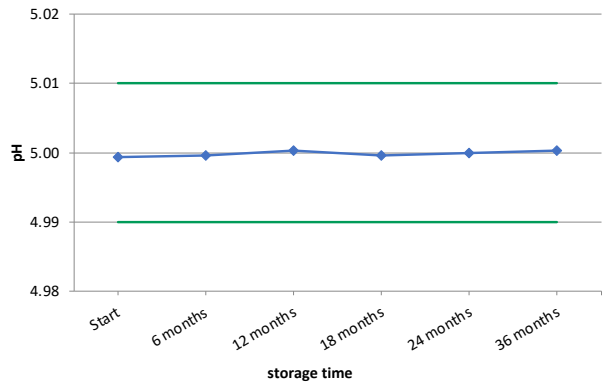
Buffer solution pH 4.00 in 4 L-Titripac® format



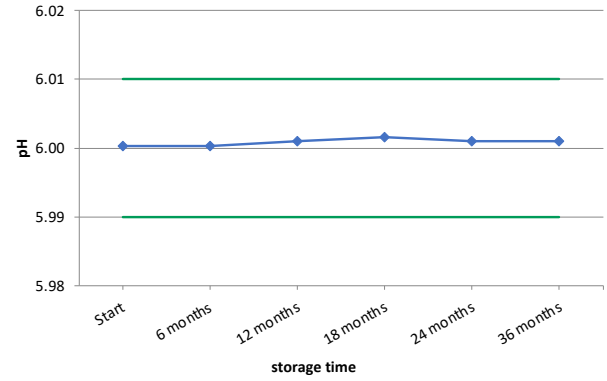
Buffer solution pH 4.00 in 10 L-Titripac® format



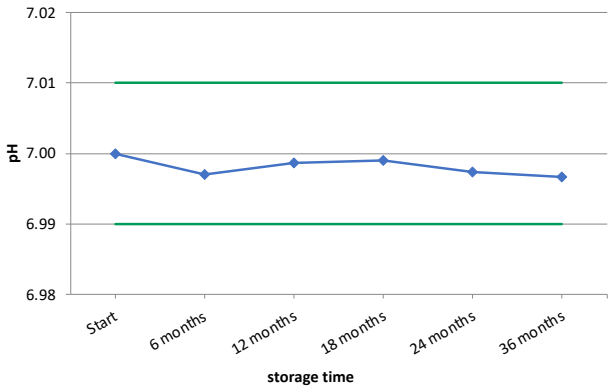
Buffer solution pH 5.00 in 4 L-Titripac® format



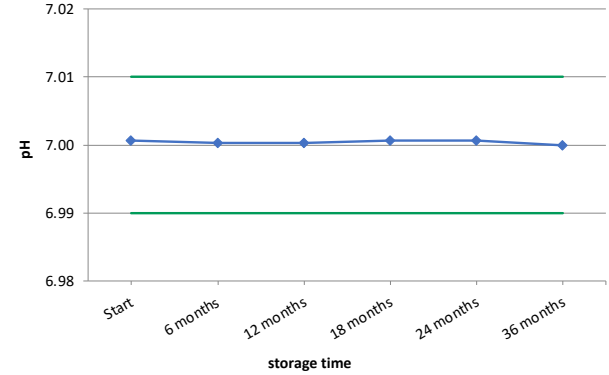
Buffer solution pH 6.00 in 4 L-Titripac® format



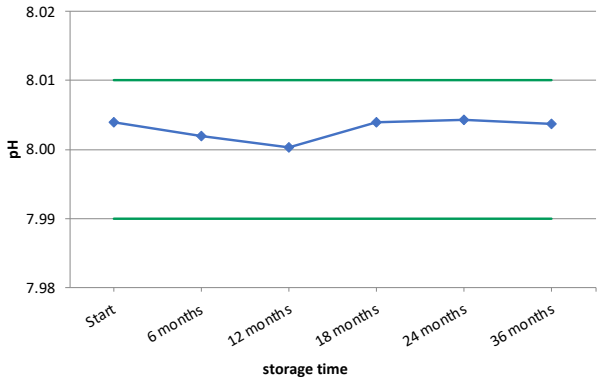
Buffer solution pH 7.00 in 4 L-Titripac® format



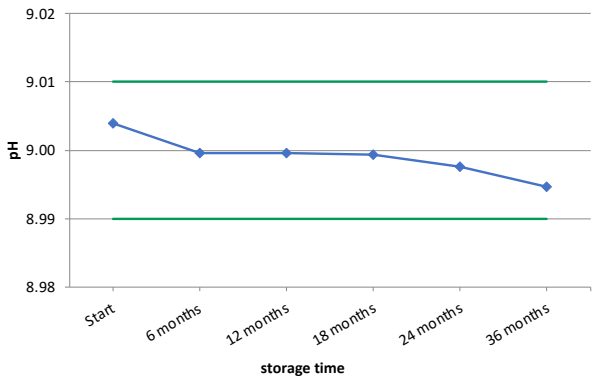
Buffer solution pH 7.00 in 10 L-Titripac® format



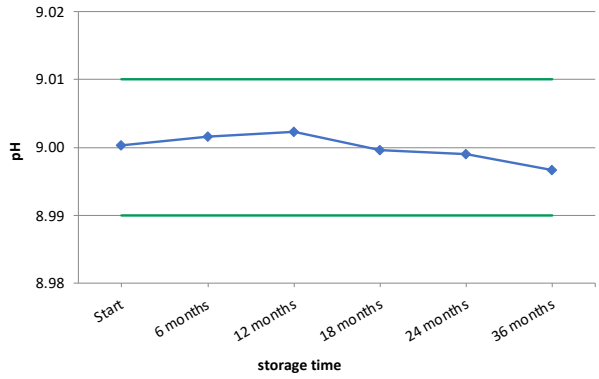
Buffer solution pH 8.00 in 4 L-Titripac® format



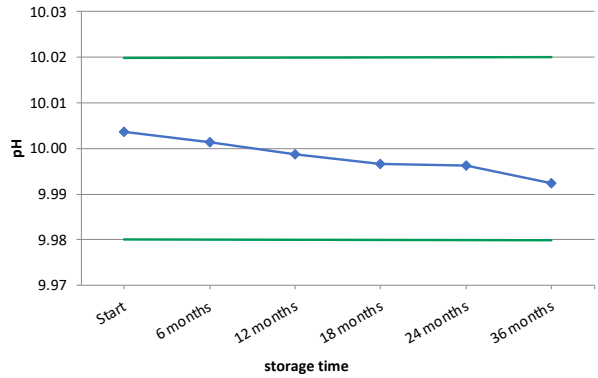
Buffer solution pH 9.00 in 4 L-Titripac® format



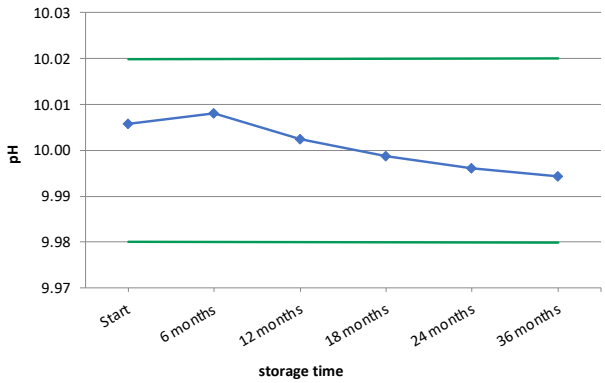
Buffer solution pH 9.00 in 10 L-Titripac® format



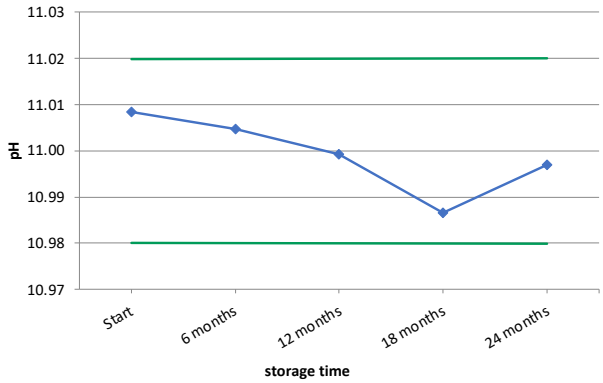
Buffer solution pH 10.00 in 4 L-Titripac® format



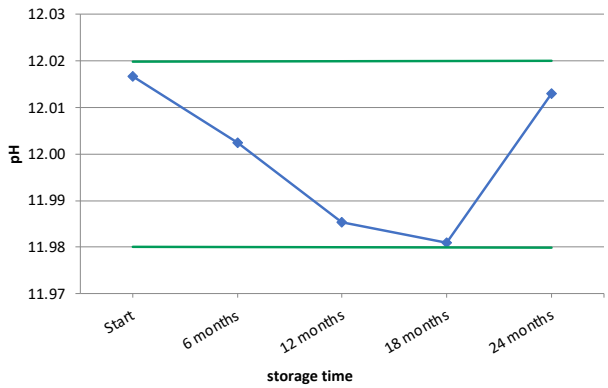
Buffer solution pH 10.00 in 10 L-Titripac® format



Buffer solution pH 11.00 in 4 L-Titripac® format



Buffer solution pH 12.00 in 4 L-Titripac® format



C. Certipur® buffer solutions in sachets [25 °C]

For precise and reliable measurements combined with ease of use, we offer a range of certified, ready-to-use Certipur® buffer solutions with exact reference pH values—safely packed in sealed sachets. All Certipur® buffer sachets are traceable to standard reference materials from NIST and PTB.

Advantages:

- Preparation effort reduced to a minimum: Just open the sachet and start calibrating
- Accurate pH value
- Available in small and handy single-use quantities (30 mL)
- Always fresh and ready-to-use
- No residues
- Decreased risk of contamination

Table 7: Certipur® buffer solutions in sachets [25 °C]

pH value [25 °C]	Designation	Composition	Package Size	Cat. No.
2.00	Buffer solution	Citric acid/sodium hydroxide/hydrogen chloride	30 sachets x 30 mL	**1.99012.0001**
4.00	Buffer solution	Citric acid/sodium hydroxide/hydrogen chloride	30 sachets x 30 mL	**1.99064.0001**
4.01	Buffer solution	Potassium hydrogen phthalate	30 sachets x 30 mL	**1.99001.0001**
6.00	Buffer solution	Citric acid/sodium hydroxide	30 sachets x 30 mL	**1.99016.0001**
7.00	Buffer solution	Potassium dihydrogen phosphate/di-sodium hydrogen phosphate	30 sachets x 30 mL	**1.99002.0001**
9.00	Buffer solution	Boric acid/potassium chloride/sodium hydroxide solution	30 sachets x 30 mL	**1.99003.0001**
9.18	Buffer solution	Di-sodium tetraborate	30 sachets x 30 mL	**1.99019.0001**
10.00	Buffer solution	Boric acid/potassium chloride/sodium hydroxide	30 sachets x 30 mL	**1.99004.0001**
11.00	Buffer solution	Boric acid/sodium hydroxide/potassium chloride	30 sachets x 30 mL	**1.99021.0001**
12.00	Buffer solution	di-Sodium hydrogen phosphate/sodium hydroxide	30 sachets x 30 mL	**1.99022.0001**
Buffer solution Kits				
4.01 7.00 9.00	Buffer solutions	pH 4.01 (25 °C, phthalate)/ pH 7.00 (25 °C, phosphate)/ pH 9.00 (borate)	3 x 10 sachets x 30 mL	**1.99005.0001**
4.01 7.00 10.00	Buffer solutions	pH 4.01 (25 °C, phthalate)/ pH 7.00 (25 °C, phosphate)/ pH 10.00 (borate)	3 x 10 sachets x 30 mL	**1.99006.0001**

D. Titrisol® buffer concentrates

We offer buffer concentrates with pH reference values ranging from 1.00 to 13.00 (at 20 °C) for the routine calibration and monitoring of your pH instruments. To prepare your ready-to-use pH buffer solution, simply dilute your Titrisol® buffer concentrate. These buffer concentrates are easy to use and provide maximum precision.

Key Features:

- Measured after dilution to 500 mL using a combination glass electrode via multiple point calibration (according to DIN 19268) with reference materials for the preparation of standard buffer solutions according to DIN 19266.
- Traceable to primary standard reference materials from NIST (U.S.) and PTB in Brunswick (Germany).
- Analytical standard Grade

Table 8: Titrisol® buffer concentrates for 500 mL buffer solutions, [20 °C]

pH value [20 °C]	Designation	Composition	Package Size	Cat. No.
1.00	Buffer concentrate	Glycine/hydrochloric acid	1 Ampoule	**1.09881.0001**
2.00	Buffer concentrate	Citrate/hydrochloric acid	1 Ampoule	**1.09882.0001**
3.00	Buffer concentrate	Citrate/hydrochloric acid	1 Ampoule	**1.09883.0001**
4.00	Buffer concentrate	Citrate/hydrochloric acid	1 Ampoule	**1.09884.0001**
5.00	Buffer concentrate	Citrate/sodium hydroxide	1 Ampoule	**1.09885.0001**
6.00	Buffer concentrate	Citrate/sodium hydroxide	1 Ampoule	**1.09886.0001**
7.00	Buffer concentrate	Phosphate	1 Ampoule	**1.09887.0001**
7.20	Buffer concentrate acc. to Weise	Phosphate	1 Ampoule	**1.09879.0001**
8.00	Buffer concentrate	Borate/hydrochloric acid	1 Ampoule	**1.09888.0001**
9.00	Buffer concentrate	Boric acid/potassium chloride/sodium hydroxide	1 Ampoule	**1.09889.0001**
10.00	Buffer concentrate	Boric acid/potassium chloride/sodium hydroxide	1 Ampoule	**1.09890.0001**
11.00	Buffer concentrate	Boric acid/potassium chloride/sodium hydroxide	1 Ampoule	**1.09880.0001**
12.00	Buffer concentrate	Phosphate/sodium hydroxide	1 Ampoule	**1.09892.0001**
13.00	Buffer concentrate	Potassium chloride/sodium hydroxide	1 Ampoule	**1.09893.0001**

E. Other pH Buffers

Table 9: pH Buffers (available only in USA)*

pH value	Designation	Package Size	Cat. No.
1.00	Buffer pH 1.0 Clear	500 mL	**BX1651-1**
1.68	Buffer pH 1.68	500 mL	**EM0182-2**
2.00	Buffer pH 2.0 Clear	500 mL	**BX1652-1**
3.00	Buffer pH 3.0 Clear	500 mL	**BX1653-1**
4.00	Buffer pH 4.0 Clear	500 mL	**BX1634-1**
4.00	Buffer pH 4.0 Red	500 mL	**BX1628-1**
		4 L	**BX1628-4**
		20 L	**BX1628-3**
5.00	Buffer pH 5.0 Clear	500 mL	**BX1655-1**
6.00	Buffer pH 6.0 Clear	500 mL	**BX1656-1**
6.86	Buffer pH 6.86	500 mL	**EM0186-2**
7.00	Buffer pH 7.0 Clear	500 mL	**BX1635-1**
7.00	Buffer Concentrate, pH 7.0	500 mL	**BX1627-1**
7.00	Buffer pH 7.0 Yellow	500 mL	**BX1632-1**
		4 L	**BX1632-4**
		20 L	**BX1632-3**
8.00	Buffer pH 8.0 Clear	500 mL	**BX1657-1**
9.00	Buffer pH 9.0 Clear	500 mL	**BX1658-1**
10.00	Buffer pH 10.00 Blue	500 mL	**BX1633-1**
		4 L	**BX1633-4**
		20 L	**BX1633-3**
10.00	Buffer pH 10.0 Clear	500 mL	**BX1636-1**
10.00	Buffer pH 10.0 Blue	500 mL	**BX1641-1**
10.00	Buffer pH 10.0 Clear	500 mL	**BX1642-1**
12.45	Buffer pH 12.45	500 mL	**EM0180-2**
-	Buffer Variety Pack, Kit	1 pk	**BX1626-1**

***Key features:**

- Traceable to NIST standards
- Accurate up to +/- 0.02 at 25 °C
- Available in a sealed bottle with convenient packaging to protect against contamination
- Accompanied with a certificate of analysis (CoA) for an effective audit

Benefits & Applications

Table 10: Benefits & Applications of various pH calibration buffers

Benefits & Applications	Certified secondary standard reference materials	Ready-to-use buffer solutions	Certipur® buffer solutions in sachets	Titrisol® buffer concentrates
pH instrument and electrode qualification & validation	✓			
Routine pH instrument & electrode calibration		✓	✓	
Preparation of buffer solutions				✓
Directly traceable to primary SRM from NIST/PTB	✓	✓	✓	✓
Manufactured according to ISO 17034	✓	✓	✓	
Shelf Life	4 years	3years	3 & 2 years	5 years
Storage (+15 °C to +25 °C)	✓	✓	✓	✓
Packaging				
Sachets			✓	
Titripac® Packaging		✓		
PE & glass bottles	✓	✓		
Plastic ampoule				✓

More information on pH buffers: **SigmaAldrich.com/phbuffers**

Supelco®
Analytical Products

MilliporeSigma
400 Summit Drive
Burlington, MA 01803

SigmaAldrich.com

To place an order or receive technical assistance

Order/Customer Service: **SigmaAldrich.com/order**
Technical Service: **SigmaAldrich.com/techservice**
Safety-related Information: **SigmaAldrich.com/safetycenter**

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