

Certipur[®] reference materials.

Not all reference materials
are the same ...



Certipur[®] reference materials

In order to obtain accurate analytical results, it is essential to calibrate all of the instruments used for analysis before commencing. However, such calibration work is only meaningful if reliable reference materials are employed. With EMD Millipore's Certipur[®] reference materials you can always have confidence in your analytical results.

All Certipur[®] reference materials and standards come with a comprehensive Certificate of Analysis (CoA), where all batch-specific parameters and important inspection-relevant data are documented: used analytical method, uncertainty data, traceability including batch number, date of release, minimum shelf life and the responsible laboratory head.

■ Contents

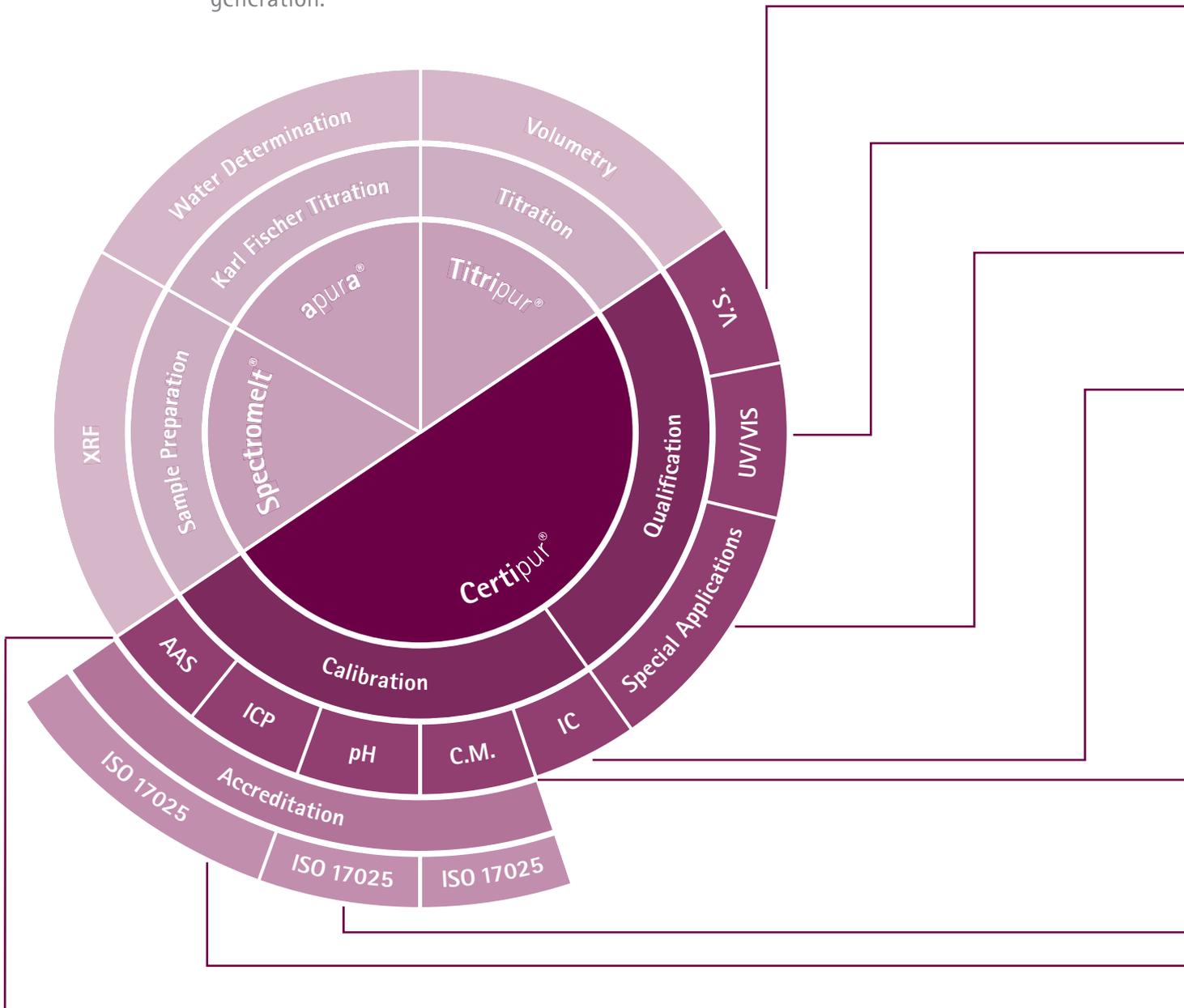
- Quality standards
 - Certipur® reference materials for reliable calibration
- ... in atomic absorption spectroscopy
- ... in pH measurement
- ... in conductivity measurement
- ... in ion chromatography
- ... in UV-VIS spectroscopy
- ... in volumetry
- ... in special applications

■ Benefits

- Outstanding, application-oriented quality
- Stringent quality management system
- Always reliable and reproducible results
- Accreditation according to ISO 17025
- Traceability to standard reference material from NIST and PTB
- Strict specifications

Certipur® – our quality standard in instrumental analysis

EMD Millipore supplies a range of first-class reference materials for a huge range of analytical methods under the trade name Certipur®, so as to fulfill your quality management requirements. For each standard provided, the optimal analytical method has been selected; not only that, but the methods involved are constantly being refined. EMD Millipore invests substantially in equipping its own laboratories and optimizes the quality and accuracy of its products with each new instrument generation.



Specification / Traceability

- ISO** International Organization for Standardization
- NIST** National Institute of Standards and Technology, USA
- PTB** Physical Technical Institute, Germany
- Reag. Ph Eur** Reagents specified by the European Pharmacopoeia
- USP** United States Pharmacopoeia requirements for reagents

Volumetric standards for titration [V.S.]

Volumetric standards | Traceable to standard reference material from NIST and specified according to Reag. Ph Eur and USP

UV-VIS spectroscopy [UV-VIS]

UV-VIS standards | UV-VIS standards are specified according to Reag. Ph Eur

Special applications

Refractive Index standards | Barium sulfate white standard | TOC standard | Reference colour solutions according to Ph Eur

Ion chromatography [IC]

Ion chromatography standards | Traceable to standard reference material from NIST

Conductivity measurement [C.M.]

Conductivity standards | Conductivity standards traceable to standard reference material from NIST and PTB | Measured in Merck KGaA, Darmstadt, Germany, accredited laboratory for pH and conductivity measurement according to ISO 17025

pH measurement [pH]

Buffer solutions and substances and buffer concentrates | Traceable to standard reference material from NIST and PTB | Measured in Merck KGaA, Darmstadt, Germany, accredited laboratory for pH and conductivity measurement according to ISO 17025

Inductively coupled plasma spectroscopy [ICP]

ICP single-element standards | ICP multi-element standards | Traceable to standard reference material from NIST and PTB | Measured in Merck KGaA, Darmstadt, Germany, accredited laboratory for ICP according to ISO 17025

Atomic absorption spectroscopy [AAS]

AAS standards: ready-to-use solutions and concentrates in ampoules | AAS standards dissolved in oil | Traceable to standard reference material from NIST | Measured in Merck KGaA, Darmstadt, Germany, accredited laboratory for ICP according to ISO 17025

Certipur[®] – accreditation and ISO certification

With the worldwide globalization, analytical results have to become more comparable and transparent. Quality management especially for reference material is gaining in importance with respect to the accuracy and precision of analytical measurements. Using highly sophisticated reference materials leads to avoid repeat analysis and save costs.

Accreditation

Accreditation and certification is a process in which certification of competency, authority, or credibility is presented. The basis of our accreditation is our adherence to DIN EN ISO / IEC 17025. In contrast to certification according to DIN EN ISO 9001:2008 which is based on the presence of a company-wide quality management system, accreditation is based on the presence of a competent testing laboratory where not only qualified staff have to be employed, but where each and every analysis carried out has to correspond to specified criteria.

All instrumentation used is regularly checked by officially authorized calibration laboratories. In addition, all relevant parameters used in measurement, e.g. weight and temperature, have to correspond to national and international standards.

Within the framework of accreditation EMD Millipore is required to make a comprehensive statistical uncertainty budget according to GUM (Guide to the expression of Uncertainty in Measurement): all errors that can influence measurement are assessed and included in a so-called uncertainty budget. The accredited laboratory of Merck KGaA, Darmstadt, Germany, is also obliged to participate regularly in an external international laboratory testing program. Merck KGaA, Darmstadt, Germany is accredited by the German Accreditation Authority, DAkkS and registered as a calibration laboratory according to DIN EN ISO / IEC 17025



ISO 9001

With our DIN EN ISO 9001:2008 certification we ensure customer satisfaction and improve our efficiency. It helps to sponsor our business and organization in being best in class. Our commitment for continuous improvements are exhibited and it provides confidence to the supply chain.

ISO 17025

DIN EN ISO / IEC 17025:2005 is one of the most popular quality standards for all testing and calibration laboratories. It is used by laboratories to design their Quality Management System, administrative and operative procedures and specifies the general requirements for the competence to carry out tests and / or calibration methods. All measurements and decisions should be based on accurate, repeatable, verifiable, reliable and correct measurements and procedures. Customers should ensure that all data and opinions upon which they rely could be traced back through an unbroken chain of data based on ISO 17025.

Reference material

Material, sufficiently homogeneous and stable with respect to one or more specified properties, which has been established to be fit for its intended use in a measurement process [ISO Guide 30].

Certified reference material

Reference material characterized by a metrologically valid procedure for one or more specified properties, accompanied by a certificate that provides the values of the specified property, its associated uncertainty, and a statement of metrological traceability [ISO Guide 30].

- **Primary reference material** is directly measured and certified by a certifying body.
- **Secondary reference material** is directly measured against primary reference material.

Traceability

Traceability means to verify a reference material to a stated international reference material, of an official authority body like NIST and PTB, through an unbroken chain of comparisons.

Certipur[®] reference materials for reliable calibration in atomic absorption spectroscopy

■ Certipur[®] products

- ICP standards
- Multi-element standards
- Tritisol[®] standards
- AAS standards

■ Benefits

- ICP and AAS single-element standards according to ISO 17025
- Standards are traceable to primary standards
- ICP and AAS standards with an extensive Certificate of Analysis

Certipur[®] by EMD Millipore – with ISO 17025 accreditation to give you reliable results.



Quality management

ICP and AAS standards are analyzed using ICP / OES and ICP / MS methods. The true value is certified by an accredited calibration laboratory according to ISO / IEC 17025.

For this analysis, a method has been developed for all 68 element standards. The advantage is obvious: a high degree of precision; this is reflected in the uncertainty data, which can vary, depending on the chemical nature of the element concerned.

Traceability

ICP and AAS standards are directly traceable to an international standard. Direct traceability means that the measuring instrument used in quality control is calibrated prior to each measurement using a primary standard obtained from an international institution such as NIST.

Traceability to the primary standard is documented in the Certificate of Analysis with indication of the batch used.



Certificate of Analysis
Certipur® Reference Material

Bismuth ICP Standard 1000 mg/l Bi CertiPUR®
1.70306.0100 Lot No.: **HC112304**

This Certificate of Analysis is based on the data from the Merck Calibration Laboratory for ICP-OES, according to DIN EN ISO / IEC 17025. Accredited by the DKD (Deutscher Kalibrierdienst).

DAR Reg.-No.: DKD-K-14302
 Ref. Calibration Certificate: 504/DKD-K-14302/11-03

Composition: Bismuth nitrate in nitric acid Suprapur® 2-3%
Assay: **988 mg/kg** Analysis: ICP-OES
1001 mg/l (calculated)

Measurement: ± 3 mg/kg (± 0.3%)
Uncertainty: This value represents the expanded uncertainty (U) for a coverage probability of 95%. Refer to page 2 for further details.

Traceability: This ICP Standard has been measured applying high precision ICP-OES in comparison to the corresponding NIST SRM® 3106, lot 991212

Trace impurities µg/ml:

Ag	<0.10	Cr	<0.02	In	<0.02	Ni	<0.02	Sb	<0.02	Tl	<0.02
Al	<0.05	Cu	<0.02	Ir	<0.02	Ce	<0.20	Sc	<0.02	Tm	<0.02
As	<0.20	Dy	<0.02	K	<0.20	P	<0.20	Se	<0.20	U	<0.02
Au	<0.02	Er	<0.02	La	<0.02	Pb	<0.05	Si	<0.20	V	<0.02
B	<0.05	Sr	<0.02	Li	<0.02	Pd	<0.02	Sm	<0.02	W	<0.05
Ba	<0.02	Fe	<0.05	Lu	<0.02	Pv	<0.02	Sn	<0.02	Y	<0.02
Be	<0.02	Ga	<0.02	Mg	<0.02	Pt	<0.02	Sr	<0.02	Yb	<0.02
Bi	+	Ge	<0.02	Mn	<0.02	Rh	<0.02	Ta	<0.05	Zn	<0.02
Cd	<0.05	Gd	<0.02	Mo	<0.02	Ru	<0.02	Tb	<0.02	Zr	<0.02
Cf	<0.02	Hf	<0.02	Nb	<0.10	Rf	<0.02	Te	<0.20		
Ce	<0.02	Hg	<0.05	Nd	<0.02	S	<0.20	Th	<0.02		
Co	<0.02	Ho	<0.02								

Date of release: 2011-03-11
 Minimum shelf life: 2014-03-31

A. Yildirim
 Dipl.-Ing. Ayfer Yıldırım
 (responsible laboratory manager quality control)

agreement of the EA (European Accreditation Cooperation)

to GUM and EA-402 as U₉₅, U₉₅ is obtained from the standard deviation of the primary reference item.

metrically from high purity bismuth with filtered (0.2µm) high purity B standards. The density of the

le units performs the assessment conducted in accordance to the

ditions for analytical method and in of the suitable shelf life of this in losses of solvent through the 1st year.

Application and correct use:
 This solution is intended for use as a calibration standard for inductively coupled plasma spectroscopy (e.g. ICP, DCP). Keep tightly sealed when not in use. Store at +15°C to +25°C. Never pipet directly from original container.
 All trace level elements were determined by ICP-MS / OES or graphite furnace AAS. These analysis values are subject to unavoidable systematic variations in this concentration range. They therefore do not form part of our guarantee and are subsequently no subject of release.

Quality Management System:
 The CertiPUR® Reference Material has been prepared and certified under an ISO 9001 quality management system in accordance to the following guides:

Guide to the Expression of Uncertainty in Measurement	GUM: 1995
Expression of the Uncertainty of Measurement in Calibration	EA-402: 1999
Quantifying Uncertainty in Analytical Measurement	EURACHEM / CITAC: 2000
Reference Materials - Contents of certificates and labels	ISO Guide 31: 2000
General requirements for the competence of reference materials producers	ISO Guide 34: 2000
General requirements for the competence of testing and calibration laboratories	DIN EN ISO / IEC 17025: 2005
Guideline for the requirements for the competence of reference materials producers	ILAC G12: 2000

ICP single-element standards

The quality control of our ICP single-element standards is carried out by our accredited calibration laboratory according to ISO 17025. They are directly traceable to primary reference material from NIST. A Certificate of Analysis is enclosed in each package. It includes exact data on content including uncertainty budget, trace element impurities, composition, traceability, date of release and minimum shelf life.



Certipur® ICP standards A-M

Designation	Element	Composition	ICP 1000 mg/l VWR Cat. No. [100 ml]	ICP 10000 mg/l VWR Cat. No. [100 ml]
A Aluminium	Al	Al(NO ₃) ₃ in HNO ₃ 2-3%	EM1.70301.0100	EM1.70371.0100
Antimony	Sb	Sb ₂ O ₃ in HCl 7%	EM1.70302.0100	–
Arsenic	As	H ₃ AsO ₄ in HNO ₃ 2-3%	EM1.70303.0100	–
B Barium	Ba	Ba(NO ₃) ₂ in HNO ₃ 2-3%	EM1.70304.0100	–
Bismuth	Bi	Bi(NO ₃) ₃ in HNO ₃ 2-3%	EM1.70306.0100	–
C Cadmium	Cd	Cd(NO ₃) ₂ in HNO ₃ 2-3%	EM1.70309.0100	–
Calcium	Ca	Ca(NO ₃) ₂ in HNO ₃ 2-3%	EM170308.0100	EM1.70373.0100
Cerium	Ce	Ce(NO ₃) ₃ in HNO ₃ 2-3%	EM1.70311.0100	–
Cesium	Cs	CsNO ₃ in HNO ₃ 2-3%	EM1.70310.0100	–
Chromium	Cr	Cr(NO ₃) ₃ in HNO ₃ 2-3%	EM1.70312.0100	EM1.70374.0100
Cobalt	Co	Co(NO ₃) ₂ in HNO ₃ 2-3%	EM1.70313.0100	EM1.70375.0100
Copper	Cu	Cu(NO ₃) ₂ in HNO ₃ 2-3%	EM1.70314.0100	EM1.70378.0100
D Dysprosium	Dy	Dy ₂ O ₃ in HNO ₃ 2-3%	EM1.70315.0100	–
E Erbium	Er	Er ₂ O ₃ in HNO ₃ 2-3%	EM1.70316.0100	–
Europium	Eu	Eu ₂ O ₃ in HNO ₃ 2-3%	EM170317.0100	–
G Gadolinium	Gd	Gd ₂ O ₃ in HNO ₃ 2-3%	EM1.70318.0100	–
Gallium	Ga	Ga(NO ₃) ₃ in HNO ₃ 2-3%	EM1.70319.0100	–
Germanium	Ge	(NH ₄) ₂ GeF ₆ in water	EM1.70320.0100	–
Gold	Au	H(AuCl ₄) in HCl 7%	EM1.70321.0100	–
H Hafnium	Hf	HfOCl ₂ in HCl 7%	EM1.70322.0100	–
Holmium	Ho	Ho ₂ O ₃ in HNO ₃ 2-3%	EM1.70323.0100	–
I Indium	In	In(NO ₃) ₃ in HNO ₃ 2-3%	EM1.70324.0100	–
Iridium	Ir	IrCl ₃ in HCl 7%	EM1.70325.0100	–
Iron	Fe	Fe(NO ₃) ₃ in HNO ₃	EM1.70326.0100	EM1.70376.0100
L Lanthanum	La	La(NO ₃) ₃ in HNO ₃ 2-3%	EM1.70327.0100	–
Lead	Pb	Pb(NO ₃) ₂ in HNO ₃ 2-3%	EM1.70328.0100	EM1.70372.0100
Lithium	Li	LiNO ₃ in HNO ₃ 2-3%	EM1.70329.0100	–
Lutetium	Lu	Lu ₂ O ₃ in HNO ₃ 2-3%	EM1.70330.0100	–
M Magnesium	Mg	Mg(NO ₃) ₂ in HNO ₃ 2-3%	EM1.70331.0100	EM1.70379.0100
Manganese	Mn	Mn(NO ₃) ₂ in HNO ₃ 2-3%	EM1.70332.0100	EM1.70380.0100
Mercury	Hg	Hg(NO ₃) ₂ in HNO ₃ 10%	EM1.70333.0100	EM1.70384.0100
Molybdenum	Mo	(NH ₄) ₆ Mo ₇ O ₂₄ in water	EM1.70334.0100	–

Certipur® ICP standards N-Z

	Designation	Element	Composition	ICP 1000 mg/l VWR Cat. No. [100 ml]	ICP 10000 mg/l VWR Cat. No. [100 ml]
N	Neodymium	Nd	Nd ₂ O ₃ in HNO ₃ 2-3%	EM1.70335.0100	-
	Nickel	Ni	Ni(NO ₃) ₂ in HNO ₃ 2-3%	EM1.70336.0100	EM1.70382.0100
	Niobium	Nb	NH ₄ NbF ₆ in water	EM1.70337.0100	-
O	Osmium	Os	(NH ₄) ₂ OsCl ₆ in HCl 7%	EM1.70338.0100	-
P	Palladium	Pd	Pd(NO ₃) ₂ in HNO ₃ 2-3%	EM1.70339.0100	-
	Phosphorous	P	H ₃ PO ₄ in water	-	EM1.70383.0100
	Platinum	Pt	H ₂ PtCl ₆ in HCl 7%	EM1.70341.0100	-
	Potassium	K	KNO ₃ in HNO ₃ 2-3%	EM1.70342.0100	EM1.70377.0100
	Praseodymium	Pr	Pr ₂ O ₃ in HNO ₃ 2-3%	EM1.70343.0100	-
R	Rhenium	Re	NH ₄ ReO ₄ in water	EM1.70344.0100	-
	Rhodium	Rh	Rh(NO ₃) ₃ in HNO ₃ 2-3%	EM1.70345.0100	-
	Rubidium	Rb	RbNO ₃ in HNO ₃ 2-3%	EM1.70346.0100	-
	Ruthenium	Ru	RuCl ₃ in HCl 7%	EM1.70347.0100	-
S	Samarium	Sm	Sm ₂ O ₃ in HNO ₃ 2-3%	EM1.70348.0100	-
	Selenium	Se	SeO ₂ in HNO ₃ 2-3%	EM1.70350.0100	-
	Silicon	Si	SiO ₂ in NaOH 2%	EM1.70365.0100	EM1.70386.0100
	Silver	Ag	AgNO ₃ in HNO ₃ 2-3%	EM1.70352.0100	-
	Sodium	Na	NaNO ₃ in HNO ₃ 2-3%	EM1.70353.0100	EM1.70381.0100
	Sulfur	S	H ₂ SO ₄ in water	EM1.70355.0100	EM1.70385.0100
	Strontium	Sr	Sr(NO ₃) ₂ in HNO ₃ 2-3%	EM1.70354.0100	-
	T	Tantalum	Ta	(NH ₄) ₂ TaF ₇ in water	EM170356.0100
Tellurium		Te	H ₆ TeO ₆ in HNO ₃ 2-3%	EM170357.0100	-
Terbium		Tb	Tb(NO ₃) ₃ in HNO ₃ 2-3%	EM1.70358.0100	-
Thallium		Tl	TlNO ₃ in HNO ₃ 2-3%	EM1.70359.0100	-
Thulium		Tm	Tm(NO ₃) ₃ in HNO ₃ 2-3%	EM1.70361.0100	-
Tin		Sn	SnCl ₄ in HCl 7%	EM1.70362.0100	-
Titanium		Ti	(NH ₄) ₂ TiF ₆ in water (trace HF)	EM1.70363.0100	-
V	Vanadium	V	NH ₄ VO ₃ in HNO ₃	EM1.70366.0100	EM1.70388.0100
Y	Ytterbium	Yb	Yb ₂ O ₃ in HNO ₃ 2-3%	EM1.70367.0100	-
Z	Zinc	Zn	Zn(NO ₃) ₂ in HNO ₃ 2-3%	EM1.70369.0100	EM1.70389.0100
	Zirconium	Zr	ZrCl ₄ in HCl 7%	EM1.70370.0100	EM1.70390.0100

Certipur® standards 10 mg/l

	Designation	Element	Composition	ICP 10 mg/l VWR Cat. No. [100 ml]
R	Rhodium, internal standard for ICP	Rh	Rh(NO ₃) ₃ in HNO ₃ 2-3%	EM1.08525.0100
T	Thorium	Th	Th(NO ₃) ₄ in HNO ₃ 2-3%	EM1.70391.0100
U	Uranium	U	UO ₂ (NO ₃) ₂ in HNO ₃ 2-3%	EM1.70360.0100

ICP multi-element standards

Multi-element calibration standards are traceable to standard reference material from NIST. A Certificate of Analysis is enclosed in each package. It includes data on content, composition, traceability, date of release and minimum shelf life.

Certipur® Multi-element standards		ICP calibration standards	Multi-element standard I 19 elements, different concentrations VWR Cat. No. EM1.15474.0100	Multi-element standard VIII 24 elements, 100 mg/l VWR Cat. No. EM1.09492.0100	Multi-element standard IX toxic elements, Chromium VI VWR Cat. No. EM1.09494.0100	Multi-element standard X for surface water, equivalent to NIST SRM 1643d VWR Cat. No. EM1.09493.0100	Multi-element standard XI for sewage sludge VWR Cat. No. EM1.09491.0100
Designation	Element						
A	Aluminium	Al	100 mg/l	100 mg/l	-	-	-
	Arsenic	As	-	-	100 mg/l	50 µg/l	-
B	Barium	Ba	5 mg/l	100 mg/l	-	50 µg/l	-
	Beryllium	Be	1 mg/l	100 mg/l	100 mg/l	20 µg/l	-
	Bismuth	Bi	200 mg/l	100 mg/l	-	10 µg/l	-
	Boron	B	15 mg/l	100 mg/l	-	100 µg/l	-
C	Cadmium	Cd	20 mg/l	100 mg/l	100 mg/l	20 µg/l	10 mg/l
	Calcium	Ca	-	100 mg/l	-	35000 µg/l	-
	Chromium	Cr	25 mg/l	100 mg/l	100 mg/l	20 µg/l	900 mg/l
	Cobalt	Co	20 mg/l	100 mg/l	-	25 µg/l	-
	Copper	Cu	20 mg/l	100 mg/l	-	20 µg/l	800 mg/l
G	Gallium	Ga	150 mg/l	100 mg/l	-	-	-
I	Indium	In	200 mg/l	-	-	-	-
	Iron	Fe	15 mg/l	100 mg/l	-	100 µg/l	-
L	Lead	Pb	200 mg/l	100 mg/l	100 mg/l	25 µg/l	900 mg/l
	Lithium	Li	-	100 mg/l	-	-	-
M	Magnesium	Mg	-	100 mg/l	-	15000 µg/l	-
	Manganese	Mn	5 mg/l	100 mg/l	-	30 µg/l	-
	Mercury	Hg	-	-	100 mg/l	-	8 mg/l
	Molybdenum	Mo	-	-	-	100 µg/l	-
N	Nickel	Ni	50 mg/l	100 mg/l	100 mg/l	50 µg/l	200 mg/l
P	Potassium	K	-	100 mg/l	-	3000 µg/l	-
S	Selenium	Se	-	100 mg/l	100 mg/l	10 µg/l	-
	Silver	Ag	50 mg/l	-	-	-	-
	Sodium	Na	-	100 mg/l	-	8000 µg/l	-
	Strontium	Sr	1 mg/l	100 mg/l	-	100 µg/l	-
T	Tellurium	Te	-	100 mg/l	-	-	-
	Thallium	Tl	400 mg/l	100 mg/l	100 mg/l	10 µg/l	-
V	Vanadium	V	-	-	-	50 µg/l	-
Z	Zinc	Zn	20 mg/l	100 mg/l	-	50 µg/l	2500 mg/l
	Matrix		1 mol/l HNO ₃	1 mol/l HNO ₃	1 mol/l HNO ₃	1 mol/l HNO ₃	1 mol/l HNO ₃

Certipur®
Multi-element standards

Designation		Element	ICP calibration standards Multi-element standard XIII 15 elements VWR Cat. No. EM1.09480.0100	Multi-element standard XVI 21 elements VWR Cat. No. EM1.09487.0100	ICP/MS calibration standards Multi-element standard VI calibration in ICP/MS, 30 elements VWR Cat. No. EM1.10580.0100	Multi-element standard XXI set, contains 274473 and 108623 VWR Cat. No. EM1.09498.0001	Tuning solution Multi-element standard XXIV tuning solution 700 ES VWR Cat. No. EM1.09411.0500
A	Aluminium	Al	500 mg/l	-	10 mg/l	10 mg/l	50 mg/l
	Antimony	Sb	-	100 mg/l	-	-	-
	Arsenic	As	100 mg/l	100 mg/l	100 mg/l	10 mg/l	50 mg/l
B	Barium	Ba	-	-	10 mg/l	10 mg/l	50 mg/l
	Beryllium	Be	100 mg/l	100 mg/l	100 mg/l	10 mg/l	-
	Bismuth	Bi	-	-	10 mg/l	10 mg/l	-
	Boron	B	-	-	100 mg/l	-	-
C	Cadmium	Cd	25 mg/l	100 mg/l	10 mg/l	10 mg/l	50 mg/l
	Calcium	Ca	-	100 mg/l	1000 mg/l	10 mg/l	-
	Cesium	Cs	-	-	-	10 mg/l	-
	Chromium	Cr	100 mg/l	100 mg/l	10 mg/l	10 mg/l	50 mg/l
	Cobalt	Co	100 mg/l	100 mg/l	10 mg/l	10 mg/l	50 mg/l
	Copper	Cu	100 mg/l	100 mg/l	10 mg/l	10 mg/l	50 mg/l
G	Gallium	Ga	-	-	10 mg/l	10 mg/l	-
H	Hafnium	Hf	-	-	-	-	-
I	Indium	In	-	-	-	10 mg/l	-
	Iridium	Ir	-	-	-	-	-
	Iron	Fe	100 mg/l	100 mg/l	100 mg/l	10 mg/l	-
L	Lead	Pb	100 mg/l	100 mg/l	10 mg/l	10 mg/l	50 mg/l
	Lithium	Li	-	100 mg/l	10 mg/l	10 mg/l	-
M	Magnesium	Mg	-	100 mg/l	10 mg/l	10 mg/l	-
	Manganese	Mn	100 mg/l	100 mg/l	10 mg/l	10 mg/l	50 mg/l
	Mercury	Hg	5 mg/l	-	-	* 10 mg/l	-
	Molybdenum	Mo	-	100 mg/l	10 mg/l	-	50 mg/l
N	Nickel	Ni	100 mg/l	100 mg/l	10 mg/l	10 mg/l	50 mg/l
P	Potassium	K	-	-	10 mg/l	10 mg/l	500 mg/l
R	Rubidium	Rb	-	-	10 mg/l	10 mg/l	-
S	Selenium	Se	25 mg/l	100 mg/l	100 mg/l	10 mg/l	50 mg/l
	Silver	Ag	-	-	10 mg/l	10 mg/l	-
	Sodium	Na	-	-	10 mg/l	10 mg/l	-
	Strontium	Sr	-	100 mg/l	10 mg/l	10 mg/l	50 mg/l
T	Tantalum	Ta	-	-	-	-	-
	Tellurium	Te	-	-	10 mg/l	-	-
	Thallium	Tl	-	100 mg/l	10 mg/l	10 mg/l	-
	Tin	Sn	-	-	-	-	-
	Titanium	Ti	-	100 mg/l	-	-	-
U	Uranium	U	-	-	10 mg/l	10 mg/l	-
V	Vanadium	V	250 mg/l	100 mg/l	10 mg/l	10 mg/l	-
Z	Zinc	Zn	100 mg/l	100 mg/l	100 mg/l	10 mg/l	50 mg/l
	Zirconium	Zr	-	-	-	-	-
Matrix			5% HNO ₃	5% HNO ₃	1 mol/l HNO ₃	5% HNO ₃	1% HNO ₃

Certipur®
Multi-element standards

Designation	Element	ICP/MS mass calibration	Multi-element standard XXIII for mass calibration VWR Cat. No. EM1.09410.0500	Graphit furnace AAS stand.	Multi-element standard XVIII for calibration VWR Cat. No. EM1.09500.0100	Wavelength calibration stand.	Multi-element standard V HCl soluble elements VWR Cat. No. EM1.10714.0500	Multi-element standard XIV HCl soluble elements VWR Cat. No. EM1.09481.0500
A	Aluminium	Al	-	-	100 mg/l	-	20 mg/l	-
	Antimony	Sb	-	-	100 mg/l	-	-	-
	Arsenic	As	-	-	100 mg/l	-	20 mg/l	20 mg/l
B	Barium	Ba	1 µg/l	-	50 mg/l	-	2 mg/l	-
	Beryllium	Be	-	-	5 mg/l	-	1 mg/l	-
	Boron	B	1 µg/l	-	-	-	2 mg/l	-
C	Cadmium	Cd	-	-	5 mg/l	-	2 mg/l	-
	Calcium	Ca	-	-	-	-	10 mg/l	-
	Cerium	Ce	-	-	-	-	-	-
	Chromium	Cr	-	-	20 mg/l	-	2 mg/l	-
	Cobalt	Co	1 µg/l	-	50 mg/l	-	-	-
	Copper	Cu	-	-	50 mg/l	-	2 mg/l	-
G	Gallium	Ga	1 µg/l	-	-	-	-	-
	Germanium	Ge	-	-	-	-	-	-
I	Indium	In	1 µg/l	-	-	-	-	-
	Iron	Fe	1 µg/l	-	20 mg/l	-	2 mg/l	-
L	Lanthanum	La	-	-	-	-	-	20 mg/l
	Lead	Pb	-	-	100 mg/l	-	20 mg/l	-
	Lithium	Li	1 µg/l	-	-	-	2 mg/l	20 mg/l
	Lutetium	Lu	1 µg/l	-	-	-	-	-
M	Magnesium	Mg	-	-	-	-	1 mg/l	-
	Manganese	Mn	-	-	20 mg/l	-	1 mg/l	20 mg/l
	Mercury	Hg	-	-	-	-	5 mg/l	-
	Molybdenum	Mo	-	-	-	-	-	20 mg/l
N	Nickel	Ni	-	-	50 mg/l	-	5 mg/l	20 mg/l
P	Phosphorous	P	-	-	-	-	10 mg/l	100 mg/l
	Potassium	K	1 µg/l	-	-	-	100 mg/l	100 mg/l
R	Rhodium	Rh	1 µg/l	-	-	-	-	-
S	Scandium	Sc	1 µg/l	-	-	-	1 mg/l	20 mg/l
	Selenium	Se	-	-	100 mg/l	-	20 mg/l	-
	Silver	Ag	-	-	10 mg/l	-	-	-
	Sodium	Na	1 µg/l	-	-	-	20 mg/l	20 mg/l
	Strontium	Sr	-	-	-	-	1 mg/l	-
	Sulfur	S	-	-	-	-	-	100 mg/l
T	Tellurium	Te	-	-	-	-	20 mg/l	-
	Terbium	Tb	-	-	-	-	-	-
	Thallium	Tl	1 µg/l	-	100 mg/l	-	-	-
	Titanium	Ti	-	-	-	-	2 mg/l	-
U	Uranium	U	1 µg/l	-	-	-	-	-
Y	Yttrium	Y	1 µg/l	-	-	-	1 mg/l	-
Z	Zinc	Zn	-	-	-	-	2 mg/l	-
	Matrix		5% HNO ₃		5% HNO ₃		5% HCl	2% HCl

Titrisol® standards

Titrisol® standards are traceable to standard reference material from NIST. A batch specific Certificate of Analysis is available via internet (www.emdmillipore.com).

Dilution of Titrisol® standards

In preparing a dilution series, the ICP- and AAS standards should be diluted with the same concentration of acid as is in the standard itself. Titrisol® standards should be diluted to 1 l with 0.1 mol/l hydrochloric acid in the first step. Alternatively, 30 ml of 30% hydrochloric acid can be placed in a volumetric flask and made up to 1 l with distilled water. Further dilutions should then be made with distilled water.

Minimum shelf life of standard solutions

Unopened Titrisol® ampoules	5 years
Solution of 1000 mg/l	Recommended max. 12 months
Solution of 10–100 mg/l	Recommended 1 month
Solution of 1–10 mg/l	Recommended max. 1 week
Solution of < 1 mg/l	Recommended 1 day

As exceptions, the following Titrisol® standards should be diluted as indicated:

Gold	Place 500 ml 30% hydrochloric acid in a volumetric flask and make up to 1 l with distilled water.
Lead, Selenium Silver	Dilute to 1 l with 0.1 mol/l or place 5 ml 65% nitric acid in a volumetric flask and make up to the mark.
Molybdenum	Place 10 ml 25% ammonia solution in a volumetric flask and make up to 1 l with distilled water.
Silicon	Make up to the mark with distilled water.
Vanadium	Place 5 ml 96% sulfuric acid in a volumetric flask and make up to 1 l with distilled water.

Titrisol® standards

	Designation	Element	Composition [1000 mg of element per ampoule]	VWR Cat. No	
A	Aluminium	Al	AlCl ₃ in water	EM1.09967.0001	
	Arsenic	As	As ₂ O ₅ in water	EM1.09939.0001	
B	Barium	Ba	BaCl ₂ in 7% HCl	EM1.09968.0001	
C	Cadmium	Cd	CdCl ₂ in water	EM1.09960.0001	
	Calcium	Ca	CaCl ₂ in 6.5% HCl	EM1.09943.0001	
	Chloride	Cl	HCl in water	EM1.09871.0001	
	Chromium	Cr	CrCl ₃ in 4.2% HCl	EM1.09948.0001	
	Cobalt	Co	CoCl ₂ in water	EM1.09986.0001	
	Copper	Cu	CuCl ₂ in water	EM1.09987.0001	
	F	Fluoride	F	KF in water	EM1.09869.0001
	G	Gold	Au	H(AuCl ₄) in 12.72% HCl	EM1.09868.0001
I	Iron	Fe	FeCl ₃ in 15% HCl	EM1.09972.0001	
L	Lead	Pb	Pb(NO ₃) ₂ in water	EM1.09969.0001	
	Lithium	Li	LiCl in water	EM1.09934.0001	
M	Magnesium	Mg	MgCl ₂ in 6% HCl	EM1.09949.0001	
	Manganese	Mn	MnCl ₂ in water	EM1.09988.0001	
	Molybdenum	Mo	(NH ₄) ₆ Mo ₇ O ₂₄ in 0.7% NH ₄ OH	EM1.09926.0001	
N	Nickel	Ni	NiCl ₂ in water	EM1.09989.0001	
	Nitrite	NO ₂	NaNO ₂ in water	EM1.09866.0001	
P	Phosphate	PO ₄	H ₃ PO ₄ in water	EM1.09870.0001	
	Potassium	K	KCl in water	EM1.09924.0001	
S	Silicon	Si	SiCl ₄ in 14% NaOH	EM1.09947.0001	
	Silver	Ag	AgNO ₃ in 5% HNO ₃	EM1.09906.0001	
	Sodium	Na	NaCl in water	EM1.09927.0001	
	Strontium	Sr	SrCl ₂ in 7% HCl	EM1.09993.0001	
	Sulfate	SO ₄	H ₂ SO ₄ in water	EM1.09872.0001	
T	Titanium	Ti	(NH ₄) ₂ TiF ₆ in water	EM1.09829.0001	
V	Vanadium	V	VO ₂ SO ₄ in 8.6% H ₂ SO ₄	EM1.09994.0001	
Z	Zinc	Zn	ZnCl ₂ in 0.06% HCl	EM1.09953.0001	

AAS standards

Atomic absorption spectroscopy standards are traceable to standard reference material from NIST. The AAS standards are measured according to ISO 17025. Analysis of content is carried out by ICP-OES. A batch specific Certificate of Analysis is available via internet (www.emdmillipore.com).

Certipur® AAS standards

	Designation	Element	Composition	Concentration 1000 mg/ VWR Cat. No. [100 ml]	Concentration 1000 mg/ VWR Cat. No. [500 ml]
A	Antimony	Sb	Sb ₂ O ₃ in HCl 2 mol/l	–	EM1.70204.0500
	Arsenic	As	H ₃ AsO ₄ in HNO ₃ 0.5 mol/l	EM1.19773.0100	–
B	Barium	Ba	Ba(NO ₃) ₂ in HNO ₃ 0.5 mol/l	EM1.19774.0100	EM1.19774.0500
	Bismuth	Bi	Bi(NO ₃) ₃ in HNO ₃ 0.5 mol/l	EM1.19804.0100	EM1.19804.0500
	Boron	B	H ₃ BO ₃ in water	EM1.19500.0100	–
C	Cadmium	Cd	Cd(NO ₃) ₂ in HNO ₃ 0.5 mol/l	EM1.19777.0100	EM1.19777.0500
	Calcium	Ca	Ca(NO ₃) ₂ in HNO ₃ 0.5 mol/l	EM1.19778.0100	–
	Cesium	Cs	CsNO ₃ in HNO ₃ 0.5 mol/l	EM1.70212.0100	–
	Chromium	Cr	Cr(NO ₃) ₃ in HNO ₃ 0.5 mol/l	EM1.19779.0100	EM1.19779.0500
	Copper	Cu	Cu(NO ₃) ₂ in HNO ₃ 0.5 mol/l	EM1.19786.0100	EM1.19786.0500
	I	Indium	In	In(NO ₃) ₃ in HNO ₃ 0.5 mol/l	EM1.19504.0100
Iron		Fe	Fe(NO ₃) ₃ in HNO ₃ 0.5 mol/l	EM1.19781.0100	–
L	Lithium	Li	LiNO ₃ in HNO ₃ 0.5 mol/l	EM1.70223.0100	EM1.70223.0500
M	Magnesium	Mg	Mg(NO ₃) ₂ in HNO ₃ 0.5 mol/l	EM1.19788.0100	EM1.19788.0500
	Manganese	Mn	Mn(NO ₃) ₂ in HNO ₃ 0.5 mol/l	EM1.19789.0100	EM1.19789.0500
	Mercury	Hg	Hg(NO ₃) ₂ in HNO ₃ 2 mol/l	–	EM1.70226.0500
	Molybdenum	Mo	(NH ₄) ₆ Mo ₇ O ₂₄ in water	EM1.70227.0100	EM1.70227.0500
P	Palladium	Pd	Pd(NO ₃) ₂ in HNO ₃ 0.5 mol/l	–	EM1.14282.0500
	Platinum	Pt	H ₂ PtCl ₆ in HCl 2 mol/l	EM170219.0100	EM1.70219.0500
	Potassium	K	KNO ₃ in HNO ₃ 0.5 mol/l	EM1.70230.0100	EM1.70230.0500
S	Scandium	Sc	Sc ₂ O ₃ in HNO ₃ 1 mol/l	EM1.19513.0100	EM1.19513.0500
	Selenium	Se	SeO ₂ in HNO ₃ 0.5 mol/l	EM1.19796.0100	EM1.19796.0500
	Silicon	Si	(NH ₄) ₂ SiF ₆ in water	EM1.12310.0100	EM1.12310.0500
	Silicon	Si	SiO ₂ in NaOH 0.5 mol/l	EM1.70236.0100	–
	Silver	Ag	AgNO ₃ in HNO ₃ 0.5 mol/l	EM1.19797.0100	EM1.19797.0500
	Sodium	Na	NaNO ₃ in HNO ₃ 0.5 mol/l	EM1.70238.0100	EM1.70238.0500
	Strontium	Sr	Sr(NO ₃) ₂ in HNO ₃ 0.5 mol/l	EM1.19799.0100	EM1.19799.0500
	T	Tellurium	Te	H ₆ TeO ₆ in HNO ₃ 0.5 mol/l	EM1.19514.0100
Thallium		Tl	TlNO ₃ in HNO ₃ 0.5 mol/l	EM1.19801.0100	EM1.19801.0500
Tin		Sn	SnCl ₄ in HCl 2 mol/l	–	EM1.70242.0500
Titanium		Ti	(NH ₄) ₂ TiF ₆ in water	EM1.70243.0100	–
Tungsten		W	(NH ₄) ₂ WO ₄ in water	EM1.70244.0100	EM1.70244.0500
V		Vanadium	V	NH ₄ VO ₃ in HNO ₃ 0.5 mol/l	EM1.70245.0100
Y	Yttrium	Y	Y(NO ₃) ₃ in HNO ₃ 0.5 mol/l	EM1.19809.0100	EM1.19809.0500
Z	Zinc	Zn	Zn(NO ₃) ₂ in HNO ₃ 0.5 mol/l	EM1.19806.0100	EM1.19806.0500
	Zirconium	Zr	ZrOCl ₂ in HCl 2 mol/l	EM1.70234.0100	–

AAS standards dissolved in oil

Standards dissolved in oil are ready-to-use calibration standards for the analysis of non-aqueous matrices. For AAS, they are diluted to the required concentration with EMD Millipore standard oil or with non-polar solvents.

Certipur® standards, dissolved in oil

Designation	Raw material	Concentration	VWR Cat. No. [100 ml]
Calcium	2-Ethylhexanoic acid-Ca salt	1 g/kg	EM1.15053.0100
Cobalt	Cyclohexanebutyric acid-Co(II) salt	1 g/kg	EM1.15061.0100
Phosphorus	Triphenyl phosphate	1 g/kg	EM1.15072.0100
Potassium	Cyclohexanebutyric acid-K salt	1 g/kg	EM1.15054.0100
Sodium	Cyclohexanebutyric acid-Na salt	1 g/kg	EM1.15058.0100

Certipur® multi-element standards, Oil dissolved calibration standards

Designation	Composition	VWR Cat. No. [100 ml]
Multi-element standard I	4 elements, different concentrations Ba (8 g/kg), Ca (4 g/kg), Mg (1 g/kg), Zn (1.6 g/kg)	EM1.15075.0100
Multi-element standard II	21 elements, 100 ppm Ag, Al, B, Ba, Ca, Cd, Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, P, Pb, Si, Sn, Ti, V, Zn	EM1.09469.0100
Multi-element standard III	21 elements, 900 ppm Ag, Al, B, Ba, Ca, Cd, Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, P, Pb, Si, Sn, Ti, V, Zn	EM1.09479.0100

Auxiliaries

Designation	VWR Cat. No. [2.5 l]
Standard oil for AAS (30–40 mPas)	EM1.13898.2500



Certipur[®] reference materials for reliable calibration in pH measurement

Certipur[®] products

- Certified secondary standard reference materials
- Certified buffer solutions
- Titrisol[®] buffer concentrates
- Certified buffer solutions in sachets

Benefits

- Measured and qualified in Merck KGaA, Darmstadt, Germany, ISO 17025 accredited lab
- Conducts always reliable and accurate results
- Traceable to NIST and PTB
- Available in convenient and safe packaging

Ready-to-use buffer solutions



The measurement of pH value is the most commonly used analytical method. This is because the determination itself and the subsequent maintenance of pH value is of critical importance in numerous chemical, biochemical and biological processes, especially those in quality assurance and in-process-control.



Certipur® reference materials for pH measurement

EMD Millipore offers a distinguished range of buffer solutions and substances for the calibration, monitoring and qualifying of pH instruments and buffer solutions. All buffer solutions and substances are measured and qualified in our DIN EN ISO 17025 / IEC accredited laboratory for pH measurement and conductivity measurement. Buffer reference materials have a direct influence on the accuracy of measurement results and therefore they are important for modern quality management systems.

Our laboratory for pH measurement operates a comprehensive quality management system accredited by the German accreditation body to the current DIN EN ISO / IEC 17025 standard. For our customer, accreditation ensures state recognition of the reliability of our testing and calibration results, worldwide comparability of the results; independence and impartiality, international approval of our competence; high-level quality and transparency of our services.

Quality control

Merck KGaA, Darmstadt, Germany, laboratory for pH measurement is accredited according to DIN EN ISO / IEC 17025. We run our own accredited calibration laboratory for buffer reference material. Beside the accreditation of the pH method, EMD Millipore produces as well its own primary and secondary certified reference material, which is tested and certified from the German metrological institute (PTB; German Physical Technical Institute, Germany Braunschweig).

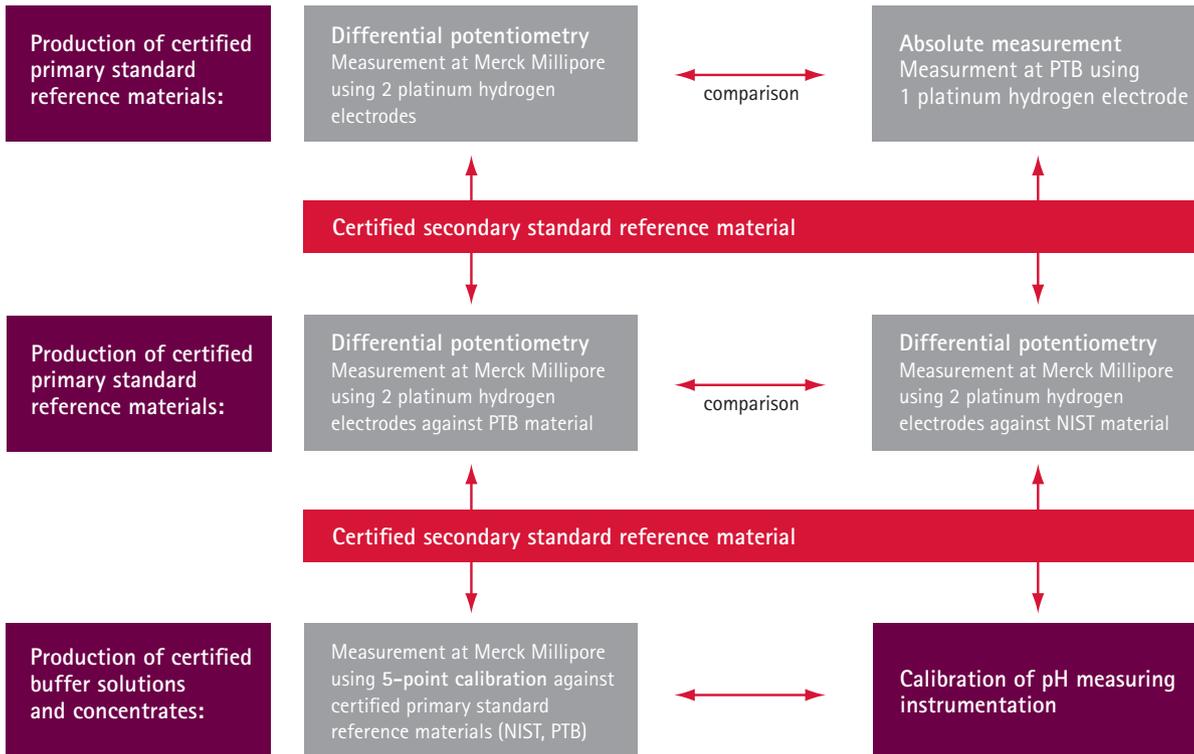
Therefore Merck KGaA, Darmstadt, Germany, laboratory for pH measurement is not only an accredited calibration laboratory it is also an accredited testing laboratory. A testing laboratory has the permission to act as an independent authority to test samples and materials.



Certified secondary reference buffer solutions

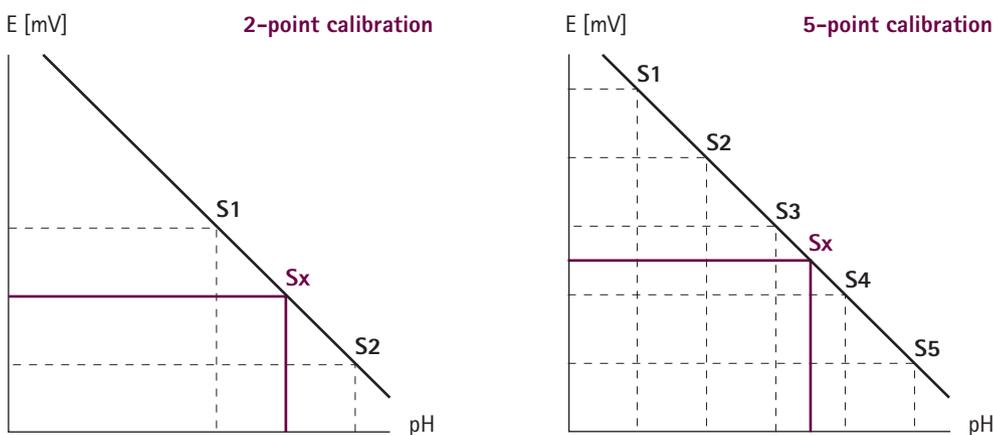
Quality control of certified secondary reference buffers

EMD Millipore offers certified secondary standard reference buffer solution and substances which is at most used for extremely precise calibration, qualifying and monitoring of pH instruments and testing other buffer solutions. These certified secondary reference materials are tested with two platinum hydrogen electrodes using a differential potentiometry. The uncertainty of this measuring method is ± 0.003 pH units.



Quality control of ready-to-use buffer solutions for the daily calibration

For the precise measurement of our ready-to-use reference buffer solutions for the regular calibration of pH instruments, EMD Millipore uses a 5-point calibration. The 5-point calibration is more accurate than a 2- or 3-point calibration.



Certified secondary standard reference buffer solutions | substances

Certified secondary standard reference buffers are employed for precisely calibrating and monitoring of pH measurement instruments and buffers solutions. Deviation is max. ± 0.003 pH units. Every Certipur® product is delivered with a Certificate of Analysis showing the relevant data for every quality management system. The quality control is carried out in Merck KGaA, Darmstadt, Germany, accredited calibration laboratory using differential potentiometry with two specially developed platinum hydrogen electrodes. This method allows the pH value of two solutions of the same composition to be accurately compared using differential potentiometry method. In addition, the Certipur® buffer solutions and substances are compared to the standard reference material from NIST.

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

Designation	pH value [25°C]	Package size	VWR Cat. No.
Certipur® certified secondary standard reference buffer solution pH 1.68 ₁ Potassium tetroxalat dihydrate	1.68 ₁	5 x 100 ml	EM1.07204.0105
Certipur® certified secondary standard reference buffer solution pH 4.00 ₅ Potassium hydrogen phthalate	4.00 ₅	5 x 100 ml	EM1.07200.0105
Certipur® certified secondary standard reference buffer solution pH 6.86 ₃ Potassium dihydrogen phosphate / di-Sodium hydrogen phosphate	6.86 ₃	5 x 100 ml	EM1.07202.0105
Certipur® certified secondary standard reference buffer solution pH 7.41 ₆ Potassium dihydrogen phosphate / di-Sodium hydrogen phosphate	7.41 ₆	5 x 100 ml	EM1.07205.0105
Certipur® pH certified secondary standard reference buffer solution 9.18 ₄ di-Sodium tetraborate decahydrate	9.18 ₄	5 x 100 ml	EM1.07203.0105

Certipur® certified secondary reference buffer substances [25°C]

Designation	pH value [25°C]	Package size	VWR Cat. No.
Certipur® certified secondary reference buffer substance Potassium tetroxalate dihydrate	1.68 ₁	25 g	EM1.01961.0025
Certipur® certified secondary reference buffer substance Potassium hydrogen tartate	3.63 ₉	25 g	EM1.01963.0025
Certipur® certified secondary reference buffer substance Potassium hydrogen phthalate	4.00 ₅	25 g	EM1.01965.0025
Certipur® certified secondary reference buffer substance Potassium hydrogen phosphate / di-Sodium hydrogen phosphate	6.86 ₃ / 7.41 ₆	2 x 25 g	EM1.01960.0001
Certipur® certified secondary reference buffer substance di-Sodium tetraborate decahydrate	9.18 ₄	25 g	EM1.01964.0025
Certipur® certified secondary reference buffer substance Sodium hydrogen carbonate / Sodium carbonate	10.01 ₄	2 x 25 g	EM1.01962.0001

Ready-to-use buffer solutions

All Certipur® buffer solutions are traceable to standard reference materials from NIST and PTB. They are analyzed in our own independent accredited calibration laboratory with a combined glass electrode and 5-point calibration according to DIN 19628 using reference material for the preparation of standard buffer solutions according to DIN 19266.

Certipur® buffer solutions [20°C] (Products available January 1, 2013)

Designation	pH value [20°C]	Composition	Package size	VWR Cat. No.
Certipur® buffer solution	1.00	Glycine, Sodium chloride, Hydrogen chloride	1000 ml	EM1.09432.1000
Certipur® buffer solution	2.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1000 ml	EM1.09433.1000
			10 l Titripac®	EM1.09433.9010
Certipur® buffer solution	3.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1000 ml	EM1.09434.1000
Certipur® buffer solution	4.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1000 ml	EM1.09435.1000
			4 l Titripac®	EM1.09435.4000
			10 l Titripac®	EM1.09435.9010
Certipur® buffer solution	4.66	Acetic acid, Sodium acetate	1000 ml	EM1.07827.1000
Certipur® buffer solution	5.00	Citric acid, Sodium hydroxide	1000 ml	EM1.09436.1000
Certipur® buffer solution	6.00	Citric acid, Sodium hydroxide	1000 ml	EM1.09437.1000
Certipur® buffer solution	6.88	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	1000 ml	EM1.07294.1000
Certipur® buffer solution	7.00s	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	1000 ml	EM1.09439.1000
			4 l Titripac®	EM1.09439.4000
			10 l Titripac®	EM1.09439.9010
Certipur® buffer solution	8.00	Boric acid, Sodium hydroxide, Hydrogen chloride	1000 ml	EM1.09460.1000
Certipur® buffer solution	9.00	Boric acid, Sodium hydroxide, Potassium chloride	1000 ml	EM1.09461.1000
			4 l Titripac®	EM1.09461.4000
			10 l Titripac®	EM1.09461.9010
Certipur® buffer solution	9.22	di-Sodium tetraborate	1000 ml	EM1.01645.1000
Certipur® buffer solution	10.00	Boric acid, Sodium hydroxide, Potassium chloride	1000 ml	EM1.09438.1000
			4 l Titripac®	EM1.09438.4000
			10 l Titripac®	EM1.09438.9010
Certipur® buffer solution	11.00	Boric acid, Sodium hydroxide, Potassium chloride	1000 ml	EM1.09462.1000

Certipur® buffer solutions [25°C]

Designation	pH value [25°C]	Composition	Package size	Package	VWR Cat. No.
Certipur® buffer solution	1.00	Glycine, Sodium chloride, Hydrogen chloride	500 ml	PE bottle	EM1.094410500
			4 l	Titripac®	EM1.094414000
Certipur® buffer solution	2.00	Citric acid, Sodium hydroxide, Hydrogen chloride	500 ml	PE bottle	EM1.094420500
			4 l	Titripac®	EM1.094424000
Certipur® buffer solution	3.00	Citric acid, Sodium hydroxide, Hydrogen chloride	500 ml	PE bottle	EM1.094440500
			4 l	Titripac®	EM1.094444000
Certipur® buffer solution	4.00	Citric acid, Sodium hydroxide, Hydrogen chloride	500 ml	PE bottle	EM1.094450500
			4 l	Titripac®	EM1.094454000
Certipur® buffer solution	4.01	Potassium hydrogen phthalate	500 ml	PE bottle	EM1.094060500
			1 l	PE bottle	EM1.094061000
			4 l	Titripac®	EM1.094064000
Certipur® buffer solution	5.00	Citric acid, Sodium hydroxide	500 ml	PE bottle	EM1.094460500
			4 l	Titripac®	EM1.094464000

Certipur® buffer solutions [25°C] (continued)

Designation	pH value [25°C]	Composition	Package size	Package	VWR Cat. No.
Certipur® buffer solution	6.00	Citric acid, Sodium hydroxide	500 ml	PE bottle	EM1.990364000
			4 l	Titripac®	EM1.990360500
Certipur® buffer solution	7.00	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	500 ml	PE bottle	EM1.094070500
			1 l	PE bottle	EM1.094071000
Certipur® buffer solution	8.00	Boric acid, Sodium hydrogen, Hydrogen chloride	500 ml	PE bottle	EM1.990380500
			4 l	Titripac®	EM1.990384000
Certipur® buffer solution	9.00	Boric acid, Sodium hydrogen, Potassium chloride	500 ml	PE bottle	EM1.094080500
			1 l	PE bottle	EM1.094081000
Certipur® buffer solution	9.00	Boric acid, Sodium hydrogen, Potassium chloride	4 l	Titripac®	EM1.094084000
			Certipur® buffer solution	10.00	Boric acid, Sodium hydrogen, Potassium chloride
1 l	PE bottle	EM1.094091000			
Certipur® buffer solution	10.00	Boric acid, Sodium hydrogen, Potassium chloride	4 l	Titripac®	EM1.094094000
			Certipur® buffer solution	11.00	Boric acid, Sodium hydrogen, Potassium chloride
4 l	Titripac®	EM1.990414000			

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

Designation	pH value [20°C]	Composition	Package size	VWR Cat. No.
Certipur® buffer solution	4.00 [red]	Citric acid, Sodium hydroxide, Hydrogen chloride	500 ml	EM1.09475.0500
			4 l Titripac®	EM1.09475.4000
			10 l Titripac®	EM1.09475.9010
Certipur® buffer solution	7.00 [green]	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	500 ml	EM1.09477.0500
			4 l Titripac®	EM1.09477.4000
			10 l Titripac®	EM1.09477.9010
Certipur® buffer solution	9.00 [blue]	Boric acid, Potassium chloride, Sodium hydroxide	500 ml	EM1.09476.0500
			4 l Titripac®	EM1.09476.4000
			10 l Titripac®	EM1.09476.9010
Certipur® buffer solution	10.00 [yellow]	Boric acid, Potassium chloride, Sodium hydroxide	500 ml	EM1.09400.0500
			4 l Titripac®	EM1.09400.4000
			10 l Titripac®	EM1.09400.9010



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

Designation	pH value [25°C]	Composition	Package size	Package	VWR Cat. No.
Certipur® buffer solution	7.00 (yellow)	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	500 ml	PE bottle	EM1.99057.0500
			1 l	Titripac®	EM1.99057.4000

Titrisol® buffer concentrates

All Titrisol® buffer concentrates are traceable to standard reference materials from NIST and PTB. They are analyzed in our own independent accredited calibration laboratory with a combined glass electrode and 5-point calibration according to DIN 19628 using reference material for the preparation of standard buffer solutions according to DIN 19266.



Titrisol® buffer concentrate for 500 ml buffer solution [20°C]

Designation	pH value [20°C]	Composition	Package size	VWR Cat. No.
Buffer Titrisol®	1.00	Glycine, Sodium chloride, Hydrogen chloride	1 ampoule	EM1.09881.0001
Buffer Titrisol®	2.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1 ampoule	EM1.09882.0001
Buffer Titrisol®	3.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1 ampoule	EM1.09883.0001
Buffer Titrisol®	4.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1 ampoule	EM1.09884.0001
Buffer Titrisol®	5.00	Citric acid, Sodium hydroxide	1 ampoule	EM1.09885.0001
Buffer Titrisol®	6.00	Citric acid, Sodium hydroxide	1 ampoule	EM1.09886.0001
Buffer Titrisol®	7.00	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	1 ampoule	EM1.09887.0001
Buffer Titrisol® acc. to Weise	7.20	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	1 ampoule	EM1.09879.0001
Buffer Titrisol®	8.00	Boric acid, Sodium hydroxide, Hydrogen chloride	1 ampoule	EM1.09888.0001
Buffer Titrisol®	9.00	Boric acid, Sodium hydroxide, Hydrogen chloride	1 ampoule	EM1.09889.0001
Buffer Titrisol®	10.00	Boric acid, Sodium hydroxide, Hydrogen chloride	1 ampoule	EM1.09890.0001
Buffer Titrisol®	11.00	Boric acid, Sodium hydroxide, Potassium chloride	1 ampoule	EM1.09880.0001
Buffer Titrisol®	12.00	di-Sodium hydrogen phosphate, Sodium hydroxide	1 ampoule	EM1.09892.0001
Buffer Titrisol®	13.00	Potassium chloride, Sodium hydroxide	1 ampoule	EM1.09893.0001

Certipur® buffer sachets

Ready-to-use buffer solutions, packed in practical small quantities in sealed sachets. All Certipur® buffer sachets are traceable to standard reference materials from NIST and PTB. They are analyzed in our own independent accredited calibration laboratory with a combined glass electrode and 5-point calibration according to DIN 19628 using reference material for the preparation of standard buffer solutions according to DIN 19266.

Advantages of Certipur® buffer sachets

- Always fresh and ready-to-use
- Always available in suitable quantities
- Precise pH value
- No risk of contamination
- No residues
- Easy to use
- Includes batch-specific Certificate of Analysis
- Traceable to NIST and PTB



Certipur® buffer solutions in sachets [25°C] (Products available January 1, 2013)

Designation	pH value [25°C]	Composition	Package size	VWR Cat. No.
Certipur® buffer solution	2.00	Citric acid, Sodium hydroxide, Hydrogen chloride	30 sachets x 30 ml	EM1.99012.0001
Certipur® buffer solution	4.01	Potassium hydrogen phthalate	30 sachets x 30 ml	EM1.99001.0001
Certipur® buffer solution	6.00	Citric acid, sodium hydroxide	30 sachets x 30 ml	EM1.99016.0001
Certipur® buffer solution	7.00	Potassium dihydrogen phosphate, di-Sodium hydrogen phosphate	30 sachets x 30 ml	EM1.99002.0001
Certipur® buffer solution	9.00	Boric acid, Sodium hydroxide, Potassium chloride	30 sachets x 30 ml	EM1.99003.0001
Certipur® buffer solution	10.00	Boric acid, Sodium hydroxide, Potassium chloride	30 sachets x 30 ml	EM1.99004.0001
Certipur® buffer solution	12.00	di-Sodium hydrogen phosphate, Sodium hydroxide	30 sachets x 30 ml	EM1.99022.0001
Certipur® buffer solution Set I	4.01 7.00 9.00	Potassium hydrogen phthalate Potassium dihydrogen phosphate, di-Sodium hydrogen phosphat Boric acid, Sodium hydroxide, Potassium chloride	3 x 10 sachets x 30 ml	EM1.99005.0001



Certipur[®] reference materials for reliable calibration in conductivity measurement

■ Certipur[®] products

- Certified reference material for conductivity measurement
- Certipur[®] conductivity sachets

■ Benefits

Certipur[®] conductivity sachets

- Solutions are always fresh and ready-to-use
- Available in suitable quantities
- Precise conductivity values
- No risk of contamination
- No residues
- Easy to use
- Includes batch-specific Certificate of Analysis
- Traceable to PTB and NIST



For precise conductivity measurement, EMD Millipore offers a distinguished range of conductivity standards. In conductivity measurement the reliable calibration of your instruments is the first, indispensable step. Our laboratory for conductivity measurement operates like our laboratory for pH measurements a comprehensive quality management system accredited by the German accreditation body to the current DIN EN ISO / IEC 17025 standard.



Merck KGaA, Darmstadt, Germany, offers secondary reference materials for conductivity measurement, which are measured in our own ISO 17025 accredited lab.



Reference material for conductivity

EMD Millipore offers certified secondary standard reference conductivity standards, which are mainly used for extremely precise calibration, qualifying and monitoring of instruments for conductivity measurement. These certified secondary reference materials are tested against our own primary reference standards certified from the German metrological institute (PTB; German Physical Technical Institute, Germany Braunschweig). The EMD Millipore conductivity standards are then hence traceable to these primary reference materials. In addition, the EMD Millipore standards are measured against international conductivity standards from NIST (National Institute of Standards and Technology, Gaithersburg, Maryland, USA). Both of the traceability procedures are documented in the Certificate of Analysis.

Certipur® reference material for conductivity measurement

Designation	Nominal conductivity [mS/cm] at 25°C	Package size	VWR Cat. No. [500 ml]
Potassium chloride solution (0.0001 mol/l)	0.015	5 PE bottles x 100 ml	EM1.01811.0105
Potassium chloride solution (0.001 mol/l)	0.147	1 PE bottle x 500 ml	EM1.01557.0500
Potassium chloride solution (0.01 mol/l)	1.41	1 PE bottle x 500 ml	EM1.01203.0500
Potassium chloride solution (0.1 mol/l)	12.8	1 PE bottle x 500 ml	EM1.01254.0500
Potassium chloride solution (1 mol/l)	111	1 PE bottle x 500 ml	EM1.01255.0500





Certipur® conductivity sachets

Ready-to-use conductivity standards can be used in laboratories or outside in the field. The package is convenient and easy to use and ensures accurate and reliable results. They are measured as well in our own accredited laboratory. In environmental analysis it is often necessary to perform the measurement directly at the river or at similar places. Our sachets were designed especially for this purpose. They are reliable, easy-to-use and always fresh. Safe and neat packages with small portions suitable for laboratory and external use prevent the solutions from contamination through micro-organisms, CO₂ or other foreign substances. The conductivity standards are ready-to-use and therefore ideal for mobile analysis. In principle, you do not even need a beaker. To measure the electrode can simply be inserted into the sachet.

Certipur® conductivity solutions in sachets

Designation	Nominal conductivity [mS/cm] at 25°C	Package size	VWR Cat. No. [500 ml]
Potassium chloride solution (0.001 mol/l)	0.147	30 sachets à 30 ml	EM1.01586.0001
Potassium chloride solution (0.1 mol/l)	12.8	30 sachets à 30 ml	EM1.01554.0001

Certipur[®] reference materials for reliable calibration in ion chromatography

Certipur[®] products

- Ion chromatography standards
- Ion chromatography multi standards, anionic
- Ion chromatography multi standards, cationic

Benefits

- Single-element standards as ready-to-use standards or as concentrates
- Multi-element standards available as anionic and cationic solution
- Traceable to NIST



Ion chromatography

Ion chromatography requires the constant use of calibration solutions. EMD Millipore has a wide range of single- and multi-element solutions for this purpose. Recent additions are the multi-element solutions. All ion chromatography standards are traceable to NIST standard reference materials.

Certipur® ion chromatography standards

Designation	Item	Composition	Concentration	Package size	VWR Cat. No.
Ammonium	Ready-to-use solution	NH ₄ Cl in water	1000 mg/l	500 ml	EM1.19812.0500
Bromide	Ready-to-use solution	NaBr in water	1000 mg/l	500 ml	EM1.19896.0500
Chloride	Ready-to-use solution	NaCl in water	1000 mg/l	500 ml	EM1.19897.0500
	Titrisol®	HCl in water	1000 mg	1 ampoule	EM1.09871.0001
Chromate	Ready-to-use solution	K ₂ CrO ₄ in water	1000 mg/l	500 ml	EM1.19780.0500
Cyanide	Ready-to-use solution	K ₂ [Zn(CN) ₄] in water	1000 mg/l	500 ml	EM1.19533.0500
Fluoride	Ready-to-use solution	NaF in water	1000 mg/l	500 ml	EM1.19814.0500
	Titrisol®	KF in water	1000 mg	1 ampoule	EM1.09869.0001
Nitrate	Ready-to-use solution	NaNO ₃ in water	1000 mg/l	500 ml	EM1.19811.0500
Nitrite	Ready-to-use solution	NaNO ₂ in water	1000 mg/l	500 ml	EM1.19899.0500
	Titrisol®	NaNO ₂ in water	1000 mg	1 ampoule	EM1.09866.0001
Phosphate	Ready-to-use solution	KH ₂ PO ₄ in water	1000 mg/l	500 ml	EM1.19898.0500
	Titrisol®	H ₃ PO ₄ in water	1000 mg	1 ampoule	EM1.09870.0001
Sulfate	Ready-to-use solution	Na ₂ SO ₄ in water	1000 mg/l	500 ml	EM1.19813.0500
	Titrisol®	H ₂ SO ₄ in water	1000 mg	1 ampoule	EM1.09872.0001

Certipur® ion chromatography multi-element standards, anionic

Designation	Composition	Matrix	Package size	VWR Cat. No.
Anion multi-element standard I	1000 mg/l: F, Br, PO ₄	Water	500 ml	EM1.11437.0500
Anion multi-element standard II	1000 mg/l: Cl, NO ₃ , SO ₄	Water	500 ml	EM1.11448.0500
IC multi-element standard I	100 mg/l: F / 250 mg/l: Cl / 500 mg/l: NO ₃ / 500 mg/l: SO ₄ / 1000 mg/l: PO ₄	Water	500 ml	EM1.70398.0500

Certipur® ion chromatography multi-element standards, cationic

Designation	Composition	Matrix	Package size	VWR Cat. No.
IC multi-element standard VII acc. to EN ISO 14911	100 mg/l: Li, Na, K, NH ₄ , Mn, Ca, Mg, Sr, Ba	0.001 mol/l HNO ₃	100 ml	EM1.10322.0100

Certipur[®] reference materials for reliable calibration in UV-VIS spectroscopy

Certipur[®] products

- UV-VIS standards

Benefits

- Ready-to-use solutions
- Solutions are according to Reag. Ph Eur
- Stable solutions in glass ampoules



UV-VIS spectroscopy

UV-VIS spectroscopy is indispensable in the modern analytical laboratory. It is a method that is well-established and is reliable and accurate. However, UV-VIS spectrometers must be checked regularly for correctness and uniformity of results and function and documented as such. This is obligatory when working according to Ph Eur, but also when working according to GLP, GMP, USP, ASTM and DIN EN ISO 9001:2008.

The following parameters can be determined using UV-VIS standards according to Ph Eur:

- Absorbance
- Stray light
- Spectral resolution power
- Wavelength accuracy

Certipur® UV-VIS standards

Designation	Content	Package size	VWR Cat. No.
UV-VIS standard 1A	Potassium dichromate solution for the absorbance at 430 nm acc. to Ph Eur	2 x 10 ml $K_2Cr_2O_7$ 600.6 mg/l in H_2SO_4 0.01 N and 6 x 10 ml H_2SO_4 0.01 N	EM1.04660.0001
UV-VIS standard 5	Toluene solution in hexane for testing the spectral resolution power acc. to Ph Eur	2 x 10 ml 0.02% (v/v) Toluol in n-Hexan and 6 x 10 ml n-Hexan	EM1.08165.0001

Auxiliaries

Designation	Content	Package size	VWR Cat. No.
Rectangular cells	Quartz 10 mm Spectroquant®	2 cells	EM1.00784.0001

Certipur[®] reference materials for reliable calibration in volumetry

■ Certipur[®] products

Certipur[®] secondary reference materials ...

- ... for acidimetry
- ... for alkalimetry
- ... for argentometry
- ... for complexometry
- ... for iodometry
- ... for redox titration

■ Benefits

- Secondary reference material for accurate titer determination
- Highly pure materials traceable to NIST
- In accordance to the reagents part of Pharmacopoeias



Certipur® secondary reference materials in volumetry

Certipur® primary substances are directly traceable to standard reference materials from the NIST (National Institute for Standard 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® – secondary 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.

Volumetric standards

Analysis	Designation	Package size	VWR Cat. No.
Acidimetry	Sodium carbonate ¹	80 g	EM1.02405.0080
Alkalimetry	Potassium hydrogen phthalate ^{1,2}	80 g	EM1.02400.0080
	Benzoic acid ^{1,2}	60 g	EM1.02401.0060
Complexometry	Zinc ¹	100 g	EM1.02409.0100
	Calcium carbonate ²	50 g	EM1.02410.0050
Redox titration	Iron(II)ethylenediammonium sulfate	80 g	EM1.02402.0080
	Potassium dichromate ²	80 g	EM1.02403.0080

1: Solution according to Reag. Ph Eur | 2: Solution according to the reagents chapter of USP

Certipur[®] reference materials for reliable calibration in special applications

■ Certipur[®] products

- Ready-to-use colour comparison solutions according to Ph Eur
- Reference materials for refractometry
- Barium sulfate white standard DIN 5033
- TOC standard solution according to EN 1484
- 2-Propanol standard for the analysis of tobacco

■ Benefits

- Ready-to-use solutions
- Solutions according to international norms
- Stable solutions with long minimum shelf lives



Ready-to-use colour comparison solutions according to the Ph Eur

Analysis of the color of a liquid in the range brown – yellow – red is described in European pharmacopoeia. However, the preparation of the solutions required is complex and time-consuming. Certipur® reference solutions save time and money: all color standards – B, BY, Y, GY and R – are available as a ready-to-use kit. To perform the analysis, the sample is simply placed in the empty cuvette contained in the kit and placed alongside the color comparison solutions in the rack provided.

Certipur® colour reference solutions acc. to Ph Eur

Designation	For examination of the color of solutions	Package size	VWR Cat. No.
Colour reference solution BY	According to Ph Eur BY1–BY7	1 set of cuvettes	EM1.00266.0001
Colour reference solution GY	According to Ph Eur GY1–GY7	1 set of cuvettes	EM1.00268.0001
Colour reference solution R	According to Ph Eur R1–R7	1 set of cuvettes	EM1.00269.0001
Empty cells with screw cap		25 units	EM1.14724.0001

Reference materials for refractometry

These standards are for the calibration of refractometers. We offer a range of different refractive index standards in order to perform calibration in the same range as the final measurement. These Certipur® standards are traceable to SRM from NIST and to PTB.

Certipur® refractive index standards acc. to Ph Eur

Designation	Composition	Refractive index (20°C)	Package size	VWR Cat. No.
Refractive index standard Kit 1,	(2,2,4-Trimethyl-pentane/water)	1.3915	1 box with 5 x 8 ml ampoules	EM1.08962.0001
Refractive index standard Kit 2,	(Toluene/water)	1.4969	1 box with 5 x 8 ml ampoules	EM1.08961.0001
Refractive index standard Kit 3,	(1-Methyl-naphthalene/water)	1.6160	1 box with 5 x 8 ml ampoules	EM1.08963.0001

TOC analysis according to DIN EN 1484-H3

Potassium hydrogen phthalate standard. The European standard has come into force for the analysis of TOC (Total Organic Compound): DIN EN 1484-H3 (which replaces DIN 38409-H3). This standard regulates the procedures for the determination of the concentration of organic carbon in drinking-, ground-, surface-, lake- and waste water. Our Certipur® TOC standard facilitates the calibration of TOC instruments according to the new standard, hence creating a reliable basis for your analyses. The potassium hydrogen phthalate solution is available as a ready-to-use standard in a concentration of 1000 mg/l in water. The standard is stabilized and protected from light in brown glass bottles. It has a minimum shelf life of 3 years for sealed, properly stored products.

Certipur® TOC standard

Designation	Package size	VWR Cat. No.
TOC standard solution acc. to DIN EN 1484 / DIN 38409-H3 as potassium hydrogen phthalate in water, stabilized, 1000 mg/l	100 ml	EM1.09017.0100

Color measurement and photometry according to DIN 5033, part 9

Color measurement according to this standard is possible using the primary reference material provided by EMD Millipore. This has been certified by the PTB. The Certificate of Analysis of barium sulfate white standard includes values for spectral density (reflection from 350-800 nm), reflection factor and standard color values.

Certipur® white standard

Designation	Package size	VWR Cat. No.
Barium sulfate white standard acc. to DIN 5033	250 g	EM1.01748.0250



Platinum Cobalt color reference solution (Hazen)

Color measurement according to DIN EN ISO 7887, ASTM D 1209-05, DIN EN ISO 6271-1 and APHA 2120 B + C can be done with the ready-to-use Hazen 500 reference solution.

Certipur® Hazen color reference solution

Designation	Package size	VWR Cat. No.
Hazen 500 color reference solution	250 ml	EM1.00246.0250



We provide information and advice to our customers on application technologies and regulatory matters to the best of our knowledge and ability, but without obligation or liability. Existing laws and regulations are to be observed in all cases by our customers. This also applies in respect to any rights of third parties. Our information and advice do not relieve our customers of their own responsibility for checking the suitability of our products for the envisaged purpose.



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