Volumetric Solutions and Standards for Titration

Accuracy and precision, every time

The life science business of Merck KGaA, Darmstadt, Germany operates as MilliporeSigma in the U.S. and Canada.

Supelco®
Analytical Products

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Advantages

- Consistent high level of quality
- Innovative and safe packaging options
- Produced under stringent production processes
- Titripur® volumetric solutions analyzed by our DIN EN ISO/IEC 17025 accredited lab

SigmaAldrich.com/titration

Volumetric solutions

Titripur® | Titripac® | Titrisol® | Titriplex®

Sophisticated and precise analyses require precisely adjusted and produced volumetric solutions. Whether you're titrating reducing or oxidizing substances, acids, bases or complexing reagents in either aqueous or non-aqueous solutions: we offer the right solutions for every application.

Trust your titration results with Titripur® volumetric solutions

Titripur® – precision and quality

Like all products we offer, Titripur® volumetric solutions are subject to stringent manufacturing and testing requirements. From the selection of the raw materials and packaging to quality control, the highest demands are placed on purity and quality. The Quality Control Laboratory at Merck KGaA, Darmstadt, Germany is now accredited by DAkkS (Deutsche Akkreditierungsstelle - German Accreditation Body) as calibration laboratory D-K-15185-01-00 for the “amount-of-substance concentrations in volumetric solutions” according to DIN EN ISO/IEC 17025. All Titripur® volumetric solutions are are analyzed by our DIN EN ISO/IEC 17025 accredited laboratory.

Specification / Traceability

NIST	National Institute of Standards and Technology, Gaithersburg, Maryland, USA
Reag Ph Eur	Reagents according to the reagents part of the European Pharmacopeia
Reag USP	United States Pharmacopoeia requirements for reagents

Titripur®

- Reagent
- Titration
- Quantitative determination of a compound
- ISO 17205

Certipur®

- Standard
- Qualification
- Verification of the titration system
- ISO 17025 / ISO 17034

Titripur® | Volumetric solutions

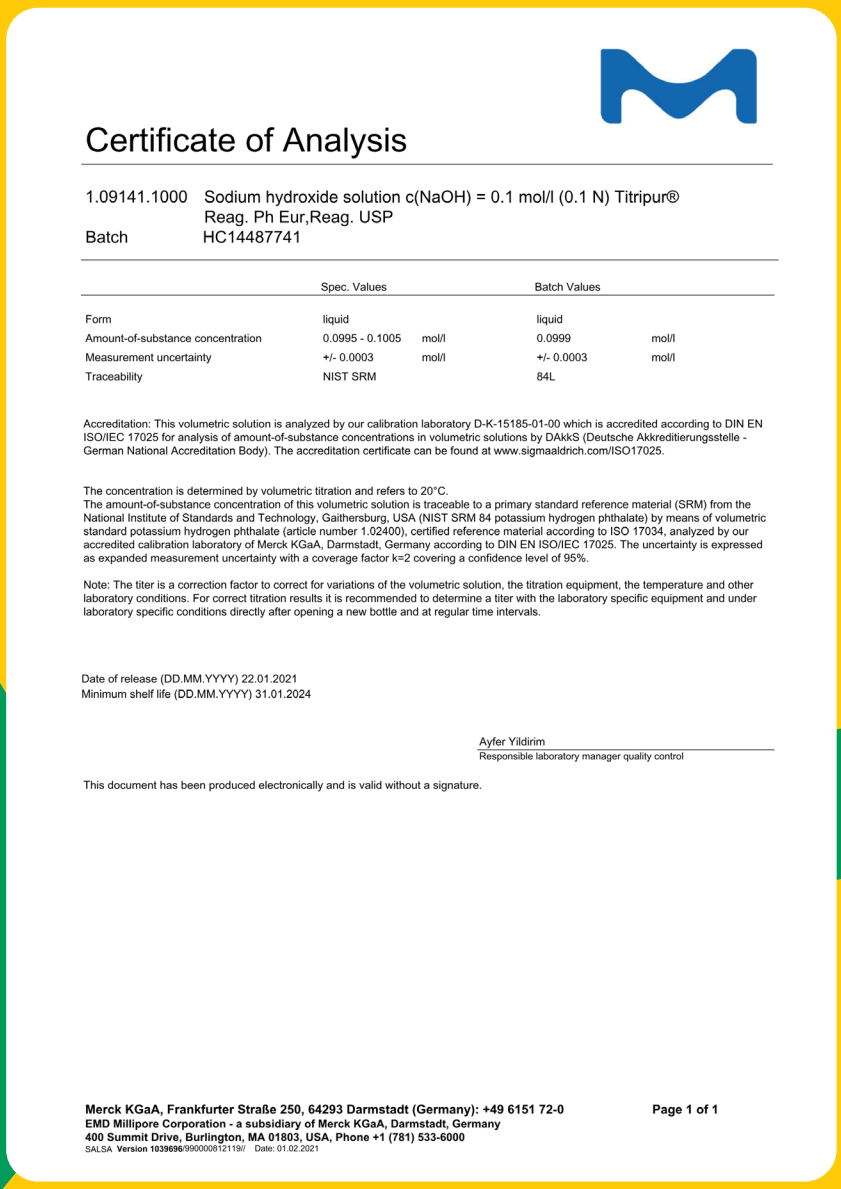
Under the brand name Titripur®, we offer you first-rate volumetric solutions. Additionally, some volumetric solutions are described in the European and US Pharmacopeia; those solutions we offer are in accordance with the reagents chapter of the Pharmacopeias. For each solution, titer determination is performed under optimum and standardized conditions. All volumetric solutions are traceable to certified reference materials, which in turn are directly traceable to standard reference materials from the NIST. Consequently all our volumetric solutions are traceable to NIST standard reference materials and measured in our DIN EN ISO/IEC 17025 accredited Quality Control Laboratory at Merck KGaA, Darmstadt, Germany.

Certipur® | Volumetric standards

Volumetric standards are used for the standardization – titer determination – of volumetric solutions and for the qualification of the titration system. Influencing factors such as temperature, instrument variances, different methods of handling, weighing errors etc., as well as the volumetric solution itself can impact the titration result. To compensate for these factors, titer determination under working conditions is necessary in the respective laboratory. All Certipur® voluemtric standards are according to European and/or the United States Pharemacopeia. The quality control laboratory of Merck KGaA, Darmstadt, Germany is in the scope of the DIN EN ISO/IEC 17025 accreditation for mass fraction of titrimetric standards and our volumetric standards are qualified as certified reference materials according to ISO 17034. All our volumetric standards are tracable to Standard Reference Materials from NIST (National Institute of Standards and Technology, Gaithersburg, USA).

That’s Titripur®: Quality assurance throughout the entire manufacturing and quality control process

The manufacturing and quality control process for Titripur® solutions meets the highest standards. The Certificate of Analysis contains all the information important for quality management documentation. Furthermore, it includes information on traceability and the batch of the primary standards used from NIST. Additionally, it gives the information about the measurement in the DIN EN ISO/IEC 17025 accredited laboratory.



Certificate of Analysis

1.09141.1000 Sodium hydroxide solution c(NaOH) = 0.1 mol/l (0.1 N) Titripur® Reag. Ph Eur,Reag. USP

Batch HC14487741

	Spec. Values		Batch Values	
Form	liquid		liquid	
Amount-of-substance concentration	0.0995 - 0.1005	mol/l	0.0999	mol/l
Measurement uncertainty	+/- 0.0003	mol/l	+/- 0.0003	mol/l
Traceability	NIST SRM		84L	

Accreditation: This volumetric solution is analyzed by our calibration laboratory D-K-15185-01-00 which is accredited according to DIN EN ISO/IEC 17025 for analysis of amount-of-substance concentrations in volumetric solutions by DAkkS (Deutsche Akkreditierungsstelle - German National Accreditation Body). The accreditation certificate can be found at www.sigmaaldrich.com/ISO17025.

The concentration is determined by volumetric titration and refers to 20°C.
The amount-of-substance concentration of this volumetric solution is traceable to a primary standard reference material (SRM) from the National Institute of Standards and Technology, Gaithersburg, USA (NIST SRM 84 potassium hydrogen phthalate) by means of volumetric standard potassium hydrogen phthalate (article number 1.02400), certified reference material according to ISO 17034, analyzed by our accredited calibration laboratory of Merck KGaA, Darmstadt, Germany according to DIN EN ISO/IEC 17025. The uncertainty is expressed as expanded measurement uncertainty with a coverage factor k=2 covering a confidence level of 95%.

Note: The titer is a correction factor to correct for variations of the volumetric solution, the titration equipment, the temperature and other laboratory conditions. For correct titration results it is recommended to determine a titer with the laboratory specific equipment and under laboratory specific conditions directly after opening a new bottle and at regular time intervals.

Date of release (DD.MM.YYYY) 22.01.2021
Minimum shelf life (DD.MM.YYYY) 31.01.2024

Ayfer Yildirim
Responsible laboratory manager quality control

This document has been produced electronically and is valid without a signature.

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Titripur® volumetric solutions analyzed by our DIN EN ISO / IEC 17205 accredited calibration laboratory

Rely on consistently good results in your laboratory using Titripur® volumetric solutions analyzed by our ISO/IEC 17025 laboratory with Certipur® volumetric standard, certfied reference materials (CRMs) according to ISO 17034 . Laboratories that either work in regulated environments, or are ISO/IEC 17025 accredited, are better prepared for audits. ISO/IEC 17025 is a recognized international accreditation for laboratories and is accepted worldwide through the International Laboratory Accreditation Organization (ILAC), and every country has its own accreditation bodies that are members of the ILAC.

DAkkS
Deutsche
Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV
Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition

Accreditation

The Deutsche Akkreditierungsstelle GmbH attests that the calibration laboratory

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

is competent under the terms of DIN EN ISO/IEC 17025:2018 to carry out calibrations in the following fields:

Chemical and medical quantities
Chemical analysis and reference materials
- **pH value**
- **Electrolytic conductivity**
- **Mass fraction of elements in standard solutions**
- **Amount of substance concentration of elements in standard solutions**
- **Mass fraction of titrimetric standards**
- **Mass fraction in water and titrimetric standards**
- **Amount-of-substance concentration in volumetric solutions**

The accreditation certificate shall only apply in connection with the notice of accreditation of 18.11.2019 with the accreditation number D-K-15185-01. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 3 pages.

Registration number of the certificate: **D-K-15185-01-00**

Braunschweig, 18.11.2019 — Dr. Heike Menke, Head of Division — Translation issued: 18.11.2019 — Head of Division

The certificate together with its annex reflects the status at the time of the date of issue. The current status of the scope of accreditation can be found in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH.
https://www.dakks.de/en/content/accredited-bodies-dakks

This document is a translation. The definitive version is the original German accreditation certificate.

Titripur® for reliabile quality all the time

Titripur® volumetric solutions are analyzed by our DIN EN ISO/IEC 17025 accredited calibration laboratory. The Quality Control Laboratory at Merck KGaA, Darmstadt, Germany is accredited by the Deutsche Akkreditierungsstelle- German Accreditation Body (DAkkS) as calibration laboratory D-K-15185-01-00 for the “amount-of-substance concentrations in volumetric solutions” according to DIN EN ISO/IEC 17025 , which is one of the highest standards for laboratories.

Traceability & Uncertainty

With the ISO/IEC 17025 accreditation as calibration laboratory the traceability to a national normal is completely ensured. For the Titripur® volumetric solution we trace back to a primary NIST (National Institute of Standards and Technology) standard, USA. Deviations from the normal in every single stage will be documented in the test chain and further sources of errors e.g. repeatability or reproducibility will be documented and included in the expanded measurement uncertainty. The expanded measurement uncertainty for the amount of substance concentration can be found in the Certificate of Analysis and as well in the DAkkS Accreditation certificate annex (See the annex at **SigmaAldrich.com/ISO17025**), as well the specification range.

With the Titripur® grade, you can be sure that your analyses always meet the highest demands.

Compliance, always ensured

Titripur® – volumetric solutions in accordance with the reagents part of European and US pharmacopoeias

The Titripur® line also includes volumetric solutions that are used specifically for analytical purposes in the pharmaceutical industry and correspond to the reagents part of the European and US Pharmacopoeia for analytical applications. For available solutions, this is indicated in the certificate and on the label.

Titriplex® – for complexometric titration

For chelate ligands, we offer the well-known Titriplex® brand to determine metal ions by complexometric titration. In addition to solid substances, ready-to-use solutions are also available in PE bottles and Titripac®.

Innovative packaging – optimized for every application

In order to ensure high product quality, packaging is needed to protect the solution from impurities and contamination. Therefore, we offer a wide range of high-quality packaging options for volumetric solutions and only uses glass and plastic grades that do not alter any of the product's characteristics. All our packaging materials have been tested for their quality and atmospheric permeability, thereby ensuring the purity and concentration of the solutions; also during storage up to their minimum shelf life for sealed, original containers.

Titrisol® – concentrates for greater flexibility

For users who regularly perform different types of analysis and need specific concentrations, we also offer most volumetric solutions as Titrisol® concentrates.

Every ampoule contains a precisely defined quantity of substance that is normally filled to a final volume of 1 L. However, any other concentrations can be produced by diluting correspondingly.

Titrisol® advantages

- Space-saving
- Flexible and easy to use
- Individual concentrations can be prepared

Titripur® – reliable and precise ready-to-use solutions

The Titripur® portfolio offers ready-to-use volumetric solutions for daily laboratory analyses. These can be connected directly to a titrator via an adaptor.

Depending on the amount required, volumetric solutions are available in 0.5 L, 1 L, 2.5 L, 5 L, 10 L and 25 L PE bottles or canisters. In addition, volumetric solutions, such as acetic acid or potassium hydroxide solution in methanol that cannot be stored in a stable manner for an extended period of time in PE containers, are available in 1 L and 2.5 L glass bottles.

Additionally, we offer Titripur® grade ready-to-use solutions in our innovative 4 L and 10 L Titripac® packaging systems.

Polyethylene bottles and canisters

- Packaging diversity for every different requirement
- Unbreakable and contamination-free material
- Direct connection to the titrator
- The stability of the solution is ensured for the entire shelf life in unopened bottles

Glass bottles

- Ensuring the stability of special volumetric solutions
- Direct connection to the titrator
- The stability of the solution is ensured for the entire shelf life in unopened bottles

Titripac® – the innovative packaging: Good for the lab, good for the environment

Titripac® – reliable solution from the first to the last drop

Titripac® is an innovative and safe packaging option for high-quality, ready-to-use volumetric solutions. Its economical and ecological advantages enable you to optimize your working processes. The consistent quality of a volumetric solution is ensured from the first to the last drop. A hermetically sealed package system makes this possible. Contamination caused by air, carbon dioxide or microorganisms is excluded.

Titripac® reduces the time-consuming process of titer determinations, because the solution will not change as well as the cost intensive disposal of contaminated residual amounts. The carton can simply be disposed of together with paper, and the internal liner can be easily folded together prior to disposal.

Titripac® is extremely easy to use. The integrated spout appears simply by pressing on the pack. By opening the tap, liquid can be withdrawn at any time – conveniently and without the risk of contamination. In addition, Titripac® can be connected directly to the titrator via an adaptor.

Thanks to this unique eco-friendly concept, Titripac® is a proud winner of the 2016 Green Good Design Award.

The Titripac® packaging system for volumetric solutions is constructed from a recyclable outer carton and a durable inner bag. The inner bag collapses during withdrawal of reagent through the built-in contamination-proof dispenser tap. Therefore the reagent in the bag cannot be contaminated, and when empty, the outer carton can be fully recycled. The amount of packaging per liter is less than half the weight of alternative packaging options like PE bottles.

Green Good Design - the World's Leading Sustainable Green Design

The Green Good Design program is presented by The European Centre for Architecture Art Design and Urban Studies and The Chicago Athenaeum: Museum of Architecture and Design.
It awards innovation in the fields of energy saving, increasing sustainability and recycling.

Precise analyses require precisely adjusted volumetric solutions. With Titripac® you can be sure that you've got a consistent solution up to the very last drop. A direct connection to the titrator via an adaptor makes lab work easier and helps to avoid contamination.

Titripac® advantages

- No contamination: Hermetically sealed pack
- Easy to use: Integrated withdrawal tap, direct connection to a titrator is possible
- Saves costs and time: No unnecessary titer determinations, no contaminated residual amounts
- Environmentally friendly disposal: Reduced package waste, as carton and internal liner can be disposed of separately

Exclusive packaging: Internal liner and external carton can be easily disposed of separately.

Quality perfected for your intended use

Rigorous control throughout our facilities – quality throughout every stage of product design, development and manufacture ensures they work reliably in your testing protocols

Our efficiency improves yours

Easy to order, easy to use – our industry-leading eCommerce platform will help you find the product you need and our efficient supply chain will get it to you on time

SigmaAldrich.com/titration

Waste of 20 x 1 L PE bottles, 2 x 10 L Titripac®

Ordering information

Titripur® volumetric solutions

			Ready-to-use solutions				
				Titripur®		Titripur®	
	Product	Concentration	Titrisol® Ampoules for 1 L solution Order No.	Glass bottles, PE bottles/canisters Order No.		Titripac® Order No.	
A	Acetic acid	0.1 mol/L (0.1 N)	1.09944.0001	1 L:	1.60250.1000	—	
		1 mol/L (1 N)	1.09951.0001		1.60305.1000	—	
		1 mol/L (1 N) prepared from raw materials acc. to Ph Eur	—	25 L:	1.99061.9025	—	
		2 mol/L (2 N)		1 L:	1.60323.1000		
	Ammonium cer(IV)nitrate solution	0.1 mol/L (0.1 N)	—	1 L:	1.02277.1000[1]	—	
	Ammonium iron(II) sulfate solution	0.1 mol/L (0.1 N)	1.09864.0001	—		—	
	Ammonium thiocyanate solution	0.1 mol/L (0.1 N)	1.09900.0001	1 L:	1.09079.1000[1,2]	—	
B	Barium chloride solution	0.05 mol/L (0.1 N)	1.09962.0001	1 L:	1.60325.1000	—	
		0.1 mol/L (0.2 N)		1 L:	1.60324.1000		
	Barium perchlorate solution	0.005 mol/L in 2-propanol/water (80:20)	—	1 L:	1.09086.1000[2]	—	
	Bromide bromate solution	0.05 mol/L (0.1 N)	1.09905.0001	1 L:	1.60316.1000	—	
C	Cer (IV) sulfate solution	0.1 mol/L (0.1 N)	—	1 L:	1.09092.1000[1,2]	—	
		0.1 mol/l (0.1 N)		1L:	1.60338.1000		
	Copper sulfate solution	0.1 mol/L	—	1 L:	1.02784.1000	—	
	Copper-di-ammonium Titriplex® solution	0.1 mol/L	—	0.5 L:	1.05217.0500	—	
H	Hanus solution (Iodomonobromide solution)	0.1 mol/L in acetic acid	—	1 L:	1.09164.1000	—	
	Hyamine, 1622 solution for the determination of anionic tensides	0.004 mol/L	—	1 L:	1.15480.1000	—	
	Hydrochloric acid	0.01 mol/L (0.01 N)	1.09974.0001	1 L:	1.60238.1000	4 L:	1.60238.4000
		0.05 mol/L (0.05 N)		1 L:	1.60327.1000		
		0.1 mol/L	1.09973.0001	1 L:	1.09060.1000[1,2]	4 L:	1.09060.4000[1,2]
			—	5 L:	1.09060.5000[1,2]	10 L:	1.09060.9010[1,2]
			—	25 L:	1.09060.9025[1,2]		
		0.1 mol/L (0.1 N) in 2-propanol	—	1 L:	1.00326.1000	—	
		0.357 mol/L (1/2.8 N)	—	—		10 L:	1.13136.9010
		0.5 mol/L (0.5 N)	1.09971.0001	1 L:	1.09058.1000[1,2]	4 L:	1.09058.4000[1,2]
			—	5 L:	1.09058.5000[1,2]	—	
			—	25 L:	1.09058.9025[1,2]	—	
		1 mol/L (1 N)	1.09970.0001	1 L:	1.09057.1000[1,2]	4 L:	1.09057.4000[1,2]
			—	2.5 L:	1.09057.2500[1,2]	10 L:	1.09057.9010[1,2]
			—	5 L:	1.09057.5000[1,2]	—	
			—	25 L:	1.09057.9025[1,2]	—	
		1 mol/L (1 N) prepared from raw materials acc. to Ph Eur	—	25 L:	1.99070.9025	—	
		2 mol/L (2 N)	—	1 L:	1.09063.1000	—	
				25 L:	1.09063.9025		
		3.571 mol/L (1/0.28 N)	—	—		10 L:	1.13134.9010
		4 mol/L (4 N)		1 L:	1.60328.1000		
		5 mol/L (5 N)	—	1 L:		—	

[1] Solution in accordance with the reagents chapter of Pharm. Eur (European Pharmacopoeia)
[2] Solution in accordance with the reagents chapter of USP (United States Pharmacopeia)

			Ready-to-use solutions			
				Titripur®		Titripur®
	Product	Concentration	Titrisol® Ampoules for 1 L solution Order No.	Glass bottles, PE bottles/canisters Order No.		Titripac® Order No.
I	Iodide-iodate solution	1/128 mol/L I 2 (1/64 N)	1.09911.0001	—		—
		1/128 mol/L (1/64 N)		1L:	1.60337.1000	
	Iodine solution	0.05 mol/L (0.1 N)	1.09910.0001	1 L:	1.09099.1000 [1,2]	—
		0.5 mol/L (1 N)	—	1 L:	1.09098.1000 [1]	—
M	Mercury(II)nitrate solution	0.05 mol/L (0.1 N)	—	1 L:	1.09143.1000 [2]	—
N	Nitric acid	0.1 mol/L	1.09964.0001	1 L:	1.60236.1000	—
		1 mol/L (1 N)	1.09966.0001	1 L:	1.60307.1000	—
		10 mol/L (10 N)	—	1 L:	1.00630.1000	—
O	Oxalic acid solution	0.005 mol/L (0.01 N)	1.09932.0001	1L:	1.60329.1000	—
		0.05 mol/L (0.1 N)	1.09965.0001	1L:	1.60330.1000	—
P	Perchloric acid	0.1 mol/L (0.1 N) in water-free acetic acid	—	1 L:	1.09065.1000 [1,2]	—
	Potassium bromate solution	1/60 mol/L (0.1 N)	1.09925.0001	1 L:	1.60308.1000	—
	Potassium chloride solution	0.2 mol/L (0.2 N)	—	1 L:	1.60332.1000	—
		1 mol/L (1 N)	—	1 L:	1.60333.1000	—
	Potassium dichromate solution	1/60 mol/L (0.1 N)	1.09928.0001	1 L:	1.60333.1000	—
		1/24 mol/L (0.25 N)	—	1 L:	1.09118.1000	—
		0.020 mol/L	—	1 L:	1.09119.1000	—
	Potassium hydroxide solution	0.1 mol/L (0.1 N)	1.09921.0001	1 L:	1.09112.1000 [1]	—
		0.1 mol/L (0.1 N) in ethanol	—	1 L:	1.09115.1000 [1,2]	—
			—	2.5 L:	1.09115.2500 [1,2]	—
		0.1 mol/L (0.1 N) in methanol	—	1 L:	1.11587.1000	—
		0.1 mol/L (0.1 N) in 2-propanol	—	1 L:	1.05544.1000	—
		0.5 mol/L (0.5 N)	1.09919.0001	5 L:	1.11586.5000 [2]	—
		0.5 mol/L (0.5 N) in ethanol	—	1 L:	1.09114.1000 [1]	—
			—	1 L:	1.60341.1000 [2]	—
			—	2.5 L:	1.09114.2500 [1,2]	—
		0.5 mol/L (0.5 N) in methanol	—	1 L:	1.09351.1000	—
		1 mol/L (1 N)	1.09918.0001	1 L:	1.09108.1000 [1,2]	—
		1 mol/L (1 N) max. 0.4 ppm Ca	—	1 L:	1.09107.1000	—
		1 mol/L (1 N) in methanol	—	1 L:	1.60334.1000	
		2.0 mol/L (2 N) in methanol	—	2.5 L:	1.11787.2500 [2]	—
	Potassium iodate solution	1/60 mol/L (0.1 N)	1.09917.0001	1 L:	1.60335.1000	—
	Potassium permanganate solution	0.002 mol/L (0.01 N)	1.09930.0001	1 L:	1.60322.1000	—
		0.01mol/L (0.05 N)	—	1 L:	1.60321.1000	
		0.02 mol/L (0.1 N)	1.09935.0001	—		—
		0.02 mol/L (0.1 N) standardized with sodium thiosulfate	—	1 L:	1.09121.1000 [1]	—
		0.02 mol/L (0.1 N) standardized with oxalate	—	1 L:	1.09122.1000 [2]	—
		0.05 mol/L (0.25 N)	—	2.5 L:	4.80160.2500	—

[1] Solution in accordance with the reagents chapter of Pharm. Eur (European Pharmacopoeia)
[2] Solution in accordance with the reagents chapter of USP (United States Pharmacopeia)

Titripur® volumetric solutions

				Ready-to-use solutions			
				Titripur®		Titripur®	
	Product	Concentration	Titrisol® Ampoules for 1 L solution Order No.	Glass bottles, PE bottles/canisters Order No.		Titripac® Order No.	
S	Silver nitrate solution	0.05 mol/L (0.05 N)	—	1 L:	1.11718.1000[1,2]	—	
		0.1 mol/L (0.1 N)	1.09990.0001	1 L:	1.09081.1000[1,2]	4 L:	1.09081.4000[1,2]
			—	2.5 L:	1.09081.2500[1,2]	10 L:	1.09081.9010[1,2]
		1 mol/L (1 N)	—	1 L:	1.09080.1000	—	
	Sodium arsenite solution	0.05 mol/L (0.1 N)	—	1 L:	1.06277.1000[2]	—	
	Sodium carbonate solution	0.05 mol/L (0.1 N)	1.09940.0001	1 L:	1.60310.1000	—	
	Sodium chloride solution	0.1 mol/L (0.1 N)	1.09945.0001	1 L:	1.60336.1000	—	
	Sodium hydroxide solution	0.005 mol/L (0.005 N) in methanol	—	10 L:	4.80621.9010	—	
		0.01 mol/L (0.01 N)	1.09961.0001	1 L:	1.60309.1000	4 L:	1.60309.4000
		0.02 mol/L (0.02 N)	—	0.5 L:	1.09142.0500	—	
		0.1 mol/L (0.1 N)	1.09959.0001	1 L:	1.09141.1000[2]	4 L:	1.09141.4000[1]
			—	5 L:	1.09141.5000[1]	10 L:	1.09141.9010[1]
			—	25 L:	1.09141.9025[1]	—	1.60340.4000[2]
		0.2 mol/L (0.2 N)	—	1 L:	1.09140.1000	10 L:	1.09140.9010
		0.25 mol/L (0.25 N)	1.09958.0001	1 L:	1.09139.1000	10 L:	1.09139.9010
		0.33 mol/L (0.33 N)	—	1 L:	1.05595.1000	10 L:	1.05595.9010
		0.5 mol/L (0.5 N)	1.09957.0001	1 L:	1.09138.1000	4 L:	1.09138.4000
				25 L:	1.09138.9025	10 L:	1.09138.9010
		1 mol/L (1 N)	1.09956.0001	1 L:	1.09137.1000[1]	4 L:	1.09137.4000[1,2]
				1L	1.60340.1000[2]		
			—	2.5 L:	1.09137.2500[1,2]	10 L:	1.09137.9010[1,2]
				25 L:	1.09137.9025[1,2]	—	
		1 mol/L (1 N) prepared from raw materials acc. to Ph Eur	—	25 L:	1.99060.9025	—	
		2 mol/L (2 N)	—	1 L:	1.09136.1000	—	
			—	25 L:	1.09136.9025		
		4 mol/L (4 N)	—	5 L:	1.11584.5000	—	
		5 mol/L (5 N)	1.09913.0001	1 L:	—	—	
		6 mol/L (1 N) prepared from raw materials acc. to Ph Eur	—	25 L:	1.99062.9025	—	
	Sodium thiosulfate solution	0.01 mol/L (0.01 N)	1.09909.0001	1 L:	1.60318.1000	—	
		0.05 mol/L (0.05 N)	—	1 L:	1.60311.1000	—	
		0.1 mol/L (0.1 N)	1.09950.0001	1 L:	1.09147.1000[1,2]	4 L:	1.09147.4000[1,2]
			—	25 L:	1.09147.9025[1,2]	10 L:	1.09147.9010[1,2]
		1 mol/L (1 N)	—	1 L:	1.60312.1000	—	
	Sulfuric acid	0.005 mol/L (0.01 N)	1.09982.0001	1 L:	1.60314.1000	—	
		0.05 mol/L (0.1 N)	1.09984.0001	1 L:	1.09074.1000[1]	4 L:	1.09074.4000[1]
			—	5 L:	1.09074.5000[1]	10 L:	1.09074.9010[1]
		0.1mol/ L (0.2 N)	—	1 L:	1.60236.1000	—	
		0.25 mol/L (0.5 N)	—	1 L:	1.09073.1000	4 L:	1.09073.4000
			—	—		10 L:	1.09073.9010

[1] Solution in accordance with the reagents chapter of Pharm. Eur (European Pharmacopoeia)
[2] Solution in accordance with the reagents chapter of USP (United States Pharmacopeia)

			Ready-to-use solutions			
			Titripur®		Titripur®	
	Product	Concentration	Titrisol® Ampoules for 1 L solution Order No.	Glass bottles, PE bottles/canisters Order No.	Titripac® Order No.	
S	Sulfuric acid	0.5 mol/L (1 N)	1.09981.0001	1 L: 1.09072.1000[1,2]	4 L:	1.09072.4000[1,2]
			—	5 L: 1.09072.5000[1,2]	10 L:	1.09072.9010[1,2]
		1 mol/L (2 N)		1 L: 1.60313.1000	—	
		2.5 mol/L (5 N)	1.09912.0001	1 L: 4.80364.1000	—	
			—	25 L: 4.80364.9025	—	
		5 mol/L (10 N)	—	1 L: 1.60315.1000	—	
T	Tetra-n-butyl-ammonium hydroxide solution	0.1 mol/L (0.1 N) in 2-propanol/methanol	—	0.5 L: 1.09162.0500[1,2]	—	
			—	1 L: 1.09162.1000[1,2]	—	
	Tetramethylammonium hydroxide solution	0.1 mol/L (0.1 N) in 2-propanol/methanol	—	0.25 L: 1.08124.0250[2]	—	
			—	1 L: 1.08124.1000	—	
	Titriplex® solution A	50 mg CaO/L = 1 mL	—	1 L: 1.08419.1000	—	
	Titriplex® solution B	10 mg CaO/L = 1 mL	—	1 L: 1.08420.1000	10 L:	1.08420.9010
			—	5 L: 1.08420.5000	—	
	Titriplex® III solution (Na_2-EDTA)	0.05 mol/L (0.05 N)	—	1 L: 1.60320.1000	—	
		0.01 mol/L	1.08446.0001	1 L: 1.60319.1000	—	
		0.1 mol/L	1.09992.0001	1 L: 1.08431.1000 1	4 L:	1.08431.4000[1]
			—	—	10 L:	1.08431.9010[1]
	Trifluoromethanesulfonic acid in anhydrous acetic acid	0.1 mol/L	—	1 L: 1.08458.1000	—	
	Titriplex® IV solution (Na_2-DCTA)	0.1 mol/L	—	1 L: 1.08447.1000	4 L:	1.08447.4000
W	Wijs solution (iodomonochloride in acetic acid)	0.1 mol/L	—	1 L: 1.09163.1000	—	
			—	2.5 L: 1.09163.2500		
Z	Zinc sulfate solution	0.1 mol/L	1.09991.0001[2]	1 L: 1.08879.1000[1]	—	

[1] Solution in accordance with the reagents chapter of Pharm. Eur (European Pharmacopoeia)
[2] Solution in accordance with the reagents chapter of USP (United States Pharmacopeia)

Titripur® – made from raw materials in accordance with the European Pharmacopoeia

For some pharmaceutical industry applications, it's important to work with solutions made from raw materials in accordance with the European Pharmacopoeia (Ph. Eur). Even the water[3] used for this purpose has been tested in accordance with European Pharmacopoeia. The relevant information can be found in the certificate.

Ordering information

Titripur® prepared from raw materials acc. to Ph. Eur

			Ready-to-use solutions
	Product	Concentration	Glass bottles, PE bottles/canisters Order No.
H	Hydrochloric acid	1 mol/L (1 N) prepared from raw materials acc. to Ph Eur	25 L: **1.99070.9025**
S	Sodium hydroxide solution	1 mol/L (1 N) prepared from raw materials acc. to Ph Eur	25 L: **1.99060.9025**
		6 mol/L (1 N) prepared from raw materials acc. to Ph Eur	25 L: **1.99062.9025**

Other volumetric solutions made from raw materials in accordance with Pharm. Eur are available on request.
[3]Purified water

Titriplex® solid substances

	Product	Content	Packaging	Ord. No.
I	Titriplex® I for analysis (nitrilotriacetic acid)	250 g	Plastic bottle	**1.08416.0250**
II	Titriplex® II for analysis (ethylenedinitrilotetraacetic acid, EDTA) ACS, Reag. Ph Eur	100 g	Plastic bottle	**1.08417.0100**
		250 g	Plastic bottle	**1.08417.0250**
		1 kg	Plastic bottle	**1.08417.1000**
		5 kg	Plastic bottle	**1.08417.5000**
III	Titriplex® III for analysis (ethylenedinitrilotetraacetic acid disodium salt dihydrate, EDTA disodiumsalt dihydrate) ACS, ISO, Reag. Ph Eur	100 g	Plastic bottle	**1.08418.0100**
		250 g	Plastic bottle	**1.08418.0250**
		1 kg	Plastic bottle	**1.08418.1000**
		5 kg	Plastic bottle	**1.08418.5000**
		10 kg	Plastic bottle	**1.08418.9010**
		25 kg	Plastic bottle	**1.08418.9025**
IV	Titriplex® IV for analysis (1,2-cyclohexylenedinitrilotetraacetic acid monohydrate)	25 g	Plastic bottle	**1.08424.0025**
		100 g	Plastic bottle	**1.08424.0100**
V	Titriplex® V for analysis (dietheylenetriaminepentaacetic acid)	100 g	Plastic bottle	**1.08426.0100**
VI	Titriplex® VI for analysis (3,6 -Dioxaoctamethylenedinitriloacetic acid)	25 g	Plastic bottle	**1.08435.0025**
		100 g	Plastic bottle	**1.08435.0100**

Additional products for Titration

Product	Content	Packaging	Ord. No.
Ammonia Buffer Solution (for Complexometry (ammonium chloride/ammonia) pH = 10-11 Titripur®	1 L	Plastic bottle	**1.09478.1000**
Ammonium buffer solution for complexometry pH = 10 – 11	1 L	Plastic bottle	**1.09478.1000**
Indicator buffer tablets for determination of water hardness with Titriplex® solutions	500 tabs	Plastic can	**1.08430.0500**
	1,000 tabs	Plastic can	**1.08430.1000**
Nitric acid 25% for argentometric titration	0.5 L	Glass bottle	**1.60317.0500**
Sodium hydroxide on support to prevent alkaline solutions from absorbing carbondioxide	250 g	Plastic bottle	**1.01564.1000**
	1 kg	Plastic bottle	**1.01564.1000**
Hydrochloric acid 6 mol/L (6 N)	1 L	Plastic bottle	**1.43007.1000**
Glass rods to open Titrisol(R) glass ampoules	10 pieces	Carton box	**1.29998.0010**

Certipur® - volumetric standards

Certified reference materials according to ISO 17034.

Merck KGaA, Darmstadt, Germany has a DIN EN ISO/IEC 17025 accredited laboratory for mass fraction. All our Certipur® volumetric standards are analyzed in this accredited lab. Our volumetric standards are certified reference materials according to ISO 17034. Additionally, all our volumetric standards are traceable to standard reference material from NIST (National Institute of Standards and Technology, Gaithersburg, Maryland, United States). Proper titer determination is an important prerequisite for accurate and comparable analysis in the titration laboratory. Influential factors such as temperature, instrument variances, different methods of handling, weighing errors, etc. and the volumetric solution itself can impact the titration results. To compensate for these factors, titer determination under working conditions is necessary in the respective laboratory. This is where Certipur® – certified reference materials (volumetric standards) comes in. These are very pure, high-grade and stable solid substances. To ensure their high standard of quality, they are manufactured under the strictest control and measured with the highest possible precision. All our Certipur® volumetric standads are Certified Reference Materials and according to ISO 17034.

Advantages

- Reference material for accurate titer determination
- Highly pure materials traceable to NIST
- In accordance to the reagents part of Pharmacopoeias
- Measured in the ISO 17025 accredited laboratory
- Certified Reference Material according to ISO 17034

Volumetric standards

Analysis	Designation	Package size	Ord. No.
Acidimetry	Sodium carbonate[1]	80 g	**1.02405.0080**
	Tris(hydroxymethyl)aminomethane[2]	80 g	**1.02408.0080**
Alkalimetry	Potassium hydrogen phthalate[1,2]	80 g	**1.02400.0080**
	Benzoic acid[1,2]	60 g	**1.02401.0060**
Argentometry	Sodium chloride[1,2]	80 g	**1.02406.0080**
Complexometry	Zinc[1]	100 g	**1.02409.0100**
	Calcium carbonate[2]	50 g	**1.02410.0050**
Iodometry	Potassium iodate	100 g	**1.02404.0100**
Redox titration	Iron(II)ethylenediammonium sulfate	80 g	**1.02402.0080**
	Potassium dichromate[2]	80 g	**1.02403.0080**
	di-Sodium oxalate[2]	60 g	**1.02407.0060**

[1] Solution according to Reag. Ph. Eur
[2] Solution according to the reagents chapter of

Our high standards match yours

We develop innovative products in collaboration with national metrology institutes, pharmacopeias and governmental agencies.

The right indicator for every titration!

The corresponding indicators for different titrations are available to users who prefer to work manually with burettes. Extensive analysis accompanied by the high standard of quality of our indicators ensure reproducible results.

Ordering information

Indicators

Analysis	Product	Color Change	Package size	Ord. No.
Acidimetry	Bromcresol green	blue – yellow	1 g	**1.08121.0001**
			5 g	**1.08121.0005**
			25 g	**1.08121.0025**
	Thymol blue	yellow – blue	5 g	**1.08176.0005**
			25 g	**1.08176.0025**
	Mixed indicator (4.5) acc. to Mortimer	blue – red	250 mL	**1.01359.0250**
Alkalimetry	Bromphenol blue	blue – yellow	8 g	**1.08122.0005**
			25 g	**1.08122.0025**
	Bromphenol blue	blue – yellow	5 g	**1.03026.0005**
			25 g	**1.03026.0025**
			500 g	**1.03026.0500**
	Congo red	red – blue	25 g	**1.01340.0025**

Indicators

Analysis	Product	Color Change	Package size	Ord. No.
Argentometry	Bromkresol purple	purple – teal	5 g	**1.03025.0005**
			25 g	**1.03025.0025**
			500 g	**1.03025.0500**
	Potassium chromate	yellow – brown – red	250 g	**1.04952.0250**
			1,000 g	**1.04952.1000**
	Fluocrescein sodium	fluorescent green – rose	50 g	**1.03887.0050**
			250 g	**1.03887.0250**
	Neutral red	red violet – orange	25 g	**1.01369.0025**
			100 g	**1.01369.0100**
Complexometry	Methylthymol blue	blue – yellow	1 g	**1.06084.0001**
			5 g	**1.06084.0005**
	Erichrome black T	ruby colored – blue	25 g	**1.03170.0025**
			100 g	**1.03170.0100**
	Calconcarboxylic acid	ruby colored – blue	5 g	**1.04595.0005**
			25 g	**1.04595.0025**
	Indicator buffer tablets	red – green	500 tabs	**1.08430.0500**
			1,000 tabs	**1.08430.1000**
Non aqueous titration	Oracet blue 2 R	rose – blue	5 g	**1.01487.0005**
	1-Naphtholbenzein	yellow – green	5 g	**1.06202.0005**
Redox titration	Diphenyl amine	blue violet – colorless	100 g	**1.09193.0100**
			500 g	**1.09193.0500**
	Ferroin solution (1.10 Phenantroline iron(II) salt)	blue – orange – red	100 g	**1.09193.0100**
			500 g	**1.09193.0500**
	Indigocarmine	blue – yellowish	25 g	**1.04724.0025**

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