

# Certipur<sup>®</sup>

## Standard reference materials and buffers


Not all reference materials are the same ...




# Certipur<sup>®</sup> – Standard reference materials and buffers

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 Merck Millipore's Certipur<sup>®</sup> reference materials you can have always confidence in your analytical results.

All Certipur<sup>®</sup> 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.

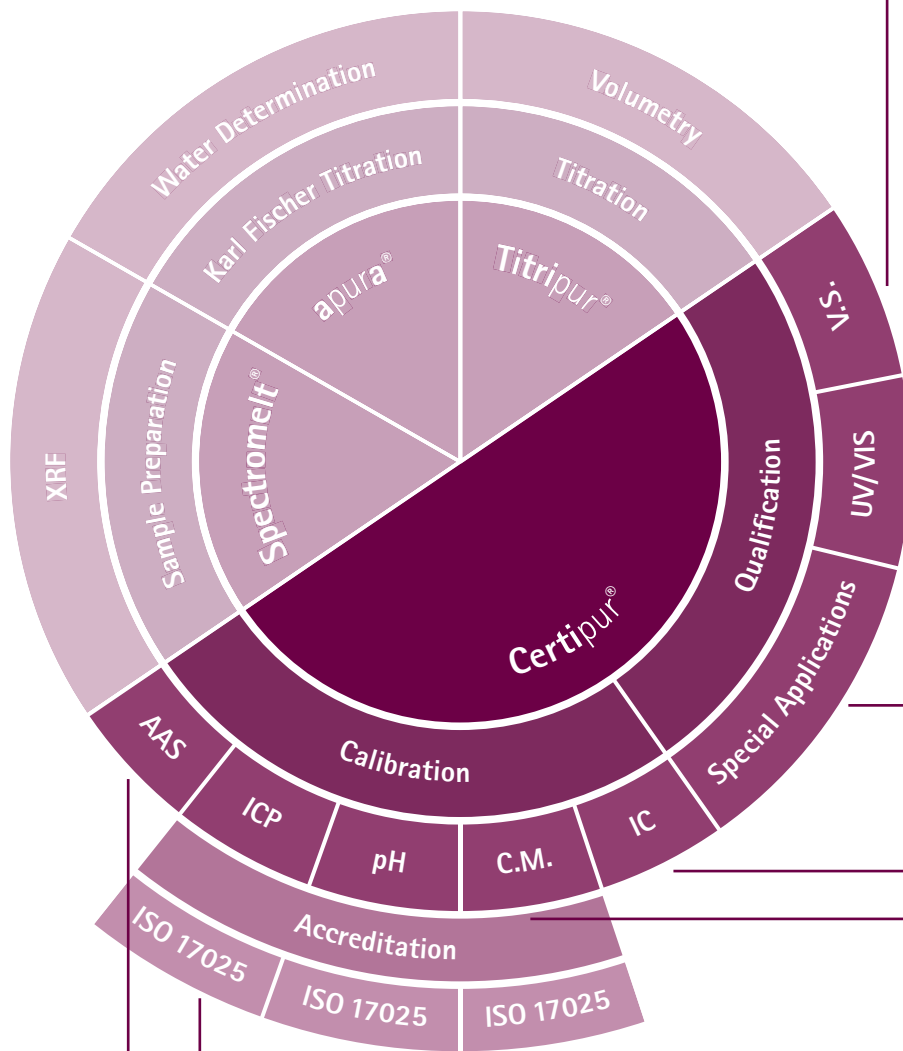
 Contents	Page
• Quality standards	174
Certipur® reference materials for reliable calibration ...	
• ... in atomic absorption spectroscopy	178
• ... in pH measurement	188
• ... in conductivity measurement	198
• ... in ion chromatography	202
• ... in UV-VIS spectroscopy	204
• ... in volumetry	206
• ... in special applications	208

-  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

 [www.merckmillipore.com/certipur](http://www.merckmillipore.com/certipur)

# Certipur®—our quality standard in instrumental analysis

Merck 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. Merck Millipore invests substantially in equipping its own laboratories and optimizes the quality and accuracy of its products with every 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 | 2-Propanol standard

### 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 Millipore's 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 Millipore's 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 Millipore's 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

# 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 high sophisticated reference materials leads to avoid repeat analysis and safe qualitatively 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 Merck Millipore is forced 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 Millipore is also obliged to participate regularly in an external international laboratory testing program. The Merck Millipore laboratory is also a member of the German calibration service (DKD) and as such is available to our customers as an accredited independent laboratory for pH, conductivity and ICP.



## 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 as 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 for use 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** It is directly measured and certified by a certifying body.
- **Secondary reference material** It 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<sup>®</sup> reference materials for reliable calibration in atomic absorption spectroscopy

## ■ Certipur<sup>®</sup> products

• ICP standards	180
• Multi-element standards	182
• Tritisol <sup>®</sup> standards	185
• AAS standards	186

## ■ Benefits

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

Certipur<sup>®</sup> by Merck Millipore – with ISO 17025 accreditation to give you reliable measuring results.





## Quality management

ICP 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.

AAS standards are normally determined titrimetrically. Depending on the element involved, the ICP / OES method is also used.

## Traceability

ICP 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.

Standards used in AAS are also traceable to SRM from NIST. Analysis of content is generally carried out titrimetrically and is traceable to the original volumetric standard.

Certificate of Analysis		Certipur® Reference Material			
<b>Bismuth ICP Standard 1000 mg/l Bi CertiPUR®</b>		<b>Lot No.: HC112304</b>			
<b>1.70306.0100</b>					
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			
<b>Composition:</b> Bismuth nitrate in nitric acid Suprapur® 2-3%					
<b>Assay:</b> 988 mg/kg		<b>Analysis:</b> ICP-OES			
1001 mg/l (calculated)					
<b>Measurement:</b> ± 3 mg/kg (± 0.3%)					
<b>Uncertainty:</b> This value represents the expanded uncertainty (U) for a coverage probability of 95%. Refer to page 2 for further details.					
<b>Traceability:</b> This ICP Standard has been measured applying high precision ICP-OES in comparison to the corresponding NIST SRM® 3106, lot 991212					
<b>Trace impurities µg/ml:</b>					
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	Eu <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	Sr <0.02	Y <0.02
Be <0.02	Ga <0.02	Mg <0.02	Pt <0.02	Sn <0.02	Zn <0.02
Bi	+ 988	Mn <0.02	Rh <0.02	Ta <0.05	Zr <0.02
Br	+ 0.02	Mo <0.02	Ru <0.02	Tb <0.02	
Cd <0.05	Gle <0.02	Nb <0.10	S <0.20	Ti <0.05	
Ce <0.02	Hf <0.02	Nd <0.02			
Co <0.02	Hg <0.05				
Cs <0.02	Ho <0.02				
Date of release: 2011-03-11		Minimum shelf life: 2014-03-31			
<i>A. Yildirim</i> Dipl.-Ing. Ayfer Yıldırım (responsible laboratory manager quality control)					
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.					
<b>Quality Management System:</b> 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	GLM: 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 the 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 Order No. [100 ml]	ICP 10000 mg/l Order No. [100 ml]
<b>A</b>	Aluminium	Al	Al(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70301.0100	1.70371.0100
	Antimony	Sb	Sb <sub>2</sub> O <sub>3</sub> in HCl 7%	1.70302.0100	-
	Arsenic	As	H <sub>3</sub> AsO <sub>4</sub> in HNO <sub>3</sub> 2-3%	1.70303.0100	-
<b>B</b>	Barium	Ba	Ba(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.70304.0100	-
	Beryllium	Be	Be <sub>4</sub> O(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) <sub>6</sub> in HNO <sub>3</sub> 2-3%	1.70305.0100	-
	Bismuth	Bi	Bi(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70306.0100	-
	Boron	B	H <sub>3</sub> BO <sub>3</sub> in water	1.70307.0100	-
	Cadmium	Cd	Cd(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.70309.0100	-
<b>C</b>	Calcium	Ca	Ca(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.70308.0100	1.70373.0100
	Cerium	Ce	Ce(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70311.0100	-
	Cesium	Cs	CsNO <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70310.0100	-
	Chromium	Cr	Cr(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70312.0100	1.70374.0100
	Cobalt	Co	Co(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.70313.0100	1.70375.0100
	Copper	Cu	Cu(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.70314.0100	1.70378.0100
	Dysprosium	Dy	Dy <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70315.0100	-
	Erbium	Er	Er <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70316.0100	-
<b>E</b>	Europium	Eu	Eu <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70317.0100	-
	Gadolinium	Gd	Gd <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70318.0100	-
<b>G</b>	Gallium	Ga	Ga(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70319.0100	-
	Germanium	Ge	(NH <sub>4</sub> ) <sub>2</sub> GeF <sub>6</sub> in water	1.70320.0100	-
	Gold	Au	H(AuCl <sub>4</sub> ) in HCl 7%	1.70321.0100	-
<b>H</b>	Hafnium	Hf	HfOCl <sub>2</sub> in HCl 7%	1.70322.0100	-
	Holmium	Ho	Ho <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70323.0100	-
<b>I</b>	Indium	In	In(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70324.0100	-
	Iridium	Ir	IrCl <sub>3</sub> in HCl 7%	1.70325.0100	-
	Iron	Fe	Fe(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub>	1.70326.0100	1.70376.0100
<b>L</b>	Lanthanum	La	La(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70327.0100	-
	Lead	Pb	Pb(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.70328.0100	1.70372.0100
	Lithium	Li	LiNO <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70329.0100	-
	Lutetium	Lu	Lu <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70330.0100	-
<b>M</b>	Magnesium	Mg	Mg(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.70331.0100	1.70379.0100
	Manganese	Mn	Mn(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.70332.0100	1.70380.0100
	Mercury	Hg	Hg(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 10%	1.70333.0100	1.70384.0100
	Molybdenum	Mo	(NH <sub>4</sub> ) <sub>6</sub> Mo <sub>7</sub> O <sub>24</sub> in water	1.70334.0100	-

## Certipur® ICP standards N-Z

	Designation	Element	Composition	ICP 1000 mg/l Order No. [100 ml]	ICP 10000 mg/l Order No. [100 ml]	
N	Neodymium	Nd	Nd <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70335.0100	-	
	Nickel	Ni	Ni(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.70336.0100	1.70382.0100	
	Niobium	Nb	NH <sub>4</sub> NbF <sub>6</sub> in water	1.70337.0100	-	
O	Osmium	Os	(NH <sub>4</sub> ) <sub>2</sub> OsCl <sub>6</sub> in HCl 7%	1.70338.0100	-	
P	Palladium	Pd	Pd(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.70339.0100	-	
	Phosphorous	P	H <sub>3</sub> PO <sub>4</sub> in water	1.70340.0100	1.70383.0100	
	Platinum	Pt	H <sub>2</sub> PtCl <sub>6</sub> in HCl 7%	1.70341.0100	-	
	Potassium	K	KNO <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70342.0100	1.70377.0100	
	Praseodymium	Pr	Pr <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70343.0100	-	
R	Rhenium	Re	NH <sub>4</sub> ReO <sub>4</sub> in water	1.70344.0100	-	
	Rhodium	Rh	Rh(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70345.0100	-	
	Rubidium	Rb	RbNO <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70346.0100	-	
	Ruthenium	Ru	RuCl <sub>3</sub> in HCl 7%	1.70347.0100	-	
S	Samarium	Sm	Sm <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70348.0100	-	
	Scandium	Sc	Sc <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 7%	1.70349.0100	-	
	Selenium	Se	SeO <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.70350.0100	-	
	Silicon	Si	SiO <sub>2</sub> in NaOH 2%	1.70365.0100	1.70386.0100	
	Silver	Ag	AgNO <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70352.0100	-	
	Sodium	Na	NaNO <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70353.0100	1.70381.0100	
	Sulfur	S	H <sub>2</sub> SO <sub>4</sub> in water	1.70355.0100	1.70385.0100	
	Strontium	Sr	Sr(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.70354.0100	-	
	T	Tantalum	Ta	(NH <sub>4</sub> ) <sub>2</sub> TaF <sub>7</sub> in water	1.70356.0100	-
		Tellurium	Te	H <sub>6</sub> TeO <sub>6</sub> in HNO <sub>3</sub> 2-3%	1.70357.0100	-
		Terbium	Tb	Tb(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70358.0100	-
Thallium		Tl	TlNO <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70359.0100	-	
Thulium		Tm	Tm(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70361.0100	-	
Tin		Sn	SnCl <sub>4</sub> in HCl 7%	1.70362.0100	-	
Titanium		Ti	(NH <sub>4</sub> ) <sub>2</sub> TiF <sub>6</sub> in water (trace HF)	1.70363.0100	-	
Tungsten		W	(NH <sub>4</sub> ) <sub>2</sub> WO <sub>4</sub> in water	1.70364.0100	-	
V		Vanadium	V	NH <sub>4</sub> VO <sub>3</sub> in HNO <sub>3</sub>	1.70366.0100	1.70388.0100
Y		Ytterbium	Yb	Yb <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70367.0100	-
	Yttrium	Y	Y(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.70368.0100	-	
Z	Zinc	Zn	Zn(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.70369.0100	1.70389.0100	
	Zirconium	Zr	ZrOCl <sub>2</sub> in HCl 7%	1.70370.0100	1.70390.0100	

## Certipur® standards 10 mg/l

	Designation	Element	Composition	ICP 10 mg/l Order No. [100 ml]
M	Mercury*	Hg	Hg(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.08623.0100
R	Rhodium, internal standard for ICP	Rh	Rh(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2-3%	1.08525.0100
T	Thorium	Th	Th(NO <sub>3</sub> ) <sub>4</sub> in HNO <sub>3</sub> 2-3%	1.70391.0100
U	Uranium	U	UO <sub>2</sub> (NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2-3%	1.70360.0100

\*suppl. to multi-element standard XXI (1.09498)

## 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 Order No. 1.15474.0100	Multi-element standard IV 23 elements, 1000 mg/l Order No. 1.11355.0100	Multi-element standard VIII 24 elements, 100 mg/l Order No. 1.09492.0100	Multi-element standard IX toxic elements, Chromium VI Order No. 1.09494.0100	Multi-element standard X for surface water, equivalent to NIST SRM 1643d   Order No. 1.09493.0100	Multi-element standard XI for sewage sludge Order No. 1.09491.0100
Designation	Element							
A	Aluminium	Al	100 mg/l	1000 mg/l	100 mg/l	-	-	-
	Arsenic	As	-	-	-	100 mg/l	50 µg/l	-
B	Barium	Ba	5 mg/l	1000 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	1000 mg/l	100 mg/l	-	10 µg/l	-
	Boron	B	15 mg/l	1000 mg/l	100 mg/l	-	100 µg/l	-
C	Cadmium	Cd	20 mg/l	1000 mg/l	100 mg/l	100 mg/l	20 µg/l	10 mg/l
	Calcium	Ca	-	1000 mg/l	100 mg/l	-	35000 µg/l	-
	Chromium	Cr	25 mg/l	1000 mg/l	100 mg/l	100 mg/l	20 µg/l	900 mg/l
	Cobalt	Co	20 mg/l	1000 mg/l	100 mg/l	-	25 µg/l	-
	Copper	Cu	20 mg/l	1000 mg/l	100 mg/l	-	20 µg/l	800 mg/l
	Gallium	Ga	150 mg/l	1000 mg/l	100 mg/l	-	-	-
I	Indium	In	200 mg/l	1000 mg/l	-	-	-	-
	Iron	Fe	15 mg/l	1000 mg/l	100 mg/l	-	100 µg/l	-
L	Lead	Pb	200 mg/l	1000 mg/l	100 mg/l	100 mg/l	25 µg/l	900 mg/l
	Lithium	Li	-	1000 mg/l	100 mg/l	-	-	-
M	Magnesium	Mg	-	1000 mg/l	100 mg/l	-	15000 µg/l	-
	Manganese	Mn	5 mg/l	1000 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	1000 mg/l	100 mg/l	100 mg/l	50 µg/l	200 mg/l
P	Potassium	K	-	1000 mg/l	100 mg/l	-	3000 µg/l	-
S	Selenium	Se	-	-	100 mg/l	100 mg/l	10 µg/l	-
	Silver	Ag	50 mg/l	1000 mg/l	-	-	-	-
	Sodium	Na	-	1000 mg/l	100 mg/l	-	8000 µg/l	-
	Strontium	Sr	1 mg/l	1000 mg/l	100 mg/l	-	100 µg/l	-
T	Tellurium	Te	-	-	100 mg/l	-	-	-
	Thallium	Tl	400 mg/l	1000 mg/l	100 mg/l	100 mg/l	10 µg/l	-
V	Vanadium	V	-	-	-	-	50 µg/l	-
Z	Zinc	Zn	20 mg/l	1000 mg/l	100 mg/l	-	50 µg/l	2500 mg/l
	Matrix		1 mol/l HNO <sub>3</sub>	1 mol/l HNO <sub>3</sub>	1 mol/l HNO <sub>3</sub>	1 mol/l HNO <sub>3</sub>	1 mol/l HNO <sub>3</sub>	1 mol/l HNO <sub>3</sub>

**Certipur®**  
**Multi-element standards**

Designation	Element	ICP calibration standards		ICP/MS calibration standards		Tuning solution		
		Multi-element standard XIII 15 elements Order No. 1.09480.0100	Multi-element standard XVI 21 elements Order No. 1.09487.0100	Multi-element standard XVII HCl soluble elements Order No. 1.09495.0100	Multi-element standard VI calibration in ICP/MS, 30 elements Order No. 1.10580.0100	Multi-element standard XXI set, contains 274473 and 108623 Order No. 1.09498.0001	Multi-element standard XXIV tuning solution 700 ES Order No. 1.09411.0500	
<b>A</b>	Aluminium	Al	500 mg/l	-	-	10 mg/l	10 mg/l	50 mg/l
	Antimony	Sb	-	100 mg/l	100 mg/l	-	-	-
	Arsenic	As	100 mg/l	100 mg/l	-	100 mg/l	10 mg/l	50 mg/l
<b>B</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	-	-
<b>C</b>	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
<b>G</b>	Gallium	Ga	-	-	-	10 mg/l	10 mg/l	-
<b>H</b>	Hafnium	Hf	-	-	100 mg/l	-	-	-
<b>I</b>	Indium	In	-	-	-	-	10 mg/l	-
	Iridium	Ir	-	-	100 mg/l	-	-	-
	Iron	Fe	100 mg/l	100 mg/l	-	100 mg/l	10 mg/l	-
<b>L</b>	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	-
<b>M</b>	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
<b>N</b>	Nickel	Ni	100 mg/l	100 mg/l	-	10 mg/l	10 mg/l	50 mg/l
<b>P</b>	Potassium	K	-	-	-	10 mg/l	10 mg/l	500 mg/l
<b>R</b>	Rubidium	Rb	-	-	-	10 mg/l	10 mg/l	-
<b>S</b>	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
<b>T</b>	Tantalum	Ta	-	-	100 mg/l	-	-	-
	Tellurium	Te	-	-	-	10 mg/l	-	-
	Thallium	Tl	-	100 mg/l	-	10 mg/l	10 mg/l	-
	Tin	Sn	-	-	100 mg/l	-	-	-
	Titanium	Ti	-	100 mg/l	100 mg/l	-	-	-
<b>U</b>	Uranium	U	-	-	-	10 mg/l	10 mg/l	-
<b>V</b>	Vanadium	V	250 mg/l	100 mg/l	-	10 mg/l	10 mg/l	-
<b>Z</b>	Zinc	Zn	100 mg/l	100 mg/l	-	100 mg/l	10 mg/l	50 mg/l
	Zirconium	Zr	-	-	100 mg/l	-	-	-
	Matrix		5% HNO <sub>3</sub>	5% HNO <sub>3</sub>	15% HCl	1 mol/l HNO <sub>3</sub>	5% HNO <sub>3</sub>	1% HNO <sub>3</sub>

\* = Hg in separate bottle (1.08623.0100)

**Certipur®**  
Multi-element standards

Designation	Element	ICP/MS mass calibration	ICP/MS plasma setup solution	Graphit furnace AAS stand.	Wavelength calibration stand.		
		Multi-element standard XXIII for mass calibration Order No. 1.09410.0500	Multi-element standard XX to setup the plasma Order No. 1.09497.1000	Multi-element standard XVIII for calibration Order No. 1.09500.0100	Multi-element standard V HCl soluble elements Order No. 1.10714.0500		
					Multi-element standard XIV HCl soluble elements Order No. 1.09481.0500		
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	10 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	-	10 µg/l	5 mg/l	2 mg/l	-
	Calcium	Ca	-	-	-	10 mg/l	-
	Cerium	Ce	-	10 µg/l	-	-	-
	Chromium	Cr	-	-	20 mg/l	2 mg/l	-
	Cobalt	Co	1 µg/l	-	50 mg/l	-	-
	Copper	Cu	-	10 µg/l	50 mg/l	2 mg/l	-
G	Gallium	Ga	1 µg/l	-	-	-	-
	Germanium	Ge	-	10 µg/l	-	-	-
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	-	10 µg/l	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	-	10 µg/l	-	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	10 µg/l	-	-	-
S	Scandium	Sc	1 µg/l	10 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	-	10 µg/l	-	-	-
	Thallium	Tl	1 µg/l	10 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 <sub>3</sub>	1% HNO <sub>3</sub>	5% HNO <sub>3</sub>	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.merckmillipore.com](http://www.merckmillipore.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]	Order No.
<b>A</b> Aluminium	Al	AlCl <sub>3</sub> in water	1.09967.0001
Arsenic	As	As <sub>2</sub> O <sub>5</sub> in water	1.09939.0001
<b>B</b> Barium	Ba	BaCl <sub>2</sub> in 7% HCl	1.09968.0001
<b>C</b> Cadmium	Cd	CdCl <sub>2</sub> in water	1.09960.0001
Calcium	Ca	CaCl <sub>2</sub> in 6.5% HCl	1.09943.0001
Chloride	Cl	HCl in water	1.09871.0001
Chromium	Cr	CrCl <sub>3</sub> in 4.2% HCl	1.09948.0001
Cobalt	Co	CoCl <sub>2</sub> in water	1.09986.0001
Copper	Cu	CuCl <sub>2</sub> in water	1.09987.0001
<b>F</b> Fluoride	F	KF in water	1.09869.0001
<b>G</b> Gold	Au	H(AuCl <sub>4</sub> ) in 12.72% HCl	1.09868.0001
<b>I</b> Iron	Fe	FeCl <sub>3</sub> in 15% HCl	1.09972.0001
<b>L</b> Lead	Pb	Pb(NO <sub>3</sub> ) <sub>2</sub> in water	1.09969.0001
Lithium	Li	LiCl in water	1.09934.0001
<b>M</b> Magnesium	Mg	MgCl <sub>2</sub> in 6% HCl	1.09949.0001
Manganese	Mn	MnCl <sub>2</sub> in water	1.09988.0001
Molybdenum	Mo	(NH <sub>4</sub> ) <sub>6</sub> Mo <sub>7</sub> O <sub>24</sub> in 0.7% NH <sub>4</sub> OH	1.09926.0001
<b>N</b> Nickel	Ni	NiCl <sub>2</sub> in water	1.09989.0001
Nitrite	NO <sub>2</sub>	NaNO <sub>2</sub> in water	1.09866.0001
<b>P</b> Phosphate	PO <sub>4</sub>	H <sub>3</sub> PO <sub>4</sub> in water	1.09870.0001
Potassium	K	KCl in water	1.09924.0001
<b>S</b> Selenium	Se	SeO <sub>2</sub> in 6.3% HNO <sub>3</sub>	1.09915.0001
Silicon	Si	SiCl <sub>4</sub> in 14% NaOH	1.09947.0001
Silver	Ag	AgNO <sub>3</sub> in 5% HNO <sub>3</sub>	1.09906.0001
Sodium	Na	NaCl in water	1.09927.0001
Strontium	Sr	SrCl <sub>2</sub> in 7% HCl	1.09993.0001
Sulfate	SO <sub>4</sub>	H <sub>2</sub> SO <sub>4</sub> in water	1.09872.0001
<b>T</b> Titanium	Ti	(NH <sub>4</sub> ) <sub>2</sub> TiF <sub>6</sub> in water	1.09829.0001
<b>V</b> Vanadium	V	VOSO <sub>4</sub> in 8.6% H <sub>2</sub> SO <sub>4</sub>	1.09994.0001
<b>Z</b> Zinc	Zn	ZnCl <sub>2</sub> in 0.06% HCl	1.09953.0001

## AAS standards

Atomic absorption spectroscopy standards are traceable to standard reference material from NIST. Analysis of content is carried out by ICP-OES or titration. A batch specific Certificate of Analysis is available via internet ([www.merckmillipore.com](http://www.merckmillipore.com)).

### Certipur® AAS standards

	Designation	Element	Composition	Concentration 1000 mg/l Order No. [100 ml]	Concentration 1000 mg/l Order No. [500 ml]	
A	Aluminium	Al	Al(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19770.0100	1.19770.0500	
	Antimony	Sb	Sb <sub>2</sub> O <sub>3</sub> in HCl 2 mol/l	1.70204.0100	1.70204.0500	
	Arsenic	As	H <sub>3</sub> AsO <sub>4</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19773.0100	1.19773.0500	
B	Barium	Ba	Ba(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19774.0100	1.19774.0500	
	Beryllium	Be	Be <sub>4</sub> O(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) <sub>6</sub> in HNO <sub>3</sub> 0.5 mol/l	1.70207.0100	1.70207.0500	
	Bismuth	Bi	Bi(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19804.0100	1.19804.0500	
	Boron	B	H <sub>3</sub> BO <sub>3</sub> in water	1.19500.0100	1.19500.0500	
C	Cadmium	Cd	Cd(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19777.0100	1.19777.0500	
	Calcium	Ca	Ca(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19778.0100	1.19778.0500	
	Cesium	Cs	CsNO <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.70212.0100	-	
	Chromium	Cr	Cr(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19779.0100	1.19779.0500	
	Cobalt	Co	Co(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19785.0100	1.19785.0500	
	Copper	Cu	Cu(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19786.0100	1.19786.0500	
	G	Gold	Au	H(AuCl <sub>4</sub> ) in HCl 2 mol/l	1.70216.0100	1.70216.0500
		I	Indium	In	In(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19504.0100
Iron	Fe		Fe(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19781.0100	1.19781.0500	
L	Lead	Pb	Pb(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19776.0100	1.19776.0500	
	Lithium	Li	LiNO <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.70223.0100	1.70223.0500	
M	Magnesium	Mg	Mg(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19788.0100	1.19788.0500	
	Manganese	Mn	Mn(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19789.0100	1.19789.0500	
	Mercury	Hg	Hg(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 mol/l	1.70226.0100	1.70226.0500	
	Molybdenum	Mo	(NH <sub>4</sub> ) <sub>6</sub> Mo <sub>7</sub> O <sub>24</sub> in water	1.70227.0100	1.70227.0500	
N	Nickel	Ni	Ni(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19792.0100	1.19792.0500	
P	Palladium	Pd	Pd(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l	1.14282.0100	1.14282.0500	
	Platinum	Pt	H <sub>2</sub> PtCl <sub>6</sub> in HCl 2 mol/l	1.70219.0100	1.70219.0500	
	Potassium	K	KNO <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.70230.0100	1.70230.0500	
S	Scandium	Sc	Sc <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 1 mol/l	1.19513.0100	1.19513.0500	
	Selenium	Se	SeO <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19796.0100	1.19796.0500	
	Silicon	Si	(NH <sub>4</sub> ) <sub>2</sub> SiF <sub>6</sub> in water	1.12310.0100	1.12310.0500	
	Silicon	Si	SiO <sub>2</sub> in NaOH 0.5 mol/l	1.70236.0100	1.70236.0500	
	Silver	Ag	AgNO <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19797.0100	1.19797.0500	
	Sodium	Na	NaNO <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.70238.0100	1.70238.0500	
	Strontium	Sr	Sr(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19799.0100	1.19799.0500	
	T	Tellurium	Te	H <sub>6</sub> TeO <sub>6</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19514.0100	-
Thallium		Tl	TlNO <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19801.0100	1.19801.0500	
Tin		Sn	SnCl <sub>4</sub> in HCl 2 mol/l	1.70242.0100	1.70242.0500	
Titanium		Ti	(NH <sub>4</sub> ) <sub>2</sub> TiF <sub>6</sub> in water	1.70243.0100	1.70243.0500	
Tungsten		W	(NH <sub>4</sub> ) <sub>2</sub> WO <sub>4</sub> in water	1.70244.0100	1.70244.0500	
V		Vanadium	V	NH <sub>4</sub> VO <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.70245.0100	1.70245.0500
Y	Yttrium	Y	Y(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19809.0100	1.19809.0500	
Z	Zinc	Zn	Zn(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19806.0100	1.19806.0500	
	Zirconium	Zr	ZrOCl <sub>2</sub> in HCl 2 mol/l	1.70234.0100	-	



## 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 Merck Millipore standard oil or with non-polar solvents.

### Certipur® standards, dissolved in oil

Designation	Raw material	Concentration	Order No. [100 ml]
Calcium	2-Ethylhexanoic acid-Ca salt	1 g/kg	1.15053.0100
Cobalt	Cyclohexanebutyric acid-Co(II) salt	1 g/kg	1.15061.0100
Phosphorus	Triphenyl phosphate	1 g/kg	1.15072.0100
Potassium	Cyclohexanebutyric acid-K salt	1 g/kg	1.15054.0100
Sodium	Cyclohexanebutyric acid-Na salt	1 g/kg	1.15058.0100

### Certipur® multi-element standards, Oil dissolved calibration standards

Designation	Composition	Order 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)	1.15075.0100
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	1.09469.0100
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	1.09479.0100

### Auxiliaries

Designation	Order No. [2.5 l]
Standard oil for AAS (30–40 mPas)	1.13898.2500



# Certipur<sup>®</sup> reference materials for reliable calibration in pH measurement

## Certipur<sup>®</sup> products

• Certified secondary standard reference materials	192
• Certified buffer solutions	193
• Titrisol <sup>®</sup> buffer concentrates	195
• Certified buffer solutions in sachets	196

Page

## Benefits

- Measured and qualified in Merck Millipore's 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

Merck 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 operate 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 Millipore's 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, Merck 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).

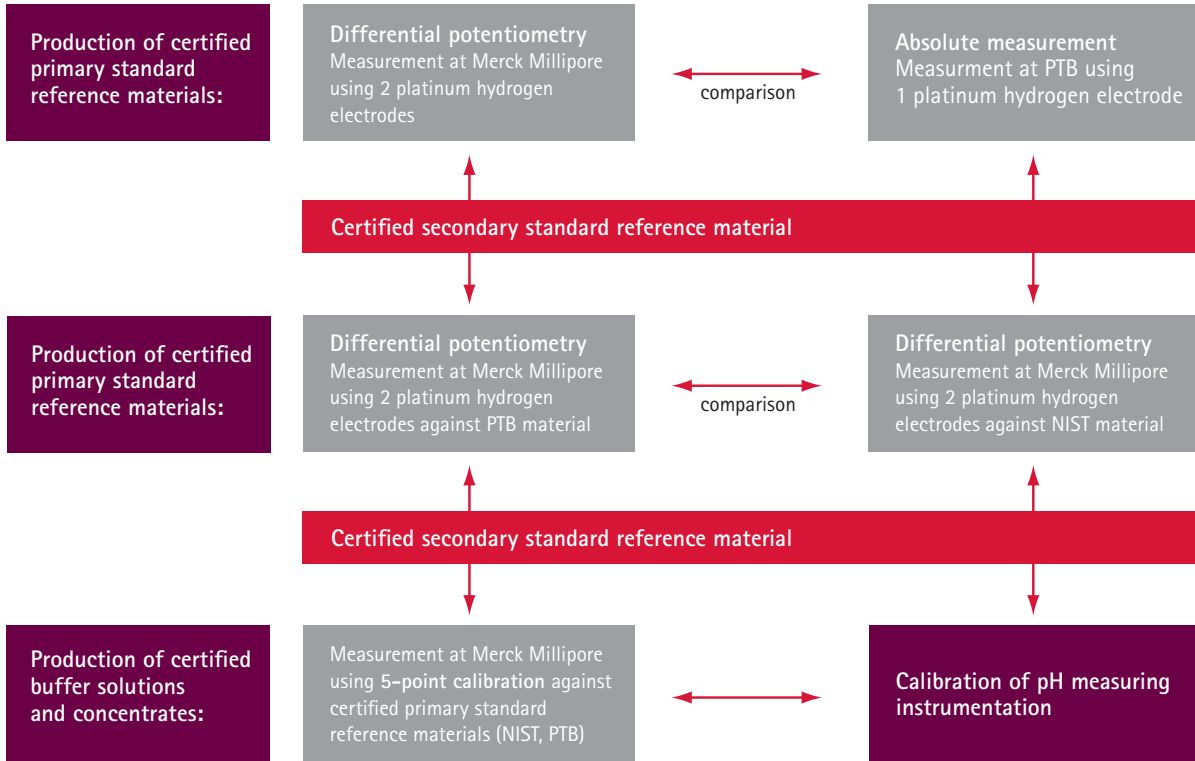
Therefore Merck Millipore's laboratory for pH measurement is not only an accredited calibration laboratory it is also an accredited testing laboratory. A testing laboratory has the permission to act as an independent authority to test samples and materials.



Certified secondary reference buffer solutions

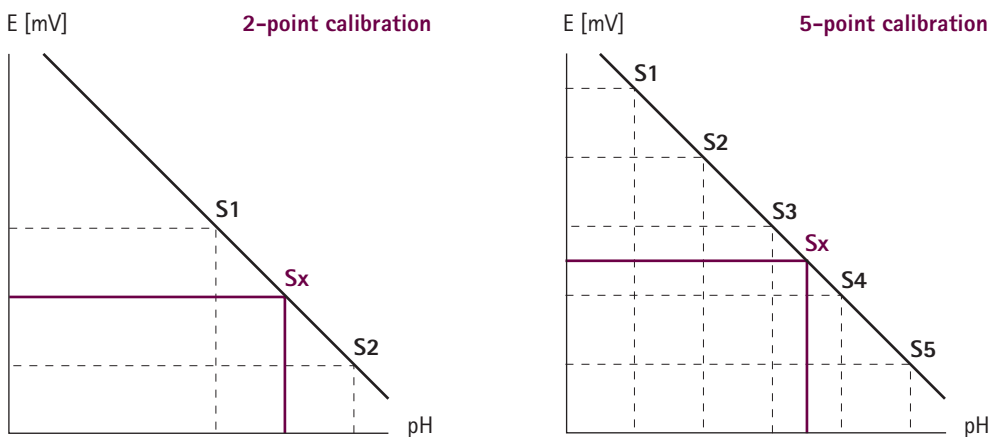
### Quality control of certified secondary reference buffers

Merck 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 material is 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 regularly calibration of pH instruments, Merck 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.  $\pm 0.003$  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 Millipore's 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	Order No.
Certipur® certified secondary standard reference buffer solution pH 1.68 <sub>1</sub> Potassium tetroxalat dihydrate	1.68 <sub>1</sub>	5 x 100 ml	1.07204.0105
Certipur® certified secondary standard reference buffer solution pH 4.00 <sub>5</sub> Potassium hydrogen phthalate	4.00 <sub>5</sub>	5 x 100 ml	1.07200.0105
Certipur® certified secondary standard reference buffer solution pH 6.86 <sub>3</sub> Potassium dihydrogen phosphate / di-Sodium hydrogen phosphate	6.86 <sub>3</sub>	5 x 100 ml	1.07202.0105
Certipur® certified secondary standard reference buffer solution pH 7.41 <sub>6</sub> Potassium dihydrogen phosphate / di-Sodium hydrogen phosphate	7.41 <sub>6</sub>	5 x 100 ml	1.07205.0105
Certipur® pH certified secondary standard reference buffer solution 9.18 <sub>4</sub> di-Sodium tetraborate decahydrate	9.18 <sub>4</sub>	5 x 100 ml	1.07203.0105

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

Designation	pH value [25°C]	Package size	Order No.
Certipur® certified secondary reference buffer substance Potassium tetroxalate dihydrate	1.68 <sub>1</sub>	25 g	1.01961.0025
Certipur® certified secondary reference buffer substance Potassium hydrogen tartate	3.63 <sub>9</sub>	25 g	1.01963.0025
Certipur® certified secondary reference buffer substance Potassium hydrogen phthalate	4.00 <sub>5</sub>	25 g	1.01965.0025
Certipur® certified secondary reference buffer substance Potassium hydrogen phosphate / di-Sodium hydrogen phosphate	6.86 <sub>3</sub> / 7.41 <sub>6</sub>	2 x 25 g	1.01960.0001
Certipur® certified secondary reference buffer substance di-Sodium tetraborate decahydrate	9.18 <sub>4</sub>	25 g	1.01964.0025
Certipur® certified secondary reference buffer substance Sodium hydrogen carbonate / Sodium carbonate	10.01 <sub>4</sub>	2 x 25 g	1.01962.0001

## 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]

Designation	pH value [20°C]	Composition	Package size	Order No.
Certipur® buffer solution	1.00	Glycine, Sodium chloride, Hydrogen chloride	1000 ml	1.09432.1000
Certipur® buffer solution	2.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1000 ml	1.09433.1000
			10 l Titripac®	1.09433.9010
Certipur® buffer solution	3.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1000 ml	1.09434.1000
Certipur® buffer solution	4.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1000 ml	1.09435.1000
			4 l Titripac®	1.09435.4000
			10 l Titripac®	1.09435.9010
Certipur® buffer solution	4.66	Acetic acid, Sodium acetate	1000 ml	1.07827.1000
Certipur® buffer solution	5.00	Citric acid, Sodium hydroxide	1000 ml	1.09436.1000
Certipur® buffer solution	6.00	Citric acid, Sodium hydroxide	1000 ml	1.09437.1000
Certipur® buffer solution	6.88	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	1000 ml	1.07294.1000
Certipur® buffer solution	7.00s	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	1000 ml	1.09439.1000
			4 l Titripac®	1.09439.4000
			10 l Titripac®	1.09439.9010
Certipur® buffer solution	8.00	Boric acid, Sodium hydroxide, Hydrogen chloride	1000 ml	1.09460.1000
Certipur® buffer solution	9.00	Boric acid, Sodium hydroxide, Potassium chloride	1000 ml	1.09461.1000
			4 l Titripac®	1.09461.4000
			10 l Titripac®	1.09461.9010
Certipur® buffer solution	9.22	di-Sodium tetraborate	1000 ml	1.01645.1000
Certipur® buffer solution	10.00	Boric acid, Sodium hydroxide, Potassium chloride	1000 ml	1.09438.1000
			4 l Titripac®	1.09438.4000
			10 l Titripac®	1.09438.9010
Certipur® buffer solution	11.00	Boric acid, Sodium hydroxide, Potassium chloride	1000 ml	1.09462.1000

### Certipur® buffer solutions [25°C]

Designation	pH value [25°C]	Composition	Package size	Package	Order No.
Certipur® buffer solution	1.00	Glycine, Sodium chloride, Hydrogen chloride	500 ml	PE bottle	1094410500
			4 l	Titripac®	1094414000
Certipur® buffer solution	2.00	Citric acid, Sodium hydroxide, Hydrogen chloride	500 ml	PE bottle	1094420500
			4 l	Titripac®	1094424000
Certipur® buffer solution	3.00	Citric acid, Sodium hydroxide, Hydrogen chloride	500 ml	PE bottle	1094440500
			4 l	Titripac®	1094444000
Certipur® buffer solution	4.00	Citric acid, Sodium hydroxide, Hydrogen chloride	500 ml	PE bottle	1094450500
			4 l	Titripac®	1094454000
Certipur® buffer solution	4.01	Potassium hydrogen phthalate	500 ml	PE bottle	1094060500
			1 l	PE bottle	1094061000
			4 l	Titripac®	1094064000
Certipur® buffer solution	5.00	Citric acid, Sodium hydroxide	500 ml	PE bottle	1094460500
			4 l	Titripac®	1094464000

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

Designation	pH value [25°C]	Composition	Package size	Package	Order No.
Certipur® buffer solution	6.00	Citric acid, Sodium hydroxide	500 ml	PE bottle	1990364000
			4 l	Titripac®	1990360500
Certipur® buffer solution	7.00	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	500 ml	PE bottle	1094070500
			1 l	PE bottle	1094071000
			4 l	Titripac®	1094074000
Certipur® buffer solution	8.00	Boric acid, Sodium hydrogen, Hydrogen chloride	500 ml	PE bottle	1990380500
			4 l	Titripac®	1990384000
Certipur® buffer solution	9.00	Boric acid, Sodium hydrogen, Potassium chloride	500 ml	PE bottle	1094080500
			1 l	PE bottle	1094081000
			4 l	Titripac®	1094084000
Certipur® buffer solution	10.00	Boric acid, Sodium hydrogen, Potassium chloride	500 ml	PE bottle	1094090500
			1 l	PE bottle	1094091000
			4 l	Titripac®	1094094000
Certipur® buffer solution	11.00	Boric acid, Sodium hydrogen, Potassium chloride	500 ml	PE bottle	1990410500
			4 l	Titripac®	1990414000
Certipur® buffer solution	12.00	di-Sodium hydrogen phosphate, Sodium hydroxide	4 l	Titripac®	1990224000

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

Designation	pH value [20°C]	Composition	Package size	Order No.
Certipur® buffer solution	4.00 [red]	Citric acid, Sodium hydroxide, Hydrogen chloride	500 ml	1.09475.0500
			4 l Titripac®	1.09475.4000
			10 l Titripac®	1.09475.9010
Certipur® buffer solution	7.00 [green]	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	500 ml	1.09477.0500
			4 l Titripac®	1.09477.4000
			10 l Titripac®	1.09477.9010
Certipur® buffer solution	9.00 [blue]	Boric acid, Potassium chloride, Sodium hydroxide	500 ml	1.09476.0500
			4 l Titripac®	1.09476.4000
			10 l Titripac®	1.09476.9010
Certipur® buffer solution	10.00 [yellow]	Boric acid, Potassium chloride, Sodium hydroxide	500 ml	1.09400.0500
			4 l Titripac®	1.09400.4000
			10 l Titripac®	1.09400.9010





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

Designation	pH value [25°C]	Composition	Package size	Package	Order No.
Certipur® buffer solution	4.00	color coded red measured 25 °C	500 ml	PE bottle	10990540500
			1 l	Titripac®	10990544000
Certipur® buffer solution	7.00	color coded yellow measured 25 °C	500 ml	PE bottle	1990570500
			1 l	Titripac®	1990574000
Certipur® buffer solution	10.00	color coded blue measured 25 °C	500 ml	PE bottle	1990500500

## 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	Order No.
Buffer Titrisol®	1.00	Glycine, Sodium chloride, Hydrogen chloride	1 ampoule	1.09881.0001
Buffer Titrisol®	2.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1 ampoule	1.09882.0001
Buffer Titrisol®	3.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1 ampoule	1.09883.0001
Buffer Titrisol®	4.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1 ampoule	1.09884.0001
Buffer Titrisol®	5.00	Citric acid, Sodium hydroxide	1 ampoule	1.09885.0001
Buffer Titrisol®	6.00	Citric acid, Sodium hydroxide	1 ampoule	1.09886.0001
Buffer Titrisol®	7.00	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	1 ampoule	1.09887.0001
Buffer Titrisol® acc. to Weise	7.20	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	1 ampoule	1.09879.0001
Buffer Titrisol®	8.00	Boric acid, Sodium hydroxide, Hydrogen chloride	1 ampoule	1.09888.0001
Buffer Titrisol®	9.00	Boric acid, Sodium hydroxide, Hydrogen chloride	1 ampoule	1.09889.0001
Buffer Titrisol®	10.00	Boric acid, Sodium hydroxide, Hydrogen chloride	1 ampoule	1.09890.0001
Buffer Titrisol®	11.00	Boric acid, Sodium hydroxide, Potassium chloride	1 ampoule	1.09880.0001
Buffer Titrisol®	12.00	di-Sodium hydrogen phosphate, Sodium hydroxide	1 ampoule	1.09892.0001
Buffer Titrisol®	13.00	Potassium chloride, Sodium hydroxide	1 ampoule	1.09893.0001

## 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]

Designation	pH value [25°C]	Composition	Package size	Order No.
Certipur® buffer solution	2.00	Citric acid, Sodium hydroxide, Hydrogen chloride	30 sachets x 30 ml	1.99012.0001
Certipur® buffer solution	4.01	Potassium hydrogen phthalate	30 sachets x 30 ml	1.99001.0001
Certipur® buffer solution	6.00	Citric acid, sodium hydroxide	30 sachets x 30 ml	1.99016.0001
Certipur® buffer solution	7.00	Potassium dihydrogen phosphate, di-Sodium hydrogen phosphate	30 sachets x 30 ml	1.99002.0001
Certipur® buffer solution	9.00	Boric acid, Sodium hydroxide, Potassium chloride	30 sachets x 30 ml	1.99003.0001
Certipur® buffer solution	9.18	di-Sodium tetraborate	30 sachets x 30 ml	1.99019.0001
Certipur® buffer solution	10.00	Boric acid, Sodium hydroxide, Potassium chloride	30 sachets x 30 ml	1.99004.0001
Certipur® buffer solution	11.00	Boric acid, Sodium hydroxide, Potassium chloride	30 sachets x 30 ml	1.99021.0001
Certipur® buffer solution	12.00	di-Sodium hydrogen phosphate, Sodium hydroxide	30 sachets x 30 ml	1.99022.0001
Certipur® buffer solution Set I	4.01 7.00 9.00	–	3 x 10 sachets x 30 ml	1.99005.0001
Certipur® buffer solution Set II	4.01 7.00 10.00	–	3 x 10 sachets x 30 ml	1.99006.0001



# Certipur<sup>®</sup> reference materials for reliable calibration in conductivity measurement

## ■ Certipur<sup>®</sup> products

- |   |     |
|---|-----|
| • Certified reference material for conductivity measurement | 200 |
| • Certipur <sup>®</sup> conductivity sachets                | 201 |

## ■ Benefits

### Certipur<sup>®</sup> 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, Merck 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 operate 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 Millipore offers secondary reference materials for conductivity measurement, which are measured in our own ISO 17025 accredited lab.



## Reference material for conductivity

Merck Millipore offers certified secondary standard reference conductivity standards, which are at most used for extremely precise calibration, qualifying and monitoring of instruments for conductivity measurement. These certified secondary reference material is tested against own primary reference standards certified from the German metrological institute (PTB; German Physical Technical Institute, Germany Braunschweig). The Merck Millipore conductivity standards are then hence traceable to these primary reference materials. In addition, the Merck 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	Order No. [500 ml]
Conductivity water	0	5 PE bottles x 100 ml	1.01810.0105
Potassium chloride solution (0.0001 mol/l)	0.015	5 PE bottles x 100 ml	1.01811.0105
Potassium chloride solution (0.001 mol/l)	0.147	1 PE bottle x 500 ml	1.01557.0500
Potassium chloride solution (0.01 mol/l)	1.41	1 PE bottle x 500 ml	1.01203.0500
Potassium chloride solution (0.1 mol/l)	12.8	1 PE bottle x 500 ml	1.01254.0500
Potassium chloride solution (1 mol/l)	111	1 PE bottle x 500 ml	1.01255.0500





## 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, CO<sub>2</sub> 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	Order No. [500 ml]
Potassium chloride solution (0.001 mol/l)	0.147	30 sachets à 30 ml	1.01586.0001
Potassium chloride solution (0.01 mol/l)	1.41	30 sachets à 30 ml	1.01553.0001
Potassium chloride solution (0.1 mol/l)	12.8	30 sachets à 30 ml	1.01554.0001

# Certipur<sup>®</sup> reference materials for reliable calibration in ion chromatography

## Certipur<sup>®</sup> products

	Page
• Ion chromatography standards	203
• Ion chromatography multi standards, anionic	203
• Ion chromatography multi standards, cationic	203

## 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. Merck 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	Order No.
Ammonium	Ready-to-use solution	NH <sub>4</sub> Cl in water	1000 mg/l	500 ml	1.19812.0500
Bromide	Ready-to-use solution	NaBr in water	1000 mg/l	500 ml	1.19896.0500
Chloride	Ready-to-use solution	NaCl in water	1000 mg/l	500 ml	1.19897.0500
	Titrisol®	HCl in water	1000 mg	1 ampoule	1.09871.0001
Chromate	Ready-to-use solution	K <sub>2</sub> CrO <sub>4</sub> in water	1000 mg/l	500 ml	1.19780.0500
Cyanide	Ready-to-use solution	K <sub>2</sub> [Zn(CN) <sub>4</sub> ] in water	1000 mg/l	500 ml	1.19533.0500
Fluoride	Ready-to-use solution	NaF in water	1000 mg/l	500 ml	1.19814.0500
	Titrisol®	KF in water	1000 mg	1 ampoule	1.09869.0001
Nitrate	Ready-to-use solution	NaNO <sub>3</sub> in water	1000 mg/l	500 ml	1.19811.0500
Nitrite	Ready-to-use solution	NaNO <sub>2</sub> in water	1000 mg/l	500 ml	1.19899.0500
	Titrisol®	NaNO <sub>2</sub> in water	1000 mg	1 ampoule	1.09866.0001
Phosphate	Ready-to-use solution	KH <sub>2</sub> PO <sub>4</sub> in water	1000 mg/l	500 ml	1.19898.0500
	Titrisol®	H <sub>3</sub> PO <sub>4</sub> in water	1000 mg	1 ampoule	1.09870.0001
Sodium	Ready-to-use solution	NaNO <sub>3</sub> in water	1000 mg/l	500 ml	1.19507.0500
Sulfate	Ready-to-use solution	Na <sub>2</sub> SO <sub>4</sub> in water	1000 mg/l	500 ml	1.19813.0500
	Titrisol®	H <sub>2</sub> SO <sub>4</sub> in water	1000 mg	1 ampoule	1.09872.0001

### Certipur® ion chromatography multi-element standards, anionic

Designation	Composition	Matrix	Package size	Order No.
Anion multi-element standard I	1000 mg/l: F, Br, PO <sub>4</sub>	Water	500 ml	1.11437.0500
Anion multi-element standard II	1000 mg/l: Cl, NO <sub>3</sub> , SO <sub>4</sub>	Water	500 ml	1.11448.0500
IC multi-element standard I	100 mg/l: F / 250 mg/l: Cl / 500 mg/l: NO <sub>3</sub> / 500 mg/l: SO <sub>4</sub> / 1000 mg/l: PO <sub>4</sub>	Water	500 ml	1.70398.0500
IC multi-element standard V	10 mg/l: F, Br / 50 mg/l: NO <sub>3</sub> , PO <sub>4</sub> / 100 mg/l: Cl / 200 mg/l: SO <sub>4</sub>	Water	100 ml	1.09032.0100

### Certipur® ion chromatography multi-element standards, cationic

Designation	Composition	Matrix	Package size	Order No.
IC multi-element standard VII acc. to EN ISO 14911	100 mg/l: Li, Na, K, NH <sub>4</sub> , Mn, Ca, Mg, Sr, Ba	0.001 mol/l HNO <sub>3</sub>	100 ml	1.10322.0100
IC multi-element standard VI	10 mg/l: NH <sub>4</sub> / 50 mg/l: K / 100 mg/l: Na, Ca, Mg	0.01 mol/l HNO <sub>3</sub>	100 ml	1.09036.0100

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

## Certipur® products

- UV-VIS standards

Page

205

## 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	Order No.
UV-VIS standard 1	Potassium dichromate solution for the absorbance acc. to Ph Eur	2 x 10 ml $K_2Cr_2O_7$ 60.06 mg/l in $H_2SO_4$ 0.01 N and 6 x 10 ml $H_2SO_4$ 0.01 N	1.08160.0001
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	1.04660.0001
UV-VIS standard 2	Sodium nitrite solution for straylight testing acc. to Ph Eur	3 x 10 ml $NaNO_2$ 50 g/l in $H_2O$	1.08161.0001
UV-VIS standard 3	Sodium iodide solution for straylight testing acc. to Ph Eur	3 x 10 ml $NaI$ 10 g/l in $H_2O$	1.08163.0001
UV-VIS standard 4	Potassium chloride solution for straylight testing acc. to Ph Eur	3 x 10 ml $KCl$ 12 g/l in $H_2O$	1.08164.0001
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	1.08165.0001
UV-VIS standard 6	Holmium oxide solution reference material for the wavelength acc. to Ph Eur	3 x 10 ml $Ho_2O_3$ 40 g/l in $HClO_4$ (10% v/v)	1.08166.0001

### Auxiliaries

Designation	Content	Package size	Order No.
Rectangular cells	Quartz 10 mm Spectroquant®	2 cells	1.00784.0001

# Certipur<sup>®</sup> reference materials for reliable calibration in volumetry

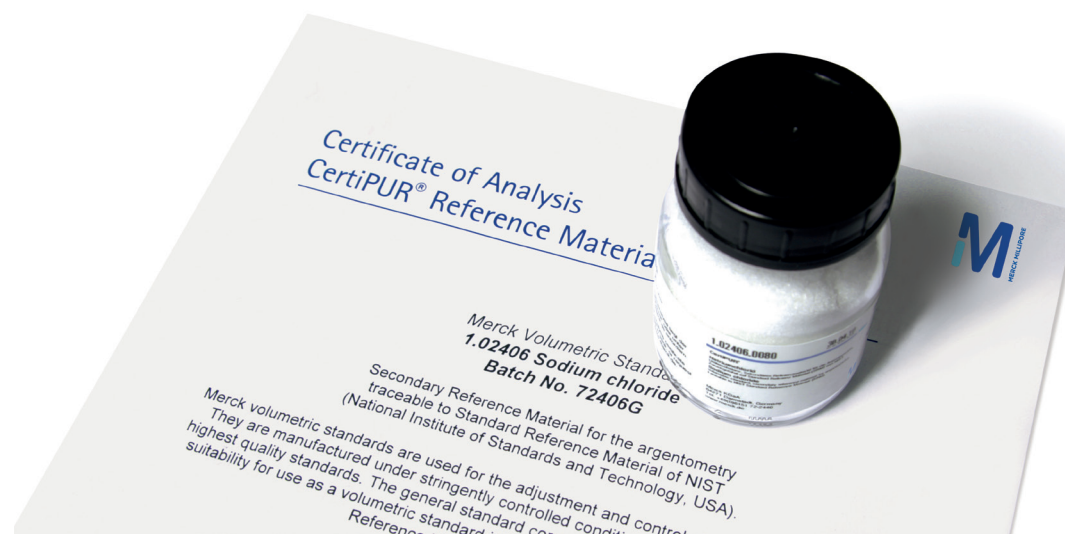
## ■ Certipur<sup>®</sup> products Page

Certipur<sup>®</sup> secondary reference materials ...

- ... for acidimetry 207
- ... for alkalimetry 207
- ... for argentometry 207
- ... for complexometry 207
- ... for iodometry 207
- ... for redox titration 207

## ■ 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	Order No.
Acidimetry	Sodium carbonate <sup>1</sup>	80 g	1.02405.0080
	Tris(hydroxymethyl)aminomethane <sup>2</sup>	80 g	1.02408.0080
Alkalimetry	Potassium hydrogen phthalate <sup>1,2</sup>	80 g	1.02400.0080
	Benzoic acid <sup>1,2</sup>	60 g	1.02401.0060
Argentometry	Sodium chloride <sup>1,2</sup>	80 g	1.02406.0080
Complexometry	Zinc <sup>1</sup>	100 g	1.02409.0100
	Calcium carbonate <sup>2</sup>	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 <sup>2</sup>	80 g	1.02403.0080
	di-Sodium oxalate <sup>2</sup>	60 g	1.02407.0060

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

# Certipur<sup>®</sup> reference materials for reliable calibration in special applications

## Certipur<sup>®</sup> products

• Ready-to-use colour comparison solutions according to Ph Eur	209
• Reference materials for refractometry	209
• Barium sulfate white standard DIN 5033	210
• TOC standard solution according to EN 1484	210
• 2-Propanol standard for the analysis of tobacco	210

## 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	Order No.
Colour reference solution B	According to Ph Eur B1–B9	1 set of cuvettes	1.00265.0001
Colour reference solution BY	According to Ph Eur BY1–BY7	1 set of cuvettes	1.00266.0001
Colour reference solution Y	According to Ph Eur Y1–Y7	1 set of cuvettes	1.00267.0001
Colour reference solution GY	According to Ph Eur GY1–GY7	1 set of cuvettes	1.00268.0001
Colour reference solution R	According to Ph Eur R1–R7	1 set of cuvettes	1.00269.0001
Empty cells with screw cap		25 units	1.14724.0001

## 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	Order No.
Refractive index standard Kit 1,	(2,2,4-Trimethyl-pentane/water)	1.3915	1 box with 5 x 8 ml ampoules	1.08962.0001
Refractive index standard Kit 2,	(Toluene/water)	1.4969	1 box with 5 x 8 ml ampoules	1.08961.0001
Refractive index standard Kit 3,	(1-Methyl-naphthalene/water)	1.6160	1 box with 5 x 8 ml ampoules	1.08963.0001

## TOC analysis according to EN 1484-H3

Potassium hydrogen phthalate standard. The European standard has come into force for the analysis of TOC (Total Organic Compound): 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	Order No.
TOC standard solution acc. to EN 1484 / DIN 38409-H3 as potassium hydrogen phthalate in water, stabilized, 1000 mg/l	100 ml	1.09017.0100

## 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 Merck 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	Order No.
Barium sulfate white standard acc. to DIN 5033	250 g	1.01748.0250



## 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	Order No.
Hazen 500 color reference solution	250 ml	1.00246.0250


## Standard for analysis of tobacco

This standard is especially developed for the tobacco industry for extraction using isopropanol. The reference material includes an internal standard for subsequent gas chromatographic analysis.

### Standard for tobacco analysis

Designation	Package size	Order No.
2-Propanol standard for tobacco analysis	2.5 l	1.00272.2500





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.



Merck KGaA  
Darmstadt, Germany  
+ 49 (0)6151 72 8396  
[www.merck-chemicals.com](http://www.merck-chemicals.com)  
[www.merckmillipore.com/certipur](http://www.merckmillipore.com/certipur)