

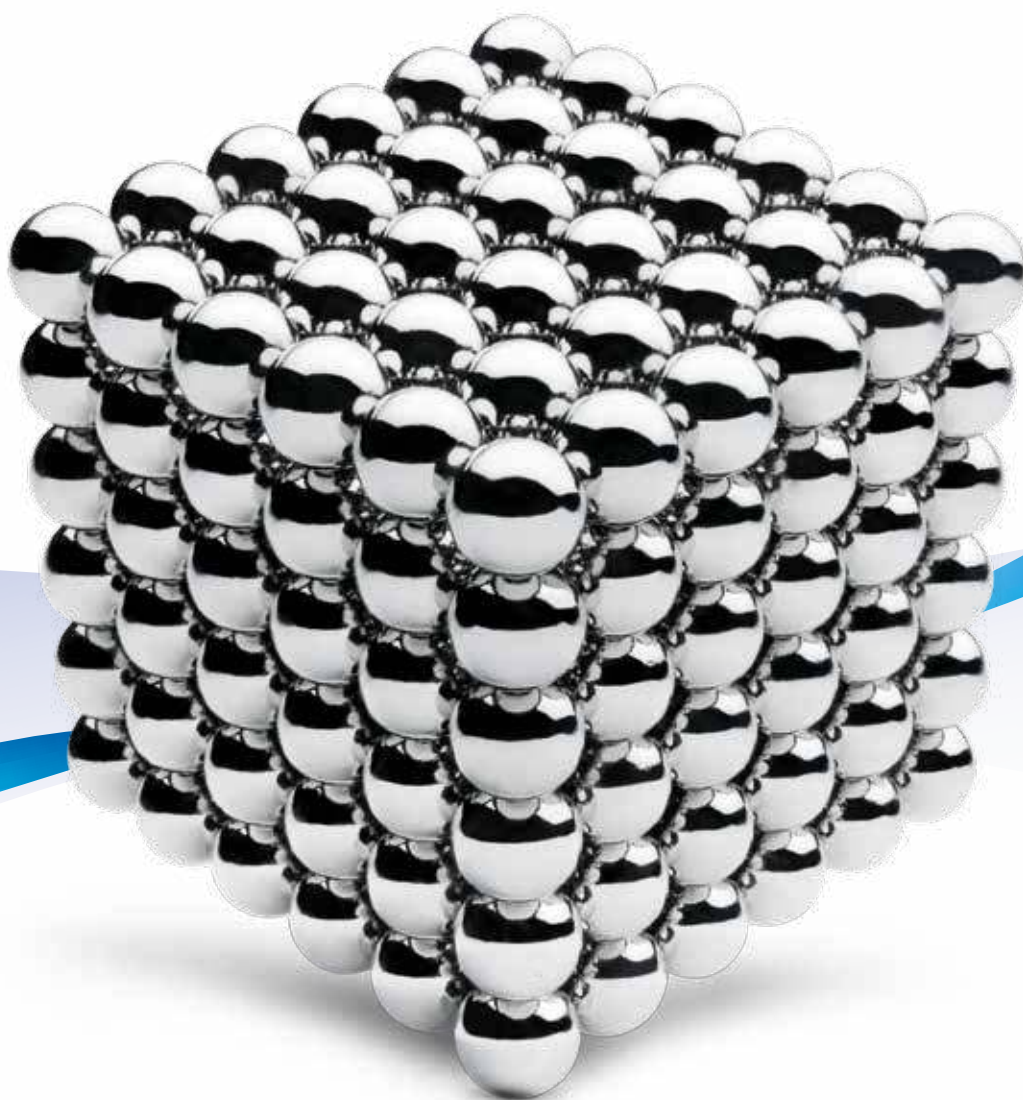
# Perfection in every dimension. Inorganic Reagents catalog



# Inorganic Reagents for laboratory use

Every customer has a different goal. We make reaching yours easier with a clear, helpful guide and straightforward directions. No matter what kind of information you seek, the Inorganic Reagents catalog will help you find exactly what you want – and quickly!

Search by special product categories, the A-Z alphabetical listing (index) or the glossary.



- **Experience and innovation**

The unique experience of the Merck own history enables us to turn our eyes on to the future and combine tradition with modernity to provide respectable and innovative products. Our extensive expertise and rich heritage enable us to deliver products that are both practical and revolutionary – a huge product range with globally renowned trademarks.

- **Quality, certification and accreditation**

Outstanding quality and purity are of utmost importance to us. This ensures that our products are consistently reliable.

- **Confidence and convenience**

We believe that entrepreneurial success starts with people. That's why our mission statement defines us as a successful and responsible company. Our goal is to operate a worldwide business that produces meaningful benefits for you – our customers, market partners and community. With Merck Millipore Inorganic Reagents, you can expect a dependable and lasting partnership.

- **Safety and environmental protection**

In order to ensure the high quality and safety of our products, Merck Millipore offers a large range of advanced packaging options for safe transport, storage and product protection. This underlines our goal of sustainable protection of people and the environment.

- **Service**

We work in close cooperation with you, our customers to develop innovative solutions based on your specific requirements and provide you an extensive range of product information.

**Special product categories** | Explore broad product ranges for numerous applications in your laboratory. These categories allow you to search within your specific application, such as volumetric solutions, reference materials or cleaning applications.

**Alphabetical listing** | The A to Z product listing spans over 1000 individual products and includes special features to make your search easier.



[www.merckmillipore.com/inorganic-reagents](http://www.merckmillipore.com/inorganic-reagents)

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[www.merckmillipore.com/classical-inorganic-analysis](http://www.merckmillipore.com/classical-inorganic-analysis)

[www.merckmillipore.com/instrumental-inorganic-analysis](http://www.merckmillipore.com/instrumental-inorganic-analysis)

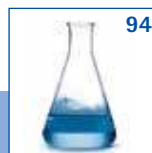
[www.merckmillipore.com/safety-products](http://www.merckmillipore.com/safety-products)





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# History

MERCK – living innovation.

The company's foundation was laid in 1668 when Friedrich Jacob Merck purchased a pharmacy in Darmstadt, which was later renamed »Engel Apotheke«. In the years that followed, the pharmacy was passed from father to son until in 1816 it came under the leadership of Heinrich Emanuel Merck. Industrial scale production was started in 1827 – and with it the birth of Merck as a company. Since then, the name Merck has stood for high quality pharmaceutical and chemical products that benefit our customers.







From the very beginning, our aim has been to deliver products of the highest standards. This was best expressed by Heinrich Emanuel Merck in his letter to a customer in 1851:

»I herewith guarantee the purity of my preparations and undertake to reimburse you for any damage that may arise through one of my preparations being impure.«

Heinrich Emanuel Merck

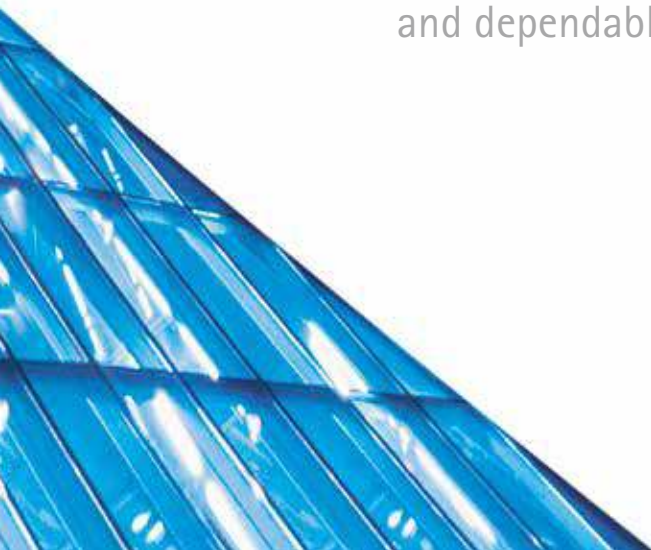
This dedication to quality was evident from the start of production with »Merck's Guaranteed Pure Reagents« and the addition of »Pro Analysis« in 1888. These measures assured consequent implementation and careful formulation to the highest purity standards, based on comparative chemical analysis. All products carried the seal »as a warranty sign for the identity and quality of the product«. And this is still valid today.

**Merck Inorganic Reagents are committed to superior quality, reliability and innovation, focused on our customer needs.**

As reliable partners, we offer a comprehensive range of premium products and services based on your requirements. We work closely with our customers, listen to your needs and challenges and integrate this knowledge into future products and services. Thanks to our cooperation today, we can develop the products you need tomorrow.

In 2010 Merck took over Millipore Corporation, one of the most leading life science companies. With the newly formed division "Merck Millipore" we strengthened our leading position in the life science market.

We always go the extra mile to ensure a lasting and dependable partnership.



# Quality management

Always high quality – just choose your grade

At Merck Millipore, we believe our tradition of world-class quality in reagents and chemicals is a reputation worth upholding. You can see how we act on this commitment on three fronts: validation, regulations and accreditation.

## Quality

We maintain our own state-of-the-art laboratories to test and certify every single product in-house. Highly qualified specialist staff is key to this procedure. As a result, you can expect batch-to-batch consistency in any chemical or reagent you choose.

During our tests – even for complex instrumental and wet chemical procedures – we always integrate the latest developments in technology and methods. Adherence to international standards and legal requirements also occupies a central position in our work.

But ultimately, quality to us encompasses more than »product quality«. As our customer, you deserve more than just product purity or batch-to-batch consistency. You deserve highest quality service, from rapid delivery to sound advice and packaging that's right for your application. In short: service that exceeds your expectations. And that's what we offer you every day.

## Regulations

Whether you manufacture products nationally or internationally, you're faced with a host of laws and guidelines. It can be difficult to maintain an overview of which requirements you need to meet where – especially when those requirements change. This is where a capable partner can help point the way.

You can also expect proven safety thanks to an unrivaled range of comprehensive specifications with up to 60 parameters, all combined with the declaration of international standards, such as ISO, ACS and Reag. Ph Eur. This means Merck Millipore analytical reagents comply with the official quality guidelines for pharmacopoeia analysis worldwide. The benefit to you? Customized, unique quality joined with the highest possible degree of reliability – a relationship that makes a real difference in your everyday lab tasks.

## Accreditation

As an integral part of the way we comply with regulations, accreditation forms another cornerstone of our quality assurance policy. It acts as a stamp of approval from qualified external organizations, confirming that our quality is as good as we say it is. Our calibration labs, for example, are accredited, and our standards are measured against international standards of the National Institute of Standards and Technology (NIST), a U.S.-based body.

One way we ensure that we continue to provide distinguished chemicals and reagents is our continuous effort to expand the implementation of quality norms like DIN EN ISO / IEC 17025.

Take advantage of first-rate chemicals and reagents that are just right for your application! Our different quality grades are designed to accommodate your needs, whether you have to meet international standards, follow safety regulations, require both bulk and small quantities, or have an application unlike any other. You're sure to find a perfect fit in our product range.



## More information

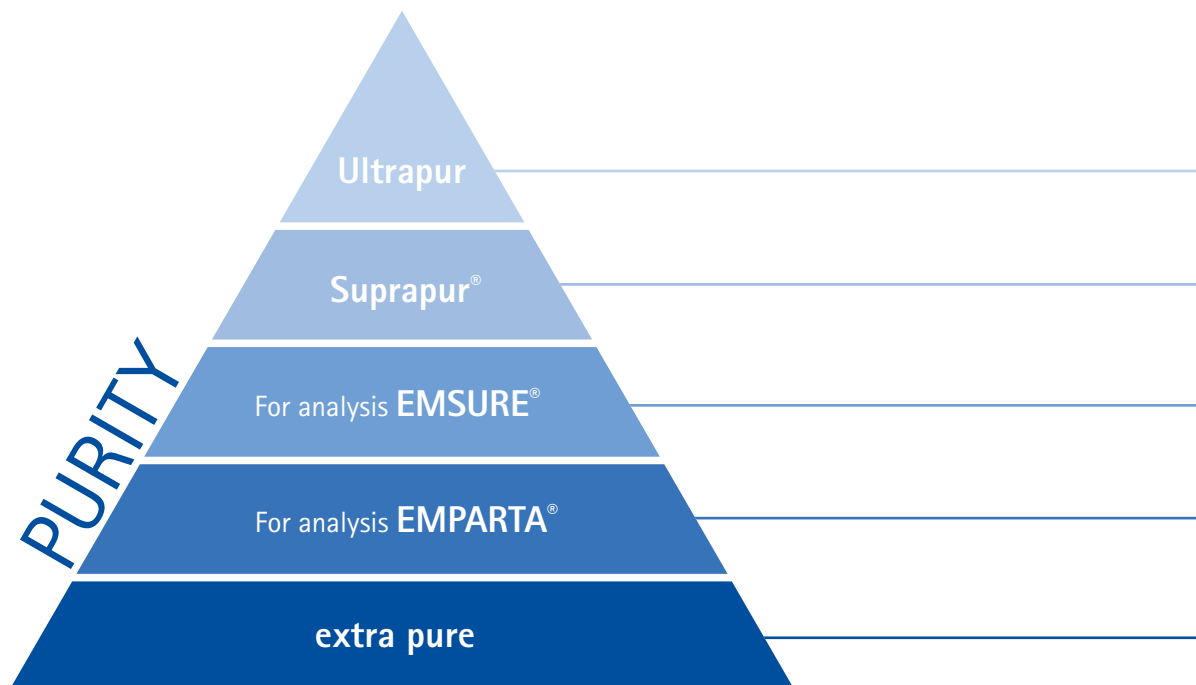
► Turn the page to explore our quality grades.

# Exceptional quality is our standard

Merck Millipore places the greatest importance on the high quality of each individual product. From development to delivery, we take the utmost care to achieve outstanding quality, particularly in the sensitive field of analytical reagents.

Always high quality – just choose your grade

Take advantage of first-rate chemicals and reagents that are perfectly suited to your individual application! Our various quality grades are designed to accommodate your every wish. Whether you need to meet international standards, follow safety regulations, require large or small quantities, or have an unique application, you are sure to find the ideal solution in our product range.



## Specification

ACS	Standards of the American Chemical Society
ISO	Standards of the International Organization for Standardization
Reag. Ph Eur	Reagents specified by the European Pharmacopoeia

## Quality grades for your individual needs

### Ultrapur

High purity acids, hydrogen peroxide | Highly sophisticated instrumental trace analysis, e.g. ICP | Specified parameters in ppt range

### Suprapur®

High purity acids, bases and salts | Instrumental trace analysis, e.g. AAS | Specified parameters in ppb range

### EMSURE®

Acids, caustics and salts | For analysis in highly demanding and regulated markets, e.g. Pharma QC | Reag. Ph Eur, ACS, ISO et al | Up to 60 specified parameters

### EMPARTA®

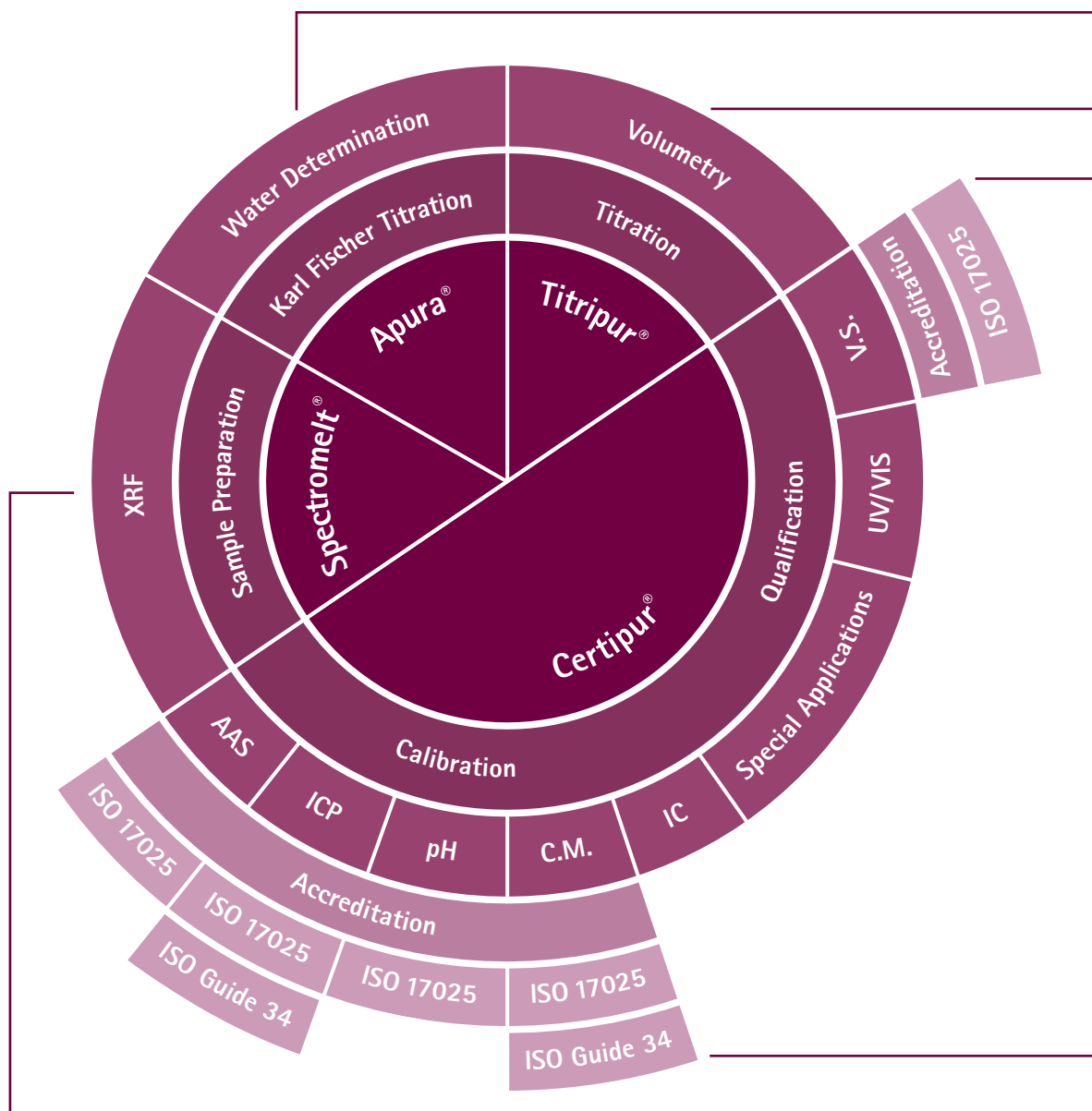
Acids | For analysis in routine applications and classical analysis | ACS | Up to 15 specified parameters

### extra pure

Acids, caustics and salts | For preparative lab applications and cleaning purposes

# Our quality standards in instrumental analysis

The more sensitive the instrumental detection becomes, the more important it is to use highly pure reagents. System error caused by impurities in the auxiliary reagents are difficult to quantify. Merck Millipore has a specially tailored range of standards and reagents to satisfy all purity requirements.





## 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

## Quality grades for your individual needs

### Apura®

Karl Fischer reagents | Titration according to Karl Fischer method for water determination

### Titripur®

Volumetric solutions | Sophisticated titration | Reag. Ph Eur, Reag. USP | Traceable to NIST standards

### Certipur®

Reference materials | Calibration and monitoring of instruments for instrumental analysis | ISO Guide 34 | ISO / IEC 17025 | Traceable to NIST and PTB standards

C.M. = Conductivity measurement | V.S. = Volumetric standards

### Spectromelt®

Reagents for X-ray fluorescence sample preparation | Fluxes and tableting aid

# Analytical reagents specified for pharmacopoeia analysis

Merck Millipore offers several hundred inorganic chemical reagents for pharmacopoeia analysis – in particular acids, salts, caustics, bases, indicators and special reagents. Our products bear the designation »for analysis EMSURE® ACS, Reag. Ph Eur«. This extensive range provides you with everything you need – from one trusted source.

In fact, no other manufacturer supplies such a wide variety of products. Furthermore, you have the confidence of working with the appropriate reagents for your particular needs that meet all quality requirements.

Our analytical reagents for pharmacopoeia analysis not only comply with the ACS standard, but also with Reag. Ph Eur. Thus, our products meet all reagent specifications described by the American as well as the European Pharmacopoeia.

Analytical reagents from Merck Millipore fulfill the following quality guidelines:

- ACS, and referred by Reag. USP
- Reag. Ph Eur

Through compliance with these comprehensive standards, we are creating a new level of quality for analytical reagents, thus providing you with the highest possible degree of reliability – worldwide. Take advantage of our premium analytical reagents to fulfill the fundamental prerequisites of your scientific work and successfully pass all audits.

## More information

► [www.merckmillipore.com/pharmacopoeia-analysis](http://www.merckmillipore.com/pharmacopoeia-analysis)

# Safety and environment

The prevention of accidents, employee safety and the security of your working environment are of utmost importance to you. As they are for Merck Millipore.

## Safety is our top priority

You can rely on Merck Millipore products, safety instructions, supporting materials and global experts to help you achieve the highest possible degree of safety.

We are committed to acting in an environmentally responsible way and safeguarding the health of every individual working with Merck Millipore products. Our Safety and Environmental Management is based on statutory legislation and the principles of Responsible Care\*.

All applicable laws and directives are strictly adhered to. Merck Millipore's Safety System follows international standards such as ISO and REACH. We take our responsibility seriously to assure your occupational health and wellbeing. High safety standards in production, processing and packaging are reflected in every Merck Millipore product you use in your laboratory.

## These high standards are achieved through:

- State-of-the-art Safety Data Sheets with detailed product information
- Specially designed packaging suited to the properties of each product (safe break bottles, safe caps etc.)
- Compilation of relevant environmental data on product properties, storage, use and disposal (SafeDat, ChemDat, Store Card)
- Extensive product tests prior to market launch
- Reliable storage and supply of products
- Exemplary and fast implementation of new GHS labelling

The basis of our joint success: innovative and reliable products that benefit humanity and safeguard the environment.

Environmental protection, occupational safety and health are at the core of all our innovations!

## Safety and environment – characteristics

► For easy detection, safety and/or sustainable characteristics of our products are highlighted with this symbol.



► [www.merckmillipore.com/protection](http://www.merckmillipore.com/protection) ► [www.responsibility.merck.de](http://www.responsibility.merck.de) ► [www.responsiblecare.org](http://www.responsiblecare.org)

\* = Responsible Care is a registered trademark of the global chemical industry

# Packaging

In order to ensure high product quality and safety, sophisticated and innovative packaging is a pre-condition. Besides offering premium quality chemicals and reagents, Merck Millipore has invested decades into developing the most advanced packaging concepts in the field of chemistry.

## Essential protection

Reliable packaging is essential to protect users and the environment, as well as to safeguard our high-quality reagents from impurities and contamination. This is why Merck Millipore offers a wide range of exceptional packaging options for safe transport, storage and user-friendly handling. All our packing materials have been tested for quality and permeability, thereby ensuring the purity of the product. Thus, not only the container itself, but also the closing system and the outer transportation box are optimized as a packaging system.

## Packaging department

**Merck Millipore's in-house packaging department is exclusively responsible for testing, developing and approving packaging materials.**

In fact, our package testing facility for hazardous chemicals is authorized by the German Institute for Materials Research and Testing (Bundesanstalt für Materialforschung und -prüfung – BAM).



## Measures to ensure high-quality, optimized packaging:

### Packaging development

- Design of innovative packaging concepts to make the use of reagents safe, easy and more convenient
- Developing sophisticated packaging for new products
- Continuous improvements and inspections of our existing packaging
- Creating ecological and economical recycling concepts

### Packaging testing

- Conformity with all safety requirements
- Maintenance of quality even after longer periods of storage
- No interferences between packaging material and contents
- No contamination of the high purity reagents
- User-friendly packaging
- Ecological and economical package recycling

In order to maintain the high quality and reliability of all our packaging, we perform extensive tests before we use it for our chemicals. For each batch of packaging material, we prepare statistical test samples for the most critical packaging characteristics, for example:

- Testing of primary packaging with respect to purity
- Cooling stress tests of glass bottles
- Compression resistance test with corrugated board boxes
- Drop test with corrugated board boxes for hazardous goods

### Qualification of suppliers

- Auditing of suppliers at regular intervals
- Hygiene management: exclusion of contamination by production procedure
- Consistent quality of packaging through process stability



# Variety of packaging types

Merck Millipore offers a unique range of packaging types in various sizes for reagents and chemicals. Here you will find more detailed information about the most important packaging types for Inorganic Reagents.



## General packaging

- Glass bottle
- Safebreak bottle
- HDPE bottle
- Closure systems
- Corrugated board boxes with PE inliner
- Canisters, drums and IBCs for large quantities

## Special packaging

- Titripac®
- Sachet
- Titrisol® ampoule
- Borosilicate bottle
- PFA bottle
- Glass ampoule

## Packaging for shipping

## Labels and GHS

## Your advantages

- Packaging is always compatible with the product
- Safe and convenient handling, storage and transportation
- Optimal protection of chemicals and reagents from contamination
- Application-oriented packaging
- Wide choice of packaging materials and sizes



### Glass bottle

Merck Millipore's amber glass bottle, made from premium blank glass, is one of our standard forms of packaging for basic liquid reagents. It is characterized by ideal handling, storage and transportation properties.



- Premium amber blank glass of hydrolytic class 3, which remains inert even to aggressive chemicals
- The glass used minimizes the leaching of impurities by the contents
- Impermeable to air and water vapor, resulting in a high level of stability and allowing long storage of the content
- Amber glass protects the content against light
- The glass bottles are produced in a clean environment thereby safeguarding reagents against contamination
- The special shape of the opening allows an optimum pouring process
- The secure base and low center of gravity make it difficult for the bottle to tip over
- Special S28 and S40 closure system developed by Merck Millipore

### Safebreak bottle

Our exceptionally safe glass bottle for especially dangerous acids



- Glass bottle with eco-friendly PE jacket
- If the glass breaks, the splinters and acid are caught safely by the PE jacket
- Offers all the benefits of conventional glass bottles
- S40 closure system
- The Safebreak bottle can be recycled together with conventional glass bottles

### More information

- ▶ See paragraph »Closure systems for liquids and solids« on page 23
- ▶ See chapter »Acids for analysis« on page 94

# Packaging overview

## HDPE narrow necked bottle



The HDPE narrow necked bottle is another standard form of packaging for liquid reagents. The bottle's low tare weight makes it easy to handle and gives it ideal transportation properties.

- Made from high-density polyethylene (HDPE)
- The high level of purity of the HDPE used means that it has little influence on the contents
- Integrated handles (for 2.5 l and 5 l) ensure comfortable handling and dosage
- The special shape of the opening allows an optimum pouring process
- The narrow base enables efficient use of laboratory storage space
- Low tare weight makes it easy to handle and keeps transport costs down
- 2.5 l bottle is extremely stable thanks to its special base geometry (even with pressure producing chemicals)
- Depending on the chemicals, the bottles are colored to protect against unwanted UV radiation
- Special S28 and S40 closure systems

For certain products such as high purity hydrogen peroxide, we offer specially developed bottles which are adapted to the product's individual properties.

## HDPE wide necked bottle



Merck Millipore mainly uses HDPE wide necked bottles for solids. With their square base and large opening, the bottles allow solids to be handled easily and safely.

- Made from high-density polyethylene (HDPE)
- The high level of purity of the HDPE used means that it has little influence on the contents
- Wide opening for easy withdrawal
- Square base allows optimum use of storage space in the laboratory and during transportation
- S38 to S85 closure systems

## More information

► See paragraph »Closure systems for liquids and solids« on the next page

## Closure systems Closure systems for liquids and solids in glass, HDPE and Safebreak bottles (S40, S28, S38, S60 and S85)



Merck Millipore's exclusive closure systems are the ideal complement to our glass, HDPE and Safebreak bottles. The screw caps and special openings of the bottles were developed especially for use with chemicals and make the bottles extremely leakproof.

- Leakproof thanks to special shape
  - 3-zone closure
  - No sealing ring necessary
- Tamper-proof seal
- Made from polypropylene or PTFE, depending on the product

## SafetyCap Our special closure for chemicals which build up pressure in the bottle.



- Allows gas to be released in case of internal pressure
- Absolutely leakproof against liquids
  - No liquid can leak, even if the bottle is tipped
  - No additional PE bag needed
- The semi-permeable PTFE valve prevents gas or liquid from entering the bottle
- No protruding parts that can break off

### More information

► See chapter »Acids for analysis« on page 94

# Packaging overview

## Corrugated board box with PE inliner



Our standard packaging for large quantities of solids. The exceptionally high-quality PE inliner provides the chemicals with ideal protection from contamination while also preventing substances from escaping.

- The PE inliner used to protect the product is produced in clean room conditions
- Corrugated board boxes are glued in a water-resistant manner in accordance with DIN 53133. This means that they remain stable even in damp conditions and provide optimum protection for the product
- Stable construction allows stacking
- The size of the corrugated board boxes is designed to fit the size of the CP-5 chemicals pallet, guaranteeing optimum use of space and safety when loading

## Packaging for larger quantities of liquid chemicals



For larger quantities of liquid reagents, we offer packaging that ensures safe and convenient handling.

### Canisters

- HDPE canisters are available in 5 l to 25 l
- For light-sensitive chemicals, the canisters are colored blue
- All canisters have a KS 60 x 6 male screw as standard
- Specially shaped canisters are used for liquids which build pressure

### Drums

- HDPE drums up to 200 l
- CombiDrum: steel drum with PE inliner and special finishing

### Intermediate Bulk Container (IBC)

- Made from HDPE, for liquids up to 950 l

## Titripac®

Titripac® is an innovative and safe packaging for ready-to-use volumetric solutions, buffer solutions and other aqueous solutions.



- Available in 4 l and 10 l
- Outer packaging is made from corrugated board, the inner bag from composite foil
- Thanks to its absolutely leakproof, sealed packaging system, Titripac® ensures that the quality of the solution remains constant from the very first to the very last drop
- No additional checks on the solution are necessary
- Contamination from air, carbon dioxide or microorganisms is excluded
- Easy to use thanks to the integrated tap, which can be connected directly to a titrator using an adaptor
- Reduced packaging waste since the box and inner bag are disposed of separately

## Sachets

Bags for portion-sized quantities of ready-to-use buffer and conductivity solutions.



- The bags are made from composite film, completely leakproof and guarantee the stability of the solution
- Portion-sized quantities for single use, so that a fresh solution is ready for any application
- Packed in boxes of 30 sachets

## More information

- ▶ See chapter »Volumetric solutions« on page 132
- ▶ See chapter »Standards, reference materials and buffers« on page 172

# Packaging overview

Bottle made from borosilicate glass

Our standard packaging for high purity liquid reagents of Suprapur® quality.



- Clear glass bottle of hydrolytic class 1 (DURAN\*)
- Especially high purity level and very low leach-out behavior by acids
- No contamination of chemicals, so that reagents retain a constant purity level

Bottle made from perfluoralkoxy copolymer (PFA)

Our standard packaging for high purity reagents of Ultrapur quality.



- Perfluoralkoxy copolymer (PFA) is an extremely chemically-resistant plastic
- High purity reagents, with maximum impurities within the ppt or ppq range, are protected from contamination and interaction with the packaging
- The quality of the chemical is retained

Plastic ampoules (Titrisol® ampoules)

Titrisol® ampoules are used for concentrates in the production of buffer solutions, element standard solutions and volumetric solutions.



- Each ampoule contains a precisely defined amount of substance, which is normally filled up to 1 liter final volume. Any concentration required, however, can be created by dilution
- Titrisol® ampoules are made from polyethylene
- Easy to open
- Space-saving storage
- Long shelf life

Glass ampoule

We use especially high-quality glass ampoules for standards and reference materials.



- Clear or brown glass of hydrolytic class 1
- Hermetically sealed so that the reagent remains stable
- Predetermined breaking point for ease of opening

\* = DURAN is a registered trademark of the Duran Group



### Packaging for shipping

The same high standards that we set for the primary packaging of our reagents, also apply to our transport packaging. This ensures that our premium products reach you safely and completely intact.

- The packaging for shipping is also subject to our strict quality assurance
- Corrugated board boxes are mainly used for shipping
- Corrugated board boxes are glued in a water-resistant manner in accordance with DIN 53133. This means that they remain stable even in damp conditions and provide optimum protection for the product
- Merck Millipore delivers on CP-5 chemicals pallets (1140 x 760 cm)
- The use of disposable pallets means that they are always clean and flawless

### Secure transport of glass bottles

#### New pulp packaging

To protect chemical bottles during transportation and storage, we have developed new pulp packaging. These robust, molded fiber trays will replace our previous polystyrene packaging, and have been especially tested for the transportation of dangerous goods. Strong yet light in weight, the molded fiber trays are made of recyclable materials, hence they are also environmentally friendly.

- Prevent breakage
- Strong yet lightweight
- Environmentally friendly
- Easy to dispose of



# Packaging overview

## Labels

Labeling products safely is extremely important. This is why Merck Millipore uses varnished paper labels which are resistant to most chemicals. PE labels are also used in exceptional cases.

Our labels are resistant to abrasion and forgery proof. They are applied with a glue specially developed for use in the chemicals sector and with the respective packaging.

Needless to say, all substances carry GHS labels. By June 1, 2015, all mixtures will also feature GHS labels. Merck Millipore's labels contain a wide range of useful information about our products (see next page).

## GHS – the first-ever globally uniform basis

GHS stands for the Globally Harmonized System of Classification and Labeling of Chemicals. In December 2002, the United Nations published the GHS in the so-called »Purple Book« with a description of harmonized classification and labeling criteria.

The goal of GHS is to harmonize the various existing classification and labeling systems all over the world. Due to inconsistent evaluation criteria, it has long been the case that the same substance can be classified as poisonous, harmful to health, or even not harmful. This leads to different levels of protection in terms of occupational health and safety, as well as for consumers and the environment. GHS offers the first ever globally uniform basis for the evaluation of substance properties. In doing so, it establishes the requirement of a globally high protection level for human health and the environment.

This harmonized system defines criteria for classification and labeling, including hazardous substance labeling, and requirements for the creation of Safety Data Sheets.

## More information

► [www.merckmillipore.com/ghs](http://www.merckmillipore.com/ghs) ► [www.merckmillipore.com/safety](http://www.merckmillipore.com/safety)

empirical formulas | Density | Molar mass

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## Inorganic Reagents A

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	Absorption tube for H <sub>2</sub> O (molecular sieve 0.3 nm with indicator)	106107	240
	Acetic acid (glacial) 100 % anhydrous for analysis EMSURE® ACS, ISO, Reag. Ph Eur	100063	105
		100063	110
	Acetic acid (glacial) 100 % for analysis EMPARTA® ACS	101830	110
	Acetic acid (glacial) 100 % Suprapur®	100066	226
	Acetic acid 1 mol/l prepared from raw materials acc. Ph Eur Titripur®	199061	142
	Acetic acid 30 % for analysis Reag. Ph Eur	159166	110
	Acetic acid 96 % for analysis EMSURE®	100062	110
	Acetic acid for 1000 ml, c(CH <sub>3</sub> COOH) = 0.1 mol/l (0.1 N) Titrisol®	109944	142
	Acetic acid for 500 ml, c(CH <sub>3</sub> COOH) = 1 mol/l (1 N) Titrisol®	109951	142
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	Aluminium ammonium sulfate dodecahydrate for analysis EMSURE® ACS	101031	70
	Aluminium fine powder, stabilized about 2 % fat	101056	127
	Aluminium ICP standard traceable to SRM from NIST Al(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Al Certipur®	170301	180
	Aluminium ICP standard traceable to SRM from NIST Al(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 10000 mg/l Al Certipur®	170371	180
	Aluminium nitrate nonahydrate for analysis EMSURE®	101063	70
	Aluminium oxide fibers for gooch crucibles	115754	243
	Aluminium potassium sulfate dodecahydrate for analysis EMSURE® ACS, Reag. Ph Eur	101047	70
	Aluminium standard 1000 mg Al, (AlCl <sub>3</sub> in H <sub>2</sub> O) Titrisol®	109967	185
	Aluminium standard solution traceable to SRM from NIST Al(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l Al Certipur®	119770	186
	Amido black 10 B [C.I. 20470] for electrophoresis	101167	297
	Amidosulfuric acid extra pure	100219	110
	Amidosulfuric acid for analysis EMSURE®	100103	110
	Ammonia solution 25 % for analysis EMSURE®	105432	121
	Ammonia solution 25 % Suprapur®	105428	226
	Ammonia solution 28 – 30 % for analysis EMSURE® ACS, Reag. Ph Eur	105423	121
	Ammonia solution 32 % extra pure	105426	121
	Ammonium acetate for analysis EMSURE® ACS, Reag. Ph Eur	101116	70
	Ammonium amidosulfonate for analysis (for detection of sulfonamide in blood) EMSURE® ACS, Reag. Ph Eur	101220	70
	Ammonium bromide for analysis EMSURE® ACS	101125	70
	Ammonium carbamate for analysis EMSURE®	101134	70
	Ammonium carbonate for analysis EMSURE® ACS, Reag. Ph Eur	159504	70
	Ammonium cerium(IV) nitrate for analysis EMSURE® ACS, Reag. Ph Eur	102276	70

## Inorganic Reagents A-B

	Product	Cat. No.	Page
A	Ammonium cerium(IV) nitrate solution $c(\text{NH}_4)_2 \text{Ce}(\text{NO}_3)_6 = 0.1 \text{ mol/l}$ (0.1 N) Titripur®	102277	142
	Ammonium cerium(IV) sulfate dihydrate for analysis EMSURE® ACS	102273	70
	Ammonium chloride 99.995 Suprapur®	101143	232
	Ammonium chloride for analysis EMSURE® ACS, ISO, Reag. Ph Eur	101145	70
	Ammonium dihydrogen phosphate 99.99 Suprapur®	101440	232
	Ammonium dihydrogen phosphate for analysis EMSURE® ACS, Reag. Ph Eur	101126	70
	Ammonium fluoride for analysis EMSURE® ACS	101164	70
	Ammonium heptamolybdate tetrahydrate for analysis EMSURE® ACS, Reag. Ph Eur	101182	70
	Ammonium iron(III) sulfate hexahydrate for analysis EMSURE®, ISO	103792	71
	Ammonium iron(II) sulfate solution for 250 ml, $c[(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2] = 0.1 \text{ mol/l}$ (0.1 N) Titrisol®	109864	142
	Ammonium iron(III) sulfate dodecahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	103776	70
	Ammonium nitrate for analysis EMSURE® ACS	101188	71
	Ammonium peroxodisulfate for analysis EMSURE® ACS, Reag. Ph Eur	101201	71
	Ammonium standard solution traceable to SRM from NIST $\text{NH}_4\text{Cl}$ in $\text{H}_2\text{O}$ 1000 mg/l $\text{NH}_4^+$ Certipur®	119812	203
	Ammonium sulfate 99.9999 Suprapur®	101209	232
	Ammonium sulfate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	101217	71
	Ammonium thiocyanate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	101213	71
	Ammonium thiocyanate solution $c(\text{NH}_4\text{SCN}) = 0.1 \text{ mol/l}$ (0.1 N) Titripur®	109079	142
	Ammonium thiocyanate solution for 1000 ml, $c(\text{NH}_4\text{SCN}) = 0.1 \text{ mol/l}$ (0.1 N) Titrisol®	109900	142
	Ammonium thiosulfate 98 %+	101208	127
	Anion multi-element standard I 1000 mg/l: $\text{F}^-$ , $\text{PO}_4^{3-}$ , $\text{Br}^-$ in $\text{H}_2\text{O}$ Certipur®	111437	203
	Anion multi-element standard II 1000 mg/l: $\text{Cl}^-$ , $\text{NO}_3^-$ , $\text{SO}_4^{2-}$ in $\text{H}_2\text{O}$ Certipur®	111448	203
	Antimony ICP standard traceable to SRM from NIST $\text{Sb}_2\text{O}_3$ in $\text{HCl}$ 7 % 1000 mg/l Sb Certipur®	170302	180
	Antimony powder for analysis particle size <150 µm EMSURE®	107832	127
	Antimony standard solution traceable to SRM from NIST $\text{Sb}_2\text{O}_3$ in $\text{HCl}$ 2 mol/l 1000 mg/l Sb Certipur®	170204	186
	Antimony(III) chloride for analysis EMSURE®	107838	127
	Antimony(III) oxide extra pure	107835	127
	Antimony(III) oxide for analysis EMSURE®	107836	127
	Arsenazo III metal indicator	110107	298
	Arsenic ICP standard traceable to SRM from NIST $\text{H}_3\text{AsO}_4$ in $\text{HNO}_3$ 2 – 3 % 1000 mg/l As Certipur®	170303	180
	Arsenic lumps for analysis (protective gas: nitrogen) EMSURE®	100115	127
	Arsenic standard 1000 mg As, $(\text{As}_2\text{O}_5 \text{ in } \text{H}_2\text{O})$ Titrisol®	109939	185
	Arsenic standard solution traceable to SRM from NIST $\text{H}_3\text{AsO}_4$ in $\text{HNO}_3$ 0.5 mol/l 1000 mg/l As Certipur®	119773	186
	L(+)-Ascorbic Acid for analysis EMSURE® ACS, ISO, Reag. Ph Eur	100468	110
	Aurin tricarboxylic acid ammonium salt for analysis (reagent for aluminium) ACS	100128	298
B	Barbituric acid for analysis EMSURE®	100132	110
	Barium acetate for analysis EMSURE® ACS	101704	71
	Barium carbonate for analysis EMSURE® ACS, Reag. Ph Eur	101714	71
	Barium chloride 99.995 Suprapur®	101716	232
	Barium chloride dihydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	101719	71

# Index B

## Inorganic Reagents B

	Product	Cat. No.	Page
B	Barium chloride solution for 1 l measure solution, $c(\text{BaCl}_2) = 0.05 \text{ mol/l}$ (0.1 N) Titrisol®	109962	142
	Barium fluoride 99.99 Suprapur®	101722	232
	Barium hydroxide octahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	101737	71
	Barium ICP standard traceable to SRM from NIST $\text{Ba}(\text{NO}_3)_2$ in $\text{HNO}_3$ 2 – 3 % 1000 mg/l Ba Certipur®	170304	180
	Barium nitrate for analysis EMSURE® ACS	101729	71
	Barium perchlorate anhydrous for analysis EMSURE®	101738	71
	Barium perchlorate solution in 2-propanol / water (80 : 20) $c(\text{Ba}(\text{ClO}_4)_2) = 0.005 \text{ mol/l}$ Titripur®	109086	142
	Barium standard 1000 mg Ba, $(\text{BaCl}_2 \text{ in } 7 \% \text{ HCl})$ Titrisol®	109968	185
	Barium standard solution traceable to SRM from NIST $\text{Ba}(\text{NO}_3)_2$ in $\text{HNO}_3$ 0.5 mol/l 1000 mg/l Ba Certipur®	119774	186
	Barium sulfate for white standard DIN 5033	101748	211
	Benzoic acid volumetric standard, secondary reference material for alkalimetry, traceable to NIST Standard Reference Material (SMR) Certipur®	102401	207
	Benzoic acid for analysis EMSURE® Reag. Ph Eur	100136	110
	Beryllium ICP standard traceable to SRM from NIST $\text{Be}_4\text{O}(\text{C}_2\text{H}_3\text{O}_2)_6$ in $\text{HNO}_3$ 2 – 3 % 1000 mg/l Be Certipur®	170305	180
	Beryllium standard solution $\text{Be}_4\text{O}(\text{C}_2\text{H}_3\text{O}_2)_6$ in $\text{HNO}_3$ 0.5 mol/l 1000 mg/l Be Certipur®	170207	186
	2,2'-Bipyridine for analysis (reagent for iron (II) and molybdenum) ACS	103098	297
	Bismuth ICP standard traceable to SRM from NIST $\text{Bi}(\text{NO}_3)_3$ in $\text{HNO}_3$ 2 – 3 % 1000 mg/l Bi Certipur®	170306	180
	Bismuth standard solution traceable to SRM from NIST $\text{Bi}(\text{NO}_3)_3$ in $\text{HNO}_3$ 0.5 mol/l 1000 mg/l Bi Certipur®	119804	186
	Bismuth(III) nitrate alkaline for analysis EMSURE® Reag. Ph Eur	101878	71
	Bismuth(III) oxide extra pure	101862	127
	Boiling chips granules ~ 1 – 2 mm	107912	280
	Boiling chips granules ~ 2 – 8 mm	107913	280
	Boric acid 99.9999 Suprapur®	100765	219
	Boric acid for analysis EMSURE® ACS, ISO, Reag. Ph Eur	100165	110
	Boron ICP standard traceable to SRM from NIST, $\text{H}_3\text{BO}_3$ in $\text{H}_2\text{O}$ 1000 mg/l B Certipur®	170307	180
	Boron standard solution traceable to SRM from NIST $\text{H}_3\text{BO}_3$ in $\text{H}_2\text{O}$ 1000 mg/l B Certipur®	119500	186
	Brilliant cresyl blue zinc chloride double salt for microscopy Certistain®	101368	297
	Brilliant green (hydrogen sulfate) [C.I. 42040] for microbiology	101310	290
	Bromide bromate solution for 1000 ml, $c(\text{Br}_2) = 0.05 \text{ mol/l}$ (0.1 N) Titrisol®	109905	142
	Bromide standard solution traceable to SRM from NIST NaBr in $\text{H}_2\text{O}$ 1000 mg/l $\text{Br}^-$ Certipur®	119896	203
	Bromine 99.9999 Suprapur®	101947	233
	Bromine extra pure	101945	127
	Bromine for analysis EMSURE® ACS, ISO, Reag. Ph Eur	101948	127
	Bromocresol green indicator ACS, Reag. Ph Eur	108121	290
	Bromocresol green sodium salt indicator water-soluble ACS	101541	290
	Bromocresol purple indicator ACS, Reag. Ph Eur	103025	290
	Bromophenol blue indicator ACS, Reag. Ph Eur	108122	290
	Bromophenol red indicator	103023	290
	Bromothymol blue indicator ACS, Reag. Ph Eur	103026	290
	Bromothymol blue sodium salt indicator water-soluble ACS	101895	290
	BTS catalyst (about 5 x 3 mm) for gas purification	104182	280

## Inorganic Reagents B

	Product	Cat. No.	Page
B	Buffer concentrate (borate / hydrochloric acid), traceable to SRM of NIST and PTB for 500 ml buffer solution, pH 8.00 +- 0.02 (20°C) Titrisol®	109888	195
	Buffer concentrate (boric acid / potassium chloride / sodium hydroxide), traceable to SRM of NIST and PTB for 500 ml buffer solution, pH 10.00 +- 0.05 (20°C) Titrisol®	109890	195
	Buffer concentrate (boric acid / potassium chloride / sodium hydroxide), traceable to SRM of NIST and PTB for 500 ml buffer solution, pH 11.00 +- 0.05 (20°C) Titrisol®	109880	195
	Buffer concentrate (boric acid / potassium chloride / sodium hydroxide), traceable to SRM of NIST and PTB for 500 ml buffer solution, pH 9.00 +- 0.02 (20°C) Titrisol®	109889	195
	Buffer concentrate (citrate / hydrochloric acid), traceable to SRM of NIST and PTB for 500 ml buffer solution, pH 2.00 +- 0.02 (20°C) Titrisol®	109882	195
	Buffer concentrate (citrate / hydrochloric acid), traceable to SRM of NIST and PTB for 500 ml buffer solution, pH 3.00 +- 0.02 (20°C) Titrisol®	109883	195
	Buffer concentrate (citrate / hydrochloric acid), traceable to SRM of NIST and PTB for 500 ml buffer solution, pH 4.00 +- 0.02 (20°C) Titrisol®	109884	195
	Buffer concentrate (citrate / sodium hydroxide), traceable to SRM of NIST and PTB for 500 ml buffer solution, pH 5.00 +- 0.02 (20°C) Titrisol®	109885	195
	Buffer concentrate (citrate / sodium hydroxide), traceable to SRM of NIST and PTB for 500 ml buffer solution, pH 6.00 +- 0.02 (20°C) Titrisol®	109886	195
	Buffer concentrate (glycine / hydrochloric acid), traceable to SRM of NIST and PTB for 500 ml buffer solution, pH 1.00 +- 0.02 (20°C) Titrisol®	109881	195
	Buffer concentrate (phosphate / sodium hydroxide), traceable to SRM of NIST and PTB for 500 ml buffer solution, pH 12.00 +- 0.05 (20°C) Titrisol®	109892	195
	Buffer concentrate (phosphate), traceable to SRM of NIST and PTB for 500 ml buffer solution, pH 7.00 +- 0.02 (20°C) Titrisol®	109887	195
	Buffer concentrate (potassium chloride / sodium hydroxide), traceable to SRM of NIST and PTB for 500 ml buffer solution, pH 13.00 +- 0.05 (20°C) Titrisol®	109893	195
	Buffer concentrate for buffer solution acc. to WEISE for 1000 ml of solution (phosphate), pH 7.20 Titrisol®	109879	195
	Buffer solution (acetic acid / sodium acetate) traceable to SRM from NIST and PTB, pH 4.66 (20°C) Certipur®	107827	193
	Buffer solution (boric acid / potassium chloride / sodium hydroxide solution), traceable to SRM from NIST and PTB, pH 9.00 (25°C) Certipur®	199003	197
	Buffer solution (boric acid / potassium chloride / sodium hydroxide) color coded: blue, traceable to NIST and PTB, pH 10.00 (25°C) Certipur®	199050	195
	Buffer solution (boric acid / potassium chloride / sodium hydroxide) color coded: yellow, traceable to NIST and PTB, pH 10.00 (20°C) Certipur®	109400	194
	Buffer solution (boric acid / potassium chloride / sodium hydroxide), colored: blue, traceable to SRM from NIST and PTB, pH 9.00 (20°C) Certipur®	109476	194
	Buffer solution (boric acid / potassium chloride / sodium hydroxide), traceable to SRM from NIST and PTB, pH 10.00 (20°C) Certipur®	109438	193
	Buffer solution (boric acid / potassium chloride / sodium hydroxide), traceable to SRM from NIST and PTB, pH 10.00 (25°C) Certipur®	109409	194
	Buffer solution (boric acid / potassium chloride / sodium hydroxide) traceable to SRM from NIST and PTB, pH 10.00 (25°C) Certipur®	199004	197



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## Inorganic Reagents B

	Product	Cat. No.	Page
B	Buffer solution (boric acid / potassium chloride / sodium hydroxide) traceable to SRM from NIST and PTB, pH 11.00 (20°C) Certipur®	109462	193
	Buffer solution (boric acid / potassium chloride / sodium hydroxide) traceable to SRM from NIST and PTB, pH 9.00 (20°C) Certipur®	109461	193
	Buffer solution (boric acid / potassium chloride / sodium hydroxide) traceable to SRM from NIST and PTB, pH 9.00 (25°C) Certipur®	109408	194
	Buffer solution (boric acid / sodium hydroxide / hydrogen chloride) traceable to SRM from NIST and PTB, pH 8.00 (20°C) Certipur®	109460	193
	Buffer solution (boric acid / sodium hydrogen / hydrogen chloride) traceable to SRM from NIST and PTB, pH 8.00 (25°C) Certipur®	199038	194
	Buffer solution (boric acid / sodium hydroxide / potassium chloride) traceable to SRM from NIST and PTB, pH 11.00 (25°C) Certipur®	199021	197
	Buffer solution (boric acid / sodium hydrogen / potassium chloride) traceable to SRM from NIST and PTB, pH 11.00 (25°C) Certipur®	199041	194
	Buffer solution (citric acid / sodium hydroxide / hydrogen chloride) color: red, traceable to SRM from NIST and PTB, pH 4.00 (20°C) Certipur®	109475	194
	Buffer solution (citric acid / sodium hydroxide / hydrogen chloride) color: red, traceable to SRM from NIST and PTB, pH 4.00 (25°C) Certipur®	199054	195
	Buffer solution (citric acid / sodium hydroxide / hydrogen chloride) traceable to SRM from NIST and PTB, pH 2.00 (20°C) Certipur®	109433	193
	Buffer solution (citric acid / sodium hydroxide / hydrogen chloride) traceable to SRM from NIST and PTB, pH 2.00 (25°C) Certipur®	109442	194
	Buffer solution (citric acid / sodium hydroxide / hydrogen chloride) traceable to SRM from NIST and PTB, pH 2.00 (25°C) Certipur®	199012	197
	Buffer solution (citric acid / sodium hydroxide / hydrogen chloride) traceable to SRM from NIST and PTB, pH 3.00 (20°C) Certipur®	109434	193
	Buffer solution (citric acid / sodium hydroxide / hydrogen chloride) traceable to SRM from NIST and PTB, pH 3.00 (25°C) Certipur®	109444	194
	Buffer solution (citric acid / sodium hydroxide / hydrogen chloride) traceable to SRM from NIST and PTB, pH 4.00 (20°C) Certipur®	109435	193
	Buffer solution (citric acid / sodium hydroxide / hydrogen chloride) traceable to SRM from NIST and PTB, pH 4.00 (25°C) Certipur®	109445	194
	Buffer solution (citric acid / sodium hydroxide / hydrogen chloride) traceable to SRM from NIST and PTB, pH 4.00 (25°C) Certipur®	199064	197
	Buffer solution (citric acid / sodium hydroxide) traceable to SRM from NIST and PTB, pH 5.00 (20°C) Certipur®	109436	193
	Buffer solution (citric acid / sodium hydroxide) traceable to SRM from NIST and PTB, pH 5.00 (25°C) Certipur®	109446	194
	Buffer solution (citric acid / sodium hydroxide) traceable to SRM from NIST and PTB, pH 6.00 (20°C) Certipur®	109437	193
	Buffer solution (citric acid / sodium hydroxide) traceable to SRM from NIST and PTB, pH 6.00 (25°C) Certipur®	199036	194
	Buffer solution (citric acid / sodium hydroxide) traceable to SRM from NIST and PTB, pH 6.00 (25°C) Certipur®	199016	197
	Buffer solution (di-sodium hydrogen phosphate / potassium dihydrogen phosphate) color: green, traceable to SRM from NIST and PTB, pH 7.00 (20°C) Certipur®	109477	194
	Buffer solution (di-sodium hydrogen phosphate / potassium dihydrogen phosphate) traceable to SRM from NIST and PTB, pH 7.00 (20°C) Certipur®	109439	193
	Buffer solution (di-sodium hydrogen phosphate / potassium hydrogen phosphate) traceable to SRM from NIST and PTB, pH 6.88 (20°C) Certipur®	107294	193
	Buffer solution (di-sodium hydrogen phosphate / potassium dihydrogen phosphate), color: yellow, traceable to SRM from NIST and PTB, pH 7.00 (25°C) Certipur®	199057	195
	Buffer solution (di-sodium hydrogen phosphate / sodium hydroxide) traceable to SRM from NIST und PTB, pH 12.00 (25°C) Certipur®	199022	194
		199022	197
	Buffer solution (di-sodium tetraborate) traceable to SRM from NIST and PTB, pH 9.18 (25°C) Certipur®	199019	197
	Buffer solution (di-sodium tetraborate) traceable to SRM from NIST and PTB, pH 9.22 (20°C) Certipur®	101645	193
	Buffer solution (glycine / sodium chloride / hydrogen chloride) traceable to SRM from NIST and PTB, pH 1.00 (20°C) Certipur®	109432	193
	Buffer solution (glycine / sodium chloride / hydrogen chloride) traceable to SRM from NIST and PTB, pH 1.00 (25°C) Certipur®	109441	194
	Buffer solution (potassium dihydrogen phosphate / di-sodium hydrogen phosphate) traceable to SRM from NIST and PTB, pH 7.00 (25°C) Certipur®	109407	194
	Buffer solution (potassium dihydrogen phosphate / di-sodium hydrogen phosphate) traceable to SRM from NIST and PTB, pH 7.00 (25°C) Certipur®	199002	197

## Inorganic Reagents B-C

	Product	Cat. No.	Page
B	Buffer solution (potassium hydrogen phthalate) traceable to SRM from NIST and PTB, pH 4.01 (25°C) Certipur®	109406	194
	Buffer solution (potassium hydrogen phthalate) traceable to SRM from NIST and PTB pH 4.01 (25°C) Certipur®	199001	197
	Buffer solution for strong acids for Karl Fischer titration Apura®	188035	163
	Buffer solution for strong bases for Karl Fischer titration Apura®	188036	163
	Buffer solutions traceable to SRM from NIST and PTB 10 x pH 4.01 (phthalate), 10 x pH 7.00 (phosphate), 10 x pH 9.00 (borate), pH 4.01 / pH 7.00 / pH 9.00 (25°C) Certipur®	199005	197
	Buffer solutions traceable to SRM from NIST and PTB 10 x pH 4.01 (phthalate)m, 10 x pH 7.00 (phosphate) 10 x pH 10.00 (borate), pH 4.01 / pH 7.00 / pH 10.00 (25°C) Certipur®	199006	197
C	Cadmium acetate dihydrate for analysis EMSURE®	102003	71
	Cadmium coarse powder, for analysis and for filling reductors particle size about 0.3 – 1.6 mm EMSURE®	102001	127
	Cadmium granular, for analysis particle size about 3 – 6 mm EMSURE®	102004	127
	Cadmium ICP standard traceable to SRM from NIST Cd(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Cd Certipur®	170309	180
	Cadmium standard 1000 mg Cd, (CdCl <sub>2</sub> in H <sub>2</sub> O) Titrisol®	109960	185
	Cadmium standard solution traceable to SRM from NIST Cd(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l Cd Certipur®	119777	186
	Cadmium sulfate hydrate for analysis EMSURE® ACS	102027	71
	Calcein indicator for metal determination	102315	298
	Calcium carbonate volumetric standard, secondary reference material for complexometry, traceable to NIST Standard Reference Material (SRM) Certipur®	102410	207
	Calcium carbonate 99.95 Suprapur®	102059	232
	Calcium carbonate precipitated for analysis EMSURE® Reag. Ph Eur	102066	71
	Calcium carbonate precipitated for analysis of silicates EMSURE®	102067	71
	Calcium chloride anhydrous powder Reag. Ph Eur	102378	264
	Calcium chloride anhydrous, granular ~ 1 – 2 mm	102379	264
	Calcium chloride anhydrous, granular ~ 2 – 6 mm	102391	264
	Calcium chloride anhydrous, granular ~ 6 – 14 mm	102392	264
	Calcium chloride dihydrate for analysis EMSURE® ACS, Reag. Ph Eur	102382	72
	Calcium chloride fused, granular about 0.5 – 2.0 mm for elementary analysis	102083	92
	Calcium chloride tetrahydrate 99.995 Suprapur®	102384	232
	Calcium granular particle size about 2 – 6 mm	102053	264
	Calcium hydroxide for analysis EMSURE® ACS, Reag. Ph Eur	102047	72
	Calcium ICP Standard traceable to SRM from NIST Ca(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Ca Certipur®	170308	180
	Calcium ICP Standard traceable to SRM from NIST Ca(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 10000 mg/l Ca Certipur®	170373	180
	Calcium nitrate tetrahydrate 99.95 Suprapur®	102123	232
	Calcium nitrate tetrahydrate for analysis EMSURE® ACS	102121	72
	Calcium oxide from marble small lumps ~ 3 – 20 mm	102109	240
	Calcium standard 1000 mg Ca, (CaCl <sub>2</sub> in 6.5 % HCl) Titrisol®	109943	185
	Calcium standard dissolved in oil c(Ca in standard oil) = 1 g/kg Certipur®	115053	187
	Calcium standard solution traceable to SRM from NIST Ca(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l Ca Certipur®	119778	186
	Calcium sulfate dihydrate precipitated for analysis EMSURE®	102161	72
	Calcon [C.I. 15705] metal indicator	104594	298
	Calconcarboxylic acid metal indicator	104595	298

# Index C

## Inorganic Reagents C

Product	Cat. No.	Page
C Cerium ICP standard traceable to SRM from NIST $\text{Ce}(\text{NO}_3)_3$ in $\text{HNO}_3$ 2 – 3 % 1000 mg/l Ce Certipur®	170311	180
Cerium(IV) sulfate solution $\text{c}(\text{Ce}(\text{SO}_4)_2 \cdot 4 \text{H}_2\text{O}) = 0.1 \text{ mol/l}$ (0.1 N) Titripur®	109092	142
Cerium(IV) sulfate tetrahydrate for analysis EMSURE®	102274	72
Certified sec. standard reference buffer solution di-sodium tetraborate decahydrate, directly traceable to primary SRM from NIST / PTB $\text{pH}(\text{S}) = 9.184$ (25°C) Certipur®	107203	192
Certified sec. standard reference buffer solution potassium dihydrogen phosphate / di-sodium hydrogen phosphate, directly traceable to primary SRM from NIST / PTB $\text{pH}(\text{S}) = 6.863$ (25°C) Certipur®	107202	192
Certified sec. standard reference buffer solution potassium hydrogen phosphate / di-sodium hydrogen phosphate, directly traceable to primary SRM from NIST / PTB $\text{pH}(\text{S}) = 7.416$ (25°C) Certipur®	107205	192
Certified sec. standard reference buffer solution potassium hydrogen phthalate, directly traceable to primary SRM from NIST / PTB $\text{pH}(\text{S}) = 4.005$ (25°C) Certipur®	107200	192
Certified sec. standard reference buffer solution potassium tetraoxalate dihydrate, directly traceable to primary SRM from NIST / PTB $\text{pH}(\text{S}) = 1.681$ (25°C) Certipur®	107204	192
Cesium chloride 99.995 Suprapur®	102039	232
Cesium chloride extra pure	102041	127
Cesium chloride for analysis EMSURE®	102038	127
Cesium ICP Standard traceable to SRM from NIST $\text{CsNO}_3$ in $\text{HNO}_3$ 2 – 3 % 1000 mg/l Cs Certipur®	170310	180
Cesium nitrate 99+	102856	127
Cesium standard solution traceable to SRM from NIST $\text{CsNO}_3$ in $\text{HNO}_3$ 0.5 mol/l 1000 mg/l Cs Certipur®	170212	186
Charcoal activated for analysis	102186	241
Charcoal activated granular about 1.5 mm extra pure food grade	102514	241
Charcoal activated powder extra pure food grade	102184	241
Charcoal activated pure	102183	241
Charcoal wood powder	102204	241
Chemizorb® granules absorbent for spilled liquids	101568	246
Chemizorb® $\text{H}^+$ absorbent and neutralizer for spilled acids, with indicator	101595	248
Chemizorb® HF absorbent and neutralizer for spilled hydrofluoric acid, with indicator	101591	249
Chemizorb® Hg reagents and accessories for absorbent for mercury	112576	247
Chemizorb® Hg reagents refill pack for Ord. No. 1.12576.0001	101569	247
Chemizorb® $\text{OH}^-$ absorbent and neutralizer for spilled alkalis, with indicator	101596	248
Chemizorb® powder absorbent for spilled liquids	102051	246
Chloride standard for 1000 mg $\text{Cl}^-$ , ( $\text{HCl}$ in $\text{H}_2\text{O}$ ) Titrisol®	109871	185
Chloride standard solution traceable to SRM from NIST $\text{NaCl}$ in $\text{H}_2\text{O}$ 1000 mg/l $\text{Cl}^-$ Certipur®	119897	203
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Chromate standard solution traceable to SRM of NIST $\text{K}_2\text{CrO}_4$ in $\text{H}_2\text{O}$ 1000 mg/l $\text{CrO}_4^{2-}$ Certipur®	119780	203
Chromium ICP standard traceable to SRM from NIST $\text{Cr}(\text{NO}_3)_3$ in $\text{HNO}_3$ 2 – 3 % 1000 mg/l Cr Certipur®	170312	180
Chromium ICP standard traceable to SRM from NIST $\text{Cr}(\text{NO}_3)_3$ in $\text{HNO}_3$ 2 – 3 % 10000 mg/l Cr Certipur®	170374	180
Chromium standard 1000 mg Cr, ( $\text{CrCl}_3$ in 4.2 % $\text{HCl}$ ) Titrisol®	109948	185
Chromium standard solution traceable to SRM from NIST $\text{Cr}(\text{NO}_3)_3$ in $\text{HNO}_3$ 0.5 mol/l 1000 mg/l Cr Certipur®	119779	186
Chromium(III) nitrate nonahydrate for analysis EMSURE®	102481	72
Chromium(III) potassium sulfate dodecahydrate for analysis EMSURE® ACS, Reag. Ph Eur	101036	72

## Inorganic Reagents C

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C	Chromium(VI) oxide extra pure	100227	127
	Chromium(VI) oxide for analysis EMSURE®	100229	127
	Chromosulfuric acid for cleaning glass vessels	102499	320
	Chromotropic acid di-sodium salt dihydrate for analysis ACS, Reag. Ph Eur	102498	300
	Citric acid monohydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	100244	110
	Cobalt ICP standard traceable to SRM from NIST Co(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Co Certipur®	170313	180
	Cobalt ICP standard traceable to SRM from NIST Co(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 10000 mg/l Co Certipur®	170375	180
	Cobalt standard 1000 mg Co, (CoCl <sub>2</sub> in H <sub>2</sub> O) Titrisol®	109986	185
	Cobalt standard dissolved in oil c(Co in standard oil) = 1 g/kg Certipur®	115061	187
	Cobalt standard solution traceable to SRM from NIST Co(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l Co Certipur®	119785	186
	Cobalt(II) acetate tetrahydrate for analysis EMSURE® ACS	102529	72
	Cobalt(II) chloride hexahydrate for analysis EMSURE® ACS, Reag. Ph Eur	102539	72
	Cobalt(II) nitrate hexahydrate for analysis (max. 0.001 % Ni) EMSURE® ACS, Reag. Ph Eur	102554	72
	Cobalt(II) nitrate hexahydrate for analysis EMSURE®	102536	72
	Cobalt(II) sulfate heptahydrate for analysis EMSURE®	102556	72
	Colour reference solutions B for testing the color intensity acc. to Ph. Eur. B1-B9 Certipur®	100265	210
	Colour reference solutions BY for testing the color intensity acc. to Ph. Eur. BY1-BY7 Certipur®	100266	210
	Colour reference solutions GY for testing the color intensity acc. to Ph. Eur. GY1-GY7 Certipur®	100268	210
	Colour reference solutions R for testing the color intensity acc. to Ph. Eur. R1-R7 Certipur®	100269	210
	Colour reference solutions Y for testing the color intensity acc. to Ph. Eur. Y1-Y7 Certipur®	100267	210
	CombiCoulomat frit Karl Fischer reagent for the coulometric water determination for cells with diaphragm Apura®	109255	167
	CombiCoulomat fritless Karl Fischer reagent for coulometric water determination for cells with and without diaphragm Apura®	109257	167
	CombiMethanol solvent for volumetric Karl Fischer titration with one component reagents max. 0.01 % H <sub>2</sub> O Apura®	188009	157
	CombiSolvent Fats solvent for volumetric Karl Fischer titration with one component reagents for fats Apura®	188021	161
	CombiSolvent Keto solvent for volumetric Karl Fischer titration with one component reagents for aldehydes and ketones Apura®	188007	163
	CombiSolvent methanol-free solvent for volumetric Karl Fischer titration with one component reagents Apura®	188008	157
	CombiSolvent Oil solvent for volumetric Karl Fischer titration with one component reagents for oils Apura®	188020	161
	CombiTitrant 1 one component reagent for volumetric Karl Fischer titration 1 ml / approx. 1 mg H <sub>2</sub> O Apura®	188001	157
	CombiTitrant 2 one component reagent for volumetric Karl Fischer titration 1 ml / approx. 2 mg H <sub>2</sub> O Apura®	188002	157
	CombiTitrant 5 Keto one component reagent for volumetric Karl Fischer titration for aldehydes and ketones 1 ml / approx. 5 mg H <sub>2</sub> O Apura®	188006	163
	CombiTitrant 5 one component reagent for volumetric Karl Fischer titration 1 ml / approx. 5 mg H <sub>2</sub> O Apura®	188005	157
	Conductivity water (nominal 0 mS/cm) test solution for measurement of electrolytic conductivity, traceable to PTB and NIST Certipur®	101810	200
	Congo red [C.I. 22120] indicator Reag. Ph Eur	101340	290
	Copper di-ammonium Titriplex® solution Cu(NH <sub>4</sub> ) <sub>2</sub> -EDTA 0.1 mol/l	105217	142
	Copper fine powder for analysis EMSURE® particle size <63 µm (>230 mesh ASTM)	102703	127
	Copper foil about 0.1 mm thickness	102700	127
	Copper ICP standard traceable to SRM from NIST Cu(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Cu Certipur®	170314	180
	Copper ICP standard traceable to SRM from NIST Cu(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 10000 mg/l Cu Certipur®	170378	180
	Copper standard 1000 mg Cu, (CuCl <sub>2</sub> in H <sub>2</sub> O) Titrisol®	109987	185

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	Product	Cat. No.	Page
C	Copper standard solution traceable to SRM from NIST $\text{Cu}(\text{NO}_3)_2$ in $\text{HNO}_3$ 0.5 mol/l 1000 mg/l Cu Certipur®	119786	186
	Copper sulfate solution $c(\text{CuSO}_4) = 0.1$ mol/l Titripur®	102784	142
	Copper(I) chloride for analysis EMSURE® ACS	102739	72
	Copper(II) acetate monohydrate for analysis EMSURE® ACS	102711	72
	Copper(II) chloride dihydrate for analysis EMSURE® ACS, Reag. Ph Eur	102733	72
	Copper(II) nitrate trihydrate for analysis EMSURE®	102753	72
	Copper(II) oxide granular for analysis EMSURE®	102768	127
	Copper(II) oxide powder extra pure	102761	127
	Copper(II) oxide powder for analysis EMSURE® ACS	102766	127
	Copper(II) sulfate anhydrous for analysis EMSURE®	102791	72
		102791	265
	Copper(II) sulfate pentahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	102790	72
	m-Cresol purple indicator	105228	290
	Cresol red indicator Reag. Ph Eur	105225	290
	Crystal violet [C.I. 42555] indicator ACS, Reag. Ph Eur	101408	290
	Cyanide standard solution traceable to SRM from NIST $\text{K}_2[\text{Zn}(\text{CN})_4]$ in $\text{H}_2\text{O}$ 1000 mg/l $\text{CN}^-$ Certipur®	119533	203
D	Decalcification solution base: citric acid about 19 %	100240	280
	Desiccant sachet 10 g silica gel with humidity indicator (orange gel) sachet: 7 x 9 cm	103804	266
	Desiccant sachet 100 g silica gel with humidity indicator (orange gel) sachet: 15 x 14 cm	103805	266
	Desiccant sachet 250 g silica gel with humidity indicator (orange gel) sachet: 15 x 20.5 cm	103806	266
	Desiccant sachet 3 g silica gel with humidity indicator (orange gel) sachet: 4 x 7 cm	103803	266
	Devarda's alloy for analysis EMSURE®	105341	127
	di-Ammonium hydrogen citrate for analysis EMSURE® ACS, Reag. Ph Eur	101154	70
	di-Ammonium hydrogen phosphate for analysis EMSURE® ACS, Reag. Ph Eur	101207	70
	di-Ammonium oxalate monohydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	101192	71
	di-Boron trioxide 99.9995 Suprapur®	100169	232
	2',7'-Dichlorofluorescein indicator ACS, Reag. Ph Eur	109676	300
	2,6-Dichlorophenol-indophenol sodium salt dihydrate for analysis for the determination of ascorbic acid	103028	297
	1,8-Dihydroxy-2-(4-sulfophenylazo)naphthalene-3,6-disulfonic acid trisodium salt for analysis (reagent for fluoride, zirconium, thorium)	107998	298
	di-Iodine pentoxide for analysis granular 0.5 – 2.5 mm EMSURE®	100358	128
	N,N-Dimethyl-1,4-phenylene-diammonium dichloride for analysis	103067	297
	3,3'-Dimethylnaphthidine metal indicator	103122	297
	Dimethylyellow [C.I. 11020] indicator	103055	298
	Dimidium bromide for surfactant tests	112130	301
	Diphenylamine-4-sulfonic acid barium salt redox indicator	100255	297
	Diphenylamine-4-sulfonic acid sodium salt redox indicator ACS	103590	297
	1,5-Diphenylcarbazide for analysis and redox indicator ACS, Reag. Ph Eur	103091	298
	1,5-Diphenylcarbazone (cont. 50 % Diphenylcarbazid) ACS, Reag. Ph Eur	103087	298
	di-Phosphorus pentoxide extra pure	100540	270
	di-Phosphorus pentoxide for analysis ACS, ISO, Reag. Ph Eur	100570	270
	di-Potassium hydrogen phosphate anhydrous 99.99 Suprapur®	105109	232

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D	di-Potassium hydrogen phosphate anhydrous for analysis EMSURE®	105104	76
	di-Potassium hydrogen phosphate trihydrate buffer substance for chromatography LiChropur®	119754	76
	di-Potassium hydrogen phosphate trihydrate for analysis EMSURE®	105099	76
	di-Potassium oxalate monohydrate for analysis EMSURE® ACS	105073	77
	di-Sodium oxalate volumetric standard, secondary reference material for redox titration, traceable to NIST Standard Reference Material (SRM) Certipur®	102407	207
	di-Sodium tetraborate decahydrate certified secondary standard reference material for pH measurement; directly traceable to primary SRM from NIST / PTB pH(S) = 9.184 (25°C) (DIN 19266) Certipur®	101964	192
	di-Sodium hydrogen phosphate anhydrous 99.99 Suprapur®	106566	233
	di-Sodium hydrogen phosphate anhydrous for analysis EMSURE® ACS, Reag. Ph Eur	106586	79
	di-Sodium hydrogen phosphate anhydrous for analysis particle size about 0.2 – 1 mm (~18 – 80 mesh ASTM) EMSURE®	106559	79
	di-Sodium hydrogen phosphate dihydrate buffer substance for chromatography LiChropur®	119753	79
	di-Sodium hydrogen phosphate dihydrate for analysis EMSURE®	106580	79
	di-Sodium hydrogen phosphate dodecahydrate for analysis EMSURE® ISO, Reag. Ph Eur	106579	79
	di-Sodium hydrogen phosphate heptahydrate for analysis EMSURE® ACS	106575	79
	di-Sodium oxalate for analysis EMSURE®	106557	80
	di-Sodium tartrate dihydrate for analysis EMSURE®	106663	80
	di-Sodium tetraborate anhydrous 99.99 Suprapur®	106309	219
		106309	233
	Disulfine blue VN 150 [C.I. 42045] for surfactant tests	112144	301
	Dithizone for analysis (1,5-diphenylthiocarbazone) Reag. Ph Eur	103092	298
	Dysprosium ICP standard traceable to SRM from NIST Dy <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Dy Certipur®	170315	180
E	Eosin B (bluish) [C.I. 45400] for microscopy Certistain®	115934	291
	Eosin Y (yellowish) [C.I. 45380] for microscopy Certistain®	115935	291
	Erbium ICP standard traceable to SRM from NIST Er <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Er Certipur®	170316	180
	Eriochrome black T [C.I. 14645] indicator for complexometry ACS, Reag. Ph Eur	103170	298
	Eriochrome blue-black B [C.I. 14640] metal indicator	103168	298
	Eriochrome cyanine R [C.I. 43820] for analysis (reagent for aluminium)	103164	298
	Erythrosine B [C.I. 45430] for microscopy Certistain®	115936	300
	Europium ICP standard traceable to SRM from NIST Eu <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Eu Certipur®	170317	180
	Extran® AP 11 mildly alkaline	107558	314
	Extran® AP 12 alkaline	107563	314
	Extran® AP 13 alkaline with detergents	107565	315
	Extran® AP 16 liquid, mild alkaline	140001	316
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	Extran® AP 21 acidic with phosphoric acid	107559	317
	Extran® AP 22 acidic with citric acid	107561	318
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	Extran® AP 41 enzymatic	107570	319
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	Extran® MA 05 liquid, alkaline, phosphate-free	140000	311

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## Inorganic Reagents F-H

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F	Ferriin indicator solution for waste water analysis	109161	297
	Ferriin solution (1,10-phenanthroline iron(II) sulfate) 1/40 mol/l redox indicator	109193	297
	Fluorescein sodium [C.I. 45350] indicator Reag. Ph Eur	103887	300
	Fluorescent indicator F <sub>254</sub>	109182	300
	Fluoride standard solution NaF in H <sub>2</sub> O 1000 mg/l F <sup>-</sup> Certipur®	119814	203
	Fluoride-standard for 1000 mg F <sup>-</sup> , (KF in H <sub>2</sub> O) Titrisol®	109869	203
	Formic acid 89 – 91 % for analysis EMSURE® ACS	100253	110
	Formic acid 90 % for determination of viscosity acc. to DIN EN ISO 307	110854	110
	Formic acid 98 – 100 % for analysis EMSURE® ACS, Reag. Ph Eur	100264	105
		100264	110
	Formic acid 98 – 100 % Suprapur®	111670	226
G	Gadolinium ICP standard traceable to SRM from NIST Gd <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Gd Certipur®	170318	180
	Gallium ICP standard traceable to SRM from NIST Ga(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Ga Certipur®	170319	180
	Germanium ICP standard traceable to SRM from NIST (NH <sub>4</sub> ) <sub>2</sub> GeF <sub>6</sub> in H <sub>2</sub> O 1000 mg/l Ge Certipur®	170320	180
	GF AAS multi-element standard XVIII (16 elements in diluted nitric acid) Certipur®	109500	184
	Glass beads 2 mm	104014	281
	Glass beads 3 mm	104015	281
	Glass beads 4 mm	104016	281
	Glass beads 5 mm	104017	281
	Glass beads 6 mm	104018	281
	Glass wool	104086	243
	Glycolic acid for analysis EMSURE®	104106	110
	Gold ICP standard traceable to SRM from NIST H(AuCl <sub>4</sub> ) in HCl 7 % 1000 mg/l Au Certipur®	170321	180
	Gold standard for 1000 mg Au, [H(AuCl <sub>4</sub> ) 3 H <sub>2</sub> O in 12.7 % HCl] Titrisol®	109868	185
	Gold standard solution traceable to SRM from NIST H(AuCl <sub>4</sub> ) in HCl 2 mol/l 1000 mg/l Au Certipur®	170216	186
	Graphite fine powder extra pure	104206	241
H	Hafnium ICP standard traceable to SRM from NIST HfOCl <sub>2</sub> in HCl 7 % 1000 mg/l Hf Certipur®	170322	180
	Hanus solution for determination of iodine number c(I <sub>2</sub> ) = 0.1 mol/l Titripur®	109164	142
	Heating bath fluid for heating baths up to approx. 170°C	115265	281
	Hematoxylin cryst. [C.I. 75290] for microscopy	104302	299
	Hexachloroplatinic(IV) acid solution about 10 % (3.8 % Pt) for analysis EMSURE®	107341	126
	Hoechst wax C micropowder	109014	218
	Holmium ICP standard traceable to SRM from NIST Ho <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Ho Certipur®	170323	180
	Hyamine® 1622-solution for the determination of anionic tensides 0.004 mol/l Titripur®	115480	142
	Hydrobromic acid 47 % extra pure	100304	111
	Hydrobromic acid 47 % for analysis EMSURE® ACS, ISO	100307	111
	Hydrobromic acid 47 % Suprapur®	100306	226
	Hydrochloric acid 1.000 l for the preparation of dilute volumetric solutions or for direct use c(HCl) = 5 mol/l (5 N) Combi-Titrisol®	109911	142
	Hydrochloric acid 25 % for analysis EMSURE®	100316	111
	Hydrochloric acid 30 % Suprapur®	100318	226
	Hydrochloric acid 30 % Ultrapur	101514	227



## Inorganic Reagents H

	Product	Cat. No.	Page
H	Hydrochloric acid 32 % extra pure	100313	111
	Hydrochloric acid 32 % for analysis EMSURE®	100319	111
	Hydrochloric acid c(HCl) = 0.1 mol/l (0.1 N) Titripur®	109060	142
	Hydrochloric acid c(HCl) = 0.357 mol/l (1/2.8 N) Titripur®	113136	142
	Hydrochloric acid c(HCl) = 0.5 mol/l (0.5 N) Titripur®	109058	142
	Hydrochloric acid c(HCl) = 1 mol/l (1 N) Titripur®	109057	142
	Hydrochloric acid c(HCl) = 2 mol/l (2 N) Titripur®	109063	142
	Hydrochloric acid c(HCl) = 3.571 mol/l (1/0.28 N) Titripur®	113134	142
	Hydrochloric acid for 1000 ml, c(HCl) = 0.01 mol/l (0.01 N) Titrisol®	109974	142
	Hydrochloric acid for 1000 ml, c(HCl) = 0.1 mol/l (0.1 N) Titrisol®	109973	142
	Hydrochloric acid for 1000 ml, c(HCl) = 0.5 mol/l (0.5 N) Titrisol®	109971	142
	Hydrochloric acid for 1000 ml, c(HCl) = 1 mol/l (1 N) Titrisol®	109970	142
	Hydrochloric acid fuming 37 % for analysis EMPARTA® ACS	101834	111
	Hydrochloric acid fuming 37 % for analysis EMSURE® ACS, ISO, Reag. Ph Eur	100317	105
		100317	111
	Hydrochloric acid fuming 37 % for analysis max. 0.001 ppm Hg EMSURE®	113386	92
		113386	111
	Hydrochloric acid in 2-propanol acc. to DIN 51558 part 1 c(HCl) = 0.1 mol/l (0.1 N) Titripur®	100326	142
	Hydrofluoric acid 38 – 40 %	100329	111
	Hydrofluoric acid 38 – 40 % extra pure	100337	111
	Hydrofluoric acid 40 % for analysis EMSURE® ISO, Reag. Ph Eur	100338	109
		100338	111
	Hydrofluoric acid 40 % Suprapur®	100335	109
		100335	226
	Hydrofluoric acid 48 % for analysis EMSURE® ACS, ISO, Reag. Ph Eur	100334	109
		100334	111
	Hydrofluoric acid 48 % Ultrapur	101513	227
	Hydrogen peroxide 30 % (Perhydrol®) for analysis EMSURE® ACS, ISO	107209	107
		107209	111
	Hydrogen peroxide 30 % (Perhydrol®) (stabilized for higher storage temperature) for analysis EMSURE® ACS, ISO	107210	107
		107210	111
	Hydrogen peroxide 30 % H <sub>2</sub> O <sub>2</sub> Suprapur®	107298	107
		107298	226
	Hydrogen peroxide 35 % technical grade	108556	107
		108556	111
	Hydrogen peroxide solution 31 % Ultrapur	106097	227
	Hydroiodic acid 57 % extra pure	100341	111
	Hydroiodic acid 57 % for analysis EMSURE®	100344	111
	Hydroiodic acid 67 % for analysis EMSURE®	100345	112
	Hydroxylammonium chloride for analysis (≤0.000001 % Hg) ACS, ISO	104619	92
	Hydroxynaphtol blue metal (pM) indicator	104593	299
	Hypophosphorous acid 50 % for analysis EMSURE®	104633	112



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## Inorganic Reagents I

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I IC multi-element standard I F <sup>-</sup> = 100 mg/l, Cl <sup>-</sup> = 250 mg/l, NO <sub>3</sub> <sup>-</sup> , SO <sub>4</sub> <sup>2-</sup> = 500 mg/l, PO <sub>4</sub> <sup>3-</sup> = 1000 mg/l in H <sub>2</sub> O Certipur®	170398	203
IC multi-element standard V F <sup>-</sup> = 10 mg/l, Br <sup>-</sup> = 10 mg/l, NO <sub>3</sub> <sup>-</sup> = 50 mg/l, PO <sub>4</sub> <sup>3-</sup> = 50 mg/l, Cl <sup>-</sup> = 100 mg/l, SO <sub>4</sub> <sup>2-</sup> = 200 mg/l in H <sub>2</sub> O Certipur®	109032	203
IC multi-element standard VI NH <sub>4</sub> = 10 mg/l, K = 50 mg/l, Na = 100 mg/l, Ca = 100 mg/l, Mg = 100 mg/l in 0,01 mol/l HNO <sub>3</sub> Certipur®	109036	203
IC multi-element standard VII 100 mg/l: NH <sub>4</sub> , Ba, Ca, K, Li, Na, Mg, Mn, Sr in 0.001 mol/l HNO <sub>3</sub> Certipur®	110322	203
ICP multi-element standard solution I (19 elements in dilute nitric acid) Certipur®	115474	182
ICP multi-element standard solution IV (23 elements in diluted nitric acid) 1000 mg/l: Ag, Al, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, In, K, Li, Mg, Mn, Na, Ni, Pb, Sr, Ti, Zn Certipur®	111355	182
ICP multi-element standard solution IX (9 elements in dilute nitric acid) 100 mg/l: As, Be, Cd, Cr(VI), Hg, Ni, Pb, Se, Ti Certipur®	109494	182
ICP multi-element standard solution VI for ICP-MS (30 elements in dilute nitric acid) Certipur®	110580	183
ICP multi-element standard solution VIII (24 elements in dilute nitric acid) 100 mg/l: Al, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, K, Li, Mg, Mn, Na, Ni, Pb, Se, Sr, Te, Ti, Zn Certipur®	109492	182
ICP multi-element standard solution X for surface water testing (23 elements in dilute nitric acid) Certipur®	109493	182
ICP multi-element standard solution XI for sludge testing (7 elements in dilute nitric acid) Certipur®	109491	182
ICP multi-element standard solution XIII (15 elements in diluted nitric acid) Certipur®	109480	183
ICP multi-element standard solution XIV (11 elements in dilute hydrochloric acid) 100 mg/l: P, S, K; 20 mg/l: As, La, Li, Mo, Mn, Ni, Sc, Na Certipur®	109481	184
ICP multi-element standard solution XVI (21 elements in diluted nitric acid) 100 mg/l: Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Li, Mg, Mn, Mo, Ni, Se, Sr, Ti, V, Zn Certipur®	109487	183
ICP multi-element standard solution XVII (7 elements in hydrochloric acid 15 %) 100 mg/l: Hf, Ir, Sb, Sn, Ta, Ti, Zr Certipur®	109495	183
ICP multi-element standard solution XXI for MS (30 elements in diluted nitric acid, Hg separately) 10 mg/l: Ag, Al, As, Ba, Be, Bi, Ca, Cd, Co, Cr, Cs, Cu, Fe, Ga, Hg, In, K, Li, Mg, Mn, Na, Ni, Pb, Rb, Se, Sr, Ti, V, U, Zn Certipur®	109498	183
ICP multi-element standard solution XXIII for mass calibration Certipur®	109410	184
ICP multi-element standard solution XXIV tuning solution Certipur®	109411	183
ICP multi-element standard V for wavelength calibration Certipur®	110714	184
Indicator buffer tablets for the determination of water hardness with Titriplex® solutions	108430	299
Indigo carmine [C.I. 73015] for analysis	104724	291
Indium ICP standard traceable to SRM from NIST In(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l In Certipur®	170324	180
Indium standard solution traceable to SRM from NIST In (NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l In Certipur®	119504	186
Iodide iodate solution for 1000 ml, c(I <sub>2</sub> ) = 1/128 mol/l (1/64 N) Titrisol®	109914	142
Iodine 99.999 Suprapur®	104763	223
Iodine indicator	104764	301
Iodine solution c(I <sub>2</sub> ) = 0.05 mol/l (0.1 N) Titripur®	109099	142
Iodine solution c(I <sub>2</sub> ) = 0.5 mol/l (1 N) Titripur®	109098	142
Iodine solution for 1000 ml, c(I <sub>2</sub> ) = 0.05 mol/l (0.1 N) Titrisol®	109910	142
Iodine sublimated for analysis EMSURE® ACS, ISO, Reag. Ph Eur	104761	128
Iridium ICP standard IrCl <sub>3</sub> in HCl 7 % 1000 mg/l Ir Certipur®	170325	180

## Inorganic Reagents I-L

	Product	Cat. No.	Page
I	Iron for analysis reduced EMSURE®, particle size 10 µm	103819	128
	Iron ICP standard traceable to SRM from NIST Fe(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Fe Certipur®	170326	180
	Iron ICP standard traceable to SRM from NIST, Fe(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 10 % 10000 mg/l Fe Certipur®	170376	180
	Iron standard 1000 mg Fe, (FeCl <sub>3</sub> in 15 % HCl) Titrisol®	109972	185
	Iron standard solution traceable to SRM from NIST Fe(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l Fe Certipur®	119781	186
	Iron(II) chloride tetrahydrate for analysis EMSURE®	103861	73
	Iron(II) ethylenediammonium sulfate volumetric standard, secondary reference material for redox titration, traceable to NIST Standard Reference Material (SRM) Certipur®	102402	207
	Iron(II) sulfate heptahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	103965	73
	Iron(II) sulfide sticks Ø ~ 1 cm	103956	281
	Iron(III) chloride hexahydrate for analysis EMSURE® ACS, Reag. Ph Eur	103943	73
	Iron(III) nitrate nonahydrate for analysis EMSURE® ACS, Reag. Ph Eur	103883	73
	Iron(III) phosphate for analysis calcined (max. 0.001 % SO <sub>4</sub> ) EMSURE®	103935	73
K	Kaolin powder	104440	283
L	L(+)-Tartaric acid for analysis EMSURE® ACS, ISO, Reag. Ph Eur	100804	113
	Lactose standard 5 % solid water standard for coulometric / volumetric Karl Fischer titration and Karl Fischer oven method Apura®	112939	171
	Lanthanum ICP standard traceable to SRM from NIST La(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l La Certipur®	170327	180
	Lanthanum(III) oxide	112220	128
	Lead foil for analysis about 0.25 mm thick EMSURE®	107365	128
	Lead ICP standard traceable to SRM from NIST Pb(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Pb Certipur®	170328	180
	Lead ICP standard traceable to SRM from NIST Pb(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 10000 mg/l Pb Certipur®	170372	180
	Lead standard 1000 mg Pb, (Pb(NO <sub>3</sub> ) <sub>2</sub> in H <sub>2</sub> O) Titrisol®	109969	185
	Lead standard solution traceable to SRM from NIST Pb(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l Pb Certipur®	119776	186
	Lead(II) acetate trihydrate for analysis EMSURE® ACS, Reag. Ph Eur	107375	73
	Lead(II) carbonate for analysis EMSURE® ACS	107381	73
	Lead(II) hydroxide acetate anhydrous, for the analysis of sugar acc. to Horne EMSURE® ACS	107414	73
	Lead(II) nitrate for analysis EMSURE® ACS, Reag. Ph Eur	107398	73
	Lead(II) oxide extra pure	105658	128
	Lead(II) oxide for analysis EMSURE®	107401	128
	Lead(IV) oxide for analysis EMSURE®	107407	128
	Lithium bromide hydrate 99.95 Suprapur®	105668	232
	Lithium carbonate 99.99 Suprapur®	105676	232
	Lithium carbonate for analysis EMSURE® ACS, Reag. Ph Eur	105680	73
	Lithium chloride for analysis EMSURE® ACS, Reag. Ph Eur	105679	73
	Lithium chloride monohydrate 99.95 Suprapur®	105677	232
	Lithium fluoride 99.99 Suprapur®	105686	232
	Lithium hydroxide 98 %+	105691	128
	Lithium ICP standard traceable to SRM from NIST LiNO <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Li Certipur®	170329	180
	Lithium nitrate 99.995 Suprapur®	105653	232
	Lithium standard 1000 mg Li, (LiCl in H <sub>2</sub> O) Titrisol®	109934	185

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	Lithium sulfate monohydrate 99.99 Suprapur®	105697	232
	Lithium sulfate monohydrate for analysis EMSURE® ACS, Reag. Ph Eur	105694	73
	Lutetium ICP standard traceable to SRM from NIST Lu <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Lu Certipur®	170330	180
M	Magnesia rods for the phosphorus salt pearls	105809	282
	Magnesium acetate tetrahydrate for analysis EMSURE® ACS, Reag. Ph Eur	105819	74
	Magnesium chloride hexahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	105833	74
	Magnesium foil 0.15 – 0.30 mm thickness, 3 mm wide	105812	128
	Magnesium hydroxide carbonate for analysis EMSURE®	105827	74
	Magnesium ICP standard traceable to SRM from NIST Mg(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Mg Certipur®	170331	180
	Magnesium ICP standard traceable to SRM from NIST Mg(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 10000 mg/l Mg Certipur®	170379	180
	Magnesium nitrate hexahydrate for analysis EMSURE® ACS, Reag. Ph Eur	105853	74
	Magnesium nitrate hexahydrate Suprapur®	105855	232
	Magnesium oxide for analysis EMSURE®	105865	128
	Magnesium oxide for analysis (max. 0.001 % SO <sub>4</sub> ) EMSURE® ACS	105866	128
	Magnesium perchlorate hydrate [about 83 % Mg(ClO <sub>4</sub> ) <sub>2</sub> ] for analysis EMSURE®	105874	74
	Magnesium perchlorate hydrate [about 83 % Mg(ClO <sub>4</sub> ) <sub>2</sub> ] for elemental analysis	105875	92
	Magnesium perchlorate hydrate [about 83 % Mg(ClO <sub>4</sub> ) <sub>2</sub> ], desiccant, about 1 – 4 mm	105873	267
	Magnesium powder particle size about 0.06 – 0.3 mm	105815	267
	Magnesium reagent acc. to Mann and Yoe (reagent for magnesium)	108712	299
	Magnesium standard 1000 mg Mg, (MgCl <sub>2</sub> in 6 % HCl) Titrisol®	109949	185
	Magnesium standard solution traceable to SRM from NIST Mg(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l Mg Certipur®	119788	186
	Magnesium sulfate anhydrous for analysis EMSURE®	106067	74
		106067	267
	Magnesium sulfate heptahydrate for analysis EMSURE® ACS, Reag. Ph Eur	105886	74
	Malachite green oxalate [C.I. 42000] for microscopy and for microbiology	101398	291
	Manganese ICP standard traceable to SRM from NIST Mn(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Mn Certipur®	170332	180
	Manganese ICP standard traceable to SRM from NIST Mn(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 10000 mg/l Mn Certipur®	170380	180
	Manganese standard 1000 mg Mn, (MnCl <sub>2</sub> in H <sub>2</sub> O) Titrisol®	109988	185
	Manganese standard solution traceable to SRM from NIST Mn(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l Mn Certipur®	119789	186
	Manganese(II) chloride dihydrate for analysis EMSURE®	105934	74
	Manganese(II) chloride tetrahydrate for analysis EMSURE® ACS	105927	74
	Manganese(II) nitrate tetrahydrate for analysis EMSURE®	105940	74
	Manganese(II) sulfate monohydrate spray-dried for analysis EMSURE® ACS, Reag. Ph Eur	105941	74
	Manganese(II) sulfate tetrahydrate for analysis EMSURE®	102786	74
	Manganese(IV) oxide powder	105957	74
	Marble granular for producing CO <sub>2</sub>	105986	282
	Mercury 99.9999 Suprapur®	104404	233
	Mercury extra pure	104401	74
	Mercury for analysis and for polarography EMSURE®	104403	74
	Mercury ICP / MS standard suppl. to multi-element standard XXI (109498) 10 mg/l Hg Certipur®	108623	181

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M	Mercury ICP standard traceable to SRM from NIST $\text{Hg}(\text{NO}_3)_2$ in $\text{HNO}_3$ 10 % 1000 mg/l Hg Certipur®	170333	92
		170333	180
	Mercury ICP standard traceable to SRM from NIST $\text{Hg}(\text{NO}_3)_2$ in $\text{HNO}_3$ 10 % 10000 mg/l Hg Certipur®	170384	180
	Mercury standard solution traceable to SRM from NIST $\text{Hg}(\text{NO}_3)_2$ in $\text{HNO}_3$ 2 mol/l 1000 mg/l Hg Certipur®	170226	92
		170226	180
	Mercury(II) acetate for analysis EMSURE® ACS, Reag. Ph Eur	104410	74
	Mercury(II) bromide for analysis EMSURE® ACS, Reag. Ph Eur	104421	74
	Mercury(II) chloride extra pure fine cryst.	104417	74
	Mercury(II) chloride for analysis EMSURE® ACS, Reag. Ph Eur	104419	74
	Mercury(II) iodide red, extra pure	104420	74
	Mercury(II) iodide red, for analysis EMSURE® ACS, Reag. Ph Eur	104428	74
	Mercury(II) nitrate monohydrate for analysis EMSURE® ACS, Reag. Ph Eur	104439	75
	Mercury(II) nitrate solution $c(\text{Hg}(\text{NO}_3)_2) = 0.05 \text{ mol/l}$ (0.1 N) Titripur®	109143	142
	Mercury(II) oxide red extra pure	104465	75
	Mercury(II) oxide red, for analysis EMSURE®	104466	75
	Mercury(II) sulfate extra pure	104481	75
	Mercury(II) sulfate for analysis EMSURE® ACS	104480	75
	Mercury(II) thiocyanate for analysis EMSURE® Reag. Ph Eur	104484	75
	Metanil yellow Reag. Ph Eur	159267	291
	meta-Phosphoric acid pieces for analysis (stabilized with sodium metaphosphate) EMSURE®	100546	112
	Methyl green zinc chloride double salt [C.I. 42590] for microscopy Certistain®	115944	291
	Methyl orange [C.I. 13025] indicator ACS, Reag. Ph Eur	101322	291
	Methyl orange solution 0.1 % indicator pH 3.1-4.4 (red yellow-orange)	101323	291
	Methyl red [C.I. 13020] indicator ACS, Reag. Ph Eur	106076	291
	Methyl red sodium salt [C.I. 13020] water-soluble ACS	106078	291
	Methylene blue [C.I. 52015] for microscopy Certistain®	115943	297
	Methylene blue [C.I. 52015] Reag. Ph Eur	159270	297
	Methylthymol blue sodium salt metal indicator	106084	299
	Mixed indicator 4.5 acc. to Mortimer	101359	291
	Mixed indicator 5 for ammonia titrations	106130	291
	Molecular sieve 0.3 nm beads ~ 2 mm	105704	242
	Molecular sieve 0.3 nm beads, with moisture indicator ~ 2 mm	105734	242
	Molecular sieve 0.3 nm rods ~ 1.6 mm (1/16")	105741	242
	Molecular sieve 0.4 nm beads ~ 2 mm Reag. Ph Eur	105708	242
	Molecular sieve 0.4 nm beads, with moisture indicator ~ 2 mm	105739	242
	Molecular sieve 0.4 nm rods ~ 1.6 mm (1/16")	105743	242
	Molecular sieve 0.4 nm rods ~ 3.2 mm (1/8")	105742	242
	Molecular sieve 0.5 nm beads ~ 2 mm	105705	242
	Molecular sieve 0.5 nm rods ~ 3.2 mm (1/8")	105752	242
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	Molybdotatophosphoric acid hydrate for analysis EMSURE® ACS, Reag. Ph Eur	100532	112

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	Product	Cat. No.	Page
M	Molybdenum ICP standard traceable to SRM from NIST $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24}$ in $\text{H}_2\text{O}$ 1000 mg/l Mo Certipur®	170334	180
	Molybdenum standard 1000 mg Mo, $[(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4 \text{H}_2\text{O}]$ in 0.7 % $\text{NH}_4\text{OH}$ Titrisol®	109926	185
	Molybdenum standard solution traceable to SRM from NIST $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24}$ in $\text{H}_2\text{O}$ 1000 mg/l MO Certipur®	170227	186
	Molybdenum(VI) oxide extra pure	100401	128
	Molybdenum(VI) oxide for analysis EMSURE®	100403	128
	Molybdic acid about 85 % $\text{MoO}_3$ (containing ammonium molybdate)	100400	112
	Multi-element standard I dissolved in oil c(Ba) = 8 g/kg; c(Ca) = 4 g/kg; c(Mg) = 1 g/kg; c(Zn) = 1.6 g/kg Certipur®	115075	187
	Multi-element standard II dissolved in oil 100 ppm: Ag, Al, B, Ba, Ca, Cd, Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, P, Pb, Si, Sn, Ti, V, Zn Certipur®	109469	187
	Multi-element standard III dissolved in oil 900 ppm: Ag, Al, B, Ba, Ca, Cd, Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, P, Pb, Si, Sn, Ti, V, Zn Certipur®	109479	187
	Multi-element standard VII for cation chromatography (9 elements in $\text{HNO}_3$ 0.001 mol/l) 100 mg/l: $\text{NH}_4$ , Ba, Ca, K, Li, Na, Mg, Mn, Sr Certipur®	110322	203
	Murexide (ammonium purpurate) metal indicator ACS, Reag. Ph Eur	106161	299
N	2-Naphtol for analysis	106234	300
	Naphthol green B [C.I. 10020] indicator	101306	299
	1-Naphtholbenzein indicator Reag. Ph Eur	106202	291
	1-Naphtholphthalein indicator	106246	291
	Neodymium ICP standard traceable to SRM from NIST $\text{Nd}_2\text{O}_3$ in $\text{HNO}_3$ 2 – 3 % 1000 mg/l Nd Certipur®	170335	181
	Neutral red [C.I. 50040] indicator and for microbiology	101369	291
	Nickel ICP standard traceable to SRM from NIST $\text{Ni}(\text{NO}_3)_2$ in $\text{HNO}_3$ 2 – 3 % 1000 mg/l Ni Certipur®	170336	181
	Nickel ICP standard traceable to SRM from NIST $\text{Ni}(\text{NO}_3)_2$ in $\text{HNO}_3$ 2 – 3 % 10000 mg/l Ni Certipur®	170382	181
	Nickel standard 1000 mg Ni, $(\text{NiCl}_2 \text{ in } \text{H}_2\text{O})$ Titrisol®	109989	185
	Nickel standard solution traceable to SRM from NIST $\text{Ni}(\text{NO}_3)_2$ in $\text{HNO}_3$ 0.5 mol/l 1000 mg/l Ni Certipur®	119792	186
	Nickel(II) chloride hexahydrate for analysis EMSURE® ACS	106717	75
	Nickel(II) nitrate hexahydrate for analysis EMSURE® ACS	106721	75
	Nickel(II) sulfate hexahydrate for analysis EMSURE® ACS	106727	75
	Nile blue (hydrogen sulfate) [C.I. 51180] for microscopy Certistain®	115946	297
	Niobium ICP standard traceable to SRM from NIST $\text{NH}_4\text{NbF}_6$ in $\text{H}_2\text{O}$ 1000 mg/l Nb Certipur®	170337	181
	Niobium(V) oxide 99+	106868	128
	Nitrate standard solution traceable to SRM from NIST $\text{NaNO}_3$ in $\text{H}_2\text{O}$ 1000 mg/l $\text{NO}_3^-$ Certipur®	119811	203
	Nitric acid 10 mol/l Titripur®	100630	142
	Nitric acid 60 % Ultrapur	101518	227
	Nitric acid 65 % extra pure	100443	112
	Nitric acid 65 % for analysis (max. 0.005 ppm Hg) EMSURE® ISO	100452	92
		100452	112
	Nitric acid 65 % for analysis EMSURE® ISO	100456	105
		100456	112
	Nitric acid 65 % Suprapur®	100441	226
	Nitric acid 69 % for analysis EMPARTA® ACS	101832	112

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N	Nitric acid 69 % for analysis EMSURE® ACS, Reag. Ph Eur	101799	105
		101799	112
	Nitric acid for 1 l measure solution, $c(\text{HNO}_3) = 0.1 \text{ mol/l}$ (0.1 N) Titrisol®	109964	142
	Nitric acid for 1000 ml, $c(\text{HNO}_3) = 1 \text{ mol/l}$ (1 N) Titrisol®	109966	142
	Nitric acid fuming 100 % extra pure	100450	144
	Nitric acid fuming 100 % for analysis EMSURE® ACS, Reag. Ph Eur	100455	112
	Nitrite standard for 1000 mg $\text{NO}_2^-$ , ( $\text{NaNO}_2$ in $\text{H}_2\text{O}$ ) Titrisol®	109866	185
	Nitrite standard solution traceable to SRM from NIST $\text{NaNO}_2$ in $\text{H}_2\text{O}$ 1000 mg/l $\text{NO}_2^-$ Certipur®	119899	203
	3-Nitrophenol indicator	106794	291
	4-Nitrophenol indicator	106798	291
	Oil bath filling for oil baths up to about 250°C	106900	282
	Oracet blue 2R [C.I. 61110] indicator for titration in non-aqueous solvents Reag. Ph Eur	101487	292
	Osmium ICP standard $(\text{NH}_4)_2\text{OsCl}_6$ in HCl 7 % 1000 mg/l Os Certipur®	170338	181
P	Oxalic acid dihydrate extra pure	100492	112
	Oxalic acid dihydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	100495	112
	Oxalic acid dihydrate Suprapur®	100489	226
	Oxalic acid solution for 1000 ml, $c(\text{C}_2\text{H}_2\text{O}_4) = 0.005 \text{ mol/l}$ (0.01 N) Titrisol®	109932	142
	Oxalic acid solution for 1000 ml, $c(\text{C}_2\text{H}_2\text{O}_4) = 0.05 \text{ mol/l}$ (0.1 N) Titrisol®	109965	142
	Palladium ICP standard traceable to SRM from NIST $\text{Pd}(\text{NO}_3)_2$ in $\text{HNO}_3$ 2 – 3 % 1000 mg/l Pd Certipur®	170339	181
	Palladium powdered 99+	119225	126
	Palladium standard solution traceable to SRM from NIST $\text{Pd}(\text{NO}_3)_2$ in $\text{HNO}_3$ 0.5 mol/l 1000 mg/l Pd Certipur®	114282	186
	Paraffin 42 – 44, in block form	107150	283
	Paraffin 46 – 48, in block form	107151	283
	Paraffin 51 – 53, in pastille form Ph Eur, BP, NF	107157	283
	Paraffin 52 – 54, in pastille form Ph Eur, BP, NF	107300	283
	Paraffin 56 – 58, in pastille form Ph Eur, BP, NF	107337	283
	Paraffin 57 – 60, in pastille form Ph Eur, BP, NF	107158	283
	Paraffin liquid Reag. Ph Eur	107162	283
	Paraffin viscous Ph Eur, BP, USP	107160	283
	Perchloric acid 60 % for analysis EMSURE® ACS	100518	112
	Perchloric acid 70 % for analysis (max. 0.0000005 % Hg) EMSURE® ACS, ISO, Reag. Ph Eur	100514	92
		100514	112
	Perchloric acid 70 % Suprapur®	100517	226
	Perchloric acid 70 – 72 % for analysis EMSURE® ACS, ISO, Reag. Ph Eur	100519	105
		100519	112
	Perchloric acid in anhydrous acetic acid, for titrations in non-aqueous media $c(\text{HClO}_4) = 0.1 \text{ mol/l}$ (0.1 N) Titripur®	109065	143
	Perhydrit® tablets 1 g (Hydrogen peroxide – Urea)	107201	107
	Periodic acid for analysis EMSURE®	100524	112
	1,10-Phenanthroline monohydrate for analysis and redox indicator	107225	297
	Phenol red Reag. Ph Eur	159375	292
	Phenol red indicator ACS	107241	292

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	Phenolphthalein solution 0.375 % in methanol indicator	107238	292
	Phenolphthalein solution 1 % in ethanol indicator pH 8.2 – 9.8	107227	292
	1,2-Phenylenediamine for analysis	107243	300
	Phenylhydrazinium chloride for analysis EMSURE® Reag. Ph Eur	107253	128
	pH-indicator solution pH 0-5 with color card	109177	292
	pH-indicator solution pH 4.0 – 10.0 universal Indicator with color card	109175	292
	pH-indicator solution pH 9.0 – 13.0 with color card	109176	292
	Phloxin B [C.I. 45410] for microscopy Certistain®	115926	300
	Phosphate standard for 1000 mg PO <sub>4</sub> <sup>3-</sup> , (H <sub>3</sub> PO <sub>4</sub> in H <sub>2</sub> O) Titrisol®	109870	185
	Phosphate standard solution traceable to SRM from NIST KH <sub>2</sub> PO <sub>4</sub> in H <sub>2</sub> O 1000 mg/l PO <sub>4</sub> <sup>3-</sup> Certipur®	119898	203
	ortho-Phosphoric acid 85 % for analysis EMSURE® ACS, ISO, Reag. Ph Eur	100573	105
		100573	112
	ortho-Phosphoric acid 85 % Suprapur®	100552	226
	ortho-Phosphoric acid 99 % cryst. for analysis EMSURE®	100565	112
	Phosphorus ICP standard traceable to SRM from NIST H <sub>3</sub> PO <sub>4</sub> in H <sub>2</sub> O 1000 mg/l P Certipur®	170340	181
	Phosphorus ICP standard traceable to SRM from NIST H <sub>3</sub> PO <sub>4</sub> in H <sub>2</sub> O 10000 mg/l P Certipur®	170383	181
	Phosphorus standard dissolved in oil c(P in standard oil) = 1 g/kg Certipur®	115072	187
	Phthalein purple metal indicator Reag. Ph Eur	107297	299
	Platinum black 98+	119233	126
	Platinum cobalt color reference solution (HAZEN 500) according to DIN EN ISO 7887 and ASTM D1209 Pt 500 mg/l Certipur®	100246	211
	Platinum ICP standard traceable to SRM from NIST H <sub>2</sub> PtCl <sub>6</sub> in HCl 7 % 1000 mg/l Pt Certipur®	170341	181
	Platinum powder 99+	119232	126
	Platinum standard solution traceable to SRM from NIST H <sub>2</sub> PtCl <sub>6</sub> in HCl 2 mol/l 1000 mg/l Pt Certipur®	170219	186
	Polyvidone 25 Ph Eur, BP	107443	283
	Polyvinyl alcohol protective colloid for argentometric titration	114266	284
	Potassium bromate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	104912	75
	Potassium bromate solution for 1000 ml, c(KBrO <sub>3</sub> ) = 1/60 mol/l (0.1 N) Titrisol®	109925	143
	Potassium bromide 99.999 Suprapur®	104904	232
	Potassium bromide for analysis EMSURE® ACS, Reag. Ph Eur	104905	75
	Potassium carbonate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	104928	75
	Potassium carbonate-1.5-hydrate 99.995 Suprapur®	104926	219
	Potassium chlorate for analysis EMSURE®	104944	219
	Potassium chloride 99.999 Suprapur®	104938	232
	Potassium chloride for analysis (≤0.005 % Br) EMSURE® ACS, ISO, Reag. Ph Eur	104933	75
	Potassium chloride for analysis EMSURE®	104936	75
	Potassium chloride solution (nominal 0.015 mS/cm) certified reference material for the measurement of electrolytic conductivity, traceable to PTB and NIST (c = 0.0001 mol/l) Certipur®	101811	200
	Potassium chloride solution (nominal 0.147 mS/cm) certified reference material for the measurement of electrolytic conductivity, traceable to PTB and NIST (c = 0.001 mol/l) Certipur®	101586	201

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P	Potassium chloride solution (nominal 0.147 mS/cm) certified reference material for the measurement of electrolytic conductivity, traceable to PTB and NIST (c = 0.001 mol/l) Certipur®	101557	200
	Potassium chloride solution (nominal 1.41 mS/cm) certified reference material for the measurement of electrolytic conductivity, traceable to PTB and NIST (c = 0.01 mol/l) Certipur®	101203	200
	Potassium chloride solution (nominal 1.41 mS/cm) certified reference material for the measurement of electrolytic conductivity, traceable to PTB and NIST (c = 0.01 mol/l) Certipur®	101553	201
	Potassium chloride solution (nominal 111 mS/cm) certified reference material for the measurement of electrolytic conductivity, traceable to PTB and NIST (c = 1.0 mol/l) Certipur®	101255	200
	Potassium chloride solution (nominal 12.8 mS/cm) certified reference material for the measurement of electrolytic conductivity, traceable to PTB and NIST (c = 0.1 mol/l) Certipur®	101254	200
	Potassium chloride solution (nominal 12.8 mS/cm) certified reference material for the measurement of electrolytic conductivity, traceable to PTB and NIST (c = 0.1 mol/l) Certipur®	101554	201
	Potassium chromate for analysis EMSURE® ACS, Reag. Ph Eur	104952	75
	Potassium cyanide for analysis EMSURE® ACS, Reag. Ph Eur	104967	75
	Potassium dichromate for analysis (max. 0.000001 % Hg) EMSURE® ACS, ISO	104865	76
		104865	92
	Potassium dichromate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	104864	75
	Potassium dichromate solution c(K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> ) = 1/24 mol/l (0.25 N) Titripur®	109118	143
	Potassium dichromate solution for 1000 ml, c(K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> ) = 1/60 mol/l (0.1 N) Titrisol®	109928	143
	Potassium dichromate solution for determination of COD c(K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> ) = 0.020 mol/l Titripur®	109119	143
	Potassium dichromate volumetric standard, secondary reference material for redox titration, traceable to NIST SRM Certipur®	102403	207
	Potassium dihydrogen phosphate anhydrous 99.995 Suprapur®	105108	232
	Potassium dihydrogen phosphate for analysis (≤0.005 % Na) EMSURE® ACS, ISO, Reag. Ph Eur	104877	76
	Potassium dihydrogen phosphate for analysis EMSURE® ISO	104873	76
	Potassium dihydrogen phosphate, di-Sodium hydrogen phosphate certified secondary standard reference material for pH measurement; directly traceable to primary SRM from NIST / PTB, pH(S) = 6.863 / pH(S) = 7.416 (25°C) (DIN 19266) Certipur®	101960	192
	Potassium disulfate (Potassium pyrosulfate) for analysis EMSURE® ACS	105107	76
	Potassium disulfite for analysis EMSURE®	105057	76
	Potassium fluoride for analysis EMSURE® ACS	104994	76
	Potassium hexachloroplatinate(IV) 99+	119238	126
	Potassium hexacyanoferrate(II) trihydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	104984	76
	Potassium hexacyanoferrate(III) for analysis EMSURE® ACS, Reag. Ph Eur	104973	76
	Potassium hexahydroxoantimonate(V) cryst. for analysis EMSURE®	105110	76
	Potassium hydrogen carbonate for analysis EMSURE® ACS	104854	76
	Potassium hydrogen diiodate for analysis EMSURE®	104867	76
	Potassium hydrogen phthalate certified secondary standard reference material for pH measurement; directly traceable to primary SRM from NIST / PTB, pH(S) = 4.005 (25°C) (DIN 19266) Certipur®	101965	192
	Potassium hydrogen phthalate for analysis EMSURE® Reag. Ph Eur	104874	76
	Potassium hydrogen phthalate Volumetric standard, secondary reference material for alkalimetry, traceable to NIST Standard Reference Material (SRM) Certipur®	102400	207
	Potassium hydrogen sulfate for analysis EMSURE® Reag. Ph Eur	104885	76



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## Inorganic Reagents P

Product	Cat. No.	Page
P Potassium hydrogen tartrate certified secondary standard reference material for pH measurement; directly traceable to primary SRM from NIST / PTB, pH(S) = 3.639 (25°C) (DIN 19266) Certipur®	101963	192
Potassium hydroxide hydrate 99.995 Suprapur®	105002	232
Potassium hydroxide pellets for analysis (max. 0.002 % Na) EMSURE® ACS, ISO, Reag. Ph Eur	105021	120
Potassium hydroxide pellets for analysis (max. 0.05 % Na) EMSURE® ACS, Reag. Ph Eur	105029	120
Potassium hydroxide pellets for analysis EMSURE®	105033	120
Potassium hydroxide solution (max. 0.00004 % Ca) c(KOH) = 1 mol/l (1 N) Titripur®	109107	143
Potassium hydroxide solution 47 % for analysis EMSURE®	105545	121
Potassium hydroxide solution c(KOH) = 0.1 mol/l (0.1 N) Titripur®	109112	143
Potassium hydroxide solution c(KOH) = 0.5 mol/l (0.5 N) Titripur®	111586	143
Potassium hydroxide solution c(KOH) = 1 mol/l (1 N) Titripur®	109108	143
Potassium hydroxide solution for 1000 ml, c(KOH) = 0.1 mol/l (0.1 N) Titrisol®	109921	143
Potassium hydroxide solution for 1000 ml, c(KOH) = 0.5 mol/l (0.5 N) Titrisol®	109919	143
Potassium hydroxide solution for 1000 ml, c(KOH) = 1 mol/l (1 N) Titrisol®	109918	143
Potassium hydroxide solution in ethanol c(KOH) = 0.1 mol/l (0.1 N) Titripur®	109115	143
Potassium hydroxide solution in ethanol c(KOH) = 0.5 mol/l (0.5 N) Titripur®	109114	143
Potassium hydroxide solution in isopropanol acc. to DIN 51558 part 1 c(KOH) = 0.1 mol/l (0.1 N) Titripur®	105544	143
Potassium hydroxide solution in methanol c(KOH) = 0.1 mol/l (0.1 N) Titripur®	111587	143
Potassium hydroxide solution in methanol c(KOH) = 0.5 mol/l (0.5 N) Titripur®	109351	143
Potassium hydroxide solution in methanol c(KOH) = 2.0 mol/l (2 N) Titripur®	111787	143
Potassium ICP standard traceable to SRM from NIST KNO <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l K Certipur®	170342	181
Potassium ICP standard traceable to SRM from NIST KNO <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 10000 mg/l K Certipur®	170377	181
Potassium iodate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	105051	76
Potassium iodate solution for 1000 ml, c(KIO <sub>3</sub> ) = 1/60 mol/l (0.1 N) Titrisol®	109917	143
Potassium iodate volumetric standard, secondary reference material for iodometry, traceable to NIST SRM Certipur®	102404	207
Potassium iodide 99.995 Suprapur®	105044	232
Potassium iodide for analysis EMSURE® ISO, Reag. Ph Eur	105043	77
Potassium nitrate 99.995 Suprapur®	105065	232
Potassium nitrate for analysis EMSURE® ISO, Reag. Ph Eur	105063	77
Potassium nitrite cryst. for analysis EMSURE® ACS	105067	77
Potassium perchlorate for analysis EMSURE® ACS	105076	77
Potassium permanganate for analysis (max. 0.000005 % Hg) EMSURE® ACS	105084	77
	105084	92
Potassium permanganate for analysis EMSURE® ACS, Reag. Ph Eur	105082	77
Potassium permanganate solution c(KMnO <sub>4</sub> ) = 0.05 mol/l (0.25 N) Titripur®	480160	143
Potassium permanganate solution for 1000 ml, c(KMnO <sub>4</sub> ) = 0.002 mol/l (0.01 N) Titrisol®	109930	143
Potassium permanganate solution for 1000 ml, c(KMnO <sub>4</sub> ) = 0.02 mol/l (0.1 N) Titrisol®	109935	143
Potassium permanganate solution standardised against oxalate c(KMnO <sub>4</sub> ) = 0.02 mol/l (0.1 N) Titripur®	109122	143
Potassium permanganate solution standardised against sodium thiosulfate c(KMnO <sub>4</sub> ) = 0.02 mol/l (0.1 N) Titripur®	109121	143
Potassium peroxodisulfate for analysis (≤0.001 % N) EMSURE® ACS, Reag. Ph Eur	105092	77
	105092	92

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	Product	Cat. No.	Page
P	Potassium peroxodisulfate for analysis EMSURE®	105091	77
	Potassium sodium tartrate tetrahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	108087	77
	Potassium standard 1000 mg K, (KCl in H <sub>2</sub> O) Titrisol®	109924	185
	Potassium standard dissolved in oil c(K in standard oil) = 1 g/kg Certipur®	115054	187
	Potassium standard solution traceable to SRM from NIST KNO <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l K Certipur®	170230	186
	Potassium sulfate 99.999 Suprapur®	105152	219
	Potassium sulfate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	105153	77
	Potassium sulfide small lumps for analysis EMSURE®	105134	77
	Potassium tetrachloroplatinate(II) 99+	119235	126
	Potassium tetraoxalate dihydrate certified secondary standard reference material for pH measurement; directly traceable to primary reference material from NIST / PTB, pH(S) = 1.681 (25°C) (DIN 19266) Certipur®	101961	192
	Potassium thiocyanate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	105125	77
	Praseodymium ICP standard traceable to SRM from NIST Pr <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Pr Certipur®	170343	181
	1-(2-Pyridylazo)-2-naphthol (PAN) metal indicator Reag. Ph Eur	107531	299
	4-(2-Pyridylazo)resorcinol monosodium salt monohydrate metal indicator Reag. Ph Eur	107533	299
	3,5-Pyrocatecholdisulfonic acid di-sodium salt monohydrate (Tiron) metal indicator	101922	299
	Pyrogallol red metal indicator	107534	299
Q	Quartz fine granular, washed and calcined for analysis	107536	284
	Quinaldine red indicator Reag. Ph Eur	102282	292
R	Refractive index standard kit 1 2,2,4-Trimethyl-pentane / water, traceable to SRM from NIST and PTB n (20°C) = 1.3915 Certipur®	108962	209
	Refractive index standard kit 2 Toluene / water, traceable to SRM from NIST and PTB n (20°C) = 1.4969 Certipur®	108961	209
	Refractive index standard kit 3 1-Methyl-naphthalene / water, traceable to SRM from NIST and PTB n (20°C) = 1.6160 Certipur®	108963	209
	Refractive index standard traceable to SRM from NIST and PTB 0° Brix Certipur®	500400	209
	Refractive index standard traceable to SRM from NIST and PTB 5° Brix Certipur®	500405	209
	Refractive index standard traceable to SRM from NIST and PTB 10° Brix Certipur®	500410	209
	Refractive index standard traceable to SRM from NIST and PTB 20° Brix Certipur®	500420	209
	Refractive index standard traceable to SRM from NIST and PTB 30° Brix Certipur®	500430	209
	Refractive index standard traceable to SRM from NIST and PTB 40° Brix Certipur®	500440	209
	Refractive index standard traceable to SRM from NIST and PTB 50° Brix Certipur®	500450	209
	Refractive index standard traceable to SRM from NIST and PTB 60° Brix Certipur®	500460	209
	Rhenium ICP standard traceable to SRM from NIST NH <sub>4</sub> ReO <sub>4</sub> in H <sub>2</sub> O 1000 mg/l Re Certipur®	170344	181
	Rhodium ICP standard traceable to SRM from NIST Rh(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Rh Certipur®	170345	181
	Rhodium standard 10 mg/l (Rhodium(III) nitrate in nitric acid 0.5 mol/l) internal standard for ICP-MS	108525	181
	Rhodizonic acid di-sodium salt indicator for sulfate titration	106595	299
	Rubidium chloride for analysis EMSURE®	107615	128
	Rubidium ICP standard traceable to SRM from NIST RbNO <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Rb Certipur®	170346	181
	Ruthenium ICP standard RuCl <sub>3</sub> in HCl 7 % 1000 mg/l Ru Certipur®	170347	181
	Ruthenium(III) chloride hydrate	119247	126

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	Product	Cat. No.	Page
S	Safranin O [C.I. 50240] for microscopy Certistain®	115948	297
	Samarium ICP standard traceable to SRM from NIST Sm <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Sm Certipur®	170348	181
	Scandium ICP standard traceable to SRM from NIST Sc <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 7 % 1000 mg/l Sc Certipur®	170349	181
	Scandium standard solution traceable to SRM from NIST Sc <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 1 mol/l 1000 mg/l Sc Certipur®	119513	186
	Sea sand extra pure	107711	243
	Sea sand purified by acid and calcined for analysis	107712	243
	Selenium black 99+	107714	128
	Selenium ICP standard traceable to SRM from NIST SeO <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Se Certipur®	170350	181
	Selenium standard 1000 mg Se, (SeO <sub>2</sub> in HNO <sub>3</sub> ) Titrisol®	109915	185
	Selenium standard solution traceable to SRM from NIST SeO <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l Se Certipur®	119796	186
	SICAPENT® with indicator (phosphorus pentoxide drying agent for desiccators) on inert carrier material	100543	271
	Silica gel beads, desiccant ~ 2 – 5 mm	107735	93
		107735	272
	Silica gel granules, desiccant ~ 0.2 – 1 mm	101905	272
	Silica gel granules, desiccant ~ 2 – 5 mm	101907	272
	Silica gel with indicator (orange gel), granulate ~ 1 – 3 mm	101969	93
		101969	272
	Silica gel with moisture indicator (brown gel) desiccant ~ 1 – 4 mm	101972	272
	Silicic acid precipitated extra pure heavy	100656	284
	Silicic acid precipitated extra pure light DAB	100657	284
	Silicon anti-foaming agent	107743	93
		107743	284
	Silicon ICP standard traceable to SRM from NIST (SiO <sub>2</sub> in NaOH 4 %) 10000 mg/l Si Certipur®	170386	181
	Silicon ICP standard traceable to SRM from NIST SiO <sub>2</sub> in NaOH 2 % 1000 mg/l Si Certipur®	170365	181
	Silicon standard 1000 mg Si, (SiCl <sub>4</sub> in 14 % NaOH) Titrisol®	109947	185
	Silicon standard solution traceable to SRM from NIST acidic, (NH <sub>4</sub> ) <sub>2</sub> SiF <sub>6</sub> in H <sub>2</sub> O 1000 mg/l Si Certipur®	112310	186
	Silicon standard solution traceable to SRM from NIST SiO <sub>2</sub> in NaOH 0.5 mol/l 1000 mg/l Si Certipur®	170236	186
	Silicone grease	107746	285
	Silicone high vacuum grease heavy	107921	285
	Silicone high vacuum grease medium	107922	285
	Silicone oil for oil baths up to 250°C	107742	285
	Silver chloride 99+	119203	126
	Silver diethyldithiocarbamate for analysis (reagent for arsenic and antimony) EMSURE® ACS, Reag. Ph Eur	101515	126
	Silver ICP standard traceable to SRM from NIST AgNO <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Ag Certipur®	170352	181
	Silver nitrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur,	101512	78
	Silver nitrate solution c(AgNO <sub>3</sub> ) = 0.05 mol/l (0.05 N) Titripur®	111718	143
	Silver nitrate solution c(AgNO <sub>3</sub> ) = 0.1 mol/l (0.1 N) Titripur®	109081	143
	Silver nitrate solution c(AgNO <sub>3</sub> ) = 1 mol/l (1 N) Titripur®	109080	143
	Silver nitrate solution for 1000 ml, c(AgNO <sub>3</sub> ) = 0.1 mol/l (0.1 N) Titrisol®	109990	143
	Silver oxide 99+	119208	126
	Silver standard 1000 mg Ag, (AgNO <sub>3</sub> in HNO <sub>3</sub> 5 %) Titrisol®	109906	185
	Silver standard solution traceable to SRM from NIST AgNO <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l Ag Certipur®	119797	186

## Inorganic Reagents S

Product	Cat. No.	Page
S Silver wool for elemental analysis	101506	126
Sodalime pellets with indicator for analysis	106839	242
Sodalime with indicator, granules ~ 1 – 2.5 mm	106733	242
Sodium acetate anhydrous 99.99 Suprapur®	106264	233
Sodium acetate trihydrate for analysis indifferent to potassium permanganate EMSURE® ACS, ISO, Reag. Ph Eur	106267	78
Sodium ammonium hydrogen phosphate tetrahydrate for analysis EMSURE®	106682	78
Sodium arsenite solution $c(\text{NaAsO}_2) = 0.05 \text{ mol/l}$ (0.1 N) Titripur®	106277	143
Sodium borohydride for analysis	106371	93
Sodium bromide 99.995 Suprapur®	106363	233
Sodium carbonate anhydrous 99.999 Suprapur®	106395	233
Sodium carbonate anhydrous for analysis EMSURE® ISO	106392	78
Sodium carbonate anhydrous, for analysis EMSURE® ACS, ISO, Reag. Ph Eur	106393	78
Sodium carbonate decahydrate for analysis EMSURE® ISO, Reag. Ph Eur	106391	78
Sodium carbonate solution for 1000 ml, $c(\text{Na}_2\text{CO}_3) = 0.05 \text{ mol/l}$ (0.1 N) Titrisol®	109940	143
Sodium carbonate volumetric standard, secondary reference material for acidimetry, traceable to NIST SRM Certipur®	102405	207
Sodium chloride 99.99 Suprapur®	106406	233
Sodium chloride for analysis EMSURE® ACS, ISO, Reag. Ph Eur	106404	78
Sodium chloride solution for 1000 ml, $c(\text{NaCl}) = 0.1 \text{ mol/l}$ (0.1 N) Titrisol®	109945	143
Sodium chloride volumetric standard, secondary reference material for argentometry, traceable to NIST SRM Certipur®	102406	207
Sodium dichromate dihydrate for analysis EMSURE® ACS	106336	78
Sodium dihydrogen phosphate anhydrous 99.99 Suprapur®	106370	233
Sodium dihydrogen phosphate dihydrate for analysis EMSURE® Reag. Ph Eur	106342	78
Sodium dihydrogen phosphate monohydrate for analysis EMSURE® ACS, Reag. Ph Eur	106346	78
Sodium disulfite (sodium metabisulfite) for analysis EMSURE® ACS, Reag. Ph Eur	106528	79
Sodium dithionite for analysis	106507	79
Sodium fluoride 99.99 Suprapur®	106450	233
Sodium fluoride for analysis EMSURE® ACS, ISO, Reag. Ph Eur	106449	79
Sodium formate for analysis EMSURE® ACS, Reag. Ph Eur	106443	79
Sodium hexanitrocobaltate(III) [sodium cobalt(III)nitrite] for analysis EMSURE® ACS, Reag. Ph Eur	102521	79
Sodium hydrogen carbonate / sodium carbonate certified secondary standard reference material for pH measurement; directly traceable to primary SRM from NIST / PTB, $\text{pH}(S) = 10.014$ (25°C) (DIN 19266) Certipur®	101962	192
Sodium hydrogen carbonate for analysis EMSURE® ACS	106329	79
Sodium hydrogen sulfate monohydrate for analysis EMSURE®	106352	79
Sodium hydroxide 1.000 l for the preparation of dilute volumetric solutions or for direct use $c(\text{NaOH}) = 5 \text{ mol/l}$ (5 N) Combi-Titrisol®	109913	144
Sodium hydroxide monohydrate 99.99 Suprapur®	106466	233
Sodium hydroxide pellets for analysis (max. 0.0002 % K) EMSURE® ACS, Reag. Ph Eur	106495	120
Sodium hydroxide pellets for analysis (max. 0.02 % K) EMSURE® ACS, Reag. Ph Eur	106469	120
Sodium hydroxide pellets for analysis EMSURE® ISO	106498	120
Sodium hydroxide solution 1 mol/l prepared from raw materials acc. Ph Eur Titripur®	199060	144
Sodium hydroxide solution 30 % Suprapur®	105589	226
Sodium hydroxide solution 50 % for analysis EMSURE®	158793	121

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## Inorganic Reagents S

	Product	Cat. No.	Page
S	Sodium hydroxide solution about 32 % (for the determination of nitrogen) for analysis EMSURE®	105590	121
	Sodium hydroxide solution about 32 % extra pure	105587	320
	Sodium hydroxide solution c(NaOH) = 0.02 mol/l (0.02 N) Titripur®	109142	144
	Sodium hydroxide solution c(NaOH) = 0.1 mol/l (0.1 N) Titripur®	109141	144
	Sodium hydroxide solution c(NaOH) = 0.2 mol/l (0.2 N) Titripur®	109140	144
	Sodium hydroxide solution c(NaOH) = 0.25 mol/l (0.25 N) Titripur®	109139	144
	Sodium hydroxide solution c(NaOH) = 0.33 mol/l (1/3 N) Titripur®	105595	144
	Sodium hydroxide solution c(NaOH) = 0.5 mol/l (0.5 N) Titripur®	109138	144
	Sodium hydroxide solution c(NaOH) = 1 mol/l (1 N) Titripur®	109137	144
	Sodium hydroxide solution c(NaOH) = 2 mol/l (2 N) Titripur®	109136	144
	Sodium hydroxide solution c(NaOH) = 4 mol/l (4 N) Titripur®	111584	144
	Sodium hydroxide solution for 1000 ml, c(NaOH) = 0.01 mol/l (0.01 N) Titrisol®	109961	144
	Sodium hydroxide solution for 1000 ml, c(NaOH) = 0.1 mol/l (0.1 N) Titrisol®	109959	144
	Sodium hydroxide solution for 1000 ml, c(NaOH) = 0.25 mol/l (0.25 N) Titrisol®	109958	144
	Sodium hydroxide solution for 1000 ml, c(NaOH) = 0.5 mol/l (0.5 N) Titrisol®	109957	144
	Sodium hydroxide solution for 1000 ml, c(NaOH) = 1 mol/l (1 N) Titrisol®	109956	144
	Sodium hydroxide solution min. 10 % (1.11) for analysis EMSURE®	105588	121
	Sodium hydroxide solution min. 27 % (1.30) for analysis (for the determination of nitrogen) EMSURE®	105591	121
	Sodium hydroxide solution min. 45 % for analysis EMSURE®	111360	121
	Sodium hydroxide solution prepared from raw materials acc. Ph Eur c(NaOH) = 6 mol/l (6 N) Titripur®	199062	144
	Sodium hypochlorite solution (6 – 14 % active chlorine)	105614	107
	Sodium ICP standard traceable to SRM from NIST NaNO <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Na Certipur®	170353	181
	Sodium ICP standard traceable to SRM from NIST NaNO <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 10000 mg/l Na Certipur®	170381	181
	Sodium iodate for analysis EMSURE®	106525	79
	Sodium iodide 99.99 Suprapur®	106519	233
	Sodium iodide for analysis EMSURE® ACS, Reag. Ph Eur	106523	79
	Sodium metaperiodate for analysis EMSURE® ACS, Reag. Ph Eur	106597	80
	Sodium molybdate dihydrate for analysis EMSURE®	106521	80
	Sodium nitrate 99.99 Suprapur®	106546	233
	Sodium nitrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	106537	80
	Sodium nitrite for analysis EMSURE® ACS, Reag. Ph Eur	106549	80
	Sodium perchlorate monohydrate for analysis EMSURE®	106564	80
	Sodium peroxide granular for analysis ACS, ISO	106563	219
	Sodium peroxodisulfate for analysis EMSURE®	106609	80
	Sodium rod diameter 2.5 cm (protective liquid: paraffin oil)	106260	128
	Sodium salicylate for analysis EMSURE®	106601	80
	Sodium standard 1000 mg Na, (NaCl in H <sub>2</sub> O) Titrisol®	109927	185
	Sodium standard dissolved in oil c(Na in standard oil) = 1 g/kg Certipur®	115058	187
	Sodium standard solution traceable to SRM from NIST NaNO <sub>3</sub> in H <sub>2</sub> O 1000 mg/l Na Certipur®	119507	203
	Sodium standard solution traceable to SRM from NIST NaNO <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l Na Certipur®	170238	186
	Sodium sulfate anhydrous 99.99 Suprapur®	106647	233
	Sodium sulfate anhydrous for analysis EMSURE® ACS, ISO, Reag. Ph Eur	106649	80
		106649	274

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	Product	Cat. No.	Page
S	Sodium sulfate anhydrous granulated for organic trace analysis EMSURE®	106639	80
		106639	274
	Sodium sulfate anhydrous, coarse granules for analysis 0.63 – 2.0 mm EMSURE® ACS	106637	80
		106637	274
	Sodium sulfate decahydrate for analysis EMSURE® ACS, Reag. Ph Eur	106648	80
	Sodium sulfite anhydrous for analysis EMSURE® Reag. Ph Eur	106657	80
	Sodium tartrate dihydrate, water standard for volumetric Karl Fischer titration (volumetric standard) Apura®	106664	171
	Sodium thiosulfate pentahydrate 99.999 Suprapur®	106509	233
	Sodium thiosulfate pentahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	106516	80
	Sodium thiosulfate solution $c(\text{Na}_2\text{S}_2\text{O}_3 \cdot 5 \text{H}_2\text{O}) = 0.1 \text{ mol/l}$ (0.1 N) Titripur®	109147	144
	Sodium thiosulfate solution for 1000 ml, $c(\text{Na}_2\text{S}_2\text{O}_3) = 0.01 \text{ mol/l}$ (0.01 N) Titrisol®	109909	144
	Sodium thiosulfate solution for 1000 ml, $c(\text{Na}_2\text{S}_2\text{O}_3) = 0.1 \text{ mol/l}$ (0.1 N) Titrisol®	109950	144
	Sodium tungstate dihydrate for analysis EMSURE®	106673	142
	Solvent Oils & Fats, solvent for volumetric Karl Fischer titration with two component reagents for oils and fats Apura®	188016	161
	Solvent, solvent for volumetric Karl Fischer titration with two component reagents Apura®	188015	159
	Spectromelt® A 10 (di-lithium tetraborate)	110783	218
	Spectromelt® A 100 di-lithium tetraborate	112630	218
	Spectromelt® A 1000 $\text{Li}_2\text{B}_4\text{O}_7 + 0.07 \% \text{LiBr}$	113175	218
	Spectromelt® A 12 66 % di-lithium tetraborate / 34 % lithium metaborate	111802	218
	Spectromelt® A 14	111724	218
	51 % di-lithium tetraborate / 27 % lanthane(III) oxide / 12 % lithium metaborate / 10 % lithium fluoride		
	Spectromelt® A 20 lithium metaborate	112996	218
	Spectromelt® A 22 lithium metaborate / di-lithium tetraborate 22:12	124001	218
	Spectromelt® A 50 50 % lithium tetraborate / 50 % lithium metaborate	117057	218
	Spectromelt® B 10 di-Sodium tetraborate	106304	218
	Spectromelt® C 10 grinding and tableting aid for X-ray fluorescence spectroscopy	113990	218
	Spectromelt® C 15 grinding and tableting aid for X-ray fluorescence spectroscopy	117062	218
	Spectromelt® C 15 MP grinding and tableting aid micropowder for X-ray fluorescence spectroscopy	117074	218
	Spectromelt® C 20 grinding and tableting aid for X-ray fluorescence spectroscopy	113934	218
	Standard oil for atomic absorption spectroscopy	113898	187
	Stopcock grease melting point 45 – 53°C	104318	285
	Strontium chloride hexahydrate for analysis EMSURE® ACS	107865	81
	Strontium ICP standard traceable to SRM from NIST $\text{Sr}(\text{NO}_3)_2$ in $\text{HNO}_3$ 2 – 3 % 1000 mg/l Sr Certipur®	170354	181
	Strontium nitrate anhydrous 99.99 Suprapur®	107871	233
	Strontium nitrate for analysis EMSURE®	107872	81
	Strontium standard 1000 mg Sr, $(\text{SrCl}_2 \text{ in } 7 \% \text{HCl})$ Titrisol®	109993	185
	Strontium standard solution traceable to SRM from NIST $\text{Sr}(\text{NO}_3)_2$ in $\text{HNO}_3$ 0.5 mol/l 1000 mg/l Sr Certipur®	119799	186
	Succinic acid for analysis EMSURE®	100682	113
	Sudan III, [C.I. 26100]	111747	292
	Sulfate standard for 1000 mg $\text{SO}_4^{2-}$ , $(\text{H}_2\text{SO}_4 \text{ in } \text{H}_2\text{O})$ Titrisol®	109872	185
	Sulfate standard solution traceable to SRM from NIST $\text{Na}_2\text{SO}_4$ in $\text{H}_2\text{O}$ 1000 mg/l $\text{SO}_4^{2-}$ Certipur®	119813	203
	Sulfur for external use Ph Eur, BP	107983	128

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## Inorganic Reagents S-T

	Product	Cat. No.	Page
S	Sulfur ICP standard traceable to SRM from NIST H <sub>2</sub> SO <sub>4</sub> in H <sub>2</sub> O 1000 mg/l S Certipur®	170355	181
	Sulfur ICP standard traceable to SRM from NIST H <sub>2</sub> SO <sub>4</sub> in H <sub>2</sub> O 10000 mg/l S Certipur®	170385	181
	Sulfuric acid 1.000 l for the preparation of dilute volumetric solutions or for direct use c(H <sub>2</sub> SO <sub>4</sub> ) = 2.5 mol/l (5 N) Combi-Titrisol®	109912	144
	Sulfuric acid 100 % for conductivity measurements	112223	113
	Sulfuric acid 25 % for analysis EMSURE®	100716	113
	Sulfuric acid 40 % for determination of gas metabolism acc. to Knipping	109286	113
	Sulfuric acid 62 % for analysis, for the determination of fat in cheese (d 1.52)	480531	113
	Sulfuric acid 90 – 91 % for Gerber fat determination and determination of nitrates in milk	100729	113
	Sulfuric acid 95 – 97 % for analysis (max. 0.005 ppm Hg) EMSURE® ACS, ISO, Reag. Ph Eur	100732	93
		100732	105
		100732	113
	Sulfuric acid 95 – 97 % for analysis EMPARTA® ACS	101833	113
	Sulfuric acid 95 – 97 % for analysis EMSURE® ISO	100731	105
		100731	113
		100731	275
	Sulfuric acid 96 % for the determination of viscosity acc. to DIN EN ISO 307	108131	113
	Sulfuric acid 96 % Suprapur®	100714	226
	Sulfuric acid 96 % Ultrapur	101516	227
	Sulfuric acid 98 % for analysis EMSURE®	112080	105
		112080	113
	Sulfuric acid 98 % for the determination of nitrogen	100748	113
	Sulfuric acid c(H <sub>2</sub> SO <sub>4</sub> ) = 0.05 mol/l (0.1 N) Titripur®	109074	144
	Sulfuric acid c(H <sub>2</sub> SO <sub>4</sub> ) = 0.25 mol/l (0.5 N) Titripur®	109073	144
	Sulfuric acid c(H <sub>2</sub> SO <sub>4</sub> ) = 0.5 mol/l (1 N) Titripur®	109072	144
	Sulfuric acid c(H <sub>2</sub> SO <sub>4</sub> ) = 2.5 mol/l (5 N) Titripur®	480364	144
	Sulfuric acid for 1000 ml, c(H <sub>2</sub> SO <sub>4</sub> ) = 0.005 mol/l (0.01 N) Titrisol®	109982	144
	Sulfuric acid for 1000 ml, c(H <sub>2</sub> SO <sub>4</sub> ) = 0.05 mol/l (0.1 N) Titrisol®	109984	144
	Sulfuric acid for 1000 ml, c(H <sub>2</sub> SO <sub>4</sub> ) = 0.5 mol/l (1 N) Titrisol®	109981	93
		109981	144
	Sulfuric acid fuming 65 % SO <sub>3</sub> extra pure	100720	113
	Sulfurous acid 5 – 6 % SO <sub>2</sub> for analysis EMSURE®	100761	113
T	Tantalum ICP standard traceable to SRM from NIST (NH <sub>4</sub> ) <sub>2</sub> TaF <sub>7</sub> in H <sub>2</sub> O 1000 mg/l Ta Certipur®	170356	181
	Tellurium ICP standard traceable to SRM from NIST H <sub>6</sub> TeO <sub>6</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Te Certipur®	170357	181
	Tellurium standard solution traceable to SRM from NIST H <sub>6</sub> TeO <sub>6</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l Te Certipur®	119514	186
	Terbium ICP standard traceable to SRM from NIST Tb(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Tb Certipur®	170358	181
	Tetrachloroauric(III) acid trihydrate 99.5 % for analysis EMSURE®	101582	126
	Test Kit for water determination according to Karl Fischer Apura®	188025	159
	Test Kit Solvent for water determination acc. to Karl Fischer Apura®	188026	159
	Test Kit Titrant for water determination acc. to Karl Fischer Apura®	188027	159
	Tetramethylammonium hydroxide solution in 2-propanol / methanol for titrations in non-aqueous media c(C <sub>4</sub> H <sub>13</sub> NO) = 0.1 mol/l (0.1 N) Titripur®	108124	144



## Inorganic Reagents T

Product	Cat. No.	Page
Tetra-n-butylammonium hydroxide solution in 2-propanol / methanol for titrations in nonaqueous media $c[(C_4H_9)_4NOH] = 0.1 \text{ mol/l}$ (0.1 N) Titripur®	109162	144
Tetraphenylarsonium chloride monohydrate for analysis EMSURE®	108150	128
tetra-Sodium diphosphate decahydrate for analysis EMSURE® ACS, Reag. Ph Eur	106591	78
Thallium ICP standard traceable to SRM from NIST $TiNO_3$ in $HNO_3$ 2 – 3 % 1000 mg/l Ti Certipur®	170359	181
Thallium standard solution traceable to SRM from NIST $TiNO_3$ in $HNO_3$ 0.5 mol/l 1000 mg/l Ti Certipur®	119801	186
Thionine (acetate) [C.I. 52000] for microscopy Certistain®	115929	297
Thorin indicator for sulfate titration	108294	299
Thorium ICP standard traceable to SRM from NIST $Th(NO_3)_4$ in $HNO_3$ 2 – 3 % 10 mg/l Th Certipur®	170391	181
Thulium ICP standard traceable to SRM from NIST $Tm(NO_3)_3$ in $HNO_3$ 2 – 3 % 1000 mg/l Tm Certipur®	170361	181
Thymol blue indicator ACS, Reag. Ph Eur	108176	292
Thymolphthalein indicator ACS, Reag. Ph Eur	108175	292
Tin fine powder pure (particle size <71 µm)	107807	128
Tin foil about 0.04 mm thick	107826	129
Tin granulated for analysis (particle size about 4 mm) EMSURE® Reag. Ph Eur	107806	129
Tin ICP standard traceable to SRM from NIST $SnCl_4$ in $HCl$ 7 % 1000 mg/l Sn Certipur®	170362	181
Tin standard solution traceable to SRM from NIST $SnCl_4$ in $HCl$ 2 mol/l 1000 mg/l Sn Certipur®	170242	186
Tin(II) chloride dihydrate for analysis (max. 0.000001 % Hg) EMSURE®	107814	81
	107814	93
Tin(II) chloride dihydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	107815	81
Tin(II) sulfate for analysis EMSURE®	107823	81
Tin(IV) oxide extra pure	107818	128
Titan yellow [C.I. 19540] indicator Reag. Ph Eur	101307	292
Titanium ICP standard traceable to SRM from NIST $(NH_4)_2TiF_6$ in $H_2O$ 1000 mg/l Ti Certipur®	170363	181
Titanium standard 1000 mg Ti, $(NH_4)_2TiF_6$ in $H_2O$ Titrisol®	109829	185
Titanium standard solution traceable to SRM from NIST $(NH_4)_2TiF_6$ in $H_2O$ 1000 mg/l Ti Certipur®	170243	186
Titanium(IV) oxide for analysis EMSURE® Reag. Ph Eur	100808	129
Titran 2, titrant for volumetric Karl Fischer titration with two component reagents 1 ml / approx. 2 mg $H_2O$ Apura®	188011	159
Titran 5, titrant for volumetric Karl Fischer titration with two component reagents 1 ml / approx. 5 mg $H_2O$ Apura®	188010	159
Titriplex® III solution for 1000 ml, $c(Na_2-EDTA \cdot 2 H_2O) = 0.01 \text{ mol/l}$ Titrisol®	108446	144
Titriplex® III solution for 1000 ml, $c(Na_2-EDTA \cdot 2 H_2O) = 0.1 \text{ mol/l}$ Titrisol®	109992	144
Titriplex® III solution for metal titration $c(Na_2-EDTA \cdot 2 H_2O) = 0.1 \text{ mol/l}$ Titripur®	108431	144
Titriplex® solution A for the determination of alkaline earth metals in water 1 ml / approx. 56 mg $CaO$ / l using 100 ml of water	108419	144
Titriplex® solution B for the determination of alkaline earth metals in water 1 ml / approx. 10 mg $CaO$ / l using 100 ml of water Apura®	108420	144
TOC standard solution acc. to EN 1484-H3 / DIN 38409-H3 as potassium hydrogen phthalate in water, stabilized 1000 mg/l Certipur®	109017	211
Toluene-4-sulfonic acid monohydrate for analysis EMSURE® ACS	109613	113



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## Inorganic Reagents T-Y

	Product	Cat. No.	Page
T	Trichloroacetic acid for analysis EMSURE® ACS, Reag. Ph Eur	100807	113
	Trifluoromethanesulfonic acid in anhydrous acetic acid $c(\text{CF}_3\text{SO}_3\text{H}) = 0.1 \text{ mol/l}$ Titripur®	108450	145
	Tris(hydroxymethyl)aminomethane volumetric standard, secondary reference material for acidimetry, traceable to NIST Standard Reference Material (SRM) Certipur®	102408	207
	tri-Sodium citrate dihydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	106448	78
	tri-Sodium phosphate dodecahydrate for analysis EMSURE®	106572	80
	tri-Sodium phosphate dodecahydrate for analysis EMSURE® ACS, Reag. Ph Eur	106578	80
	Triton® X-100 for analysis	108603	285
	Tungsten ICP standard traceable to SRM from NIST $(\text{NH}_4)_2\text{WO}_4$ in $\text{H}_2\text{O}$ 1000 mg/l W Certipur®	170364	181
	Tungsten standard solution traceable to SRM from NIST $(\text{NH}_4)_2\text{WO}_4$ in $\text{H}_2\text{O}$ 1000 mg/l W Certipur®	170244	186
	Tungstophosphoric acid hydrate cryst. extra pure	100582	113
	Tungstophosphoric acid hydrate for analysis EMSURE®	100583	113
	Tungstosilicic acid hydrate for analysis EMSURE®	100659	113
U	Uranine AP [C.I. 45350] concentrated for the examination of subterranean waters	108462	300
	Uranium ICP standard traceable to SRM from NIST $\text{UO}_2(\text{NO}_3)_2$ in $\text{HNO}_3$ 2 – 3 % 10 mg/l U Certipur®	170360	181
	UV-VIS Standard 1: Potassium dichromate solution for absorbance according to Ph Eur	108160	205
	UV-VIS Standard 1a: Potassium dichromate solution (600 mg/l) for the absorbance at 430 nm acc. to Ph Eur	104660	205
	UV-VIS Standard 2: Sodium nitrite solution for stray light testing according to Ph Eur	108161	205
	UV-VIS Standard 3: Sodium iodide solution for stray light testing according to Ph Eur	108163	205
	UV-VIS Standard 4: Potassium chloride solution for stray light testing according to Ph Eur	108164	205
	UV-VIS Standard 5: Toluene solution in n-hexane for testing of the resolution power acc. to Ph Eur	108165	205
	UV-VIS Standard 6: Holmium oxide solution reference material for the wavelength according to Ph Eur	108166	205
V	Vanadium ICP standard traceable to SRM from NIST $\text{NH}_4\text{VO}_3$ in $\text{HNO}_3$ 15 % 10000 mg/l V Certipur®	170388	181
	Vanadium ICP standard traceable to SRM from NIST $\text{NH}_4\text{VO}_3$ in $\text{HNO}_3$ 2 – 3 % 1000 mg/l V Certipur®	170366	181
	Vanadium standard 1000 mg V, $(\text{VOSO}_4$ in 8.6 % $\text{H}_2\text{SO}_4$ ) Titrisol®	109994	185
	Vanadium standard solution traceable to SRM from NIST $\text{NH}_4\text{VO}_3$ in $\text{HNO}_3$ 0.5 mol/l 1000 mg/l V Certipur®	170245	186
	Vanadium(V) oxide extra pure	100824	129
W	Water detection paste N	108641	285
	Water for analysis EMSURE®	116754	93
	Water standard 0.01 % standard for coulometric Karl Fischer titration 1 g / approx. 0.1 mg $\text{H}_2\text{O}$ Apura®	188050	171
	Water standard 0.1 % Standard for coulometric Karl Fischer titration 1 g / approx. 1 mg $\text{H}_2\text{O}$ Apura®	188051	171
	Water standard 1 % Standard for volumetric Karl Fischer titration 1 g / approx. 10 mg $\text{H}_2\text{O}$ Apura®	188052	171
	Water standard 5 mg / ml (1 ml contains 5 mg $\text{H}_2\text{O}$ ) Apura®	109259	171
	Water standard oil standard for oil samples for coulometric Karl Fischer titration (15 – 30 ppm) Apura®	188055	171
	Water standard oven 1 % solid standard for KF oven method Apura®	188054	171
	Water Ultrapur	101262	227
	Wijs solution for determination of the iodine number $c(\text{I}_2) = 0.1 \text{ mol/l}$ Titripur®	109163	145
X	Xylenol orange tetrasodium salt metal indicator ACS, Reag. Ph Eur	108677	299
Y	Ytterbium ICP standard traceable to SRM from NIST $\text{Yb}_2\text{O}_3$ in $\text{HNO}_3$ 2 – 3 % 1000 mg/l Yb Certipur®	170367	181
	Yttrium ICP standard traceable to SRM from NIST $\text{Y}(\text{NO}_3)_3$ in $\text{HNO}_3$ 2 – 3 % 1000 mg/l Y Certipur®	170368	181
	Yttrium oxide 99+	112412	129
	Yttrium standard solution traceable to SRM from NIST $\text{Y}(\text{NO}_3)_3$ in $\text{HNO}_3$ 0.5 mol/l 1000 mg/l Y Certipur®	119809	186

## Inorganic Reagents Z

	Product	Cat. No.	Page
Z	Zinc acetate dihydrate for analysis EMSURE® ACS	108802	81
	Zinc chloride for analysis EMSURE® ACS, ISO, Reag. Ph Eur	108816	81
	Zinc coarse powder for analysis suitable for filling of reductors, particle size about 0.3 – 1.5 mm EMSURE® Reag. Ph Eur	108756	129
	Zinc dust particle size <63 µm	108774	129
	Zinc granular extra pure particle size about 3 – 8 mm	108755	129
	Zinc granular for analysis, particle size about 3 – 8 mm EMSURE® ISO	108780	129
	Zinc ICP standard traceable to SRM from NIST Zn(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 1000 mg/l Zn Certipur®	170369	181
	Zinc ICP standard traceable to SRM from NIST Zn(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 % 10000 mg/l Zn Certipur®	170389	181
	Zinc iodide for analysis EMSURE®	108828	81
	Zinc iodide starch solution for analysis	105445	297
	Zinc nitrate tetrahydrate for analysis EMSURE®	108833	81
	Zinc oxide for analysis EMSURE® ACS, Reag. Ph Eur	108849	129
	Zinc powder for analysis particle size <45 µm EMSURE®	108789	129
	Zinc standard 1000 mg Zn, (ZnCl <sub>2</sub> in 0.06 % HCl) Titrisol®	109953	185
	Zinc standard solution traceable to SRM from NIST Zn(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 0.5 mol/l 1000 mg/l Zn Certipur®	119806	186
	Zinc sticks, triangular cross section about 8 mm for analysis EMSURE®	108782	129
	Zinc sulfate heptahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	108883	81
	Zinc sulfate solution c(ZnSO <sub>4</sub> ) = 0.1 mol/l Titripur®	108879	145
	Zinc sulfate solution for 1000 ml, c(ZnSO <sub>4</sub> ) = 0.1 mol/l (0.1 M) Titrisol®	109991	145
	Zinc volumetric standard, secondary reference material for complexometry, traceable to NIST SRM Certipur®	102409	207
	Zincon for the photometric determination of copper and zinc	108739	299
	Zirconium ICP standard traceable to SRM from NIST, ZrOCl <sub>2</sub> in HCl 7 % 1000 mg/l Zr Certipur®	170370	181
	Zirconium ICP standard traceable to SRM from NIST, ZrOCl <sub>2</sub> in HCl 10 % 10000 mg/l Zr Certipur®	170390	181
	Zirconium standard solution traceable to SRM from NIST ZrOCl <sub>2</sub> in HCl 2 mol/l 1000 mg/l Zr Certipur®	170234	186
	Zirconium(IV) oxide chloride octahydrate for analysis EMSURE®	108917	129

# Classical inorganic analysis

Merck Millipore offers an extensive range of acids, salts, caustic alkalis and special inorganic reagents for analytical use, mainly in wet chemical labs. EMSURE® is our designation for analytical reagents, where we place the greatest importance on the high quality of each individual product. Thus, quality assurance laboratories benefit from the international acceptance of our reagents, as well as safe analytical laboratory auditing. With our comprehensive product range, you enjoy the convenience of obtaining all your basic reagents from one trusted source.



## Salts

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EMSURE® Salts for analytical use are manufactured under strictly controlled conditions at Merck Millipore facilities in Darmstadt, Germany. The key feature of these salts is their outstanding analytical purity. The product range contains a wide assortment of inorganic salts for use in qualitative and quantitative analysis.



## Acids

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EMSURE® | EMPARTA® Merck Millipore's acids for analysis offer the highest possible quality, the greatest safety and most optimized packaging. Our products undergo strict quality checks using the most sensitive analytical instruments and methods. That is why you can rely on Merck Millipore's acids for analysis for a multitude of applications.



## Caustics and bases

Page 114

EMSURE® Our premium quality caustic alkalis and bases are produced using specially selected raw materials. The product range includes sodium and potassium hydroxide pellets and the corresponding solutions, as well as ammonia solutions in various concentrations and quality grades. Please find the right caustic and base for your specific use.



## Metals and metal oxides

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Merck Millipore's metal salts, metals and noble metals renowned high quality and purity are used in a multitude of applications in R&D laboratories, production departments and for quality control. These products are available in the grades ›extra pure‹ or ›for analysis EMSURE®‹.



# Salts for analysis

## EMSURE®

EMSURE® inorganic salts are manufactured under strictly controlled conditions at Merck Millipore facilities in Darmstadt, Germany. Their outstanding analytical purity makes them the ideal choice for both qualitative and quantitative analysis. The product range offers a wide assortment of inorganic salts that are suitable for analyzing various substances and substance mixtures.



# Salts

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- | ■ Advantages   |
|--|
| <ul style="list-style-type: none"><li>• Comprehensive product range</li><li>• Standardized high quality – premium grade for reagents</li><li>• High batch-to-batch consistency</li><li>• Extensive Certificate of Analysis (CoA)</li><li>• Compliance with international standards, such as ISO, ACS and Reag. Ph Eur</li><li>• Salts are specified for pharmacopoeia analysis</li><li>• Reliability, flexibility and safety</li></ul> |



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

# Characteristics



## Safety and environment

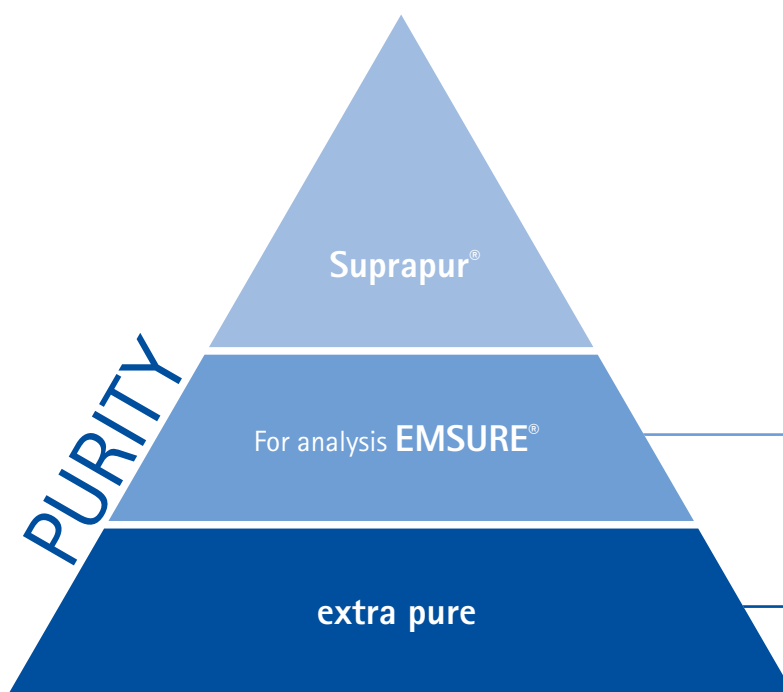
In 2010, Merck Millipore established a new production facility for inorganic salts, enabling us to increase capacity by 50 percent. This expansion and modernization is our response to a growing global demand for superior quality and product safety. The new plant, is also our commitment to developing Darmstadt into a powerful center for Merck Millipore's chemical production.

## Quality management

Merck Millipore is certified according to the DIN EN ISO 9001 quality management systems, as well as the ISO 14001 environmental management system.

## Improved flowability

Many inorganic salts tend to cake naturally, forming hard lumps. This makes it difficult to extract the product from the pack and process it. Exact dosing is also very important for most analytical tests in order to obtain precise and reproducible results. Since chemical purity may not be altered, we looked for a solution that neither changed the promised specifications nor involved any anti-caking materials. Our answer: a new and improved production process that substantially reduces the clumping of substances.



## Specification

<b>ACS</b>	Standards of the American Chemical Society
<b>ISO</b>	Standards of the International Organization for Standardization
<b>Reag. Ph Eur</b>	Requirements for reagents specified by the European Pharmacopoeia

## Quality grades for your individual needs

### Salts Suprapur®

- For instrumental analysis we offer a range of high purity salts Suprapur®
- For further information please have a look in chapter »High purity salts«

### Salts for analysis EMSURE® with ACS declaration

ACS standards are currently the most recognized international regulations and specifications for analytical reagents. This is why Merck Millipore tests and releases reagents based on the specifications and analytical regulations of the ACS – in addition to other criteria. The 10th edition of ACS was released in 2006. Our reagent declaration always conforms to the latest version of ACS. Updates are published regularly online.

### Salts for analysis EMSURE® specified for pharmacopoeia analysis

Production and quality control in the pharmaceutical industry are strictly regulated. With the product designation »for analysis EMSURE® ACS, Reag. Ph Eur« Merck Millipore offers an extensive range of reagents including salts for pharmacopoeia analysis. These products conform fully to the specifications described in the reagents section of the European Pharmacopoeia as well as that of the U.S. Pharmacopoeia. Thus, quality assurance laboratories in the pharmaceutical industry benefit from the international acceptance of these reagents and the security of analytical laboratory auditing.

### Salts extra pure



# Categories

## Categories A–O

Category	Definition	Area of application
<b>A</b>	<b>Acetates</b>	Salts of acetic acid
	<b>Antimonates</b>	Antimony compounds with antimony in oxidation state +5
<b>B</b>	<b>Bismuthates</b>	Bismuth compounds with bismuth in oxidation state +5
	<b>Bromates</b>	Salts of bromic acid only stable in aqueous solution
	<b>Bromides</b>	Salts of hydrobromic acid
<b>C</b>	<b>Carbamates</b>	Salts of carbamic acid – stable »carbonate«
	<b>Carbonates</b>	Salts of carbonic acid
	<b>Chlorates</b>	Salts of chloric acid
	<b>Chlorides</b>	Salts of aqueous hydrogen chloride (hydrochloric acid)
	<b>Chromates/dichromates</b>	Chromium compounds with chromium in oxidation state +6
	<b>Citrates</b>	Salts of citric acid
	<b>Cyanides</b>	Salts of hydrogen cyanide
	<b>Difluorides</b>	Acid salts of hydrofluoric acid
	<b>Diiodates</b>	Acid salts of iodic acid
	<b>Disulfates</b>	Salts of thiosulfurous acid
<b>D</b>	<b>Disulfites</b>	Salts of pyrosulfurous acid
	<b>Dithionites</b>	Salts of dithionous acid
	<b>Fluorides</b>	Salts of hydrofluoric acid
	<b>Formates</b>	Salts of formic acid
	<b>Hexacyanoferrates</b>	Stable cyano complexes with iron(II) and iron(III)
<b>F</b>	<b>Hexanitrocobaltates</b>	Stable cyano complex with cobalt
	<b>Hydroxide</b>	alkaline compounds
	<b>Iodates</b>	Salts of iodic acid
<b>I</b>	<b>Iodides</b>	Salts of hydriodic acid
	<b>Molybdates</b>	Molybdenum compounds with molybdenum in oxidation state +6
<b>M</b>	<b>Nitrates</b>	Salts of nitric acid
	<b>Nitrites</b>	Salts of nitrous acid
<b>N</b>	<b>Oxalates</b>	Salts of oxalic acid
<b>O</b>	<b>Pentacyanonitrosylferrates</b>	Cyano complex with nitrosyl ion
	<b>Perchlorates</b>	Salts of perchloric acid
	<b>Periodates</b>	Salts of periodic acid
	<b>Permanganates</b>	Salts of unstable permanganic acid
	<b>Peroxides</b>	Salts with peroxo groups
	<b>Peroxodisulfates</b>	Disulfates with peroxo groups
	<b>Phosphates</b>	Salts of phosphoric acid
	<b>Phthalates</b>	Salts of phthalic acid

## Categories P-Z

	Category	Definition	Area of application
S	Salicylates	Salts of salicylic acid	Laboratory reagent
	Selenites	Salts of selenous acid	Special reducing agent, technical applications (e.g. trace element, free-radical scavenger)
	Sulfates	Salts of sulfuric acid	Very important inorganic compound in laboratory and production
	Sulfides	Salts of hydrosulfuric acid	H <sub>2</sub> S development, heavy metal precipitation
	Sulfites	Salts of sulfurous acid	Special reducing agent
T	Tartrates	Salts of tartaric acid	Special marker in complexometry, buffer substance
	Thiocyanates	Salts of unstable thiocyanic acid	Iron(III) detection
	Thiosulfates	Salts of unstable thiosulfuric acid	Iodometry and photography
	Tungstates	Tungsten compounds with tungsten in oxidation state +6	Special oxidizing agent, Folin-Ciocalteu's phenol determination
V	Vanadates	Vanadium compounds with vanadium in oxidation state +5	Special oxidizing agent, phosphate determination



# Storage instructions

## Recommended storage instructions

We recommend storing all inorganic salts – with the exception of the compounds listed here – in airtight containers in a dry place at room temperature when possible. Further storage instructions are included in our Safety Data Sheets.

## Higher water of crystallization content

In case of temperature fluctuations, products with a higher water of crystallization content have a greater tendency to cake than anhydrous salts. In addition, many products tend to decompose when exposed to heat. These compounds should therefore be stored in a dry place that is as cool as possible or at room temperature (max. 25°C). Please follow the storage instructions on the labels of the products.

## Store in a cool place [below 25°C]

Product	Cat. No.
Ammonium carbamate for analysis EMSURE®	101134
Ammonium fluoride for analysis EMSURE® ACS	101164
Ammonium iron(III) sulfate dodecahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	103776
Ammonium iron(II) sulfate hexahydrate for analysis EMSURE® ISO	103792
Ammonium peroxodisulfate for analysis EMSURE® ACS, Reag. Ph Eur	101201
Iron(III) chloride hexahydrate for analysis EMSURE® ACS, Reag. Ph Eur	103943
Iron(II) sulfate heptahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	103965
Magnesium hydroxide carbonate for analysis EMSURE®	105827
Manganese(II) sulfate tetrahydrate for analysis EMSURE®	102786
Sodium carbonate decahydrate for analysis EMSURE® ISO, Reag. Ph Eur	106391
di-Sodium hydrogen phosphate anhydrous for analysis particle size about 0.2 – 1 mm (~ 18 – 80 mesh ASTM) EMSURE®	106559
di-Sodium hydrogen phosphate dodecahydrate for analysis EMSURE® ISO, Reag. Ph Eur	106579
di-Sodium hydrogen phosphate heptahydrate for analysis EMSURE® ACS	106575
Sodium peroxodisulfate for analysis EMSURE®	106609
Sodium sulfate decahydrate for analysis EMSURE® ACS, Reag. Ph Eur	106648
Tin(II) chloride dihydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	107815
Tin(II) chloride dihydrate for analysis (max. 0.000001 % Hg) EMSURE®	107814

# Salts for analysis

## FAQ's

### **What enables Merck Millipore to provide highly specified salts for analytical use?**

Our state-of-the-art production facilities in Darmstadt, and close cooperation with our customers.

### **Are Merck Millipore reagents for analytical use ACS certified?**

Yes, Merck Millipore offers ACS validated reagents.

### **What kind of anti-caking additives does Merck Millipore use?**

None. Due to the analytical purity of EMSURE® salts it is not possible to use anti-caking agents.

### **How do Merck Millipore salts achieve improved flowability?**

Improved flowability is attained through optimization during the production process.



# Ordering information Salts | EMSURE®

## Salts A

Product	CAS No.	Chemical formula	Molar weight	Content	Packaging	Ord. No.
<b>A Aluminium ammonium sulfate dodecahydrate for analysis EMSURE® ACS</b>	7784-26-1	$\text{NH}_4\text{Al}(\text{SO}_4)_2 \cdot 12 \text{H}_2\text{O}$	453.33 g/mol	500 g	Plastic bottle	1.01031.0500
<b>Aluminium nitrate nonahydrate for analysis EMSURE®</b>	7784-27-2	$\text{Al}(\text{NO}_3)_3 \cdot 9 \text{H}_2\text{O}$	375.13 g/mol	500 g	Plastic bottle	1.01063.0500
				50 kg	Fibre carton	1.01063.9050
<b>Aluminium potassium sulfate dodecahydrate for analysis EMSURE® ACS, Reag. Ph Eur</b>	7784-24-9	$\text{KAl}(\text{SO}_4)_2 \cdot 12 \text{H}_2\text{O}$	474.39 g/mol	1 kg	Plastic bottle	1.01047.1000
				25 kg	Fibre carton	1.01047.9025
<b>Ammonium acetate for analysis EMSURE® ACS, Reag. Ph Eur</b>	631-61-8	$\text{CH}_3\text{COONH}_4$	77.08 g/mol	500 g	Plastic bottle	1.01116.0500
				1 kg	Plastic bottle	1.01116.1000
				5 kg	Plastic bottle	1.01116.5000
				50 kg	Fibre carton	1.01116.9050
<b>Ammonium amidosulfonate for analysis EMSURE® ACS, Reag. Ph Eur</b>	7773-06-0	$\text{H}_2\text{NSO}_3\text{NH}_4$	114.13 g/mol	100 g	Plastic bottle	1.01220.0100
<b>Ammonium bromide for analysis EMSURE® ACS</b>	12124-97-9	$\text{NH}_4\text{Br}$	97.94 g/mol	1 kg	Plastic bottle	1.01125.1000
				25 kg	Fibre carton	1.01125.9025
<b>Ammonium carbamate for analysis EMSURE®</b>	1111-78-0	$\text{H}_2\text{NCOONH}_4$	78.07 g/mol	500 g	Plastic bottle	1.01134.0500
<b>Ammonium carbonate for analysis EMSURE® ACS, Reag. Ph Eur</b>	10361-29-2	$\text{CH}_6\text{N}_2\text{O}_2 \cdot \text{CH}_5\text{NO}_3$	157.13 g/mol	250 g	Plastic bottle	1.59504.0250
				1 kg	Plastic bottle	1.59504.1000
<b>Ammonium cerium(IV) nitrate for analysis EMSURE® ACS, Reag. Ph Eur</b>	16774-21-3	$(\text{NH}_4)_2[\text{Ce}(\text{NO}_3)_6]$	548.22 g/mol	100 g	Plastic bottle	1.02276.0100
				1 kg	Plastic bottle	1.02276.1000
<b>Ammonium cerium(IV) sulfate dihydrate for analysis EMSURE® ACS</b>	10378-47-9	$(\text{NH}_4)_4\text{Ce}(\text{SO}_4)_4 \cdot 2 \text{H}_2\text{O}$	632.55 g/mol	100 g	Plastic bottle	1.02273.0100
<b>Ammonium chloride for analysis EMSURE® ACS, ISO, Reag. Ph Eur</b>	12125-02-9	$\text{NH}_4\text{Cl}$	53.49 g/mol	500 g	Plastic bottle	1.01145.0500
				1 kg	Plastic bottle	1.01145.1000
				5 kg	Plastic bottle	1.01145.5000
				25 kg	Fibre carton	1.01145.9025
<b>Ammonium dihydrogen phosphate for analysis EMSURE® ACS, Reag. Ph Eur</b>	7722-76-1	$(\text{NH}_4)_2\text{H}_2\text{PO}_4$	115.02 g/mol	500 g	Plastic bottle	1.01126.0500
				50 kg	Fibre carton	1.01126.9050
<b>Ammonium fluoride for analysis EMSURE® ACS</b>	12125-01-8	$\text{NH}_4\text{F}$	37.04 g/mol	250 g	Plastic bottle	1.01164.0250
				1 kg	Plastic bottle	1.01164.1000
				25 kg	Fibre carton	1.01164.9025
<b>Ammonium heptamolybdate tetrahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur</b>	12054-85-2	$(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4 \text{H}_2\text{O}$	1.235.86 g/mol	250 g	Plastic bottle	1.01182.0250
				1 kg	Plastic bottle	1.01182.1000
				5 kg	Plastic bottle	1.01182.5000
<b>di-Ammonium hydrogen citrate for analysis EMSURE® ACS, Reag. Ph Eur</b>	3012-65-5	$\text{C}_6\text{H}_8\text{O}_7 \cdot 2 \text{NH}_3$	226.19 g/mol	500 g	Plastic bottle	1.01154.0500
				2.5 kg	Plastic bottle	1.01154.2500
				50 kg	Fibre carton	1.01154.9050
<b>di-Ammonium hydrogen phosphate for analysis EMSURE® ACS, Reag. Ph Eur</b>	7783-28-0	$(\text{NH}_4)_2\text{HPO}_4$	132.05 g/mol	500 g	Plastic bottle	1.01207.0500
				50 kg	Fibre carton	1.01207.9050
<b>Ammonium iron(III) sulfate dodecahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur</b>	7783-83-7	$(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2 \cdot 12 \text{H}_2\text{O}$	482.19 g/mol	500 g	Plastic bottle	1.03776.0500
				1 kg	Plastic bottle	1.03776.1000
				5 kg	Plastic bottle	1.03776.5000
				50 kg	Fibre carton	1.03776.9050

## Salts A-C

Product	CAS No.	Chemical formula	Molar weight	Content	Packaging	Ord. No.
<b>A</b>	<b>Ammonium iron(II) sulfate hexahydrate for analysis EMSURE® ISO</b>	$(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2 \cdot 6 \text{H}_2\text{O}$	392.14 g/mol	500 g	Plastic bottle	1.03792.0500
				1 kg	Plastic bottle	1.03792.1000
				5 kg	Plastic bottle	1.03792.5000
				50 kg	Fibre carton	1.03792.9050
	<b>Ammonium nitrate for analysis EMSURE® ACS</b>	$\text{NH}_4\text{NO}_3$	80.04 g/mol	500 g	Plastic bottle	1.01188.0500
				1 kg	Plastic bottle	1.01188.1000
				5 kg	Plastic bottle	1.01188.5000
	<b>di-Ammonium oxalate monohydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur</b>	$(\text{NH}_4)_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$	142.11 g/mol	250 g	Plastic bottle	1.01192.0250
				1 kg	Plastic bottle	1.01192.1000
	<b>Ammonium peroxodisulfate for analysis EMSURE® ACS, Reag. Ph Eur</b>	$(\text{NH}_4)_2\text{S}_2\text{O}_8$	228.19 g/mol	500 g	Plastic bottle	1.01201.0500
				1 kg	Plastic bottle	1.01201.1000
				5 kg	Plastic bottle	1.01201.5000
				25 kg	Fibre carton	1.01201.9025
	<b>Ammonium sulfate for analysis EMSURE® ACS, ISO, Reag. Ph Eur</b>	$(\text{NH}_4)_2\text{SO}_4$	132.14 g/mol	100 g	Plastic bottle	1.01217.0100
				1 kg	Plastic bottle	1.01217.1000
				5 kg	Plastic bottle	1.01217.5000
				25 kg	Fibre carton	1.01217.9025
	<b>Ammonium thiocyanate for analysis EMSURE® ACS, ISO, Reag. Ph Eur</b>	$\text{NH}_4\text{SCN}$	76.11 g/mol	500 g	Plastic bottle	1.01213.0500
				25 kg	Fibre carton	1.01213.9025
<b>B</b>	<b>Barium acetate for analysis EMSURE® ACS</b>	$\text{Ba}(\text{CH}_3\text{COO})_2$	255.42 g/mol	500 g	Plastic bottle	1.01704.0500
	<b>Barium carbonate for analysis EMSURE® ACS, Reag. Ph Eur</b>	$\text{BaCO}_3$	197.34 g/mol	250 g	Plastic bottle	1.01714.0250
				1 kg	Plastic bottle	1.01714.1000
	<b>Barium chloride dihydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur</b>	$\text{BaCl}_2 \cdot 2 \text{H}_2\text{O}$	244.28 g/mol	500 g	Plastic bottle	1.01719.0500
				1 kg	Plastic bottle	1.01719.1000
				5 kg	Plastic bottle	1.01719.5000
	<b>Barium hydroxide octahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur</b>	$\text{Ba}(\text{OH})_2 \cdot 8 \text{H}_2\text{O}$	315.48 g/mol	500 g	Plastic bottle	1.01737.0500
				500 g	Plastic bottle	1.01737.0500
				50 kg	Fibre carton	1.01729.9050
	<b>Barium nitrate for analysis EMSURE® ACS</b>	$\text{Ba}(\text{NO}_3)_2$	261.34 g/mol	500 g	Plastic bottle	1.01729.0500
				50 kg	Fibre carton	1.01729.9050
<b>C</b>	<b>Barium perchlorate anhydrous for analysis EMSURE®</b>	$\text{Ba}(\text{ClO}_4)_2$	336.23 g/mol	250 g	Metal can	1.01738.0250
				1 kg	Metal can	1.01738.1000
	<b>Bismuth(III) nitrate alkaline for analysis EMSURE® Reag. Ph Eur</b>	$\text{Bi}_5\text{O}(\text{OH})_9(\text{NO}_3)_4$	1461.99 g/mol	100 g	Plastic bottle	1.01878.0100
	<b>Cadmium acetate dihydrate for analysis EMSURE®</b>	$(\text{CH}_3\text{COO})_2\text{Cd} \cdot 2 \text{H}_2\text{O}$	266.52 g/mol	500 g	Plastic bottle	1.02003.0500
	<b>Cadmium sulfate hydrate for analysis EMSURE® ACS</b>	$3 \text{ CdSO}_4 \cdot 8 \text{H}_2\text{O}$	769.51 g/mol	100 g	Plastic bottle	1.02027.0100
	<b>Calcium carbonate precipitated for analysis EMSURE® Reag. Ph Eur</b>	$\text{CaCO}_3$	100.09 g/mol	250 g	Plastic bottle	1.02066.0250
				1 kg	Plastic bottle	1.02066.1000
				50 kg	Fibre carton	1.02066.9050
	<b>Calcium carbonate precipitated for analysis of silicates EMSURE®</b>	$\text{CaCO}_3$	100.09 g/mol	500 g	Plastic bottle	1.02067.0500

# Ordering information Salts | EMSURE®

## Salts C-H

Product	CAS No.	Chemical formula	Molar weight	Content	Packaging	Ord. No.
<b>C</b> Calcium chloride dihydrate for analysis EMSURE® ACS, Reag. Ph Eur	10035-04-8	$\text{CaCl}_2 \cdot 2 \text{H}_2\text{O}$	147.02 g/mol	250 g	Plastic bottle	1.02382.0250
				500 g	Plastic bottle	1.02382.0500
				1 kg	Plastic bottle	1.02382.1000
				5 kg	Plastic bottle	1.02382.5000
				25 kg	Fibre carton	1.02382.9025
				50 kg	Fibre carton	1.02382.9050
Calcium hydroxide for analysis EMSURE® ACS, Reag. Ph Eur	1305-62-0	$\text{Ca(OH)}_2$	74.09 g/mol	500 g	Plastic bottle	1.02047.0500
				1 kg	Plastic bottle	1.02047.1000
				50 kg	Fibre carton	1.02047.9050
Calcium nitrate tetrahydrate for analysis EMSURE® ACS	13477-34-4	$\text{Ca(NO}_3)_2 \cdot 4 \text{H}_2\text{O}$	236.15 g/mol	500 g	Plastic bottle	1.02121.0500
				50 kg	Fibre carton	1.02121.9050
Calcium sulfate dihydrate precipitated for analysis EMSURE®	10101-41-4	$\text{CaSO}_4 \cdot 2 \text{H}_2\text{O}$	172.17 g/mol	500 g	Plastic bottle	1.02161.0500
Cerium(IV) sulfate tetrahydrate for analysis EMSURE®	10294-42-5	$\text{Ce(SO}_4)_2 \cdot 4 \text{H}_2\text{O}$	404.30 g/mol	25 g	Plastic bottle	1.02274.0025
				100 g	Plastic bottle	1.02274.0100
				250 g	Plastic bottle	1.02274.0250
Chromium(III) nitrate nonahydrate for analysis EMSURE®	7789-02-8	$\text{Cr(NO}_3)_3 \cdot 9 \text{H}_2\text{O}$	400.15 g/mol	250 g	Plastic bottle	1.02481.0250
Chromium(III) potassium sulfate dodecahydrate for analysis EMSURE® ACS, Reag. Ph Eur	7788-99-0	$\text{KCr(SO}_4)_2 \cdot 12 \text{H}_2\text{O}$	499.41 g/mol	250 g	Plastic bottle	1.01036.0250
Cobalt(II) acetate tetrahydrate for analysis EMSURE® ACS	6147-53-1	$(\text{CH}_3\text{COO})_2\text{Co} \cdot 4 \text{H}_2\text{O}$	249.08 g/mol	100 g	Plastic bottle	1.02529.0100
Cobalt(II) chloride hexahydrate for analysis EMSURE® ACS, Reag. Ph Eur	7791-13-1	$\text{CoCl}_2 \cdot 6 \text{H}_2\text{O}$	237.93 g/mol	100 g	Plastic bottle	1.02539.0100
				250 g	Plastic bottle	1.02539.0250
Cobalt(II) nitrate hexahydrate for analysis EMSURE®	10026-22-9	$\text{Co(NO}_3)_2 \cdot 6 \text{H}_2\text{O}$	291.04 g/mol	100 g	Plastic bottle	1.02536.0100
				250 g	Plastic bottle	1.02536.0250
Cobalt(II) nitrate hexahydrate for analysis (max. 0.001 % Ni) EMSURE® ACS, Reag. Ph Eur	10026-22-9	$\text{Co(NO}_3)_2 \cdot 6 \text{H}_2\text{O}$	291.04 g/mol	50 g	Plastic bottle	1.02554.0050
				250 g	Plastic bottle	1.02554.0250
Cobalt(II) sulfate heptahydrate for analysis EMSURE®	10026-24-1	$\text{CoSO}_4 \cdot 7 \text{H}_2\text{O}$	281.10 g/mol	100 g	Plastic bottle	1.02556.0100
				250 g	Plastic bottle	1.02556.0250
Copper(II) acetate monohydrate for analysis EMSURE® ACS	6046-93-1	$(\text{CH}_3\text{COO})_2\text{Cu} \cdot \text{H}_2\text{O}$	199.65 g/mol	250 g	Plastic bottle	1.02711.0250
Copper(I) chloride for analysis EMSURE® ACS	7758-89-6	$\text{CuCl}$	99 g/mol	250 g	Plastic bottle	1.02739.0250
Copper(II) chloride dihydrate for analysis EMSURE® ACS, Reag. Ph Eur	10125-13-0	$\text{CuCl}_2 \cdot 2 \text{H}_2\text{O}$	170.48 g/mol	250 g	Plastic bottle	1.02733.0250
				1 kg	Plastic bottle	1.02733.1000
Copper(II) nitrate trihydrate for analysis EMSURE®	10031-43-3	$\text{Cu(NO}_3)_2 \cdot 3 \text{H}_2\text{O}$	241.60 g/mol	250 g	Plastic bottle	1.02753.0250
				1 kg	Plastic bottle	1.02753.1000
				25 kg	Fibre carton	1.02753.9025
Copper(II) sulfate anhydrous for analysis EMSURE®	7758-98-7	$\text{CuSO}_4$	159.61 g/mol	250 g	Plastic bottle	1.02791.0250
				1 kg	Plastic bottle	1.02791.1000
Copper(II) sulfate pentahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7758-99-8	$\text{CuSO}_4 \cdot 5 \text{H}_2\text{O}$	249.68 g/mol	250 g	Plastic bottle	1.02790.0250
				1 kg	Plastic bottle	1.02790.1000
				5 kg	Plastic bottle	1.02790.5000
				50 kg	Fibre carton	1.02790.9050



## Salts I-L

	Product	CAS No.	Chemical formula	Molar weight	Content	Packaging	Ord. No.
I	Iron(III) chloride hexahydrate for analysis EMSURE® ACS, Reag. Ph Eur	10025-77-1	$\text{FeCl}_3 \cdot 6 \text{H}_2\text{O}$	270.33 g/mol	250 g	Plastic bottle	1.03943.0250
					1 kg	Plastic bottle	1.03943.1000
					25 kg	Plastic drum	1.03943.9025
	Iron(II) chloride tetrahydrate for analysis EMSURE®	13478-10-9	$\text{FeCl}_2 \cdot 4 \text{H}_2\text{O}$	198.83 g/mol	250 g	Plastic bottle	1.03861.0250
					1 kg	Plastic bottle	1.03861.1000
					50 kg	Plastic drum	1.03861.9050
	Iron(III) nitrate nonahydrate for analysis EMSURE® ACS, Reag. Ph Eur	7782-61-8	$\text{Fe}(\text{NO}_3)_3 \cdot 9 \text{H}_2\text{O}$	404.00 g/mol	250 g	Plastic bottle	1.03883.0250
					1 kg	Plastic bottle	1.03883.1000
					50 kg	Steel drum	1.03883.9050
	Iron(III) phosphate for analysis calcined (max. 0.001 % $\text{SO}_4$ ) EMSURE®	10045-86-0	$\text{FePO}_4$	150.82 g/mol	100 g	Plastic bottle	1.03935.0100
					500 g	Plastic bottle	1.03935.0500
	Iron(II) sulfate heptahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7782-63-0	$\text{FeSO}_4 \cdot 7 \text{H}_2\text{O}$	278.02 g/mol	100 g	Plastic bottle	1.03965.0100
					500 g	Plastic bottle	1.03965.0500
					1 kg	Plastic bottle	1.03965.1000
					5 kg	Plastic bottle	1.03965.5000
L	Lead(II) acetate trihydrate for analysis EMSURE® ACS, Reag. Ph Eur	6080-56-4	$(\text{CH}_3\text{COO})_2\text{Pb} \cdot 3 \text{H}_2\text{O}$	379.34 g/mol	250 g	Plastic bottle	1.07375.0250
					1 kg	Plastic bottle	1.07375.1000
	Lead(II) carbonate for analysis EMSURE® ACS	598-63-0	$\text{PbCO}_3$	267.21 g/mol	250 g	Plastic bottle	1.07381.0250
	Lead(II) hydroxide acetate anhydrous, for the analysis of sugar acc. to Horne EMSURE® ACS	51404-69-4	$(\text{CH}_3\text{COO})_2\text{Pb} \cdot \text{Pb}(\text{OH})_2$	566.50 g/mol	1 kg	Plastic bottle	1.07414.1000
					30 kg	Fibre carton	1.07414.9030
	Lead(II) nitrate for analysis EMSURE® ACS, Reag. Ph Eur	10099-74-8	$\text{Pb}(\text{NO}_3)_2$	331.2 g/mol	100 g	Plastic bottle	1.07398.0100
					1 kg	Plastic bottle	1.07398.1000
	Lithium carbonate for analysis EMSURE® ACS, Reag. Ph Eur	554-13-2	$\text{Li}_2\text{CO}_3$	73.89 g/mol	250 g	Plastic bottle	1.05680.0250
	Lithium chloride for analysis EMSURE® ACS, Reag. Ph Eur	7447-41-8	$\text{LiCl}$	42.39 g/mol	100 g	Plastic bottle	1.05679.0100
					250 g	Plastic bottle	1.05679.0250
	Lithium sulfate monohydrate for analysis EMSURE® ACS, Reag. Ph Eur	10102-25-7	$\text{Li}_2\text{SO}_4 \cdot \text{H}_2\text{O}$	127.96 g/mol	250 g	Plastic bottle	1.05694.0250





# Ordering information Salts | EMSURE®

## Salts M

Product	CAS No.	Chemical formula	Molar weight	Content	Packaging	Ord. No.
<b>M</b> Magnesium acetate tetrahydrate for analysis EMSURE® ACS, Reag. Ph Eur	16674-78-5	$(\text{CH}_3\text{COO})_2\text{Mg} \cdot 4 \text{H}_2\text{O}$	214.46 g/mol	250 g	Plastic bottle	1.05819.0250
				1 kg	Plastic bottle	1.05819.1000
				50 kg	Fibre carton	1.05819.9050
Magnesium chloride hexahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7791-18-6	$\text{MgCl}_2 \cdot 6 \text{H}_2\text{O}$	203.30 g/mol	250 g	Plastic bottle	1.05833.0250
				1 kg	Plastic bottle	1.05833.1000
				5 kg	Plastic bottle	1.05833.5000
				25 kg	Fibre carton	1.05833.9025
				50 kg	Fibre carton	1.05833.9050
Magnesium hydroxide carbonate for analysis EMSURE®	12125-28-9	$\sim 4 \text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 \cdot 5 \text{H}_2\text{O}$	485 g/mol	250 g	Plastic bottle	1.05827.0250
				1 kg	Plastic bottle	1.05827.1000
Magnesium nitrate hexahydrate for analysis EMSURE® ACS, Reag. Ph Eur	13446-18-9	$\text{Mg}(\text{NO}_3)_2 \cdot 6 \text{H}_2\text{O}$	256.41 g/mol	500 g	Plastic bottle	1.05853.0500
				25 kg	Plastic drum	1.05853.9025
Magnesium perchlorate hydrate [about 83 % $\text{Mg}(\text{ClO}_4)_2$ ] for analysis EMSURE®	64010-42-0	$\text{Mg}(\text{ClO}_4)_2 \cdot x \text{H}_2\text{O}$	–	100 g	Metal can	1.05874.0100
				500 g	Metal can	1.05874.0500
Magnesium sulfate anhydrous for analysis EMSURE®	7487-88-9	$\text{MgSO}_4$	120.37 g/mol	1 kg	Glass bottle	1.06067.1000
				25 kg	Plastic drum	1.06067.9025
Magnesium sulfate heptahydrate for analysis EMSURE® ACS, Reag. Ph Eur	10034-99-8	$\text{MgSO}_4 \cdot 7 \text{H}_2\text{O}$	246.48 g/mol	500 g	Plastic bottle	1.05886.0500
				1 kg	Plastic bottle	1.05886.1000
				5 kg	Plastic bottle	1.05886.5000
				50 kg	Fibre carton	1.05886.9050
Manganese(II) chloride dihydrate for analysis EMSURE®	20603-88-7	$\text{MnCl}_2 \cdot 2 \text{H}_2\text{O}$	161.87 g/mol	100 g	Plastic bottle	1.05934.0100
				1 kg	Plastic bottle	1.05934.1000
Manganese(II) chloride tetrahydrate for analysis EMSURE® ACS	13446-34-9	$\text{MnCl}_2 \cdot 4 \text{H}_2\text{O}$	197.91 g/mol	100 g	Plastic bottle	1.05927.0100
				1 kg	Plastic bottle	1.05927.1000
Manganese(II) nitrate tetrahydrate for analysis EMSURE®	20694-39-7	$\text{Mn}(\text{NO}_3)_2 \cdot 4 \text{H}_2\text{O}$	251.01 g/mol	500 g	Plastic bottle	1.05940.0500
				1 kg	Plastic bottle	1.05940.1000
				5 kg	Plastic bottle	1.05940.5000
Manganese(II) sulfate monohydrate spray-dried for analysis EMSURE® ACS, Reag. Ph Eur	10034-96-5	$\text{MnSO}_4 \cdot 4 \text{H}_2\text{O}$	169.02 g/mol	250 g	Plastic bottle	1.05941.0250
				25 kg	Fibre carton	1.05941.9025
Manganese(II) sulfate tetrahydrate for analysis EMSURE®	10101-68-5	$\text{MnSO}_4 \cdot \text{H}_2\text{O}$	223.06 g/mol	1 kg	Plastic bottle	1.02786.1000
				25 kg	Fibre carton	1.02786.9025
Mercury extra pure	7439-97-6	Hg	200.59 g/mol	250 g	Plastic bottle	1.04401.0250
				1 kg	Plastic bottle	1.04401.1000
Mercury for analysis and for polarography EMSURE®	7439-97-6	Hg	200.59 g/mol	250 g	Plastic bottle	1.04403.0250
				1 kg	Plastic bottle	1.04403.1000
Mercury(II) acetate for analysis EMSURE® ACS, Reag. Ph Eur	1600-27-7	$\text{Hg}(\text{CH}_3\text{COO})_2$	318.68 g/mol	50 g	Plastic bottle	1.04410.0050
				250 g	Plastic bottle	1.04410.0250
Mercury(II) bromide for analysis EMSURE® ACS, Reag. Ph Eur	7789-47-1	$\text{HgBr}_2$	360.39 g/mol	50 g	Plastic bottle	1.04421.0050
				250 g	Plastic bottle	1.04421.0250
Mercury(II) chloride extra pure fine cryst.	7487-94-7	$\text{HgCl}_2$	271.5 g/mol	100 g	Plastic bottle	1.04417.0100
				1 kg	Plastic bottle	1.04417.1000
Mercury(II) chloride for analysis EMSURE® ACS, Reag. Ph Eur	7487-94-7	$\text{HgCl}_2$	271.5 g/mol	50 g	Plastic bottle	1.04419.0050
				250 g	Plastic bottle	1.04419.0250
				1 kg	Plastic bottle	1.04419.1000
Mercury(II) iodide red, for analysis EMSURE® ACS, Reag. Ph Eur	7774-29-0	$\text{HgI}_2$	454.39 g/mol	50 g	Plastic bottle	1.04428.0050
				250 g	Plastic bottle	1.04428.0250
Mercury(II) iodide red, extra pure	7774-29-0	$\text{HgI}_2$	454.39 g/mol	100 g	Plastic bottle	1.04420.0100
				1 kg	Plastic bottle	1.04420.1000

## Salts M-P

	Product	CAS No.	Chemical formula	Molar weight	Content	Packaging	Ord. No.
M	Mercury(II) nitrate monohydrate for analysis EMSURE® ACS, Reag. Ph Eur	7783-34-8	$\text{Hg}(\text{NO}_3)_2 \cdot \text{H}_2\text{O}$	342.62 g/mol	50 g	Plastic bottle	1.04439.0050
					250 g	Plastic bottle	1.04439.0250
	Mercury(II) oxide red extra pure	21908-53-2	$\text{HgO}$	216.58 g/mol	100 g	Plastic bottle	1.04465.0100
	Mercury(II) oxide red, for analysis EMSURE®	21908-53-2	$\text{HgO}$	216.58 g/mol	50 g	Plastic bottle	1.04466.0050
					250 g	Plastic bottle	1.04466.0250
	Mercury(II) sulfate extra pure	7783-35-9	$\text{HgSO}_4$	296.65 g/mol	100 g	Plastic bottle	1.04481.0100
					250 g	Plastic bottle	1.04481.0250
					1 kg	Plastic bottle	1.04481.1000
	Mercury(II) sulfate for analysis EMSURE® ACS	7783-35-9	$\text{HgSO}_4$	296.65 g/mol	50 g	Plastic bottle	1.04480.0050
					250 g	Plastic bottle	1.04480.0250
N	Mercury(II) thiocyanate for analysis EMSURE®, Reag. Ph Eur	592-85-8	$\text{Hg}(\text{SCN})_2$	316.76 g/mol	25 g	Glass bottle	1.04484.0025
					100 g	Glass bottle	1.04484.0100
	Nickel(II) chloride hexahydrate for analysis EMSURE® ACS	7791-20-0	$\text{NiCl}_2 \cdot 6 \text{H}_2\text{O}$	237.70 g/mol	250 g	Plastic bottle	1.06717.0250
					1 kg	Plastic bottle	1.06717.1000
	Nickel(II) nitrate hexahydrate for analysis EMSURE® ACS	13478-00-7	$\text{Ni}(\text{NO}_3)_2 \cdot 6 \text{H}_2\text{O}$	290.81 g/mol	100 g	Plastic bottle	1.06721.0100
					250 g	Plastic bottle	1.06721.0250
					1 kg	Plastic bottle	1.06721.1000
	Nickel(II) sulfate hexahydrate for analysis EMSURE® ACS	10101-97-0	$\text{NiSO}_4 \cdot 6 \text{H}_2\text{O}$	262.86 g/mol	100 g	Plastic bottle	1.06727.0100
					250 g	Plastic bottle	1.06727.0250
					1 kg	Plastic bottle	1.06727.1000
P	Potassium bromate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7758-01-2	$\text{KBrO}_3$	167 g/mol	100 g	Metal can	1.04912.0100
					250 g	Metal can	1.04912.0250
	Potassium bromide for analysis EMSURE® ACS, Reag. Ph Eur	7758-02-3	$\text{KBr}$	119.00 g/mol	500 g	Plastic bottle	1.04905.0500
	Potassium carbonate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	584-08-7	$\text{K}_2\text{CO}_3$	138.21 g/mol	500 g	Plastic bottle	1.04928.0500
					1 kg	Plastic bottle	1.04928.1000
					50 kg	Fibre carton	1.04928.9050
	Potassium chlorate for analysis EMSURE®	3811-04-9	$\text{KClO}_3$	122.55 g/mol	100 g	Metal can	1.04944.0100
					500 g	Metal can	1.04944.0500
	Potassium chloride for analysis ( $\leq 0.005$ % Br) EMSURE® ACS, ISO, Reag. Ph Eur	7447-40-7	$\text{KCl}$	74.55 g/mol	500 g	Plastic bottle	1.04933.0500
	Potassium chloride for analysis EMSURE®	7447-40-7	$\text{KCl}$	74.55 g/mol	250 g	Plastic bottle	1.04936.0250
					500 g	Plastic bottle	1.04936.0500
					1 kg	Plastic bottle	1.04936.1000
					5 kg	Plastic bottle	1.04936.5000
					50 kg	Fibre carton	1.04936.9050
	Potassium chromate for analysis EMSURE® ACS, Reag. Ph Eur	7789-00-6	$\text{K}_2\text{CrO}_4$	194.19 g/mol	250 g	Plastic bottle	1.04952.0250
					1 kg	Plastic bottle	1.04952.1000
	Potassium cyanide for analysis EMSURE® ACS, Reag. Ph Eur	151-50-8	$\text{KCN}$	65.12 g/mol	100 g	Plastic bottle	1.04967.0100
					250 g	Plastic bottle	1.04967.0250
					1 kg	Plastic bottle	1.04967.1000
	Potassium dichromate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7778-50-9	$\text{K}_2\text{Cr}_2\text{O}_7$	294.19 g/mol	500 g	Plastic bottle	1.04864.0500
					1 kg	Plastic bottle	1.04864.1000
					5 kg	Plastic bottle	1.04864.5000

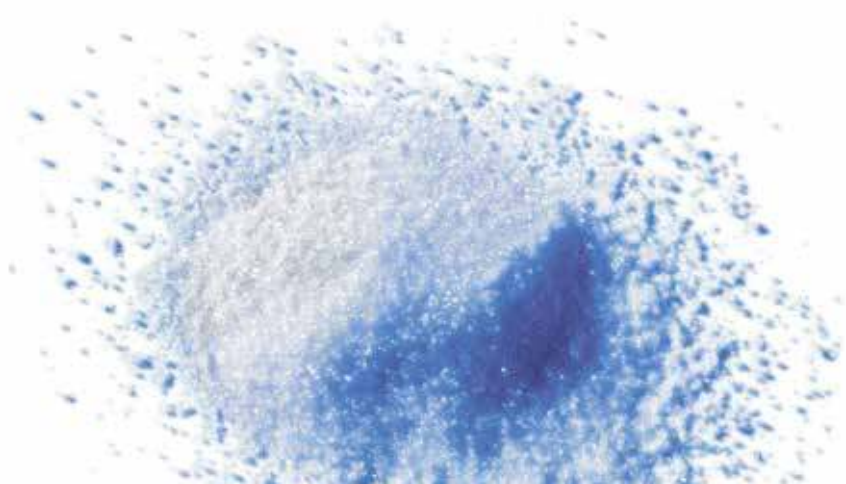
# Ordering information Salts | EMSURE®

## Salts P

Product	CAS No.	Chemical formula	Molar weight	Content	Packaging	Ord. No.
<b>P</b> Potassium dichromate for analysis (max. 0.000001 % Hg) EMSURE® ACS, ISO	7778-50-9	K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	294.19 g/mol	500 g	Glass bottle	1.04865.0500
Potassium dihydrogen phosphate for analysis (≤0.005 % Na) EMSURE® ACS, ISO, Reag. Ph Eur	7778-77-0	KH <sub>2</sub> PO <sub>4</sub>	136.08 g/mol	1 kg	Plastic bottle	1.04877.1000
				12 kg	Plastic container	1.04877.9012
				25 kg	Fibre carton	1.04877.9025
Potassium dihydrogen phosphate for analysis EMSURE® ISO	7778-77-0	KH <sub>2</sub> PO <sub>4</sub>	136.08 g/mol	250 g	Plastic bottle	1.04873.0250
				1 kg	Plastic bottle	1.04873.1000
				5 kg	Plastic bottle	1.04873.5000
				25 kg	Fibre carton	1.04873.9025
				50 kg	Fibre carton	1.04873.9050
Potassium disulfate (Potassium pyrosulfate) for analysis EMSURE® ACS	7790-62-7	K <sub>2</sub> S <sub>2</sub> O <sub>7</sub>	254.33 g/mol	1 kg	Plastic bottle	1.05107.1000
				5 kg	Plastic bottle	1.05107.5000
				50 kg	Fibre carton	1.05107.9050
Potassium disulfite for analysis EMSURE®	16731-55-8	K <sub>2</sub> S <sub>2</sub> O <sub>5</sub>	222.33 g/mol	500 g	Plastic bottle	1.05057.0500
				1 kg	Plastic bottle	1.05057.1000
				2.5 kg	Plastic bottle	1.05057.2500
Potassium fluoride for analysis EMSURE® ACS	7789-23-3	KF	58.1 g/mol	250 g	Plastic bottle	1.04994.0250
				1 kg	Plastic bottle	1.04994.1000
Potassium hexacyanoferrate(III) for analysis EMSURE® ACS, Reag. Ph Eur	13746-66-2	K <sub>3</sub> [Fe(CN) <sub>6</sub> ]	329.25 g/mol	100 g	Plastic bottle	1.04973.0100
				250 g	Plastic bottle	1.04973.0250
				1 kg	Plastic bottle	1.04973.1000
				50 kg	Fibre carton	1.04973.9050
Potassium hexacyanoferrate(II) trihydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	14459-95-1	K <sub>4</sub> [Fe(CN) <sub>6</sub> ] · 3 H <sub>2</sub> O	422.39 g/mol	100 g	Plastic bottle	1.04984.0100
				500 g	Plastic bottle	1.04984.0500
				50 kg	Fibre carton	1.04984.9050
Potassium hexahydroxoantimonate(V) cryst. for analysis EMSURE®	12208-13-8	K[Sb(OH) <sub>6</sub> ]	262.9 g/mol	100 g	Plastic bottle	1.05110.0100
Potassium hydrogen carbonate for analysis EMSURE® ACS	298-14-6	KHCO <sub>3</sub>	100.12 g/mol	500 g	Plastic bottle	1.04854.0500
Potassium hydrogen diiodate for analysis EMSURE®	13455-24-8	KH(IO <sub>3</sub> ) <sub>2</sub>	389.91 g/mol	50 g	Glass bottle	1.04867.0050
di-Potassium hydrogen phosphate anhydrous for analysis EMSURE®	7758-11-4	K <sub>2</sub> HPO <sub>4</sub>	174.18 g/mol	1 kg	Plastic bottle	1.05104.1000
				25 kg	Fibre carton	1.05104.9025
				50 kg	Fibre carton	1.05104.9050
di-Potassium hydrogen phosphate trihydrate buffer substance for chromatography LiChropur®	16788-57-1	K <sub>2</sub> HPO <sub>4</sub> · 3 H <sub>2</sub> O	228.23 g/mol	250 g	Glass bottle	1.19754.0250
di-Potassium hydrogen phosphate trihydrate for analysis EMSURE®	16788-57-1	K <sub>2</sub> HPO <sub>4</sub> · 3 H <sub>2</sub> O	228.23 g/mol	250 g	Plastic bottle	1.05099.0250
				1 kg	Plastic bottle	1.05099.1000
				5 kg	Plastic bottle	1.05099.5000
				50 kg	Fibre carton	1.05099.9050
Potassium hydrogen phthalate for analysis EMSURE® Reag. Ph Eur	877-24-7	C <sub>8</sub> H <sub>6</sub> KO <sub>4</sub>	204.22 g/mol	250 g	Plastic bottle	1.04874.0250
				1 kg	Plastic bottle	1.04874.1000
				12 kg	Plastic container	1.04874.9012
Potassium hydrogen sulfate for analysis EMSURE® Reag. Ph Eur	7646-93-7	KHSO <sub>4</sub>	136.17 g/mol	500 g	Plastic bottle	1.04885.0500
				2.5 kg	Plastic bottle	1.04885.2500
Potassium iodate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7758-05-6	KIO <sub>3</sub>	214 g/mol	100 g	Plastic bottle	1.05051.0100
				500 g	Plastic bottle	1.05051.0500

## Salts P-R

Product	CAS No.	Chemical formula	Molar weight	Content	Packaging	Ord. No.
P Potassium iodide for analysis EMSURE® ISO, Reag. Ph Eur	7681-11-0	KI	166.00 g/mol	250 g	Plastic bottle	1.05043.0250
				500 g	Plastic bottle	1.05043.0500
				1 kg	Plastic bottle	1.05043.1000
				2.5 kg	Plastic bottle	1.05043.2500
				25 kg	Fibre carton	1.05043.9025
Potassium nitrate for analysis EMSURE® ISO, Reag. Ph Eur	7757-79-1	KNO <sub>3</sub>	101.10 g/mol	500 g	Plastic bottle	1.05063.0500
				1 kg	Plastic bottle	1.05063.1000
				5 kg	Plastic bottle	1.05063.5000
				25 kg	Fibre carton	1.05063.9025
Potassium nitrite cryst. for analysis EMSURE® ACS	7758-09-0	KNO <sub>2</sub>	85.11 g/mol	250 g	Plastic bottle	1.05067.0250
				1 kg	Plastic bottle	1.05067.1000
di-Potassium oxalate monohydrate for analysis EMSURE® ACS	6487-48-5	K <sub>2</sub> C <sub>2</sub> O <sub>4</sub> · H <sub>2</sub> O	184.24 g/mol	250 g	Plastic bottle	1.05073.0250
				1 kg	Plastic bottle	1.05073.1000
Potassium perchlorate for analysis EMSURE® ACS	7778-74-7	KClO <sub>4</sub>	138.55 g/mol	250 g	Metal can	1.05076.0250
				1 kg	Metal can	1.05076.1000
Potassium permanganate for analysis EMSURE® ACS, Reag. Ph Eur	7722-64-7	KMnO <sub>4</sub>	158.03 g/mol	250 g	Glass bottle	1.05082.0250
				1 kg	Glass bottle	1.05082.1000
Potassium permanganate for analysis (max. 0.000005 % Hg) EMSURE® ACS	7722-64-7	KMnO <sub>4</sub>	158.03 g/mol	1 kg	Glass bottle	1.05084.1000
Potassium peroxodisulfate for analysis (≤0.001 % N) EMSURE® ACS, Reag. Ph Eur	7727-21-1	K <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	270.32 g/mol	250 g	Plastic bottle	1.05092.0250
Potassium peroxodisulfate for analysis EMSURE®	7727-21-1	K <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	270.32 g/mol	250 g	Plastic bottle	1.05091.0250
				1 kg	Plastic bottle	1.05091.1000
Potassium sodium tartrate tetrahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	6381-59-5	C <sub>4</sub> H <sub>4</sub> KNaO <sub>6</sub> · 4 H <sub>2</sub> O	282.23 g/mol	500 g	Plastic bottle	1.08087.0500
				1 kg	Plastic bottle	1.08087.1000
				5 kg	Plastic bottle	1.08087.5000
				12 kg	Plastic container	1.08087.9012
Potassium sulfate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7778-80-5	K <sub>2</sub> SO <sub>4</sub>	174.26 g/mol	500 g	Plastic bottle	1.05153.0500
				1 kg	Plastic bottle	1.05153.1000
				5 kg	Plastic bottle	1.05153.5000
				25 kg	Fibre carton	1.05153.9025
Potassium sulfide small lumps for analysis EMSURE®	39365-88-3	–	–	250 g	Plastic bottle	1.05134.0250
				1 kg	Plastic bottle	1.05134.1000
Potassium thiocyanate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	333-20-0	KSCN	97.18 g/mol	250 g	Plastic bottle	1.05125.0250
				1 kg	Plastic bottle	1.05125.1000
				50 kg	Fibre carton	1.05125.9050



# Ordering information Salts | EMSURE®

## Salts S

	Product	CAS No.	Chemical formula	Molar weight	Content	Packaging	Ord. No.
S	Silver nitrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7761-88-8	AgNO <sub>3</sub>	169.87 g/mol	25 g	Plastic bottle	1.01512.0025
					100 g	Plastic bottle	1.01512.0100
					250 g	Plastic bottle	1.01512.0250
					1 kg	Plastic bottle	1.01512.1000
	Sodium acetate anhydrous for analysis EMSURE® ACS, Reag. Ph Eur	127-09-3	CH <sub>3</sub> COONa	82.03 g/mol	250 g	Plastic bottle	1.06268.0250
					1 kg	Plastic bottle	1.06268.1000
					2.5 kg	Plastic bottle	1.06268.2500
					12 kg	Plastic container	1.06268.9012
	Sodium acetate trihydrate for analysis indifferent to potassium permanganate EMSURE® ACS, ISO, Reag. Ph Eur	6131-90-4	NaCH <sub>3</sub> COO · 3 H <sub>2</sub> O	136.08 g/mol	500 g	Plastic bottle	1.06267.0500
					1 kg	Plastic bottle	1.06267.1000
					5 kg	Plastic bottle	1.06267.5000
					50 kg	Fibre carton	1.06267.9050
	Sodium ammonium hydrogen phosphate tetrahydrate for analysis EMSURE®	7783-13-3	NaNH <sub>4</sub> HPO <sub>4</sub> · 4 H <sub>2</sub> O	209.07 g/mol	1 kg	Plastic bottle	1.06682.1000
	Sodium carbonate anhydrous, for analysis EMSURE® ACS, ISO, Reag. Ph Eur	497-19-8	Na <sub>2</sub> CO <sub>3</sub>	105.99 g/mol	1 kg	Plastic bottle	1.06393.1000
					50 kg	Fibre carton	1.06393.9050
	Sodium carbonate anhydrous for analysis EMSURE® ISO	497-19-8	Na <sub>2</sub> CO <sub>3</sub>	105.99 g/mol	500 g	Plastic bottle	1.06392.0500
					1 kg	Plastic bottle	1.06392.1000
					5 kg	Plastic bottle	1.06392.5000
					25 kg	Fibre carton	1.06392.9025
	Sodium carbonate decahydrate for analysis EMSURE® ISO, Reag. Ph Eur	6132-02-1	Na <sub>2</sub> CO <sub>3</sub> · 10 H <sub>2</sub> O	286.14 g/mol	1 kg	Plastic bottle	1.06391.1000
					5 kg	Plastic bottle	1.06391.5000
					25 kg	Fibre carton	1.06391.9025
	Sodium chloride for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7647-14-5	NaCl	58.44 g/mol	500 g	Plastic bottle	1.06404.0500
					1 kg	Plastic bottle	1.06404.1000
					5 kg	Plastic bottle	1.06404.5000
					12 kg	Plastic container	1.06404.9012
					25 kg	Fibre carton	1.06404.9025
	tri-Sodium citrate dihydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	6132-04-3	C <sub>6</sub> H <sub>5</sub> Na <sub>3</sub> O <sub>7</sub> · 2 H <sub>2</sub> O	294.10 g/mol	500 g	Plastic bottle	1.06448.0500
					1 kg	Plastic bottle	1.06448.1000
					5 kg	Plastic bottle	1.06448.5000
					25 kg	Fibre carton	1.06448.9025
	Sodium dichromate dihydrate for analysis EMSURE® ACS	7789-12-0	Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> · 2 H <sub>2</sub> O	298.00 g/mol	250 g	Plastic bottle	1.06336.0250
					1 kg	Plastic bottle	1.06336.1000
	Sodium dihydrogen phosphate dihydrate for analysis EMSURE® Reag. Ph Eur	13472-35-0	NaH <sub>2</sub> PO <sub>4</sub> · 2 H <sub>2</sub> O	156.02 g/mol	250 g	Plastic bottle	1.06342.0250
					1 kg	Plastic bottle	1.06342.1000
					2.5 kg	Plastic bottle	1.06342.2500
	Sodium dihydrogen phosphate monohydrate for analysis EMSURE® ACS, Reag. Ph Eur	10049-21-5	NaH <sub>2</sub> PO <sub>4</sub> · H <sub>2</sub> O	137.99 g/mol	500 g	Plastic bottle	1.06346.0500
					1 kg	Plastic bottle	1.06346.1000
					12 kg	Plastic container	1.06346.9012
					25 kg	Fibre carton	1.06346.9025
	tetra-Sodium diphosphate decahydrate for analysis EMSURE® ACS, Reag. Ph Eur	13472-36-1	Na <sub>4</sub> P <sub>2</sub> O <sub>7</sub> · 10 H <sub>2</sub> O	446.06 g/mol	500 g	Plastic bottle	1.06591.0500
					2.5 kg	Plastic bottle	1.06591.2500
					50 kg	Fibre carton	1.06591.9050

## Salts S

Product	CAS No.	Chemical formula	Molar weight	Content	Packaging	Ord. No.
<b>S</b> Sodium disulfite (sodium metabisulfite) for analysis EMSURE® ACS, Reag. Ph Eur	7681-57-4	$\text{Na}_2\text{S}_2\text{O}_5$	190.11 g/mol	100 g	Plastic bottle	1.06528.0100
				500 g	Plastic bottle	1.06528.0500
				1 kg	Plastic bottle	1.06528.1000
				5 kg	Plastic bottle	1.06528.5000
				50 kg	Fibre carton	1.06528.9050
Sodium dithionite for analysis	7775-14-6	$\text{Na}_2\text{S}_2\text{O}_4$	174.11 g/mol	500 g	Metal can	1.06507.0500
				2.5 kg	Metal can	1.06507.2500
Sodium fluoride for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7681-49-4	NaF	41.98 g/mol	250 g	Plastic bottle	1.06449.0250
				1 kg	Plastic bottle	1.06449.1000
				50 kg	Fibre carton	1.06449.9050
Sodium formate for analysis EMSURE® ACS, Reag. Ph Eur	141-53-7	HCOONa	68.01 g/mol	500 g	Plastic bottle	1.06443.0500
				50 kg	Fibre carton	1.06443.9050
Sodium hexanitrocobaltate(III) [sodium cobalt(III)nitrite] for analysis EMSURE® ACS, Reag. Ph Eur	13600-98-1	$\text{Na}_3[\text{Co}(\text{NO}_2)_6]$	403.93 g/mol	25 g	Plastic bottle	1.02521.0025
				100 g	Plastic bottle	1.02521.0100
Sodium hydrogen carbonate for analysis EMSURE® ACS, Reag. Ph Eur	144-55-8	$\text{NaHCO}_3$	84.01 g/mol	500 g	Plastic bottle	1.06329.0500
				1 kg	Plastic bottle	1.06329.1000
				5 kg	Plastic bottle	1.06329.5000
				12 kg	Plastic container	1.06329.9012
				25 kg	Plastic drum	1.06329.9025
di-Sodium hydrogen phosphate anhydrous for analysis EMSURE® ACS, Reag. Ph Eur	7558-79-4	$\text{Na}_2\text{HPO}_4$	141.96 g/mol	500 g	Plastic bottle	1.06586.0500
				1 kg	Plastic bottle	1.06586.1000
				2.5 kg	Plastic bottle	1.06586.2500
				12 kg	Plastic container	1.06586.9012
				50 kg	Fibre carton	1.06586.9050
di-Sodium hydrogen phosphate anhydrous for analysis particle size about 0.2–1 mm (~18–80 mesh ASTM) EMSURE®	7558-79-4	$\text{Na}_2\text{HPO}_4$	141.96 g/mol	500 g	Plastic bottle	1.06559.0500
				25 kg	Fibre carton	1.06559.9025
di-Sodium hydrogen phosphate dihydrate buffer substance for chromatography LiChropur®	10028-24-7	$\text{Na}_2\text{HPO}_4 \cdot 2 \text{H}_2\text{O}$	177.99 g/mol	250 g	Glass bottle	1.19753.0250
di-Sodium hydrogen phosphate dihydrate for analysis EMSURE®	10028-24-7	$\text{Na}_2\text{HPO}_4 \cdot 2 \text{H}_2\text{O}$	177.99 g/mol	500 g	Plastic bottle	1.06580.0500
				1 kg	Plastic bottle	1.06580.1000
				5 kg	Plastic bottle	1.06580.5000
				25 kg	Fibre carton	1.06580.9025
				50 kg	Fibre carton	1.06580.9050
di-Sodium hydrogen phosphate dodecahydrate for analysis EMSURE® ISO, Reag. Ph Eur	10039-32-4	$\text{Na}_2\text{HPO}_4 \cdot 12 \text{H}_2\text{O}$	358.14 g/mol	500 g	Plastic bottle	1.06579.0500
				1 kg	Plastic bottle	1.06579.1000
				5 kg	Plastic bottle	1.06579.5000
				25 kg	Fibre carton	1.06579.9025
di-Sodium hydrogen phosphate heptahydrate for analysis EMSURE® ACS	7782-85-6	$\text{Na}_2\text{HPO}_4 \cdot 7 \text{H}_2\text{O}$	268.03 g/mol	1 kg	Plastic bottle	1.06575.1000
				25 kg	Fibre carton	1.06575.9025
Sodium hydrogen sulfate monohydrate for analysis EMSURE®	10034-88-5	$\text{NaHSO}_4 \cdot \text{H}_2\text{O}$	138.07 g/mol	500 g	Plastic bottle	1.06352.0500
Sodium iodate for analysis EMSURE®	7681-55-2	$\text{NaIO}_3$	197.89 g/mol	100 g	Glass bottle	1.06525.0100
Sodium iodide for analysis EMSURE® Reag. Ph Eur, ACS	7681-82-5	NaI	149.89 g/mol	100 g	Plastic bottle	1.06523.0100
				250 g	Plastic bottle	1.06523.0250
				1 kg	Plastic bottle	1.06523.1000



# Ordering information Salts | EMSURE®

## Salts S

Product	CAS No.	Chemical formula	Molar weight	Content	Packaging	Ord. No.
<b>S</b> Sodium metaperiodate for analysis EMSURE® ACS, Reag. Ph Eur	7790-28-5	$\text{NaIO}_4$	213.89 g/mol	50 g	Plastic bottle	1.06597.0050
				250 g	Plastic bottle	1.06597.0250
				1 kg	Plastic bottle	1.06597.1000
Sodium molybdate dihydrate for analysis EMSURE®	10102-40-6	$\text{Na}_2\text{MoO}_4 \cdot 2 \text{H}_2\text{O}$	241.95 g/mol	100 g	Plastic bottle	1.06521.0100
				250 g	Plastic bottle	1.06521.0250
				1 kg	Plastic bottle	1.06521.1000
Sodium nitrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7631-99-4	$\text{NaNO}_3$	84.99 g/mol	500 g	Plastic bottle	1.06537.0500
				1 kg	Plastic bottle	1.06537.1000
				12 kg	Plastic container	1.06537.9012
				25 kg	Fibre carton	1.06537.9025
Sodium nitrite for analysis EMSURE® ACS, Reag. Ph Eur	7632-00-0	$\text{NaNO}_2$	69.00 g/mol	100 g	Plastic bottle	1.06549.0100
				500 g	Plastic bottle	1.06549.0500
				12 kg	Plastic container	1.06549.9012
di-Sodium oxalate for analysis EMSURE®	62-76-0	$\text{Na}_2\text{C}_2\text{O}_4$	134 g/mol	250 g	Plastic bottle	1.06557.0250
				1 kg	Plastic bottle	1.06557.1000
Sodium perchlorate monohydrate for analysis EMSURE®	7791-07-3	$\text{NaClO}_4 \cdot \text{H}_2\text{O}$	140.46 g/mol	100 g	Metal can	1.06564.0100
				500 g	Metal can	1.06564.0500
				25 kg	Steel drum	1.06564.9025
Sodium peroxodisulfate for analysis EMSURE®	7775-27-1	$\text{Na}_2\text{S}_2\text{O}_8$	238.11 g/mol	500 g	Plastic bottle	1.06609.0500
				1 kg	Plastic bottle	1.06609.1000
				12 kg	Plastic container	1.06609.9012
				25 kg	Fibre carton	1.06609.9025
tri-Sodium phosphate dodecahydrate for analysis EMSURE®	10101-89-0	$\text{Na}_3\text{PO}_4 \cdot 12 \text{H}_2\text{O}$	380.18 g/mol	1 kg	Plastic bottle	1.06572.1000
				5 kg	Plastic bottle	1.06572.5000
				25 kg	Fibre carton	1.06572.9025
tri-Sodium phosphate dodecahydrate for analysis EMSURE® ACS, Reag. Ph Eur	10101-89-0	$\text{Na}_3\text{PO}_4 \cdot 12 \text{H}_2\text{O}$	380.18 g/mol	1 kg	Plastic bottle	1.06578.1000
				5 kg	Plastic bottle	1.06578.5000
				12 kg	Plastic container	1.06578.9012
				50 kg	Fibre carton	1.06578.9050
Sodium salicylate for analysis EMSURE®	54-21-7	$\text{C}_7\text{H}_5\text{NaO}_3$	160.10 g/mol	250 g	Plastic bottle	1.06601.0250
				1 kg	Plastic bottle	1.06601.1000
Sodium sulfate anhydrous, coarse granules for analysis 0.63–2.0 mm EMSURE® ACS	7757-82-6	$\text{Na}_2\text{SO}_4$	142.04 g/mol	500 g	Plastic bottle	1.06637.0500
				1 kg	Plastic bottle	1.06637.1000
				25 kg	Fibre carton	1.06637.9025
Sodium sulfate anhydrous for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7757-82-6	$\text{Na}_2\text{SO}_4$	142.04 g/mol	500 g	Plastic bottle	1.06649.0500
				1 kg	Plastic bottle	1.06649.1000
				5 kg	Plastic bottle	1.06649.5000
				25 kg	Fibre carton	1.06649.9025
Sodium sulfate anhydrous granulated for organic trace analysis EMSURE®	7757-82-6	$\text{Na}_2\text{SO}_4$	142.04 g/mol	500 g	Glass bottle	1.06639.0500
Sodium sulfate decahydrate for analysis EMSURE® ACS, Reag. Ph Eur	7727-73-3	$\text{Na}_2\text{SO}_4 \cdot 10 \text{H}_2\text{O}$	322.19 g/mol	1 kg	Plastic bottle	1.06648.1000
				25 kg	Fibre carton	1.06648.9025
Sodium sulfite anhydrous for analysis EMSURE® Reag. Ph Eur	7757-83-7	$\text{Na}_2\text{SO}_3$	126.04 g/mol	500 g	Plastic bottle	1.06657.0500
				1 kg	Plastic bottle	1.06657.1000
				5 kg	Plastic bottle	1.06657.5000
				50 kg	Fibre carton	1.06657.9050
di-Sodium tartrate dihydrate for analysis EMSURE®	6106-24-7	$\text{C}_4\text{H}_4\text{Na}_2\text{O}_6 \cdot 2 \text{H}_2\text{O}$	230.08 g/mol	250 g	Plastic bottle	1.06663.0250
				1 kg	Plastic bottle	1.06663.1000

## Salts S-Z

	Product	CAS No.	Chemical formula	Molar weight	Content	Packaging	Ord. No.
S	Sodium thiosulfate pentahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	10102-17-7	$\text{Na}_2\text{S}_2\text{O}_3 \cdot 5 \text{H}_2\text{O}$	248.21 g/mol	500 g	Plastic bottle	1.06516.0500
					1 kg	Plastic bottle	1.06516.1000
					5 kg	Plastic bottle	1.06516.5000
					25 kg	Fibre carton	1.06516.9025
	Sodium tungstate dihydrate for analysis EMSURE®	10213-10-2	$\text{Na}_2\text{WO}_4 \cdot 2 \text{H}_2\text{O}$	329.86 g/mol	250 g	Plastic bottle	1.06673.0250
					1 kg	Plastic bottle	1.06673.1000
	Strontium chloride hexahydrate for analysis EMSURE® ACS	10025-70-4	$\text{SrCl}_2 \cdot 6 \text{H}_2\text{O}$	266.62 g/mol	250 g	Plastic bottle	1.07865.0250
					1 kg	Plastic bottle	1.07865.1000
	Strontium nitrate for analysis EMSURE®	10042-76-9	$\text{Sr}(\text{NO}_3)_2$	211.63 g/mol	250 g	Plastic bottle	1.07872.0250
T	Tin(II) chloride dihydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	10025-69-1	$\text{SnCl}_2 \cdot 2 \text{H}_2\text{O}$	225.63 g/mol	100 g	Glass bottle	1.07815.0100
					250 g	Glass bottle	1.07815.0250
					1 kg	Glass bottle	1.07815.1000
	Tin(II) chloride dihydrate for analysis (max. 0.000001 % Hg) EMSURE®	10025-69-1	$\text{SnCl}_2 \cdot 2 \text{H}_2\text{O}$	225.63 g/mol	250 g	Glass bottle	1.07814.0250
					2.5 kg	Glass bottle	1.07814.2500
	Tin(II) sulfate for analysis EMSURE®	7488-55-3	$\text{SnSO}_4$	214.77	250 g	Plastic bottle	1.07823.0250
Z	Zinc acetate dihydrate for analysis EMSURE® ACS	5970-45-6	$(\text{CH}_3\text{COO})_2\text{Zn} \cdot 2 \text{H}_2\text{O}$	219.49	250 g	Plastic bottle	1.08802.0250
					1 kg	Plastic bottle	1.08802.1000
	Zinc chloride for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7646-85-7	$\text{ZnCl}_2$	136.30	250 g	Plastic bottle	1.08816.0250
					1 kg	Plastic bottle	1.08816.1000
					25 kg	Plastic drum	1.08816.9025
	Zinc iodide for analysis EMSURE®	10139-47-6	$\text{ZnI}_2$	319.18	25 g	Glass bottle	1.08828.0025
					100 g	Glass bottle	1.08828.0100
	Zinc nitrate tetrahydrate for analysis EMSURE®	19154-63-3	$\text{Zn}(\text{NO}_3)_2 \cdot 4 \text{H}_2\text{O}$	261.44	1 kg	Plastic bottle	1.08833.1000
	Zinc sulfate heptahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7446-20-0	$\text{ZnSO}_4 \cdot 7 \text{H}_2\text{O}$	287.54	500 g	Plastic bottle	1.08883.0500
					1 kg	Plastic bottle	1.08883.1000
					5 kg	Plastic bottle	1.08883.5000
					50 kg	Fibre carton	1.08883.9050





## Salts A-H

Product	Chemical formula
<b>A</b> Aluminum ammonium sulfate dodecahydrate for analysis EMSURE®	$\text{NH}_4\text{Al}(\text{SO}_4)_2 \cdot 12 \text{H}_2\text{O}$
Aluminum nitrate nonahydrate for analysis EMSURE®	$\text{Al}(\text{NO}_3)_3 \cdot 9 \text{H}_2\text{O}$
Aluminum potassium sulfate dodecahydrate for analysis EMSURE® ACS	$\text{KAl}(\text{SO}_4)_2 \cdot 12 \text{H}_2\text{O}$
Ammonium acetate for analysis EMSURE® ACS, Reag. Ph Eur	$\text{CH}_3\text{COONH}_4$
Ammonium bromide for analysis EMSURE® ACS	$\text{NH}_4\text{Br}$
Ammonium carbamate for analysis EMSURE®	$\text{H}_2\text{NCOONH}_4$
Ammonium carbonate for analysis EMSURE® ACS, Reag. Ph Eur	$\text{CH}_6\text{N}_2\text{O}_2 \cdot \text{CH}_5\text{NO}_3$
Ammonium cerium(IV) nitrate for analysis EMSURE® ACS, Reag. Ph Eur	$(\text{NH}_4)_2[\text{Ce}(\text{NO}_3)_6]$
Ammonium chloride for analysis EMSURE® ACS, ISO	$\text{NH}_4\text{Cl}$
Ammonium dihydrogen phosphate for analysis EMSURE® ACS, Reag. Ph Eur	$(\text{NH}_4)_2\text{H}_2\text{PO}_4$
Ammonium fluoride for analysis EMSURE® ACS	$\text{NH}_4\text{F}$
Ammonium heptamolybdate tetrahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4 \text{H}_2\text{O}$
di-Ammonium hydrogen phosphate for analysis EMSURE® ACS, Reag. Ph Eur	$(\text{NH}_4)_2\text{HPO}_4$
Ammonium iodide for analysis EMSURE® ACS	$\text{NH}_4\text{I}$
Ammonium iron(III) sulfate dodecahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2 \cdot 12 \text{H}_2\text{O}$
Ammonium iron(II) sulfate hexahydrate for analysis EMSURE®, ISO	$(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2 \cdot 6 \text{H}_2\text{O}$
Ammonium nitrate for analysis EMSURE® ACS, ISO	$\text{NH}_4\text{NO}_3$
di-Ammonium oxalate monohydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$(\text{NH}_4)_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$
Ammonium peroxodisulfate for analysis EMSURE® ACS, Reag. Ph Eur	$(\text{NH}_4)_2\text{S}_2\text{O}_8$
Ammonium sulfate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$(\text{NH}_4)_2\text{SO}_4$
Ammonium thiocyanate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$\text{NH}_4\text{SCN}$
<b>B</b> Barium acetate for analysis EMSURE® ACS	$\text{Ba}(\text{CH}_3\text{COO})_2$
Barium carbonate for analysis EMSURE® ACS, Reag. Ph Eur	$\text{BaCO}_3$
Barium chloride dihydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$\text{BaCl}_2 \cdot 2 \text{H}_2\text{O}$
Barium hydroxide octahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$\text{Ba}(\text{OH})_2 \cdot 8 \text{H}_2\text{O}$
Barium nitrate for analysis EMSURE® ACS	$\text{Ba}(\text{NO}_3)_2$
Barium perchlorate anhydrous for analysis EMSURE®	$\text{Ba}(\text{ClO}_4)_2$
<b>C</b> Cadmium sulfate hydrate for analysis EMSURE® ACS, Reag. Ph Eur	$3 \text{CdSO}_4 \cdot 8 \text{H}_2\text{O}$
Calcium carbonate precipitated for analysis EMSURE®, Reag. Ph Eur	$\text{CaCO}_3$
Calcium chloride dihydrate cryst. for analysis EMSURE® ACS, Reag. Ph Eur	$\text{CaCl}_2 \cdot 2 \text{H}_2\text{O}$
Calcium hydroxide for analysis EMSURE®, Reag. Ph Eur	$\text{Ca}(\text{OH})_2$
Calcium nitrate tetrahydrate for analysis EMSURE® ACS	$\text{Ca}(\text{NO}_3)_2 \cdot 4 \text{H}_2\text{O}$
Calcium sulfate dihydrate precipitated for analysis EMSURE® ACS	$\text{CaSO}_4 \cdot 2 \text{H}_2\text{O}$
Cerium(II) sulfate tetrahydrate for analysis EMSURE®	$\text{Ce}(\text{SO}_4)_2 \cdot 4 \text{H}_2\text{O}$
Chromium(III) nitrate nonahydrate for analysis EMSURE®	$\text{Cr}(\text{NO}_3)_3 \cdot 9 \text{H}_2\text{O}$
Chromium(III) potassium sulfate dodecahydrate for analysis EMSURE® ACS, Reag. Ph Eur	$\text{KCr}(\text{SO}_4)_2 \cdot 12 \text{H}_2\text{O}$
Cobalt(II) acetate tetrahydrate for analysis EMSURE® ACS	$(\text{CH}_3\text{COO})_2\text{Co} \cdot 4 \text{H}_2\text{O}$
Cobalt(II) chloride hexahydrate for analysis EMSURE® ACS, Reag. Ph Eur	$\text{CoCl}_2 \cdot 6 \text{H}_2\text{O}$
Cobalt(II) nitrate hexahydrate for analysis EMSURE®	$\text{Co}(\text{NO}_3)_2 \cdot 6 \text{H}_2\text{O}$
Cobalt(II) nitrate hexahydrate for analysis EMSURE® (max. 0.001 % Ni), ACS, Reag. Ph Eur	$\text{Co}(\text{NO}_3)_2 \cdot 6 \text{H}_2\text{O}$
Cobalt(II) sulfate heptahydrate for analysis EMSURE®	$\text{CoSO}_4 \cdot 7 \text{H}_2\text{O}$
Copper(II) acetate monohydrate for analysis EMSURE® ACS	$(\text{CH}_3\text{COO})_2\text{Cu} \cdot \text{H}_2\text{O}$
Copper(I) chloride for analysis EMSURE® ACS	$\text{CuCl}$
Copper(II) chloride dihydrate for analysis EMSURE® ACS, Reag. Ph Eur	$\text{CuCl}_2 \cdot 2 \text{H}_2\text{O}$
Copper(II) nitrate trihydrate for analysis EMSURE®	$\text{Cu}(\text{NO}_3)_2 \cdot 3 \text{H}_2\text{O}$
Copper(II) sulfate anhydrous for analysis EMSURE®	$\text{CuSO}_4$
Copper(II) sulfate pentahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$\text{CuSO}_4 \cdot 5 \text{H}_2\text{O}$

– means: no values available

Solubility [g/100 g H <sub>2</sub> O] at						Saturated solution [20°C]		Cat. No.	Page
0°C	20°C	40°C	60°C	80°C	100°C	Percentage	Density		
2.6	6.6	12.4	21.1	35.2	109.2 (95°C)	6.2	1.0459 (15.5°C)	101031	70
61	75.4	89	108	–	–	43	–	101063	70
2.96	6.01	13.6	33.3	72	109.0 (90°C)	5.67	1.053	101047	70
148.0 (4°C)	–	–	–	–	–	–	–	101116	70
60.6	75.5	91.1	107.8	126.7	145.6	43.9	–	101125	70
–	78	–	–	–	–	–	–	101134	70 (68)
–	32.0	–	–	–	–	–	–	159504	70
–	141	–	–	–	–	–	–	102276	70
29.7	37.6	46	55.3	65.6	77.3	27.3	1.075	101145	70
22.7	36.8	56.7	82.9	120.7	174	26.9	–	101126	70
100	–	–	–	–	–	–	–	101164	70 (68)
–	40	–	–	–	–	–	–	101182	70
57.5	68.6	81.8	97.6	115.5	–	40.7	1.3436 (14.5°C)	101207	70
154.2	172.3	190.5	208.9	228.8	250.3	63.3	–	101173	70
–	124.0 (25°C)	–	–	–	–	–	–	103776	70 (68)
17.8	26.9	38.5	53.4	72	–	21.2	1.18	103792	71 (68)
118.5	187.7	283	415	610	1000	65	1.308	101188	71
2.5	4.4	8	–	–	–	–	–	101192	71
58.2	–	–	–	–	–	–	–	101201	71 (68)
70.4	75.4	81.2	87.4	94.1	102	43	1.247	101217	71
115	163	235	347	–	–	62	–	101213	71
58	72	79	74	74	74	–	–	101704	71
–	0.002	–	–	–	–	–	–	101714	71
30.7	35.7	40.8	46.4	52.5	58.7	26.3	1.28	101719	71
1.5	3.5	8.2	21	–	–	3.4	1.04	101737	71
5	9.1	14.4	20.3	27.2	34.2	8.3	1.069	101729	71
–	198.5 (25°C)	–	–	–	–	–	–	101738	71
75.5	76.7	79.3	81.9	84.6	–	43.4	1.616	102027	71
–	0.0014	–	–	–	–	–	–	102066	71
–	–	128.1	136.8	147	159	–	–	102382	72
–	0.012 (18°C)	–	–	–	–	–	–	102047	72
101	129.4	196	–	–	–	56.4	–	102121	72
0.18	0.2	0.21	0.2	0.19	0.16	0.2	1.001	102161	72
–	–	3.8 (50°C)	–	–	–	–	–	102274	72
–	81	–	–	–	–	–	–	102481	72
–	25 (25°C)	–	–	–	–	–	–	101036	72
–	38	–	–	–	–	–	–	102529	72
41.9	53.6	69.5	–	–	–	38.4	1.49	102539	72
83.5	100	126	169.5	–	–	–	–	102536	72
–	0.2	–	–	–	–	–	–	102554	72
25.5	36.3	49.9	–	–	–	34.9	–	102556	72
–	7.2	–	–	–	–	–	–	102711	72
–	1.5 (25°C)	–	–	–	–	1.497 (25°C)	–	102739	72
70.6	77	83.8	91.2	99.2	107.9	43.5	1.55	102733	72
–	–	160	179	208	–	–	–	102753	72
25.5	36.2	48	60	70	83	–	–	102791	72
14.8	20.8	29	39.1	53.6	73.6	17.2	1.1965	102790	72

# Detailed information Salts | EMSURE®

## Salts I-P

	Product	Chemical formula
I	Iron(III) chloride hexahydrate for analysis EMSURE® ACS, Reag. Ph Eur	$\text{FeCl}_3 \cdot 6 \text{H}_2\text{O}$
	Iron(II) chloride tetrahydrate for analysis EMSURE®	$\text{FeCl}_2 \cdot 4 \text{H}_2\text{O}$
	Iron(II) sulfate heptahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$\text{FeSO}_4 \cdot 7 \text{H}_2\text{O}$
L	Lead(II) acetate trihydrate for analysis EMSURE® ACS, Reag. Ph Eur	$(\text{CH}_3\text{COO})_2\text{Pb} \cdot 3 \text{H}_2\text{O}$
	Lead(II) nitrate for analysis EMSURE® ACS, Reag. Ph Eur	$\text{Pb}(\text{NO}_3)_2$
	Lithium carbonate for analysis EMSURE® ACS, Reag. Ph Eur	$\text{Li}_2\text{CO}_3$
	Lithium chloride for analysis EMSURE® ACS, Reag. Ph Eur	$\text{LiCl}$
	Lithium sulfate monohydrate for analysis EMSURE® ACS, Reag. Ph Eur	$\text{Li}_2\text{SO}_4 \cdot \text{H}_2\text{O}$
M	Magnesium acetate tetrahydrate for analysis EMSURE® ACS, Reag. Ph Eur	$(\text{CH}_3\text{COO})_2\text{Mg} \cdot 4 \text{H}_2\text{O}$
	Magnesium chloride hexahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$\text{MgCl}_2 \cdot 6 \text{H}_2\text{O}$
	Magnesium nitrate hexahydrate for analysis EMSURE® ACS, Reag. Ph Eur	$\text{Mg}(\text{NO}_3)_2 \cdot 6 \text{H}_2\text{O}$
	Magnesium perchlorate hydrate [about 83 % $\text{Mg}(\text{ClO}_4)_2$ ] for analysis EMSURE®	$\text{Mg}(\text{ClO}_4)_2 \cdot x \text{H}_2\text{O}$
	Magnesium sulfate anhydrous for analysis EMSURE®	$\text{MgSO}_4$
	Magnesium sulfate heptahydrate for analysis EMSURE® ACS, Reag. Ph Eur	$\text{MgSO}_4 \cdot 7 \text{H}_2\text{O}$
	Manganese(II) chloride dihydrate for analysis EMSURE®	$\text{MnCl}_2 \cdot 2 \text{H}_2\text{O}$
	Manganese(II) chloride tetrahydrate for analysis EMSURE® ACS	$\text{MnCl}_2 \cdot 4 \text{H}_2\text{O}$
	Manganese(II) nitrate tetrahydrate for analysis EMSURE®	$\text{Mn}(\text{NO}_3)_2 \cdot 4 \text{H}_2\text{O}$
	Manganese(II) sulfate tetrahydrate for analysis EMSURE®	$\text{MnSO}_4 \cdot 4 \text{H}_2\text{O}$
	Manganese(II) sulfate monohydrate spray-dried for analysis EMSURE® ACS, Reag. Ph Eur	$\text{MnSO}_4 \cdot \text{H}_2\text{O}$
	Mercury(II) acetate for analysis EMSURE® ACS, Reag. Ph Eur	$\text{Hg}(\text{CH}_3\text{COO})_2$
	Mercury(II) bromide for analysis EMSURE® ACS, Reag. Ph Eur	$\text{HgBr}_2$
	Mercury(II) chloride extra pure fine cryst.	$\text{HgCl}_2$
	Mercury(II) chloride for analysis EMSURE® ACS, Reag. Ph Eur	$\text{HgCl}_2$
	Mercury(II) iodide red, for analysis EMSURE® ACS, Reag. Ph Eur	$\text{HgI}_2$
	Mercury(II) iodide red, extra pure	$\text{HgI}_2$
	Mercury(II) sulfate extra pure	$\text{HgSO}_4$
	Mercury(II) sulfate for analysis EMSURE® ACS	$\text{HgSO}_4$
	Mercury(II) thiocyanate for analysis EMSURE®, Reag. Ph Eur	$\text{Hg}(\text{SCN})_2$
N	Nickel(II) chloride hexahydrate for analysis EMSURE® ACS	$\text{NiCl}_2 \cdot 6 \text{H}_2\text{O}$
	Nickel(II) nitrate hexahydrate for analysis EMSURE® ACS	$\text{Ni}(\text{NO}_3)_2 \cdot 6 \text{H}_2\text{O}$
	Nickel(II) sulfate hexahydrate for analysis EMSURE® ACS	$\text{NiSO}_4 \cdot 6 \text{H}_2\text{O}$
P	Potassium bromate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$\text{KBrO}_3$
	Potassium bromide for analysis EMSURE® ACS, Reag. Ph Eur	$\text{KBr}$
	Potassium carbonate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$\text{K}_2\text{CO}_3$
	Potassium chlorate for analysis EMSURE®	$\text{KClO}_3$
	Potassium chloride for analysis EMSURE® (max. 0.005 % Br), ACS, ISO, Reag. Ph Eur	$\text{KCl}$
	Potassium chloride for analysis EMSURE®	$\text{KCl}$
	Potassium chromate for analysis EMSURE®	$\text{K}_2\text{CrO}_4$
	Potassium cyanide for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$\text{KCN}$
	Potassium dichromate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$\text{K}_2\text{Cr}_2\text{O}_7$
	Potassium dichromate for analysis EMSURE® (max. 0.000001 % Hg) ACS, ISO	$\text{K}_2\text{Cr}_2\text{O}_7$
	Potassium dihydrogen phosphate for analysis EMSURE® (max. 0.005 % Na) ACS, ISO, Reag. Ph Eur	$\text{KH}_2\text{PO}_4$
	Potassium disulfite for analysis EMSURE®	$\text{K}_2\text{S}_2\text{O}_5$
	Potassium fluoride for analysis EMSURE® ACS	$\text{KF}$
	Potassium hexacyanoferrate(III) for analysis EMSURE® ACS, Reag. Ph Eur	$\text{K}_3[\text{Fe}(\text{CN})_6]$
	Potassium hexacyanoferrate(II) trihydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$\text{K}_4[\text{Fe}(\text{CN})_6] \cdot 3 \text{H}_2\text{O}$

– means: no values available

Solubility [g/100 g H <sub>2</sub> O] at						Saturated solution [20°C]		Cat. No.	Page
0°C	20°C	40°C	60°C	80°C	100°C	Percentage	Density		
83.5	100	126	169.5 (56°C)	–	–	50	–	103943	73 (68)
–	62.4	68.6	78.3	–	–	–	–	103861	73
15.6	26.6	40.3	47.6	–	–	21	1.225	103965	73 (68)
–	44.3	–	–	–	–	–	–	107375	73
36.4	52.2	69.4	88	107.5	127.3	34.3	1.4	107398	73
–	1.3	–	–	–	–	1.31	–	105680	73
–	–	–	–	–	133	–	–	105679	73
36.2	34.8	33.5	32.3	31.5	31	25.6	1.23	105694	73
–	120.0 (15°C)	–	–	–	–	–	–	105819	74
52.8	54.6	57.5	60.7	65.9	72.7	41.2	1.388 (25°C)	105833	74
63.9	70.5	81.8	93.7	110.9	–	–	–	105853	74
–	50.0 (25°C)	–	–	–	–	–	–	105874	74
–	30.0	–	–	–	–	–	–	106067	74
–	35.6	45.4	–	–	–	26.25	1.31	105886	74
–	–	–	108.6	110.5	115	–	–	105934	74
63.6	73.6	88.7	106.0 (58.1°C)	–	–	42.4	1.499	105927	74 (68)
–	380.0	–	–	–	–	–	–	105940	74
63.4 (15°C)	65.2 (25°C)	70.7 (45°C)	–	–	–	–	–	105941	74
–	–	60	58.6	45.5	35.5	–	–	102786	74 (68)
–	40.0	–	–	–	–	–	–	104410	74
–	0.6 (25°C)	1	1.7	2.8	4.9	0.62 (25°C)	–	104421	74
4.3	6.6	9.6	13.9	24.2	54.1	6.2	1.052	104417	74
4.3	6.6	9.6	13.9	24.2	54.1	6.2	1.052	104419	74
–	0.005 (25°C)	–	–	–	–	–	–	104428	74
–	0.005 (25°C)	–	–	–	–	–	–	104420	75
–	0.04 (25°C)	–	–	–	–	–	–	104481	75
–	0.04 (25°C)	–	–	–	–	–	–	104480	75
–	0.07 (25°C)	–	–	–	–	–	–	104484	75
51.7	55.3	–	–	–	–	35.6	1.46	106717	75
79.2	94.1	118.8	–	–	–	48.5	–	106721	75
–	–	–	57	–	–	–	–	106727	75
3.1	6.8	13.1	22	33.9	49.7	6.4	1.048	104912	75
54	65.8	76.1	85.9	95.3	104.9	39.7	1.37	104905	75
105.5	111.5	117	127	140	156	–	–	104928	75
3.3	7.3	14.5	25.9	39.7	56.2	6.8	1.042	104944	75
28.1	34.2	40.3	45.6	51	56.2	25.5	1.174	104933	75
–	34.7	–	–	–	–	–	–	104936	75
59	63.7	67	70.9	75.1	79.2	38.9	1.378	104952	75
63	71.6	–	81	95	122	41.73	–	104967	75
4.7	12.5	26.3	45.6	73	103	11.1	1.077	104864	75
–	13.0	–	–	–	–	–	–	104865	76
14.3	22.7	33.9	48.6	68	–	18.5	–	104877	76
27.5	44.9	63.9	85	108	133	30.99	–	105057	76
15.0	28.9	–	–	–	–	–	–	104994	76
29.9	46	59.5	70.9	81.8	91.6	31.5	1.18	104973	76
15	28.9	42.7	56	68.9	82.7	22.4	1.16	104984	76

# Detailed information Salts | EMSURE®

## Salts P-S

Product	Chemical formula
<b>P</b> Potassium hexahydroantimonate(V) cryst. for analysis EMSURE®	$K[Sb(OH)_6]$
Potassium hydrogen carbonate for analysis EMSURE® ACS	$KHCO_3$
Potassium hydrogen diiodate for analysis EMSURE®	$KH(IO_3)_2$
di-Potassium hydrogen phosphate anhydrous for analysis EMSURE®	$K_2HPO_4$
di-Potassium hydrogen phosphate trihydrate for analysis EMSURE®	$K_2HPO_4 \cdot 3 H_2O$
Potassium hydrogen phthalate for analysis EMSURE® Reag. Ph Eur	$C_8H_5KO_4$
Potassium hydrogen sulfate for analysis EMSURE® Reag. Ph Eur	$KHSO_4$
Potassium iodate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$KIO_3$
Potassium iodide for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$KI$
Potassium nitrate for analysis EMSURE® ISO, Reag. Ph Eur	$KNO_3$
Potassium nitrite cryst. for analysis EMSURE® ACS	$KNO_2$
di-Potassium oxalate monohydrate for analysis EMSURE® ACS	$K_2C_2O_4 \cdot H_2O$
Potassium perchlorate for analysis EMSURE® ACS	$KClO_4$
Potassium permanganate for analysis EMSURE® ACS, Reag. Ph Eur	$KMnO_4$
Potassium permanganate for analysis EMSURE® (max. 0.000005 % Hg) ACS	$KMnO_4$
Potassium peroxodisulfate for analysis EMSURE® (max. 0.001 % N), ACS, Reag. Ph Eur	$K_2S_2O_8$
Potassium peroxodisulfate for analysis EMSURE® ACS, Reag. Ph Eur	$K_2S_2O_8$
Potassium sodium tartrate tetrahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$C_4H_4KNaO_6 \cdot 4 H_2O$
Potassium sulfate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$K_2SO_4$
Potassium sulfide about 44 % small lumps, for analysis EMSURE®	–
Potassium thiocyanate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$KSCN$
<b>S</b> Silver nitrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$AgNO_3$
Sodium acetate anhydrous for analysis EMSURE® ACS, Reag. Ph Eur	$CH_3COONa$
Sodium acetate trihydrate for analysis EMSURE® indifferent to potassium permanganate ACS, ISO, Reag. Ph Eur	$NaCH_3COO \cdot 3 H_2O$
Sodium ammonium hydrogen phosphate tetrahydrate for analysis EMSURE®	$NaNH_4HPO_4 \cdot 4 H_2O$
Sodium carbonate anhydrous for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$Na_2CO_3$
Sodium carbonate anhydrous for analysis EMSURE®, ISO	$Na_2CO_3$
Sodium carbonate decahydrate for analysis EMSURE®, ISO, Reag. Ph Eur	$Na_2CO_3 \cdot 10 H_2O$
Sodium chloride for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$NaCl$
tri-Sodium citrate dihydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$C_6H_5Na_3O_7 \cdot 2 H_2O$
Sodium dichromate dihydrate for analysis EMSURE® ACS	$Na_2Cr_2O_7 \cdot 2 H_2O$
Sodium dihydrogen phosphate dihydrate for analysis EMSURE® Reag. Ph Eur	$NaH_2PO_4 \cdot 2 H_2O$
Sodium dihydrogen phosphate monohydrate for analysis EMSURE® ACS, Reag. Ph Eur	$NaH_2PO_4 \cdot H_2O$
tetra-Sodium diphosphate decahydrate for analysis EMSURE® ACS, Reag. Ph Eur	$Na_4P_2O_7 \cdot 10 H_2O$
Sodium disulfite (sodium metabisulfite) for analysis EMSURE® ACS, Reag. Ph Eur	$Na_2S_2O_5$
Sodium dithionite for analysis	$Na_2S_2O_4$
Sodium fluoride for analysis EMSURE® ACS, ISO, Reag. Ph Eur	$NaF$
Sodium formate for analysis EMSURE® ACS, Reag. Ph Eur	$HCOONa$
Sodium hexanitrocobaltate(III) [sodium cobalt(III)nitrite] for analysis EMSURE® ACS, Reag. Ph Eur	$Na_3[Co(NO_2)_6]$
Sodium hydrogen carbonate decahydrate for analysis EMSURE® ACS, Reag. Ph Eur	$NaHCO_3$
di-Sodium hydrogen phosphate anhydrous for analysis EMSURE® ACS, Reag. Ph Eur	$Na_2HPO_4$
di-Sodium hydrogen phosphate anhydrous for analysis EMSURE®, particle size about 0.2–1 mm (~ 18–80 mesh ASTM)	$Na_2HPO_4$
di-Sodium hydrogen phosphate dihydrate for analysis EMSURE®	$Na_2HPO_4 \cdot 2 H_2O$
di-Sodium hydrogen phosphate dodecahydrate for analysis EMSURE® ISO, Reag. Ph Eur	$Na_2HPO_4 \cdot 12 H_2O$
di-Sodium hydrogen phosphate heptahydrate for analysis EMSURE® ACS, Reag. Ph Eur	$Na_2HPO_4 \cdot 7 H_2O$
Sodium hydrogen sulfate monohydrate for analysis EMSURE®	$NaHSO_4 \cdot H_2O$
Sodium iodate for analysis EMSURE®	$NaIO_3$

– means: no values available

Solubility [g/100 g H <sub>2</sub> O] at						Saturated solution [20°C]		Cat. No.	Page
0°C	20°C	40°C	60°C	80°C	100°C	Percentage	Density		
–	2.0	–	–	–	–	–	–	105110	76
22.6	33.3	45.3	60	–	–	24.98	1.18	104854	76
–	1.3	–	–	–	–	–	–	104867	76
–	–	–	266	–	–	–	–	105104	76
–	159	212.5	–	–	–	61.4	–	105099	76
–	8.0	–	–	–	–	–	–	104874	76
36.3	51.4	76.3	–	–	121.6	33.95	–	104885	76
4.7	8.1	12.9	18.5	24.8	32.3	7.5	1.064	105051	76
127.8	144.5	161	176.2	191.5	208	59.1	1.71	105043	77
13.3	31.7	63.9	109.9	169	245.2	24.1	1.16	105063	77
278.8	298.4	334.9	–	–	412.8	–	–	105067	77
–	36.0	–	–	–	–	–	–	105073	77
0.76	1.7	3.6	7.2	13.4	22.2	1.7	1.008	105076	77
2.8	6.4	12.6	22.4	–	–	6	1.04	105082	77
–	6.4	–	–	–	–	6	1.04	105084	77
–	0.5	1.1	–	–	–	0.468	–	105092	77
0.18	0.5	1.1	–	–	–	0.468	–	105091	77
–	63.0	–	–	–	–	–	–	108087	77
7.3	11.1	14.8	18.2	21.3	24.1	10	1.0807	105153	77
–	50.0	–	–	–	–	–	–	105134	77
177	218	–	–	–	–	68.55	1.42	105125	77
115	219.2	334.8	471	652	1024	68.6	2.18	101512	78
–	36.5	–	–	–	–	–	–	106268	78
36.3	46.4	65.4	138.0 (58°C)	–	–	31.7	1.17	106267	78
–	16.7	–	–	–	–	–	–	106682	78
7.1	21.4	48.5	46.5	45.8	45.5	–	–	106393	78
–	22.0	–	–	–	–	–	–	106392	78
6.9	21.7	–	–	–	–	17.8	1.1941	106391	78 (68)
–	35.9	36.4	37.1	38.1	39.2	26.4	1.201	106404	78
–	72.0	–	–	–	–	–	–	106448	78
163.2	180.2	220.5	283	385	–	64.3	–	106336	78
–	85.0	–	–	–	–	–	–	106342	78
–	–	158.6 (50°C)	–	–	–	–	–	106346	78
2.7	5.5	12.5	21.9	30	40.3	5.2	1.05	106591	78
–	65.3	71.1	79.9	88.7	100	39.5	–	106528	79
–	25.0	–	–	–	–	–	–	106507	79
3.6	4.1	–	–	–	–	3.94	1.04	106449	79
43.8	85.3	107	131	198	150	–	–	106443	79
–	72.0	–	–	–	–	–	–	102521	79
6.9	9.6	12.7	16	19.7	23.6	8.76	1.08	106329	79
–	–	–	–	–	104.1	–	–	106586	79
–	7.7	–	–	–	–	–	–	106559	79 (68)
–	–	–	83	92.4	–	–	–	106580	79
1.63	7.7	–	–	–	–	7.2	1.08	106579	79 (68)
–	–	55	–	–	–	–	–	106575	79 (68)
–	108.0	–	–	–	–	–	–	106352	79
2.5	9.1	–	23	27	32.8	–	–	106525	79

## Salts S-Z

	Product	Chemical formula
S	Sodium iodide for analysis, Reag. Ph Eur	NaI
	Sodium metaperiodate for analysis EMSURE® ACS, Reag. Ph Eur	NaIO <sub>4</sub>
	Sodium molybdate dihydrate for analysis EMSURE®	Na <sub>2</sub> MoO <sub>4</sub> · 2 H <sub>2</sub> O
	Sodium nitrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	NaNO <sub>3</sub>
	Sodium nitrite for analysis EMSURE® ACS, Reag. Ph Eur	NaNO <sub>2</sub>
	di-Sodium oxalate for analysis EMSURE®	NaOOCNa
	Sodium perchlorate monohydrate for analysis EMSURE®	NaClO <sub>4</sub> · H <sub>2</sub> O
	Sodium peroxydisulfate for analysis EMSURE®	Na <sub>2</sub> S <sub>2</sub> O <sub>8</sub>
	tri-Sodium phosphate dodecahydrate for analysis EMSURE®	Na <sub>3</sub> PO <sub>4</sub> · 12 H <sub>2</sub> O
	tri-Sodium phosphate dodecahydrate for analysis EMSURE® ACS, Reag. Ph Eur	Na <sub>3</sub> PO <sub>4</sub> · 12 H <sub>2</sub> O
	Sodium salicylate for analysis EMSURE®	C <sub>7</sub> H <sub>5</sub> NaO <sub>3</sub>
	Sodium sulfate anhydrous for analysis EMSURE® ACS, ISO, Reag. Ph Eur	Na <sub>2</sub> SO <sub>4</sub>
	Sodium sulfate decahydrate for analysis EMSURE® ACS, Reag. Ph Eur	Na <sub>2</sub> SO <sub>4</sub> · 10 H <sub>2</sub> O
	Sodium sulfite anhydrous for analysis EMSURE® ACS, Reag. Ph Eur	Na <sub>2</sub> SO <sub>3</sub>
	di-Sodium tartrate dihydrate for analysis EMSURE®	C <sub>4</sub> H <sub>4</sub> Na <sub>2</sub> O <sub>6</sub> · 2 H <sub>2</sub> O
	Sodium thiosulfate pentahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> · 5 H <sub>2</sub> O
	Sodium tungstate dihydrate for analysis EMSURE®	Na <sub>2</sub> WO <sub>4</sub> · 2 H <sub>2</sub> O
	Strontium chloride hexahydrate for analysis EMSURE® ACS, ISO	SrCl <sub>2</sub> · 6 H <sub>2</sub> O
	Strontium nitrate for analysis EMSURE®	Sr(NO <sub>3</sub> ) <sub>2</sub>
T	Tin(II) chloride dihydrate for analysis EMSURE® ACS, Reag. Ph Eur	SnCl <sub>2</sub> · 2 H <sub>2</sub> O
	Tin(II) chloride dihydrate for analysis EMSURE® (max. 0.000001 % Hg)	SnCl <sub>2</sub> · 2 H <sub>2</sub> O
Z	Zinc acetate dihydrate for analysis EMSURE® ACS	(CH <sub>3</sub> COO) <sub>2</sub> Zn · 2 H <sub>2</sub> O
	Zinc chloride for analysis EMSURE® ACS, ISO, Reag. Ph Eur	ZnCl <sub>2</sub>
	Zinc iodide for analysis EMSURE®	ZnI <sub>2</sub>
	Zinc nitrate tetrahydrate for analysis EMSURE®	Zn(NO <sub>3</sub> ) <sub>2</sub> · 4 H <sub>2</sub> O
	Zinc sulfate heptahydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	ZnSO <sub>4</sub> · 7 H <sub>2</sub> O

– means: no values available

Solubility [g/100 g H <sub>2</sub> O] at						Saturated solution [20°C]		Cat. No.	Page
0°C	20°C	40°C	60°C	80°C	100°C	Percentage	Density		
–	–	–	–	295	303	–	–	106523	79
–	9.1	–	–	–	–	–	–	106597	80
–	84.0	–	–	–	–	–	–	106521	80
70.7	88.3	104.9	124.7	148	176	46.8	1.38	106537	80
73	84.5	95.7	112.3	135.5	163	45.8	1.33	106549	80
–	3.7	–	–	–	–	–	–	106557	80
167	181	243	–	–	–	64.4	1.757	106564	80
–	54.5	–	–	–	–	–	–	106609	80 (68)
–	28.5	–	–	–	–	–	–	106572	80
1.5	12.1	31	55	81	108	10.8	1.106	106578	80
–	100	–	–	–	–	–	–	106601	80
–	–	48.1	45.3	43.1	42.3	–	–	106649	80
4.56	19.2	–	–	–	–	16.1	1.15	106648	80 (68)
–	–	37	33.2	29	26.6	–	–	106657	80
(29)	29.0	–	–	–	–	–	–	106663	80
52.5	70.1	102.6	–	–	–	41.2	1.39	106516	80
–	73	73.9	–	90.2	96.9	–	–	106673	81
44.1	53.8	66.6	85.2	–	–	35	1.39	107865	81
–	–	91.2	94.2	97.2	101.2	–	–	107872	81
83.9	269.8 (15°C)	–	–	–	–	–	–	107815	81 (68)
–	118.7	–	–	–	–	–	–	107814	81 (68)
–	43	–	–	–	–	–	–	108802	81
–	–	453	488	541	–	–	–	108816	81
429.4	–	445.2	467.2	490	510.5	–	–	108828	81
–	–	211.5	–	–	–	–	–	108833	81
41.6	53.8	–	–	–	–	35	1.47	108883	81





# Determination of mercury

The long discussed question of the toxicity of mercury is dependent on the type of binding involved: liquid, metallic mercury is practically non-toxic; however, mercury vapor, especially that released by organo-metallic compounds which can readily be formed in the biosphere, is extremely toxic and is an ever-present danger for humans and animals. For this reason the determination of mercury in environment foodstuffs is extremely important.

## Digestion

As mercury occurs in numerous binding forms. The total material to be analyzed must first be chemically digested and the mercury converted into inorganic compounds before the mercury content in different samples can be determined.

## Methods

Due to the different compositions of the sample materials three common digestion methods are normally employed:

- Digestion with sulfuric acid / nitric acid under reflux
- Digestion with nitric acid at high temperature and under pressure in a digestion vessel
- Digestion by UV irradiation

The mercury compound is dissolved or digested using oxidation processes involving oxidants or digestion agents. The excess oxidant or digestion agent is then removed. At the same time the mercury is reduced. Elemental mercury is then transferred to the measuring cell using inert gas.



### Mercury analysis

The most common methods for the determination of mercury are:

Mercury content	Procedure
<0.5 µg/l	Amalgam
0.2 – 10 µg/l	Cold vapor AAS
>10 µg/l	Dithizone

As most mercury contamination is with the range 0.2 to 10 µg/l, the most usual procedure is that involving flameless atomic absorption spectrometry – the cold vapor AAS process.

# Reagents for routine determination of mercury

		Digestion preparation	Digestion with sulfuric / nitric acid under reflux	Digestion with nitric acid in a digestion bomb	Digestion by UV irradiation	Cold vapor AAS	Cold vapor AAS	Cold vapor AAS subsequent to UV irradiation	Cold vapor AAS subsequent to wet-chemical digestion	Dithizone method	Dithizone method	Content	Packaging	Ord. No.
<b>Mercury analysis A-R</b>														
C	Calcium chloride fused, granular about 0.5–2.0 mm for elementary analysis						•	•	•			250 g	PE bottle	1.02083.0250
												1 kg	PE bottle	1.02083.1000
	Chemisorb® Hg Reagents and accessories for absorbent for mercury						•	•	•	•		1 set	PE bottle	1.12576.0001
D	Dithizone for analysis (1,5-Diphenylthiocarbazone) Reag. Ph Eur									•		5 g	Glass bottle	1.03092.0005
												25 g	Glass bottle	1.03092.0025
H	Hydrochloric acid fuming 37 % for analysis (max. 0.001 ppm Hg) EMSURE®	•					•	•	•			2.5 l	Glass bottle	1.13386.2500
	Hydroxylammonium chloride for analysis (≤0.000001 % Hg) ACS, ISO						•	•	•	•		250 g	Glass bottle	1.04619.0250
M	Magnesium perchlorate hydrate [about 83 % Mg(ClO <sub>4</sub> ) <sub>2</sub> ] for elementary analysis						•	•	•			100 g	Metal can	1.05875.0100
												500 g	Metal can	1.05875.0500
	Mercury ICP standard traceable to SRM from NIST Hg(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 10 % 1000 mg/l Hg Certipur®						•	•	•			100 ml	PE bottle	1.70333.0100
	Mercury standard solution traceable to SRM from NIST Hg(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 mol/l 1000 mg/l Hg Certipur®						•	•	•	•		100 g	PE bottle	1.70226.0100
												500 g	PE bottle	1.70226.0500
N	Nitric acid 65 % for analysis (max. 0.005 ppm Hg) EMSURE® ISO	•	•				•	•	•			1 l	Glass bottle	1.00452.1000
												2.5 l	Glass bottle	1.00452.2500
P	Perchloric acid 70 % for analysis (max. 0.0000005 % Hg) EMSURE® ACS, ISO, Reag. Ph Eur	•										1 l	Glass bottle	1.00514.1000
	Potassium dichromate for analysis (max. 0.000001 % Hg) EMSURE® ACS, ISO	•	•	•			•	•	•			500 g	Glass bottle	1.04865.0500
	Potassium permanganate for analysis (max. 0.000005 % Hg) EMSURE® ACS	•										1 kg	Glass bottle	1.05084.1000
	Potassium peroxodisulfate for analysis (≤0.001 % N) EMSURE® ACS, Reag. Ph Eur	•	•									250 g	PE bottle	1.05092.0250
												5 kg	PE bottle	1.05092.5000

		Digestion preparation				Cold vapor AAS				Dithizone method		Content	Packaging	Ord. No.
		Digestion with sulfuric / nitric acid under reflux	Digestion with nitric acid in a digestion bomb	Digestion by UV irradiation		Cold vapor AAS	Cold vapor AAS subsequent to UV irradiation	Cold vapor AAS subsequent to wet-chemical digestion	Dithizone method					
Mercury analysis S-Z														
S	Silica gel beads, desiccant ~ 2 – 5 mm					•	•	•			1 kg	PE bottle	1.07735.1000	
	Silica gel with indicator (orange gel), granulate ~ 1 – 3 mm					•	•	•			1 kg	PE bottle	1.01969.1000	
											5 kg	PE bottle	1.01969.5000	
	Silicon anti-foaming agent					•	•	•			100 ml	PE bottle	1.07743.0100	
											500 ml	PE bottle	1.07743.0500	
	Sodium borohydride for analysis					•		•			100 g	Glass bottle	1.06371.0100	
	Sulfuric acid 95 – 97 % for analysis	•									1 l	Glass bottle	1.00732.1000	
	(max. 0.005 ppm Hg) EMSURE® ACS, ISO, Reag. Ph Eur										2.5 l	Glass bottle	1.00732.2500	
											2.5 l	Safebreak bottle	1.00732.2510	
	Sulfuric acid for 1000 ml, c(H <sub>2</sub> SO <sub>4</sub> ) = 0.5 mol/l (1 N) Titrisol®					•	•	•			1	Plastic ampoule	1.09981.0001	
T	Tin(II) chloride dihydrate for analysis					•	•	•			250 g	Glass bottle	1.07814.0250	
	(max. 0.000001 % Hg) EMSURE®										2.5 kg	Glass bottle	1.07814.2500	
W	Water for analysis EMSURE®	•	•	•		•	•	•			5 l	PE bottle	1.16754.5000	



# Acids for analysis

## EMSURE® | EMPARTA®

### High-quality, pure acids in optimized packaging

**Your responsibility is our incentive!** Merck Millipore's acids for analysis offer the highest possible quality, the greatest safety and most optimized packaging. Our products undergo strict quality checks in ultra-modern laboratories using the latest and most sensitive analytical instruments. That is why you can rely on Merck Millipore's acids for analysis for your most demanding applications.



# Acids

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- | ■ Advantages  |
|---|
| <ul style="list-style-type: none"><li>• Wide and comprehensive product range</li><li>• Outstanding, application-oriented quality</li><li>• Highly reliable and reproducible results through batch-to-batch consistency</li><li>• Extensive specification and Certificate of Analysis (CoA)</li><li>• Most acids meet or exceed the requirements of ACS, ISO and / or Reag. Ph Eur</li><li>• Excellent cost / performance ratio thanks to extensive specifications</li></ul> |



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

# High standards of purity, safety and environmental protection

## Quality management

For decades, our sophisticated quality management system has proven to be the best basis for precise and reproducible analytical applications. From purchase and storage of raw materials, through production, filling and analysis of the acids, to storage and shipment of the final product, every step is subject to stringent monitoring and documentation.

Thanks to our highly modern production chain, particulate impurities and cross-contamination of acids from other products can be ruled out.

## Reliable results

Acids from Merck Millipore are analyzed according to extensive and stringent specifications. Most of our acids for analysis with the EMSURE® quality grade are specified in compliance with international standards such as ACS, ISO and / or Reag. Ph Eur. Thus, you can always be confident of the results of your analysis made with Merck Millipore reagents.



## Safety



Working with hazardous products like acids requires particular attention in order to protect users and the environment. Our acids are delivered to you in high-quality packaging which offers the greatest safety during transportation, storage and handling. As a certified independent packaging institute, we develop and test our own packaging materials to fulfill our strict quality standards and, of course, your individual requirements.

Please see the chapter »Packaging« to find out more about the efforts we take to offer the most appropriate and safest packaging for every single product.

## Special packaging concepts

Particularly for acids, we offer packaging concepts that take into account the potential hazards of the products. You can learn more about our Safebreak bottle, SafetyCap and special bottle for hydrofluoric acid on the following pages.

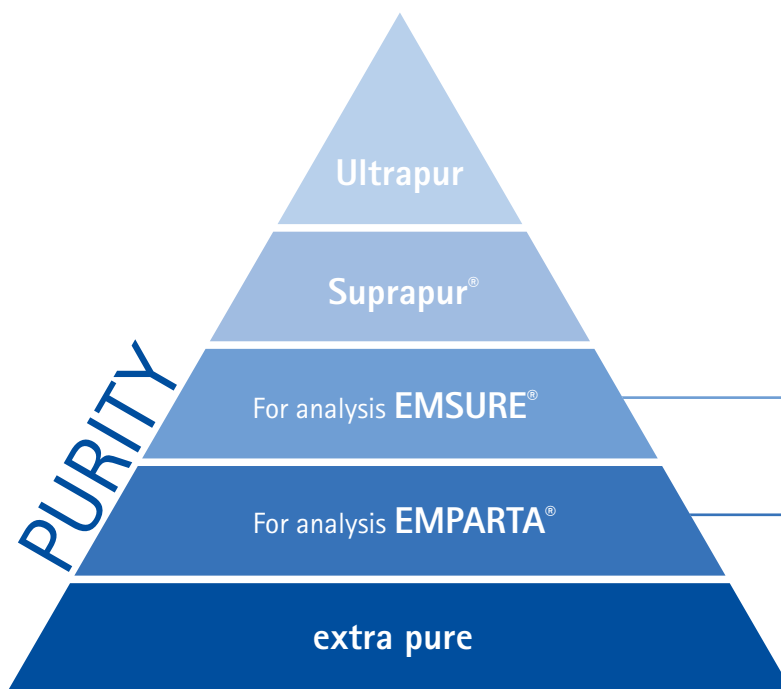
Take advantage of our leading role in the field to reach your targets swiftly and safely.





# Different grades to meet your needs

Whenever you are using an acid, you have to consider your application, your target and, of course, your budget. Each application is different and therefore we offer a wide range of acids in various grades, packaging sizes and materials. Whether you need to perform a highly critical analysis or a basic lab application, you will always find the most suitable reagent among our brand names.



## Your advantages

- The right product quality for each individual application
- The right pack size for your specific demand
- The right pricing according to the real product performance

## Specification

<b>ACS</b>	Standards of the American Chemical Society
<b>ISO</b>	Standards of the International Organization for Standardization
<b>Reag. Ph Eur</b>	Reagents specified by the European Pharmacopoeia

### Ultrapur and Suprapur® acids

- For instrumental analysis, we offer a range of high purity acids under the brand names Suprapur® and Ultrapur
- For further information please see the chapter »High purity acids and bases«

Acids for analysis	EMSURE®	EMPARTA®
Purity	99.7 – 99.9 %	99.0 – 99.5 %
Number of specified parameters	Up to 50 parameters and more	>10
Specified regulations	ACS, ISO, Reag. Ph Eur	ACS
Pack sizes	500 ml/g, 1 l/kg, 2.5 l/kg, 5 l/kg, 25 l/kg, 50 l/kg and many more	2.5 l bottle
Packaging materials	Glass, HDPE, PE-coated glass, container, barrels etc.	HDPE
Segments	All regulated industries	Non-regulated industries
Applications	Quality control (QC) Critical lab applications	Quality control (QC) Basic lab applications
	If you need to be absolutely sure in your lab application – use EMSURE®	If you need only a part of the EMSURE® performance – use EMPARTA®

### extra pure acids

- For preparative lab applications and cleaning purposes
- Specifications with the most important parameters
- Available in different pack sizes

# Why choose Merck Millipore acids for analysis?

- Wide and comprehensive product range
- Outstanding, application-oriented quality
- Great variety of packaging materials and pack sizes
- Sophisticated quality management system:
  - Every batch is subject to stringent analysis
  - Analysis of each single parameter – batch by batch!
  - Use of the latest and most sensitive analytical instruments
- Large number of specified parameters for each acid
- Extremely low limiting values
- Most acids for analysis EMSURE® meet or exceed the requirements of ACS, ISO and / or Reag. Ph Eur
- Acids for analysis EMPARTA® meet the requirements of ACS

## Your advantages

- Reliable and reproducible results
- Confidence in analytical results and right conclusions
- Fulfilling expectations of your customers
- Maximum certainty during analytical and preparative operations
- High safety during daily lab work
- Very convenient use of acids
- One product usable for many applications and all over the world
- Less validation efforts
- Excellent cost / performance ratio





## Useful information about ...

### Available concentrations of some acids

	Name	Weight %	Density g/cm <sup>3</sup> (20°C)	Concentration mol/l *
A	Acetic acid	96	1.05	17
		60	1.06	10.5
	Acetic acid (glacial acetic acid)	99 – 100	1.05	17.5
	Acetic acid, dilute	30	1.04	5
F	Formic acid	98 – 100	1.22	26
H	Hydrobromic acid	47	1.49	8.5
	Hydrochloric acid	25	1.12	7.5
		32	1.16	10
		37	1.19	12
	Hydrofluoric acid	48	1.16	28
		40	1.13	22.5
	Hydroiodic acid	57	1.7	7.5
	Hydrogen peroxide	30	1.11	10
N	Nitric acid	65	1.39	14.5
		69	1.41	15.5
	Nitric acid, fuming	100	1.51	24
P	Perchloric acid	70	1.68	11.5
		60	1.53	9
	ortho-Phosphoric acid	85	1.71	15
S	Sulfuric acid	95 – 97	1.84	18
		25	1.18	3

\* rounded off

# Variety of packaging materials

Safe and environmentally friendly packaging for every application

Acids for analysis from Merck Millipore are always delivered to you in the most suitable packaging. Our packaging materials are exactly fitted to the product. This not only secures the purity of our high-quality reagents, but also protects users and the environment. For detailed information about our packaging, please see the chapter »Packaging«.



## Overview of the most common packages for acids

### **Glass bottles from 25 ml to 2500 ml**

Our bestseller: excellent glass quality with very low traces of impurities and long shelf life

### **HDPE bottles for liquids from 250 ml to 2500 ml**

Easy to handle, very low weight

### **HDPE bottles for solids from 25 g to 5000 g**

Easy dosage thanks to the wide opening

### **Safebreak bottles (PE-coated glass bottles) for 2500 ml**

Exceptionally safe glass bottle for especially dangerous acids

### **PE containers from 5 l to 50 l, PE/metal barrels for 25 l and PE barrels up to 200 l**

Convenient handling of even large quantities

and much more ...

Hazardous acids need safe packaging!

Employee safety plays a decisive role in your lab – that is why Merck Millipore provides innovative packaging concepts especially made for acids.

### **More information**

► Turn the page to explore our packaging concepts for acids. ► See chapter »Packaging material« on page 18

# Merck Millipore Safebreak bottle. Just in case!

Glass bottles are still the most preferred packaging for reagents. As containers for all manner of chemicals, they remain a valuable inert material for everyday use in the laboratory. However, if they are to be safely used, the same care has to be taken as with glassware in private households. A problem occurs when a bottle containing a hazardous liquid breaks just when and where it shouldn't ...

## But if there is a breakage ...

We always wonder how could it happen after an accident. Despite the measures taken to avoid breakage, it is something that simply has to be reckoned with in every laboratory. How harmful breakage is in a laboratory depends on the circumstances. Fortunately, in most cases, all that is required is proper clearing up of the spilled contents and glass splinters. However, serious injury, contamination or consequential damage may result in some cases.

## ... we have the solution.

At Merck Millipore, we have carefully examined the risks involved with acids in glass bottles and have come up with an effective solution: the »Safebreak« bottle. This glass bottle is coated with polyethylene, which provides maximum safety in case of breakage. Should the bottle fall and break, the liquid and glass splinters are reliably contained within the PE coating.

Each Safebreak bottle is fitted with a screw cap made of polypropylene that has an integrated PTFE component. This S40 cap renders the bottle absolutely airtight so that no liquid or vapor can escape. Also, it can be disposed of with conventional glass; during incineration, the PE is burnt off without affecting the environment.



## More information

► [www.merckmillipore.com/safebreak](http://www.merckmillipore.com/safebreak)



## Safebreak bottles

The right bottle for your peace of mind. Exclusively available from Merck Millipore, the computer-designed Safebreak bottle combines several advantages in one solution:

- Meets all safety requirements
- Ensures that you receive exactly the same quality of contents as that dispatched from Merck Millipore
- Can be incorporated in all logistic systems
- Can be easily and ecologically disposed of and reused

## Ordering information

### Acids in Safebreak bottles

Product	Content	Packaging	Ord. No.
Acetic acid (glacial) 100 % anhydrous for analysis EMSURE® ACS, ISO, Reag. Ph Eur	2.5 l	Safebreak bottle	1.00063.2510
Formic acid 98 – 100 % for analysis EMSURE® ACS, Reag. Ph Eur	2.5 l	Safebreak bottle	1.00264.2510
Hydrochloric acid fuming 37 % for analysis EMSURE® ACS, ISO, Reag. Ph Eur	2.5 l	Safebreak bottle	1.00317.2510
Nitric acid 65 % for analysis EMSURE® ISO	2.5 l	Safebreak bottle	1.00456.2510
Nitric acid 69 % for analysis EMSURE® ACS, Reag. Ph Eur	2.5 l	Safebreak bottle	1.01799.2510
Perchloric acid 70 – 72 % for analysis EMSURE® ACS, ISO, Reag. Ph Eur	2.5 l	Safebreak bottle	1.00519.2510
ortho-Phosphoric acid 85 % for analysis EMSURE® ACS, ISO, Reag. Ph Eur	2.5 l	Safebreak bottle	1.00573.2510
Sulfuric acid 95 – 97 % for analysis EMSURE® ISO	2.5 l	Safebreak bottle	1.00731.2510
Sulfuric acid 95 – 97 % for analysis (max. 0.005 ppm Hg) EMSURE® ACS, ISO, Reag. Ph Eur	2.5 l	Safebreak bottle	1.00732.2510
Sulfuric acid 98 % for analysis EMSURE®	2.5 l	Safebreak bottle	1.12080.2510

### The right bottle from Merck Millipore

All our experience in dealing with the potential hazards of acids in glass bottles has been incorporated in the specifications of the Merck Millipore Safebreak bottle:

- The bottle is able to withstand considerable impact force
- Should breakage occur, the acid and any glass splinters are reliably contained
- Even after frequent opening and closing, the screw cap remains perfectly intact
- The bottle is just as recyclable as a conventional glass bottle



# Merck Millipore SafetyCap

## Leakproof against liquids – allows excess pressure to be released

Reagents such as sodium hypochlorite solution or hydrogen peroxide that are capable of generating excess pressure through chemical reactions are often supplied in bottles with a special screw cap. This cap has a valve that allows the gas formed to be released, hence preventing the build-up of pressure. However, on occasion, traces of reagent also diffused through the valve. For safety purposes, these bottles are additionally packaged in a PE bag.

## SafetyCap – the intelligent closure

In order to completely avoid contamination, Merck Millipore supplies all such reagents fitted with the SafetyCap. This innovative cap allows absolutely no reagent to leak – even if the bottle is tipped. The PTFE membrane sintered onto the inside of the cap allows gas to be released but is absolutely leakproof against liquids. This has been proven in numerous warehouse and stress tests at our package testing facility at all temperatures and in all positions.

## Small improvements – huge effects

The PTFE membrane incorporated in the SafetyCap protects our reagents. It allows neither gas nor liquid to enter the bottle, thus completely eliminating contamination. In addition, the SafetyCap has no protruding parts that can break off.



## SafetyCap

- Allows gas to be released and the internal pressure to be decreased
- Allows no liquid to escape, thus protecting the environment from contamination
- Allows neither gas nor liquid to enter the bottle, thus protecting the contents from contamination

## Ordering information

### Acids delivered with SafetyCap

Product	Content	Packaging	Ord. No.
Hydrogen peroxide 30 % (Perhydrol®) for analysis EMSURE® ISO	250 ml	Plastic bottle	1.07209.0250
	500 ml	Plastic bottle	1.07209.0500
	1 l	Plastic bottle	1.07209.1000
	2.5 l	Plastic bottle	1.07209.2500
Hydrogen peroxide 30 % (Perhydrol®) (stabilized for higher storage temperature) for analysis EMSURE® ISO	250 ml	Plastic bottle	1.07210.0250
	1 l	Plastic bottle	1.07210.1000
	2.5 l	Plastic bottle	1.07210.2500
Hydrogen peroxide 30 % H <sub>2</sub> O <sub>2</sub> Suprapur®	250 ml	Plastic bottle	1.07298.0250
	500 ml	Plastic bottle	1.07298.0500
	1 l	Plastic bottle	1.07298.1000
Hydrogen peroxide 35 % technical grade	25 l	Plastic container	1.08556.9025
Perhydrit® tablets 1 g (Hydrogen peroxide – Urea)	100 g	Plastic bottle	1.07201.0100
	4 kg	Plastic bottle	1.07201.4000
Sodium hypochlorite solution (6 – 14 % active chlorine)	2.5 l	Plastic bottle	1.05614.2500
	25 l	Plastic container	1.05614.9025

### More information

► [www.merckmillipore.com/safetycap](http://www.merckmillipore.com/safetycap)

# Merck Millipore HDPE dosage bottle for hydrofluoric acid

## Hydrofluoric acid

Hydrofluoric acid is one of the most dangerous acids. Even small quantities can cause severe injuries and poisoning. To avoid such fatal accidents, Merck Millipore has developed a pouring aid that is specially suited to the characteristics of hydrofluoric acid.

All 250 and 500 ml bottles are provided with this innovative and safe pouring aid. It allows drop-by-drop withdrawal of the acid and the last drop stays reliably in the bottle.

Furthermore, our exclusive S40 closure system ensures that the bottle is completely airtight.



## HDPE dosage bottle

- 250 and 500 ml bottle with a withdrawal system especially constructed for this hazardous acid
- Allows drop-by-drop withdrawal – and the last drop stays reliably in the bottle
- Special density function of our exclusive S40 screwing system
- Allows transportation and storage in cardboard boxes



## Ordering information

**Hydrofluoric acid** in HDPE dosage bottle with special pouring system

Product	Content	Packaging	Ord. No.
Hydrofluoric acid 40 % for analysis EMSURE® ISO, Reag. Ph Eur	500 ml	Plastic bottle	1.00338.0500
Hydrofluoric acid 40 % Suprapur®	250 ml	Plastic bottle	1.00335.0250
	500 ml	Plastic bottle	1.00335.0500
Hydrofluoric acid 48 % for analysis EMSURE® ACS, ISO, Reag. Ph Eur	500 ml	Plastic bottle	1.00334.0500

# Ordering information Acids

## Acids A-G

	Product	Content	Packaging	Ord. No.
A	Acetic acid 30 % for analysis Reag. Ph Eur	500 ml	Glass bottle	1.59166.0500
	Acetic acid 96 % for analysis EMSURE®	1 l	Glass bottle	1.00062.1000
		1 l	Plastic bottle	1.00062.1011
		2.5 l	Glass bottle	1.00062.2500
		2.5 l	Plastic bottle	1.00062.2511
		25 l	Plastic container	1.00062.9025
	Acetic acid (glacial) 100 % for analysis EMPARTA® ACS	2.5 l	Plastic bottle	1.01830.2500
	Acetic acid (glacial) 100 % anhydrous for analysis EMSURE® ACS, ISO, Reag. Ph Eur	1 l	Glass bottle	1.00063.1000
		1 l	Plastic bottle	1.00063.1011
		2.5 l	Glass bottle	1.00063.2500
		2.5 l	Safebreak bottle	1.00063.2510
		2.5 l	Plastic bottle	1.00063.2511
		25 l	Plastic container	1.00063.9026
	Acetic anhydride for analysis EMSURE® ACS, ISO, Reag. Ph Eur	1 l	Glass bottle	1.00042.1000
		2.5 l	Glass bottle	1.00042.2500
		25 l	Plastic container	1.00042.9025
	Amidosulfuric acid extra pure	2.5 kg	Plastic bottle	1.00219.2500
		25 kg	Fibre carton	1.00219.9025
	Amidosulfuric acid for analysis EMSURE®	100 g	Plastic bottle	1.00103.0100
		250 g	Plastic bottle	1.00103.0250
	L(+)-Ascorbic Acid for analysis EMSURE® ACS, ISO, Reag. Ph Eur	100 g	Plastic bottle	1.00468.0100
		500 g	Plastic bottle	1.00468.0500
		1 kg	Plastic bottle	1.00468.1000
B	Barbituric acid for analysis EMSURE®	25 g	Plastic bottle	1.00132.0025
		100 g	Plastic bottle	1.00132.0100
	Benzoic acid for analysis EMSURE® Reag. Ph Eur	100 g	Plastic bottle	1.00136.0100
		250 g	Plastic bottle	1.00136.0250
		1 kg	Plastic bottle	1.00136.1000
	Boric acid for analysis EMSURE® ACS, ISO, Reag. Ph Eur	100 g	Plastic bottle	1.00165.0100
		500 g	Plastic bottle	1.00165.0500
		1 kg	Plastic bottle	1.00165.1000
		5 kg	Plastic bottle	1.00165.5000
		12 kg	Plastic container	1.00165.9012
		25 kg	Fibre carton	1.00165.9025
C	Citric acid monohydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	500 g	Plastic bottle	1.00244.0500
		1 kg	Plastic bottle	1.00244.1000
		5 kg	Plastic bottle	1.00244.5000
		12 kg	Plastic container	1.00244.9012
		25 kg	Fibre carton	1.00244.9026
F	Formic acid 89 – 91 % for analysis EMSURE® ACS	1 l	Glass bottle	1.00253.1000
	Formic acid 90 % for determination of viscosity acc. to DIN EN ISO 307	2.5 l	Glass bottle	1.10854.2500
	Formic acid 98 – 100 % for analysis EMSURE® ACS, Reag. Ph Eur	100 ml	Glass bottle	1.00264.0100
		1 l	Glass bottle	1.00264.1000
		1 l	Plastic bottle	1.00264.1011
		2.5 l	Glass bottle	1.00264.2500
		2.5 l	Safebreak bottle	1.00264.2510
		2.5 l	Plastic bottle	1.00264.2511
		25 l	Plastic container	1.00264.9026
G	Glycolic acid for analysis EMSURE®	100 g	Plastic bottle	1.04106.0100

## Acids H

Product	Content	Packaging	Ord. No.
H Hydrobromic acid 47 % extra pure	500 ml	Glass bottle	1.00304.0500
	2.5 l	Glass bottle	1.00304.2500
	20 l	Glass btl. pl. coat.	1.00304.9020
Hydrobromic acid 47 % for analysis EMSURE® ACS, ISO	500 ml	Glass bottle	1.00307.0500
	1 l	Glass bottle	1.00307.1000
Hydrochloric acid 25 % for analysis EMSURE®	1 l	Glass bottle	1.00316.1000
	1 l	Plastic bottle	1.00316.1011
	2.5 l	Glass bottle	1.00316.2500
	2.5 l	Plastic bottle	1.00316.2511
Hydrochloric acid 25 % for analysis EMSURE®	25 l	Plastic container	1.00316.9025
	2.5 l	Glass bottle	1.00313.2500
	25 l	Plastic container	1.00313.9025
	180 l	Plastic barrel	1.00313.9180
Hydrochloric acid 32 % extra pure	1 l	Glass bottle	1.00319.1000
	1 l	Plastic bottle	1.00319.1011
	2.5 l	Glass bottle	1.00319.2500
	2.5 l	Plastic bottle	1.00319.2511
	25 l	Plastic container	1.00319.9025
Hydrochloric acid fuming 37 % for analysis EMPARTA® ACS	2.5 l	Plastic bottle	1.01834.2500
Hydrochloric acid fuming 37 % for analysis EMSURE® ACS, ISO, Reag. Ph Eur	1 l	Glass bottle	1.00317.1000
	2.5 l	Glass bottle	1.00317.2500
	2.5 l	Safebreak bottle	1.00317.2510
	2.5 l	Plastic bottle	1.00317.2501
Hydrochloric acid fuming 37 % for analysis EMSURE® ACS, ISO, Reag. Ph Eur	25 l	Plastic container	1.00317.9026
	2.5 l	Glass bottle	1.13386.2500
Hydrochloric acid fuming 37 % for analysis max. 0.001 ppm Hg EMSURE®	1 l	Plastic bottle	1.00329.1000
	2.5 l	Plastic bottle	1.00329.2500
Hydrofluoric acid 38 – 40 %	1 l	Plastic bottle	1.00337.1000
	2.5 l	Plastic bottle	1.00337.2500
	25 l	Plastic container	1.00337.9025
Hydrofluoric acid 38 – 40 % extra pure	500 ml	Plastic bottle	1.00338.0500
	1 l	Plastic bottle	1.00338.1000
	2.5 l	Plastic bottle	1.00338.2500
Hydrofluoric acid 40 % for analysis EMSURE® ISO, Reag. Ph Eur	500 ml	Plastic bottle	1.00334.0500
	1 l	Plastic bottle	1.00334.1000
	2.5 l	Plastic bottle	1.00334.2500
Hydrofluoric acid 48 % for analysis EMSURE® ACS, ISO, Reag. Ph Eur	5 l	Plastic container	1.00334.5000
	250 ml	Plastic bottle	1.07209.0250
	500 ml	Plastic bottle	1.07209.0500
Hydrogen peroxide 30 % (Perhydrol®) for analysis EMSURE® ACS, ISO	1 l	Plastic bottle	1.07209.1000
	2.5 l	Plastic bottle	1.07209.2500
	250 ml	Plastic bottle	1.07210.0250
Hydrogen peroxide 30 % (Perhydrol®) (stabilized for higher storage temperature) for analysis EMSURE® ACS, ISO	1 l	Plastic bottle	1.07210.1000
	2.5 l	Plastic bottle	1.07210.2500
Hydrogen peroxide 35 % technical grade	25 l	Plastic container	1.08556.9025
Hydroiodic acid 57 % extra pure	250 ml	Glass bottle	1.00341.0250
	22 l	Carboy	1.00341.9022
Hydroiodic acid 57 % for analysis EMSURE®	50 ml	Glass bottle	1.00344.0050
	250 ml	Glass bottle	1.00344.0250
	1 l	Glass bottle	1.00344.1000

# Ordering information Acids

## Acids H-P

	Product	Content	Packaging	Ord. No.
H	Hydroiodic acid 67 % for analysis EMSURE®	250 ml	Glass bottle	1.00345.0250
	Hypophosphorous acid 50 % for analysis EMSURE®	100 ml	Glass bottle	1.04633.0100
		500 ml	Glass bottle	1.04633.0500
M	Molybdatophosphoric acid hydrate for analysis EMSURE® ACS, Reag. Ph Eur	25 g	Glass bottle	1.00532.0025
		100 g	Glass bottle	1.00532.0100
	Molybdic acid about 85 % MoO <sub>3</sub> (containing ammonium molybdate)	1 kg	Plastic bottle	1.00400.1000
N	Nitric acid 65 % extra pure	1 l	Glass bottle	1.00443.1000
		2.5 l	Glass bottle	1.00443.2500
		25 l	Barrel PE/met	1.00443.9025
	Nitric acid 65 % for analysis EMSURE® ISO	1 l	Glass bottle	1.00456.1000
		2.5 l	Glass bottle	1.00456.2500
		2.5 l	Safebreak bottle	1.00456.2510
	Nitric acid 65 % for analysis (max. 0.005 ppm Hg) EMSURE® ISO	1 l	Glass bottle	1.00452.1000
		2.5 l	Glass bottle	1.00452.2500
	Nitric acid 69 % for analysis EMPARTA® ACS	2.5 l	Glass bottle	1.01832.2500
	Nitric acid 69 % for analysis EMSURE® ACS, Reag. Ph Eur	1 l	Glass bottle	1.01799.1000
		2.5 l	Glass bottle	1.01799.2500
		2.5 l	Safebreak bottle	1.01799.2510
	Nitric acid fuming 100 % extra pure	1 l	Glass btl. pl. coat.	1.00450.1000
	Nitric acid fuming 100 % for analysis EMSURE® ACS, Reag. Ph Eur	1 l	Glass btl. pl. coat.	1.00455.1000
	Oxalic acid dihydrate extra pure	1 kg	Plastic bottle	1.00492.1000
		5 kg	Plastic bottle	1.00492.5000
		50 kg	Fibre carton	1.00492.9050
	Oxalic acid dihydrate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	100 g	Plastic bottle	1.00495.0100
		500 g	Plastic bottle	1.00495.0500
		1 kg	Plastic bottle	1.00495.1000
		25 kg	Fibre carton	1.00495.9025
P	Perchloric acid 60 % for analysis EMSURE® ACS	1 l	Glass bottle	1.00518.1001
		6 x 1 l	Glass bottle	1.00518.1016
		2.5 l	Glass bottle	1.00518.2501
		4 x 2.5 l	Glass bottle	1.00518.2514
	Perchloric acid 70 % for analysis (max. 0.0000005 % Hg) EMSURE® ACS, ISO, Reag. Ph Eur	1 l	Glass bottle	1.00514.1000
		6 x 1 l	Glass bottle	1.00514.1006
	Perchloric acid 70 – 72 % for analysis EMSURE® ACS, ISO, Reag. Ph Eur	1 l	Glass bottle	1.00519.1001
		6 x 1 l	Glass bottle	1.00519.1016
		2.5 l	Glass bottle	1.00519.2501
		4 x 2.5 l	Glass bottle	1.00519.2514
		2.5 l	Safebreak bottle	1.00519.2510
	Periodic acid for analysis EMSURE®	25 g	Glass bottle	1.00524.0025
		100 g	Glass bottle	1.00524.0100
	meta-Phosphoric acid pieces for analysis (stabilized with sodium metaphosphate) EMSURE®	100 g	Metal can	1.00546.0100
		500 g	Plastic bottle	1.00546.0500
	ortho-Phosphoric acid 85 % for analysis EMSURE® ACS, ISO, Reag. Ph Eur	1 l	Plastic bottle	1.00573.1000
		2.5 l	Plastic bottle	1.00573.2500
		2.5 l	Safebreak bottle	1.00573.2510
		25 l	Plastic container	1.00573.9025
	ortho-Phosphoric acid 99 % cryst. for analysis EMSURE®	500 g	Plastic bottle	1.00565.0500



## Acids S-T

Product	Content	Packaging	Ord. No.
<b>S</b> Succinic acid for analysis EMSURE®	250 g	Plastic bottle	1.00682.0250
Sulfuric acid 25 % for analysis EMSURE®	1 l	Plastic bottle	1.00716.1000
Sulfuric acid 40 % for determination of gas metabolism acc. to Knipping	2.5 l	Glass bottle	1.09286.2500
Sulfuric acid 62 % for analysis, for the determination of fat in cheese (d 1.52)	1 l	Plastic bottle	4.80531.1000
	2.5 l	Plastic bottle	4.80531.2500
Sulfuric acid 90 – 91 % for Gerber fat determination and determination of nitrates in milk	500 ml	Glass bottle	1.00729.0500
	2.5 l	Glass bottle	1.00729.2500
	25 l	Plastic container	1.00729.9025
Sulfuric acid 95 – 97 % for analysis EMPARTA® ACS	2.5 l	Plastic bottle	1.01833.2500
Sulfuric acid 95 – 97 % for analysis EMSURE® ISO	1 l	Glass bottle	1.00731.1000
	1 l	Plastic bottle	1.00731.1011
	2.5 l	Glass bottle	1.00731.2500
	2.5 l	Safebreak bottle	1.00731.2510
	2.5 l	Plastic bottle	1.00731.2511
Sulfuric acid 95 – 97 % for analysis (max. 0.005 ppm Hg) EMSURE® ACS, ISO, Reag. Ph Eur	25 l	Plastic container	1.00731.9025
	1 l	Glass bottle	1.00732.1000
	2.5 l	Glass bottle	1.00732.2500
Sulfuric acid 96 % for the determination of viscosity acc. to DIN EN ISO 307	2.5 l	Safebreak bottle	1.00732.2510
	1 l	Plastic bottle	1.08131.1000
Sulfuric acid 96 % for the determination of viscosity acc. to DIN EN ISO 307	2.5 l	Plastic bottle	1.08131.2500
	1 l	Plastic bottle	1.08131.2500
Sulfuric acid 98 % for analysis EMSURE®	1 l	Glass bottle	1.12080.1000
	2.5 l	Glass bottle	1.12080.2500
	2.5 l	Safebreak bottle	1.12080.2510
	25 l	Plastic container	1.12080.9025
Sulfuric acid 98 % for the determination of nitrogen	500 ml	Glass bottle	1.00748.0500
	2.5 l	Glass bottle	1.00748.2500
Sulfuric acid 100 % for conductivity measurements	1 l	Glass bottle	1.12223.1000
Sulfuric acid fuming 65 % SO <sub>3</sub> extra pure	1 l	Glass btl. pl. coat.	1.00720.1000
Sulfurous acid 5 – 6 % SO <sub>2</sub> for analysis EMSURE®	1 l	Glass bottle	1.00761.1000
	2.5 l	Glass bottle	1.00761.2500
<b>T</b> L(+)-Tartaric acid for analysis EMSURE® ACS, ISO, Reag. Ph Eur	250 g	Plastic bottle	1.00804.0250
	1 kg	Plastic bottle	1.00804.1000
	5 kg	Plastic bottle	1.00804.5000
	50 kg	Fibre carton	1.00804.9050
Toluene-4-sulfonic acid monohydrate for analysis EMSURE® ACS	100 g	Plastic bottle	1.09613.0100
	500 g	Plastic bottle	1.09613.0500
Trichloroacetic acid for analysis EMSURE® ACS, Reag. Ph Eur	100 g	Glass bottle	1.00807.0100
	250 g	Glass bottle	1.00807.0250
	1 kg	Glass bottle	1.00807.1000
Tungstophosphoric acid hydrate cryst. extra pure	100 g	Plastic bottle	1.00582.0100
	1 kg	Plastic bottle	1.00582.1000
	25 kg	Fibre carton	1.00582.9025
Tungstophosphoric acid hydrate for analysis EMSURE®	100 g	Plastic bottle	1.00583.0100
	250 g	Plastic bottle	1.00583.0250
Tungstosilicic acid hydrate for analysis EMSURE®	25 g	Glass bottle	1.00659.0025
	100 g	Plastic bottle	1.00659.0100

# Caustic alkalis and bases for analysis

## EMSURE<sup>®</sup>

### Caustic alkalis and bases of high purity and defined quality

Caustic alkalis and bases are, along with salts and acids, the most important inorganic chemicals. In order to provide our customers with specified products for all types of wet chemical labs, Merck Millipore produces these chemicals itself using high-quality raw materials.



# Caustic alkalis and bases

■ Contents	Page
• Unique production technique	116
• Quality classification and branding	118
• Ordering information	120

- | ■ Advantages   |
|--|
| <ul style="list-style-type: none"><li>• Defined outstanding quality</li><li>• High reliability and reproducibility of results through batch-to-batch consistency and extremely low limiting values of impurities</li><li>• Most caustic alkalis and bases for analysis EMSURE® meet or exceed the requirements of ACS, ISO and / or Reag. Ph Eur</li><li>• Uniform pellets of defined size</li></ul> |



[www.merckmillipore.com/caustics-bases](http://www.merckmillipore.com/caustics-bases)

# Unique production technique leads to unique quality

Merck Millipore's product range for caustic alkalis and bases for analysis includes sodium and potassium hydroxide pellets and the corresponding solutions, as well as ammonia solutions in various concentrations and quality grades.

Caustic alkalis and bases are produced in a dedicated plant at Merck Millipore in Darmstadt, Germany. Product-specific production lines anticipate cross-contamination between the different materials. Our unrivaled production techniques and sophisticated quality management system enable us to offer caustic alkalis and bases of outstanding quality. Our products are even qualified for demanding lab applications in regulated markets, such as the pharmaceutical industry. Furthermore, most caustic alkalis and bases for analysis EMSURE® meet or exceed the requirements of international standards such as ACS, ISO and / or Reag. Ph Eur.



## Our speciality: Pellets with very low values of impurities

Thanks to our unique production process and extensive experience, Merck Millipore is able to offer pellets with extremely low values of impurities. Thus, you can expect sodium hydroxide pellets with very low potassium impurities, and potassium hydroxide pellets with equally low sodium impurities. The specified maximum values for potassium and sodium for these products are indicated in the product name as well as in the Certificate of Analysis.

# Why choose Merck Millipore caustic alkalis and bases for analysis?

## Your advantages

- Comprehensive product range
- Defined outstanding quality for all applications
- High reliability and reproducibility of results through batch-to-batch consistency and extremely low limiting values of impurities
- Most caustic alkalis and bases for analysis EMSURE® meet or exceed the requirements of ACS, ISO and / or Reag. Ph Eur
- Uniform pellets of defined size thanks to unique production technique
- Made using specially selected raw materials
- Complete analysis of each batch with specific data on content or other limits provided in the Certificate of Analysis
- Sophisticated quality management system with audits, thus comprehensively certificated data
- Fulfill individual customer requests

## Useful information about ...

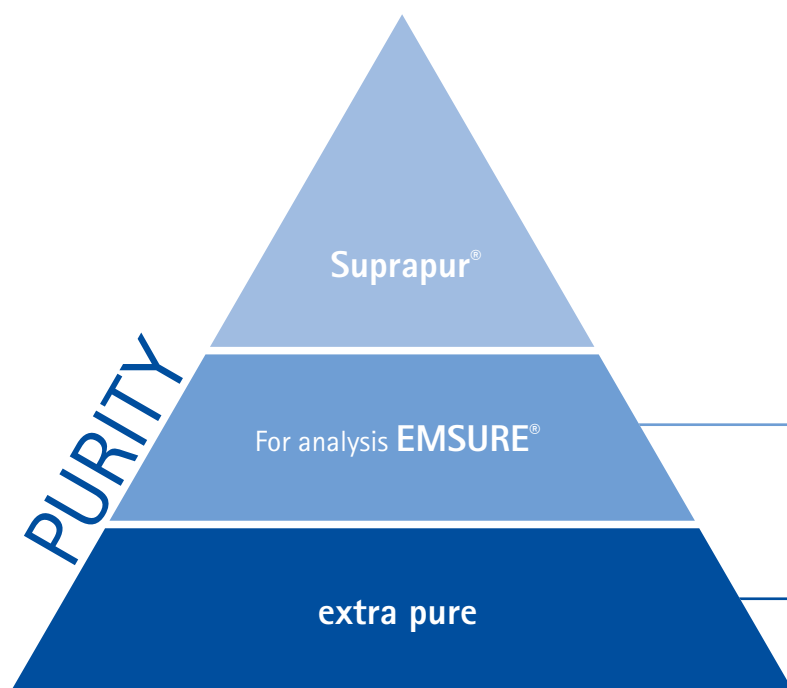
### Available concentrations of some bases

Name	Weight %	Density g/cm <sup>3</sup> [20°C]	Concentration mol/l *
Ammonia solution	32	0.88	16.5
	30	0.9	15.5
	25	0.91	13.5
Potassium hydroxide solution	30	1.48	7
Sodium hydroxide solution	10	1.11	3
	27	1.3	9
	32	1.35	11
	45	1.48	16.5
	50	1.53	19

\* rounded off

# The ideal quality grade for each application

Each application is different and therefore we offer a wide range of caustic alkalis and bases in various grades and packaging sizes. Whether you need to perform a highly critical analysis or prepare basic lab applications, you will always find the most suitable reagent with our quality grades and brand names.



## Specification

<b>ACS</b>	Standards of the American Chemical Society
<b>ISO</b>	Standards of the International Organization for Standardization
<b>Reag. Ph Eur</b>	Reagents specified by the European Pharmacopoeia

### Suprapur® caustics and bases

- Suprapur® reagents are ideal for digestion in trace analysis. They have extremely low contents of all cations
- For more information on Suprapur® reagents please see the chapter »High purity acids and bases«

### Caustics and bases for analysis EMSURE® | ACS, ISO, Reag. Ph Eur

- Our premium grade for all regulated and highly demanding lab applications
- Worldwide best and most extensive product specifications
- Widest range of pack sizes

#### Caustics and bases for analysis EMSURE® are used:

- For sample preparation
- As neutralization and digestion agents
- For the production of alkaline salts
- For the production of buffer solutions
- For the regeneration of anionic ion exchangers
- For use in refining and precipitation processes
- As alkaline cleansing agents

### Caustics and bases extra pure

- For preparative lab applications and cleaning purposes
- Specifications with the most important parameters
- Available in different pack sizes

#### Caustics and bases extra pure are used:

- For the production of sodium and potassium hydroxide solutions
- For adjusting the pH of liquids
- As alkaline cleansing agents
- As neutralization agents for acids

# Ordering information Caustics and bases for analysis EMSURE®

## Caustics and bases Pellets

Product	Content	Packaging	Ord. No.
Potassium hydroxide pellets for analysis EMSURE®	500 g	Plastic bottle	1.05033.0500
	1 kg	Plastic bottle	1.05033.1000
	5 kg	Plastic bottle	1.05033.5000
	25 kg	Fibre carton	1.05033.9025
	50 kg	Fibre carton	1.05033.9050
Potassium hydroxide pellets (max. 0.002 % Na) for analysis EMSURE® ACS, ISO, Reag. Ph Eur	250 g	Plastic bottle	1.05021.0250
	1 kg	Plastic bottle	1.05021.1000
	5 kg	Plastic bottle	1.05021.5000
	25 kg	Fibre carton	1.05021.9025
Potassium hydroxide pellets (max. 0.05 % Na) for analysis EMSURE® ACS, Reag. Ph Eur	1 kg	Plastic bottle	1.05029.1000
	12 kg	Plastic container	1.05029.9012
	50 kg	Fibre carton	1.05029.9050
Sodium hydroxide pellets for analysis EMSURE® ISO	500 g	Plastic bottle	1.06498.0500
	1 kg	Plastic bottle	1.06498.1000
	5 kg	Plastic bottle	1.06498.5000
	25 kg	Fibre carton	1.06498.9025
	50 kg	Fibre carton	1.06498.9050
Sodium hydroxide pellets (max. 0.0002 % K) for analysis EMSURE® ACS, Reag. Ph Eur	250 g	Plastic bottle	1.06495.0250
	1 kg	Plastic bottle	1.06495.1000
	5 kg	Plastic bottle	1.06495.5000
Sodium hydroxide pellets (max. 0.02 % K) for analysis EMSURE® ACS, Reag. Ph Eur	1 kg	Plastic bottle	1.06469.1000
	5 kg	Plastic bottle	1.06469.5000
	12 kg	Plastic container	1.06469.9012
	50 kg	Fibre carton	1.06469.9050





## Caustics and bases Solutions

Product	Content	Packaging	Ord. No.
Ammonia solution 25 % for analysis EMSURE®	1 l	Glass bottle	1.05432.1000
	1 l	Plastic bottle	1.05432.1011
	2.5 l	Glass bottle	1.05432.2500
	5 l	Plastic bottle	1.05432.5000
	25 l	Plastic container	1.05432.9025
Ammonia solution 28 – 30 % for analysis EMSURE® ACS, Reag. Ph Eur	1 l	Glass bottle	1.05423.1000
	2.5 l	Glass bottle	1.05423.2500
	25 l	Plastic container	1.05423.9025
Ammonia solution 32 % extra pure	1 l	Glass bottle	1.05426.1000
	2.5 l	Glass bottle	1.05426.2500
Potassium hydroxide solution 47 % for analysis EMSURE®	1 l	Plastic bottle	1.05545.1000
	25 l	Plastic container	1.05545.9025
Sodium hydroxide solution min. 10 % (1.11) for analysis EMSURE®	1 l	Plastic bottle	1.05588.1000
	10 l	Plastic container	1.05588.9010
Sodium hydroxide solution min. 27 % (1.30) (for the determination of nitrogen) for analysis EMSURE®	2.5 l	Plastic bottle	1.05591.2500
	25 l	Plastic container	1.05591.9025
Sodium hydroxide solution about 32 % extra pure	2.5 l	Plastic bottle	1.05587.2500
	5 l	Plastic bottle	1.05587.5000
	25 l	Plastic container	1.05587.9025
	200 l	Plastic barrel	1.05587.9200
Sodium hydroxide solution about 32 % (for the determination of nitrogen) for analysis EMSURE®	2.5 l	Plastic bottle	1.05590.2500
	25 l	Plastic container	1.05590.9025
Sodium hydroxide solution min. 45 % for analysis EMSURE®	2.5 l	Plastic bottle	1.11360.2500
	25 l	Plastic container	1.11360.9025
Sodium hydroxide solution 50 % for analysis EMSURE®	1 l	Plastic bottle	1.58793.1000
	25 l	Plastic container	1.58793.9025



# Metals and metal oxides

## You can count on our experience

Merck Millipore produces chemicals of internationally renowned high quality and purity. All over the world we supply laboratories and production departments across almost every industry with the products and services they need. The fact that we are in constant dialog with our customers enables us to supply very specific industrial sectors with top-class products.



# Metals and metal oxides

■	Contents	Page
	• Quality management	124
	• Quality grades	125
	• Ordering information	126
■	Advantages	
	• Top-level quality	
	• Excellent batch-to-batch consistency	
	• Application-led purity and specs	
	• Extensive choice of products and package sizes	
	• Comprehensive and individual support	



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

# Metal salts, metals and noble metals from Merck Millipore

## Highest quality standards

Our extensive range of premium metal salts, metals and noble metals is used in a multitude of applications in R&D laboratories, production departments and in quality control. As customer of Merck Millipore's metal salts, metals and noble metals you can be confident that you are purchasing products of the highest quality, no matter whether you are involved in the chemical industry, in the manufacture of ceramics or electronic components, or in food analytics.

## Selected raw materials are the cornerstone of our products

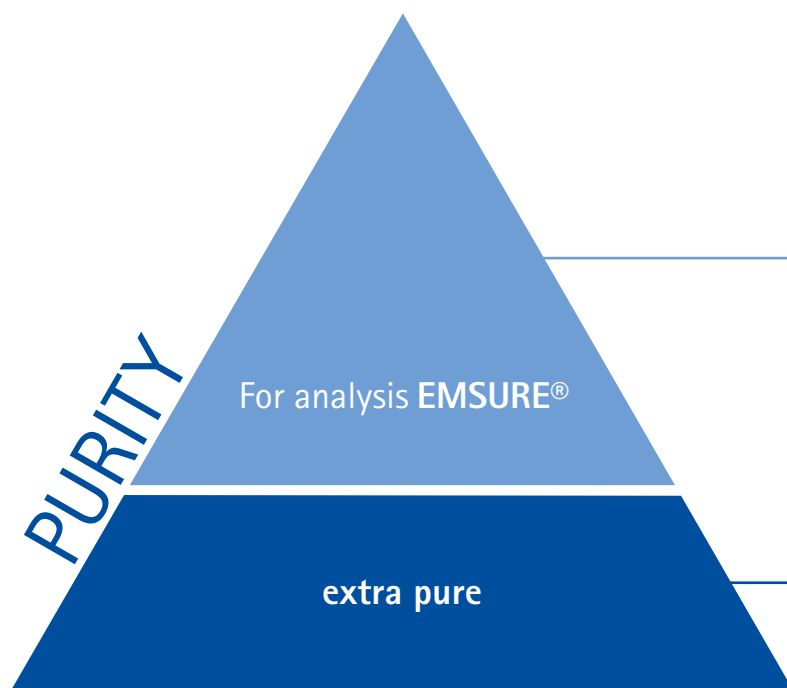
Using meticulous production techniques, our highly qualified workforce ensures that, batch for batch, they manufacture constantly premium products under tightly controlled conditions to provide you with consistently high purity and specs you need for your everyday work.

## Quality management and service – total satisfaction

We want all our customers to be always totally satisfied with the products they obtain from us, which is why we also place such emphasis on other aspects such as product documentation, traceability and certification.

## Purity grades meeting your demands

Merck Millipore sells products in purity grades consistent with what the market demands. Our metal salts, metals and noble metals come in »for analysis EMSURE®« and »extra pure« grades, so you can usually choose a product to suit your precise needs.



## Typical applications



### Chemical research

Wood's alloy is used as heating bath medium.



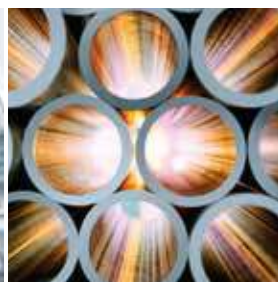
### Synthesis

Many noble metals are used as catalysts.



### Laboratory

Cesium chloride is used as reagent for density gradient centrifugation.



### Piezoelectric ceramics

Titanium(IV) oxide, antimony(III) oxide, bismuth(III) oxide and lead(II) oxide are used during synthesis.



### Electroplating

Various metals are used for deposition onto items such as bathroom fittings.

## Our purity grades

### for analysis EMSURE®

- high purity (generally >99.0 %)
- tested for trace impurities
- conforming to international standards such as ACS, ISO, Reag. Ph Eur

### extra pure

- extra purity (generally >99.0 %)
- decisive parameters listed

# Ordering information Metal salts, metals and noble metals

## Noble metals A-Z

	Product	CAS No.	Chemical formula	Content	Packaging	Ord. No.
H	Hexachloroplatinic(IV) acid solution about 10 % (3.8 % Pt) for analysis EMSURE®	–	Pt	5 ml	Glass bottle	1.07341.0005
				25 ml	Glass bottle	1.07341.0025
P	Palladium powdered 99+	7440-05-3	Pd	1 g	Glass bottle	1.19225.0001
				5 g	Glass bottle	1.19225.0005
	Platinum powder 99+	7440-06-4	Pt	1 g	Glass bottle	1.19232.0001
	Platinum black 98+	7440-06-4	Pt	5 g	Glass bottle	1.19233.0005
	Potassium hexachloroplatinate(IV) 99+	16921-30-5	$K_2PtCl_6$	1 g	Glass bottle	1.19238.0001
				5 g	Fibre case	1.19238.0005
R	Potassium tetrachloroplatinate(II) 99+	10025-99-7	Pt	5 g	Glass bottle	1.19235.0005
	Ruthenium(III) chloride hydrate	14898-67-0	$RuCl_3 \cdot x H_2O$	5 g	Glass bottle	1.19247.0005
				25 g	Glass bottle	1.19247.0025
S	Silver wool for elemental analysis	7440-22-4	Ag	10 g	Glass bottle	1.01506.0010
	Silver chloride 99+	7783-90-6	AgCl	25 g	Plastic bottle	1.19203.0025
				100 g	Plastic bottle	1.19203.0100
	Silver diethyldithiocarbamate for analysis (reagent for arsenic and antimony) EMSURE® ACS, Reag. Ph Eur	1470-61-7	$C_6H_{10}AgNS_2$	5 g	Glass bottle	1.01515.0005
	Silver oxide 99+	20667-12-3	$Ag_2O$	25 g	Plastic bottle	1.19208.0025
				100 g	Plastic bottle	1.19208.0100
T	Tetrachloroauric(III) acid trihydrate 99.5 % for analysis EMSURE®	16961-25-4	$AuCl_4H \cdot 3 H_2O$	1 g	EPS box	1.01582.0001
				5 g	Fibre case	1.01582.0005



Alloy according to Wood



## Metals and metal oxides A-D

Product	CAS No.	Chemical formula	Content	Packaging	Ord. No.
<b>A</b> Alloy acc. to Wood, melting point about 73°C bar diameter about 1 cm	8049-22-7	Bi/Pb/Sn/Cd	1 kg	Plastic bag	1.06001.1000
Aluminium (foil) for analysis	7429-90-5	Al	250 g	Plastic box	1.01057.0250
0.3 mm thickness, 30 mm width EMSURE®			1 kg	Plastic bag	1.01057.1000
Aluminium fine powder, stabilized about 2 % fat	7429-90-5	Al	250 g	Metal can	1.01056.0250
			1 kg	Metal can	1.01056.1000
Ammonium thiosulfate 98 %+	7783-18-8	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	1 kg	Plastic bottle	1.01208.1000
			25 kg	Fibre carton	1.01208.9025
Antimony powder for analysis EMSURE® particle size <150 µm	7440-36-0	Sb	25 g	Plastic bottle	1.07832.0025
Antimony(III) chloride for analysis EMSURE®	10025-91-9	SbCl <sub>3</sub>	250 g	Glass bottle	1.07838.0250
			1 kg	Glass bottle	1.07838.1000
Antimony(III) oxide extra pure	1309-64-4	Sb <sub>2</sub> O <sub>3</sub>	2.5 kg	Plastic bottle	1.07835.2500
			50 kg	Fibre carton	1.07835.9050
Antimony(III) oxide for analysis EMSURE®	1309-64-4	Sb <sub>2</sub> O <sub>3</sub>	100 g	Plastic bottle	1.07836.0100
			1 kg	Fibre carton	1.07836.1000
Arsenic lumps for analysis (protective gas: nitrogen) EMSURE®	7440-38-2	As	25 g	Metal can	1.00115.0025
<b>B</b> Bismut(III)-oxide extra pure	1304-76-3	Bi <sub>2</sub> O <sub>3</sub>	25 kg	Fibre carton	1.01862.9025
Bromine extra pure	7726-95-6	Br <sub>2</sub>	250 g	Glass bottle	1.01945.0250
			1 kg	Glass bottle	1.01945.1000
Bromine for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7726-95-6	Br <sub>2</sub>	50 g	Glass bottle	1.01948.0050
			250 g	Glass bottle	1.01948.0250
			1 kg	Glass btl. pl. coat.	1.01948.1000
<b>C</b> Calcium granular, particle size about 2-6 mm	7440-70-2	Ca	100 g	Glass bottle	1.02053.0100
			500 g	Glass bottle	1.02053.0500
Cadmium granular, for analysis EMSURE® particle size about 3-6 mm	7440-43-9	Cd	250 g	Metal can	1.02004.0250
Cadmium coarse powder, for analysis EMSURE® and for filling reductors particle size about 0.3 – 1.6 mm	7440-43-9	Cd	250 g	Metal can	1.02001.0250
			1 kg	Metal can	1.02001.1000
Cesium chloride extra pure	7647-17-8	ClCs	1 kg	Plastic bottle	1.02041.1000
Cesium chloride for analysis EMSURE®	7647-17-8	ClCs	25 g	Glass bottle	1.02038.0025
			100 g	Plastic bottle	1.02038.0100
Cesium nitrate 99+	7789-18-6	CsNO <sub>3</sub>	25 g	Glass bottle	1.02856.0025
			1 kg	Plastic bottle	1.02856.1000
Chromium(VI) oxide extra pure	1333-82-0	CrO <sub>3</sub>	2.5 kg	Glass bottle	1.00227.2500
Chromium(VI) oxide for analysis EMSURE®	1333-82-0	CrO <sub>3</sub>	250 g	Glass bottle	1.00229.0250
Copper foil about 0.1 mm thickness	7440-50-8	Cu	250 g	Fibre case	1.02700.0250
Copper fine powder for analysis EMSURE® particle size <63 µm (>230 mesh ASTM)	7440-50-8	Cu	250 g	Plastic bottle	1.02703.0250
			1 kg	Plastic bottle	1.02703.1000
Copper(II) oxide granular for analysis EMSURE®	1317-38-0	CuO	500 g	Plastic bottle	1.02768.0500
Copper(II) oxide powder extra pure	1317-38-0	CuO	500 g	Plastic bottle	1.02761.0500
			25 kg	Plastic drum	1.02761.9025
Copper(II) oxide powder for analysis EMSURE®	1317-38-0	CuO	100 g	Plastic bottle	1.02766.0100
			500 g	Plastic bottle	1.02766.0500
<b>D</b> Devarda's alloy for analysis EMSURE®	8049-11-4	Cu/Al/Zn	250 g	Plastic bottle	1.05341.0250
			1 kg	Plastic bottle	1.05341.1000

# Ordering information Metals and metal oxides

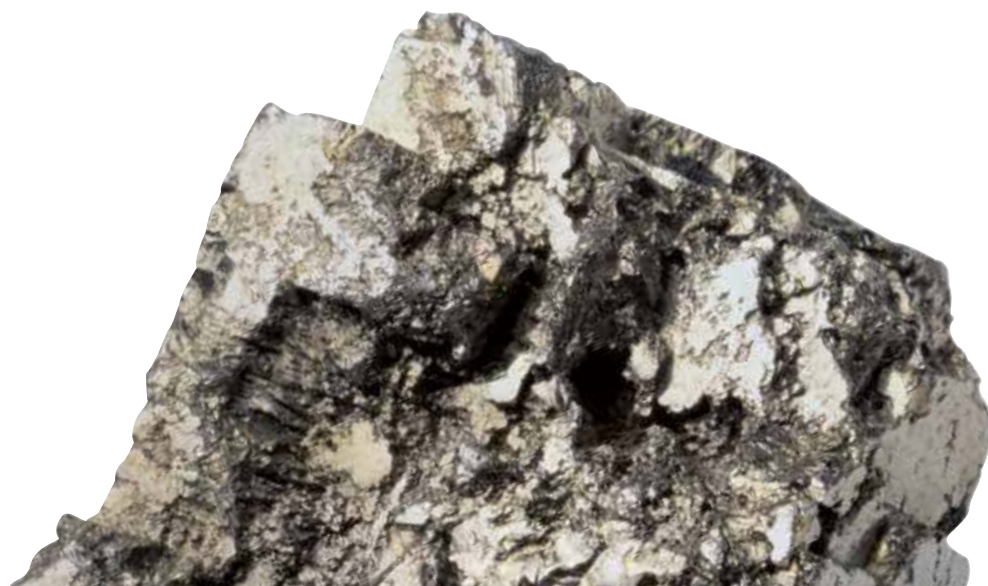
## Metals and metal oxides I–T

	Product	CAS No.	Chemical formula	Content	Packaging	Ord. No.
I	Iron for analysis reduced EMSURE®, particle size 10 µm	7439-89-6	Fe	100 g	Plastic bottle	1.03819.0100
				500 g	Plastic bottle	1.03819.0500
	di-Iodine pentoxide for analysis EMSURE® granular 0.5 – 2.5 mm	12029-98-0	I <sub>2</sub> O <sub>5</sub>	100 g	Glass bottle	1.00358.0100
	Iodine sublimated for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7553-56-2	I <sub>2</sub>	100 g	Glass bottle	1.04761.0100
				500 g	Glass bottle	1.04761.0500
L	Lanthanum(III) oxide	1312-81-8	La <sub>2</sub> O <sub>3</sub>	100 g	Plastic bottle	1.12220.0100
				500 g	Plastic bottle	1.12220.0500
	Lead foil for analysis EMSURE® about 0.25 mm thick	7439-92-1	Pb	500 g	Plastic bag	1.07365.0500
				1 kg	Plastic bottle	1.05658.1000
				5 kg	Plastic bottle	1.05658.5000
	Lead(II) oxide extra pure	1317-36-8	PbO	50 kg	Plastic drum	1.05658.9050
				250 g	Plastic bottle	1.07401.0250
				1 kg	Plastic bottle	1.07401.1000
	Lead(IV) oxide for analysis EMSURE®	1309-60-0	PbO <sub>2</sub>	250 g	Plastic bottle	1.07407.0250
				1 kg	Plastic bottle	1.07407.1000
	Lithium hydroxide about 98 %+	1310-65-2	LiOH	100 g	Plastic bottle	1.05691.0100
				1 kg	Plastic bottle	1.05691.1000
M	Magnesium foil 0.15 – 0.30 mm thickness, 3 mm wide	7439-95-4	Mg	1	Fibre case	1.05812.0001
	Magnesium powder particle size about 0.06 – 0.3 mm	7439-95-4	Mg	1 kg	Metal can	1.05815.1000
	Magnesium oxide for analysis EMSURE®	1309-48-4	MgO	100 g	Plastic bottle	1.05865.0100
				500 g	Plastic bottle	1.05865.0500
	Magnesium oxide for analysis EMSURE® (max. 0.001 % SO <sub>4</sub> ) ACS	1309-48-4	MgO	100 g	Plastic bottle	1.05866.0100
				500 g	Plastic bottle	1.05866.0500
	Manganese(IV) oxide powder	1313-13-9	MnO <sub>2</sub>	1 kg	Glass bottle	1.05957.1000
	Molybdenum(VI) oxide extra pure	1313-27-5	MoO <sub>3</sub>	250 g	Plastic bottle	1.00401.0250
N	Molybdenum(VI) oxide for analysis EMSURE®	1313-27-5	MoO <sub>3</sub>	100 g	Plastic bottle	1.00403.0100
				500 g	Plastic bottle	1.00403.0500
	Niobium(V) oxide 99+	1313-96-8	Nb <sub>2</sub> O <sub>5</sub>	100 g	Plastic bottle	1.06868.0100
	Phenylhydrazinium chloride for analysis EMSURE® Reag. Ph Eur	59-88-1	C <sub>6</sub> H <sub>9</sub> CrN <sub>2</sub>	100 g	Glass bottle	1.07253.0100
P				250 g	Glass bottle	1.07253.0250
R	Rubidium chloride for analysis EMSURE®	7791-11-9	RbCl	25 g	Glass bottle	1.07615.0025
S	Selenium black 99+	7782-49-2	Se	50 g	Plastic bottle	1.07714.0050
				250 g	Plastic bottle	1.07714.0250
				1 kg	Plastic drum	1.07714.1000
	Sodium, rod diameter 2.5 cm (protective liquid: paraffin oil)	7440-23-5	Na	250 g	Glass bottle	1.06260.0250
				1 kg	Glass bottle	1.06260.1000
	Sulfur for external use Ph Eur, BP	7704-34-9	S	2.5 kg	Plastic bottle	1.07983.2500
				25 kg	Fibre carton	1.07983.9025
T	Tetraphenylarsonium chloride monohydrate for analysis EMSURE®	104170-16-3	C <sub>24</sub> H <sub>20</sub> AsCl · H <sub>2</sub> O	5 g	Glass bottle	1.08150.0005
	Tin fine powder pure (particle size <71 µm)	7440-31-5	Sn	250 g	Plastic bottle	1.07807.0250
				1 kg	Plastic bottle	1.07807.1000



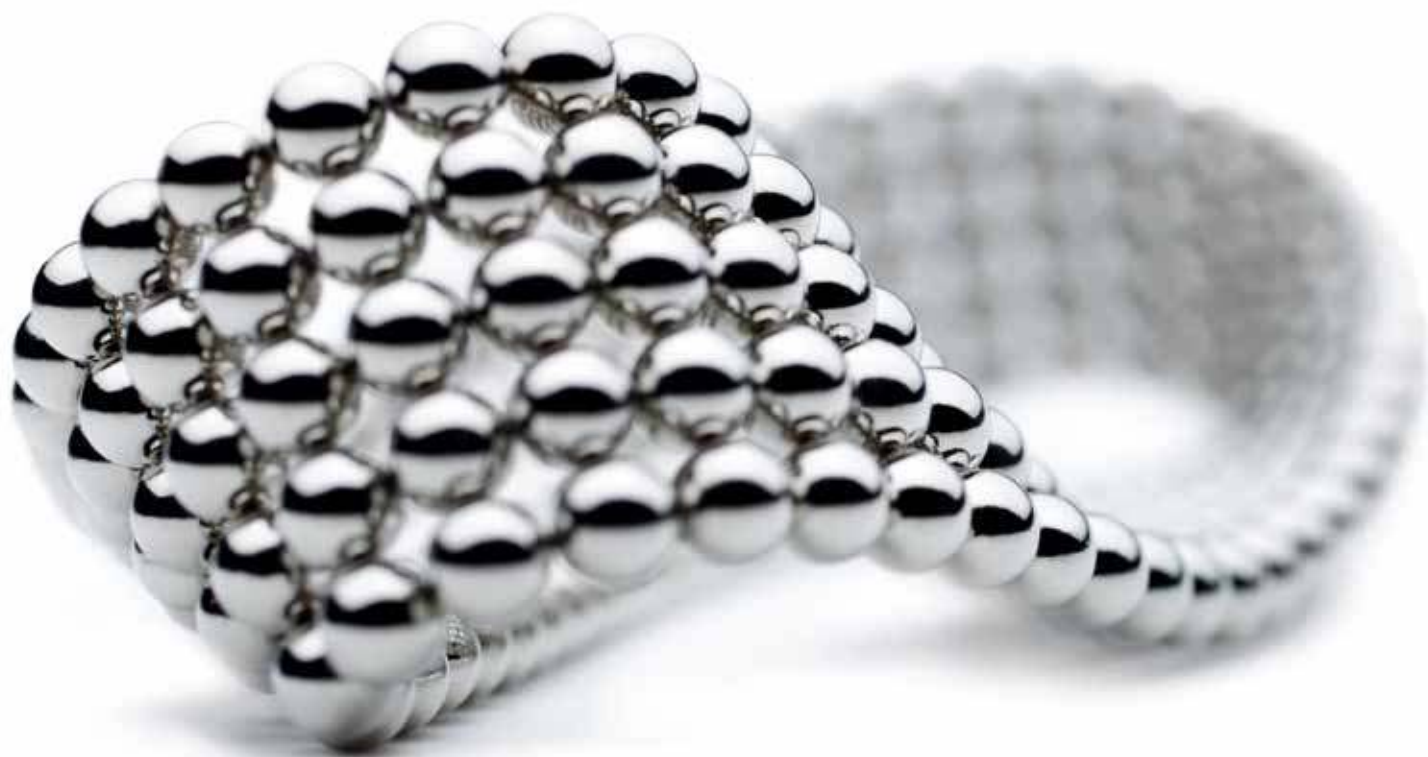
## Metals and metal oxides T-Z

	Product	CAS No.	Chemical formula	Content	Packaging	Ord. No.
T	Tin foil about 0.04 mm thick	7440-31-5	Sn	200 strips	Plastic box	1.07826.0001
	Tin granulated for analysis EMSURE® (particle size about 4 mm) Reag. Ph Eur	7440-31-5	Sn	250 g	Plastic bottle	1.07806.0250
				1 kg	Plastic bottle	1.07806.1000
	Tin(IV) oxide extra pure	7440-31-5	Sn	250 g	Plastic bottle	1.07818.0250
				1 kg	Plastic bottle	1.07818.1000
				5 kg	Plastic bottle	1.07818.5000
				25 kg	Fibre carton	1.07818.9025
	Titanium(IV) oxide for analysis EMSURE® Reag. Ph Eur	13463-67-7	TiO <sub>2</sub>	1 kg	Plastic bottle	1.00808.1000
				25 kg	Fibre carton	1.00808.9025
				50 kg	Fibre carton	1.00808.9050
V	Vanadium(V) oxide extra pure	1314-62-1	V <sub>2</sub> O <sub>5</sub>	250 g	Plastic bottle	1.00824.0250
				1 kg	Plastic bottle	1.00824.1000
Y	Yttrium oxide 99+	1314-36-9	Y <sub>2</sub> O <sub>3</sub>	25 g	Plastic bottle	1.12412.0025
Z	Zinc granular extra pure particle size about 3 – 8 mm	7440-66-6	Zn	1 kg	Plastic bottle	1.08755.1000
				10 kg	Plastic bottle	1.08755.9010
	Zinc granular for analysis EMSURE® particle size about 3 – 8 mm ISO	7440-66-6	Zn	500 g	Plastic bottle	1.08780.0500
				1 kg	Plastic bottle	1.08780.1000
	Zinc coarse powder for analysis suitable for filling of reductors, particle size about 0.3 – 1.5 mm EMSURE® Reag. Ph Eur	7440-66-6	Zn	250 g	Metal can	1.08756.0250
				1 kg	Metal can	1.08756.1000
	Zinc powder for analysis, particle size <45 µm EMSURE®	7440-66-6	Zn	500 g	Metal can	1.08789.0500
				1 kg	Metal can	1.08789.1000
	Zinc sticks, triangular cross section about 8 mm for analysis EMSURE®	7440-66-6	Zn	500 g	Plastic bag	1.08782.0500
	Zinc dust particle size <63 µm	7440-66-6	Zn	1 kg	Metal can	1.08774.1000
				50 kg	Steel drum	1.08774.9050
				500 g	Plastic bottle	1.08849.0500
	Zinc oxide for analysis EMSURE® ACS, Reag. Ph Eur	1314-13-2	ZnO	1 kg	Plastic bottle	1.08849.1000
				25 kg	Fibre carton	1.08849.9025
	Zirconium(IV) oxide chloride octahydrate for analysis EMSURE®	13520-92-8	ZrOCl <sub>2</sub> · 8 H <sub>2</sub> O	100 g	Plastic bottle	1.08917.0100



# Instrumental inorganic analysis

Merck Millipore reagents for instrumental analysis are produced from high purity materials and analyzed using the most sophisticated methods. Choose from our broad range of reagents to achieve the most reliable results!



## Volumetric solutions

Page 132

Titripur® volumetric solutions – the standard for precise titration results. With Titripur® grade we ensure that your analyses always meet the highest demands.



## Karl Fischer reagents and standards

Page 146

Apura® – Karl Fischer reagents and standards for sophisticated, precise and consistent water determination. Excellent quality distinguishes our Apura® range.



## Reference materials

Page 172

Certipur® reference materials for calibration and qualification in instrumental analysis ensure the most reliable results. Our certified reference materials come with a comprehensive Certificate of Analysis.



## Fluxes for XRF

Page 212

Spectromelt® materials for fluxing digestion or pressing of powder tablets are the perfect aids for your X-ray fluorescence analysis. The purity of Spectromelt® borates provides the necessary degree of precision and our grinding aid materials are specially developed for automated sample preparation.



## High purity acids and bases

Page 220

Suprapur® | Ultrapur acids offer the most suitable purity of wet digestion materials. High purity acids from Merck Millipore have low impurities during the entire minimum shelf life.



## High purity salts

Page 228

Suprapur® salts for sample preparation in instrumental analysis. Be sure to prepare your samples with the highest purity!



# Volumetric solutions

Titripur® | Titripac® | Titrisol® | Titriplex®

Sophisticated and correct analyses require precisely adjusted, certified volumetric solutions. Whether you're titrating reducing or oxidizing substances, acids, bases or complexing reagents in either aqueous or non-aqueous solutions: Merck Millipore offers the right solutions for every application.

The measure of all things –  
volumetric solutions from Merck Millipore.



# Volumetric solutions

■ Contents	Page
• Quality standard	134
• Quality management	136
• Optimized packaging – for every application	138
• Titripac® – innovative packaging system	140
• Ordering information	142

■ Advantages
• Certified and consistently high level of quality
• Innovative and optimum packaging systems
• Reliable and precise analyses
• Measured in a DIN EN ISO / IEC 17025 accredited laboratory

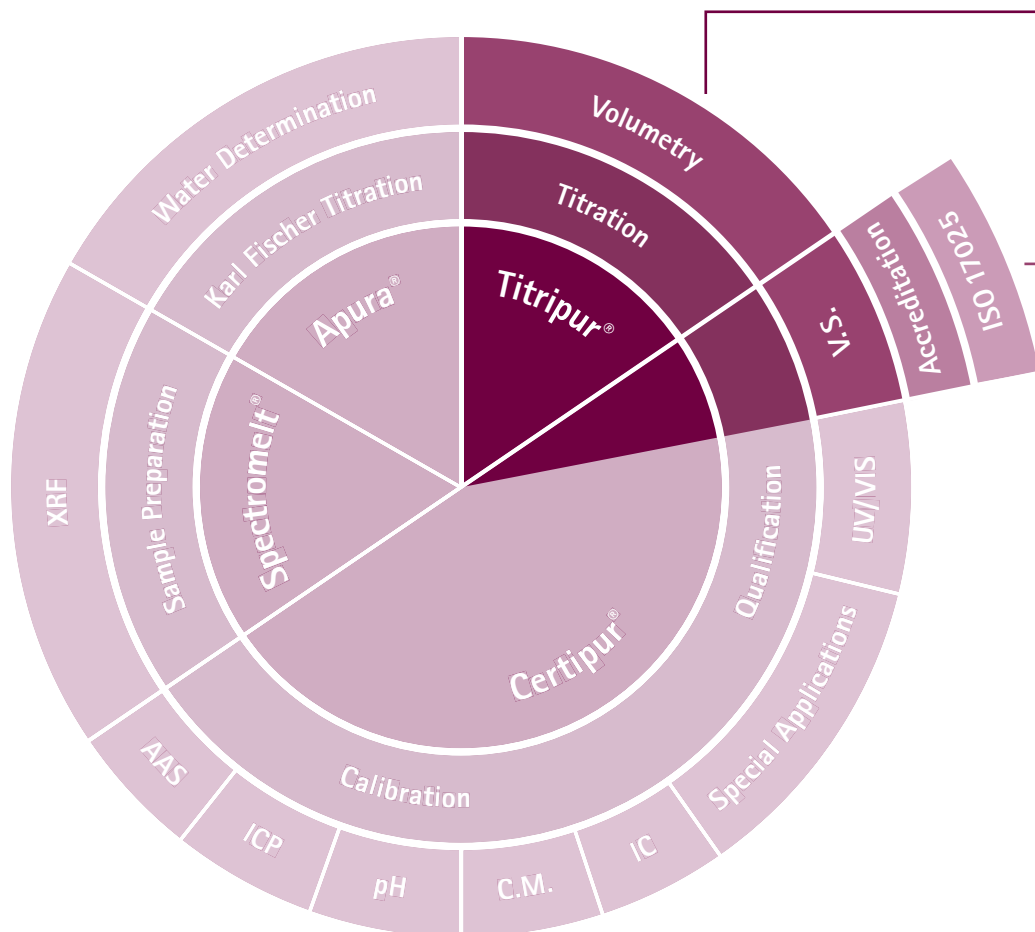


[www.merckmillipore.com/titration](http://www.merckmillipore.com/titration)

# Titripur® – our quality standard in titration

## Titripur® – precision and quality

Like all Merck Millipore products, Titripur® volumetric solutions are subject to stringent manufacturing and testing requirements. From the selection of the raw materials and packaging on up to quality control, the highest demands are placed on purity and quality. All Titripur® volumetric solutions are measured in our DIN EN ISO / IEC 17025 accredited laboratory.



## Specification / Traceability

<b>NIST</b>	National Institute of Standards and Technology, Gaithersburg, Maryland, USA
<b>Reag. Ph Eur</b>	Reagents specified by the European Pharmacopoeia
<b>USP</b>	United States Pharmacopoeia requirements for reagents

## Titripur® quality for your individual needs

### Titripur® | Volumetric solutions

Under the brand name Titripur®, Merck Millipore offers you first-rate volumetric solutions. Volumetric solution described in the European and the US Pharmacopoeia are in accordance with the reagents chapter of the Pharmacopoeia. For each solution, titer determination is performed under optimum and standardized conditions. All volumetric solutions are traceable to certified secondary reference materials, which in turn are directly traceable to standard reference materials from the NIST. Consequently, all volumetric solutions from Merck Millipore are traceable to NIST standard reference material and measured in our DIN EN ISO / IEC 17025 accredited laboratory.

### Certipur® | Volumetric standard [V.S.]

Volumetric standards are used for the standardization – titer determination – of volumetric solutions and for the qualification of the titration system. Influencing factors such as temperature, instrument variances, different methods of handling, weighing errors etc. and the volumetric solution itself can impact the titration result. To compensate for these factors, titer determination under working conditions is necessary in the respective laboratory. Merck Millipore is in the scope of the DIN EN ISO / IEC 17025 accreditation for mass fraction of titrimetric standards. Secondary standard reference materials for titration are traceable to standard reference material from NIST.

### More information

► See chapter »Standard reference materials and buffers« on page 172



# Titripur® – for reliable quality all the time

The standard for precise titration results

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



**That's Merck Millipore:**  
Quality assurance throughout the entire  
manufacturing and quality control process

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



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

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

### Titripur® – volumetric solutions made from raw materials in accordance with Ph Eur

The Titripur® line also includes volumetric solutions made from raw materials in accordance with the European Pharmacopoeia. The relevant information can be found in the certificate.

### Titriplex® – for complexometric titration

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



# Innovative packaging – optimized for every application

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

## Titrisol® – concentrates for greater flexibility

For users who regularly perform different types of analyses, we also offer most volumetric solutions as Titrisol® concentrates.

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



## Titrisol® advantages

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



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

Merck Millipore offers ready-to-use volumetric solutions for daily laboratory analyses. These can be connected directly to a titrator via an adapter.

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

Merck Millipore also offers Titripur® grade ready-to-use solutions in 4 and 10 liter Titripac®.

### Polyethylene bottles and canisters

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

### Glass bottles

- Ensuring the stability of special volumetric solutions

# Titripac® – the innovative packaging solution that saves costs and time

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

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

Titripac® saves you the trouble of time-consuming process of checking the solutions as well as the cost-intensive disposal of contaminated residual amounts. The carton can simply be disposed of together with paper and the internal liner can be easily folded together prior to disposal.

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



*Titripac® is available in 4 liter and 10 liter sizes.*



*Exclusively from Merck Millipore: Internal liner and external carton can be easily disposed of separately.*

## Titripac® advantages

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



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

# Ordering information Titripur® volumetric solutions

Product	Concentration	Titrisol® Ampoules for 1 l solution Ord. No.	Ready-to-use solutions	
			Glass bottles, PE bottles/canisters Ord. No.	Titripac® Ord. No.
<b>A</b> Acetic acid	0.1 mol/l (0.1 N)	1.09944.0001	–	–
	1 mol/l (1 N)	1.09951.0001	–	–
	1 mol/l (1 N) prepared from raw materials acc. to Ph Eur	–	25 l: 1.99061.9025	–
Ammonium cer(IV)nitrate solution	0.1 mol/l (0.1 N)	–	1 l: 1.02277.1000 <sup>1</sup>	–
Ammonium iron(II) sulfate solution	0.1 mol/l (0.1 N)	1.09864.0001	–	–
Ammonium thiocyanate solution	0.1 mol/l (0.1 N)	1.09900.0001	1 l: 1.09079.1000 <sup>1,2</sup>	–
<b>B</b> Barium chloride solution	0.05 mol/l (0.1 N)	1.09962.0001	–	–
Barium perchlorate solution	0.005 mol/l in 2-propanol/ water (80 : 20)	–	1 l: 1.09086.1000 <sup>2</sup>	–
Bromide bromate solution	0.05 mol/l (0.1 N)	1.09905.0001	–	–
<b>C</b> Cer (IV) sulfate solution	0.1 mol/l (0.1 N)	–	1 l: 1.09092.1000 <sup>1,2</sup>	–
Copper sulfate solution	0.1 mol/l	–	1 l: 1.02784.1000	–
Copper-di-ammonium Titriplex® solution	0.1 mol/l	–	0.5 l: 1.05217.0500	–
<b>H</b> Hanus solution (Iodomobromide solution)	0.1 mol/l in acetic acid	–	1 l: 1.09164.1000	–
Hyamine, 1622 solution for the determination of anionic tensides	0.004 mol/l	–	1 l: 1.15480.1000	–
Hydrochloric acid	0.01 mol/l (0.01 N)	1.09974.0001	–	–
	0.1 mol/l	1.09973.0001	1 l: 1.09060.1000 <sup>1,2</sup> 5 l: 1.09060.5000 <sup>1,2</sup> 25 l: 1.09060.9025 <sup>1,2</sup>	4 l: 1.09060.4000 <sup>1,2</sup> 10 l: 1.09060.9010 <sup>1,2</sup>
	0.1 mol/l (0.1 N) in 2-propanol	–	1 l: 1.00326.1000	–
	0.357 mol/l (1/2.8 N)	–	–	10 l: 1.13136.9010
	0.5 mol/l (0.5 N)	1.09971.0001	1 l: 1.09058.1000 <sup>1,2</sup> 5 l: 1.09058.5000 <sup>1,2</sup> 25 l: 1.09058.9025 <sup>1,2</sup>	4 l: 1.09058.4000 <sup>1,2</sup>
	1 mol/l (1 N)	1.09970.0001	1 l: 1.09057.1000 <sup>1,2</sup> 2.5 l: 1.09057.2500 <sup>1,2</sup> 5 l: 1.09057.5000 <sup>1,2</sup> 25 l: 1.09057.9025 <sup>1,2</sup>	4 l: 1.09057.4000 <sup>1,2</sup> 10 l: 1.09057.9010 <sup>1,2</sup>
	1 mol/l (1 N) prepared from raw materials acc. to Ph Eur	–	25 l: 1.99070.9025	–
	2 mol/l (2 N)	–	1 l: 1.09063.1000 25 l: 1.09063.9025	–
	3.571 mol/l (1/0.28 N)	–	–	10 l: 1.13134.9010
	5 mol/l (5 N)	–	1 l: 1.09911.1000	–
<b>I</b> Iodide-iodate solution	1/128 mol/l I 2 (1/64 N)	1.09914.0001	–	–
Iodine solution	0.05 mol/l (0.1 N)	1.09910.0001	1 l: 1.09099.1000 <sup>1,2</sup>	–
	0.5 mol/l (1 N)	–	1 l: 1.09098.1000 <sup>1</sup>	–
<b>M</b> Mercury(II)nitrate solution	0.05 mol/l (0.1 N)	–	1 l: 1.09143.1000 <sup>2</sup>	–
<b>N</b> Nitric acid	0.1 mol/l	1.09964.0001	–	–
	1 mol/l (1 N)	1.09966.0001	–	–
	10 mol/l (10 N)	–	1 l: 1.00630.1000	–
<b>O</b> Oxalic acid solution	0.005 mol/l (0.01 N)	1.09932.0001	–	–
	0.05 mol/l (0.1 N)	1.09965.0001	–	–

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

Product	Concentration	Titrisol® Ampoules for 1 l solution Ord. No.	Ready-to-use solutions	
			Glass bottles, PE bottles/canisters Ord. No.	Titripac® Ord. No.
<b>P</b> Perchloric acid	0.1 mol/l (0.1 N) in water-free acetic acid	–	1 l: 1.09065.1000 <sup>1,2</sup>	–
Potassium bromate solution	1/60 mol/l (0.1 N)	1.09925.0001	–	–
Potassium dichromate solution	1/60 mol/l (0.1 N)	1.09928.0001	–	–
	1/24 mol/l (0.25 N)	–	1 l: 1.09118.1000	–
	0.020 mol/l	–	1 l: 1.09119.1000	–
Potassium hydroxide solution	0.1 mol/l (0.1 N)	1.09921.0001	1 l: 1.09112.1000 <sup>1</sup>	–
	0.1 mol/l (0.1 N) in ethanol	–	1 l: 1.09115.1000 <sup>1,2</sup> 2.5 l: 1.09115.2500 <sup>1,2</sup>	–
	0.1 mol/l (0.1 N) in methanol	–	1 l: 1.11587.1000	–
	0.1 mol/l (0.1 N) in 2-propanol	–	1 l: 1.05544.1000	–
	0.5 mol/l (0.5 N)	1.09919.0001	5 l: 1.11586.5000 <sup>2</sup>	–
	0.5 mol/l (0.5 N) in ethanol	–	1 l: 1.09114.1000 <sup>1,2</sup> 2.5 l: 1.09114.2500 <sup>1,2</sup>	–
	0.5 mol/l (0.5 N) in methanol	–	1 l: 1.09351.1000	–
	1 mol/l (1 N)	1.09918.0001	1 l: 1.09108.1000 <sup>1,2</sup>	–
	1 mol/l (1 N) max. 0.4 ppm Ca	–	1 l: 1.09107.1000	–
	2.0 mol/l (2 N) in methanol	–	2.5 l: 1.11787.2500 <sup>2</sup>	–
Potassium iodate solution	1/60 mol/l (0.1 N)	1.09917.0001	–	–
Potassium permanganate solution	0.002 mol/l (0.01 N)	1.09930.0001	–	–
	0.02 mol/l (0.1 N)	1.09935.0001	–	–
	0.02 mol/l (0.1 N) standardized with sodium thiosulfate	–	1 l: 1.09121.1000 <sup>1</sup>	–
	0.02 mol/l (0.1 N) standardized with oxalate	–	1 l: 1.09122.1000 <sup>2</sup>	–
	0.05 mol/l (0.25 N)	–	2.5 l: 4.80160.2500	–
<b>S</b> Silver nitrate solution	0.05 mol/l (0.05 N)	–	1 l: 1.11718.1000	–
	0.1 mol/l (0.1 N)	1.09990.0001	1 l: 1.09081.1000 <sup>1,2</sup> 2.5 l: 1.09081.2500 <sup>1,2</sup>	4 l: 1.09081.4000 <sup>1,2</sup> 10 l: 1.09081.9010 <sup>1,2</sup>
	1 mol/l (1 N)	–	1 l: 1.09080.1000	–
Sodium arsenite solution	0.05 mol/l (0.1 N)	–	1 l: 1.06277.1000 <sup>2</sup>	–
Sodium carbonate solution	0.05 mol/l (0.1 N)	1.09940.0001	–	–
Sodium chloride solution	0.1 mol/l (0.1 N)	1.09945.0001	–	–

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

# Ordering information Titripur® volumetric solutions

Product	Concentration	Titrisol® Ampoules for 1 l solution Ord. No.	Ready-to-use solutions	
			Glass bottles, PE bottles/canisters Ord. No.	Titripac® Ord. No.
S Sodium hydroxide solution	0.005 mol/l (0.005 N) in methanol	–	10 l: 4.80621.9010	–
	0.01 mol/l (0.01 N)	1.09961.0001	–	–
	0.02 mol/l (0.02 N)	–	0.5 l: 1.09142.0500	–
	0.1 mol/l (0.1 N)	1.09959.0001	1 l: 1.09141.1000 <sup>1,2</sup> 5 l: 1.09141.5000 <sup>1,2</sup> 25 l: 1.09141.9025 <sup>1,2</sup>	4 l: 1.09141.4000 <sup>1,2</sup> 10 l: 1.09141.9010 <sup>1,2</sup>
	0.111 mol/l (0.111 N)	–	25 l: 1.10822.9025	–
	0.2 mol/l (0.2 N)	–	1 l: 1.09140.1000	10 l: 1.09140.9010
	0.25 mol/l (0.25 N)	1.09958.0001	1 l: 1.09139.1000	10 l: 1.09139.9010
	0.33 mol/l (0.33 N)	–	1 l: 1.05595.1000	10 l: 1.05595.9010
	0.5 mol/l (0.5 N)	1.09957.0001	1 l: 1.09138.1000 25 l: 1.09138.9025	4 l: 1.09138.4000 10 l: 1.09138.9010
	1 mol/l (1 N)	1.09956.0001	1 l: 1.09137.1000 <sup>1,2</sup> 2.5 l: 1.09137.2500 <sup>1,2</sup> 25 l: 1.09137.9025 <sup>1,2</sup>	4 l: 1.09137.4000 <sup>1,2</sup> 10 l: 1.09137.9010 <sup>1,2</sup>
	1 mol/l (1 N) prepared from raw materials acc. to Ph Eur	–	25 l: 1.99060.9025	–
	2 mol/l (2 N)	–	1 l: 1.09136.1000 25 l: 1.09136.9025	–
	4 mol/l (4 N)	–	5 l: 1.11584.5000	–
	5 mol/l (5 N)	–	1 l: 1.09913.1000	–
	6 mol/l (1 N) prepared from raw materials acc. to Ph Eur	–	25 l: 1.99062.9025	–
Sodium thiosulfate solution	0.01 mol/l (0.01 N)	1.09909.0001	–	–
	0.1 mol/l (0.1 N)	1.09950.0001	1 l: 1.09147.1000 <sup>1,2</sup> 25 l: 1.09147.9025 <sup>1,2</sup>	4 l: 1.09147.4000 <sup>1,2</sup> 10 l: 1.09147.9010 <sup>1,2</sup>
Sulfuric acid	0.005 mol/l (0.01 N)	1.09982.0001	–	–
	0.05 mol/l (0.1 N)	1.09984.0001	1 l: 1.09074.1000 <sup>1</sup> 5 l: 1.09074.5000 <sup>1</sup>	4 l: 1.09074.4000 <sup>1</sup> 10 l: 1.09074.9010 <sup>1</sup>
	0.25 mol/l (0.5 N)	–	1 l: 1.09073.1000	4 l: 1.09073.4000 10 l: 1.09073.9010
	0.5 mol/l (1 N)	1.09981.0001	1 l: 1.09072.1000 <sup>1,2</sup> 5 l: 1.09072.5000 <sup>1,2</sup>	4 l: 1.09072.4000 <sup>1,2</sup> 10 l: 1.09072.9010 <sup>1,2</sup>
	2.5 mol/l (5 N)	1.09912.0001	1 l: 4.80364.1000 25 l: 4.80364.9025	–
T Tetra-n-butyl-ammonium hydroxide solution	0.1 mol/l (0.1 N) in 2-propanol/methanol	–	0.5 l: 1.09162.0500 <sup>1,2</sup> 1 l: 1.09162.1000 <sup>1,2</sup>	–
	Tetramethylammonium hydroxide solution	–	0.25 l: 1.08124.0250 <sup>2</sup> 1 l: 1.08124.1000	–
	Titriplex® solution A	50 mg CaO/l = 1 ml	1.08419.1000	–
	Titriplex® solution B	10 mg CaO/l = 1 ml	1.08420.1000	5 l: 1.08420.5000 10 l: 1.08420.9010
	Titriplex®, III solution (Na <sub>2</sub> -EDTA)	0.01 mol/l	1.08446.0001	–
		0.1 mol/l	1.09992.0001	1 l: 1.08431.1000 <sup>1</sup> 4 l: 1.08431.4000 <sup>1</sup> 10 l: 1.08431.9010 <sup>1</sup>

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



Product	Concentration	Titrisol® Ampoules for 1 l solution Ord. No.	Ready-to-use solutions	
			Glass bottles, PE bottles/canisters Ord. No.	Titripac® Ord. No.
<b>T</b> Trifluoromethanesulfonic acid in anhydrous acetic acid	0.1 mol/l	–	1 l: 1.08050.1000	–
Titriplex®, IV solution (Na <sub>2</sub> -DCTA)	0.1 mol/l	–	1 l: 1.08447.1000	4 l: 1.08447.4000
<b>W</b> Wijs solution (iodomonoiodide in acetic acid)	0.1 mol/l	–	1 l: 1.09163.1000 2.5 l: 1.09163.2500	–
<b>Z</b> Zinc sulfate solution	0.1 mol/l	1.09991.0001	2.5 l: 1.08879.1000 <sup>1</sup>	–

<sup>1</sup>: Solution in accordance with the reagents chapter of Pharm. Eur (European Pharmacopoeia)

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

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

### Ordering information Titripur® prepared from raw materials acc. to Ph Eur

Product	Concentration	Ready-to-use solutions	
		Glass bottles, PE bottles/canisters Ord. No.	Titripac® Ord. No.
<b>A</b> Acetic acid	1 mol/l (1 N) prepared from raw materials acc. to Ph Eur	25 l: 1.99061.9025	–
<b>H</b> Hydrochloric acid	1 mol/l (1 N) prepared from raw materials acc. to Ph Eur	25 l: 1.99070.9025	–
<b>S</b> Sodium hydroxide solution	1 mol/l (1 N) prepared from raw materials acc. to Ph Eur	25 l: 1.99060.9025	–
	6 mol/l (1 N) prepared from raw materials acc. to Ph Eur	25 l: 1.99062.9025	–

Other volumetric solutions made from raw materials in accordance with Pharm. Eur are available on request. | <sup>3</sup>: Purified water

### Ordering information Titriplex® solid substances

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

# Karl Fischer reagents

Apura<sup>®</sup>

Using the Karl Fischer titration together with our Apura<sup>®</sup> reagents from Merck Millipore, the water content of gases, liquids and solids can be determined easily and with a high degree of accuracy. Not without reason is no other method as widespread as this one: Determination of water content according to Karl Fischer is rapid, accurate and reliable; it is thus the method of choice in quality and in-process control, production and research & development.

Brilliant results with Apura<sup>®</sup>  
for highest standards.



# Karl Fischer reagents and standards

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• Precise water determination every time	148
• Quality standard	150
• The right method for any application	152
• Volumetric method and reagents	154
• Coulometric method and reagents	164
• Standards for volumetric and coulometric titration	168

Advantages
• High accuracy and excellent precise
• Rapid and reproducible titration results
• Large water capacity
• No crystallization
• Innovative formulations for special applications
• Comprehensive product line
• Wide range of water standards



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

# Apura® – precise water determination every time ...

## The standard for reproducible results

Since we apply the highest standards to production processes and stringent testing requirements, Apura® reagents and standards are distinguished by excellent quality. The measuring results are therefore always reliable and accurate. From the selection of raw materials, packaging on up to quality control of the finished reagents we apply the strictest standards. This ensures a sophisticated consistency, quality and thus comparable and transparent results. The certificates of analysis for reagents and standards contain all the information important for quality management documentation.



# ... with 30 years of experience

A proven method, modified according to the latest research

- Brand quality** We use only high-quality and approved raw materials. This ensures batch-to-batch consistency and comparable analytical results.
- Competence** You benefit from our high scientific standards and our long international experience.
- Safety** Merck Millipore in particular places great importance on safety. For this reason, the Apura® Karl Fischer reagents contain no toxic components or, if this is not possible, they are limited to a minimum.
- Service** Our international sales network and local offices ensure safe delivery and service – worldwide.
- Support** Whenever you need help, we can supply it via our application and development laboratories. Here we can advise you on applications, offer technical support, and assist you in validation projects. Contact us at [apura@merckgroup.com](mailto:apura@merckgroup.com) or visit our application finder: [www.merckmillipore.com/applicationfinder-apura](http://www.merckmillipore.com/applicationfinder-apura)
- Transparency** Our quality control is carried out according to the most stringent standards. Analyses are carried out using recognized international standards. This renders the results achieved completely transparent.

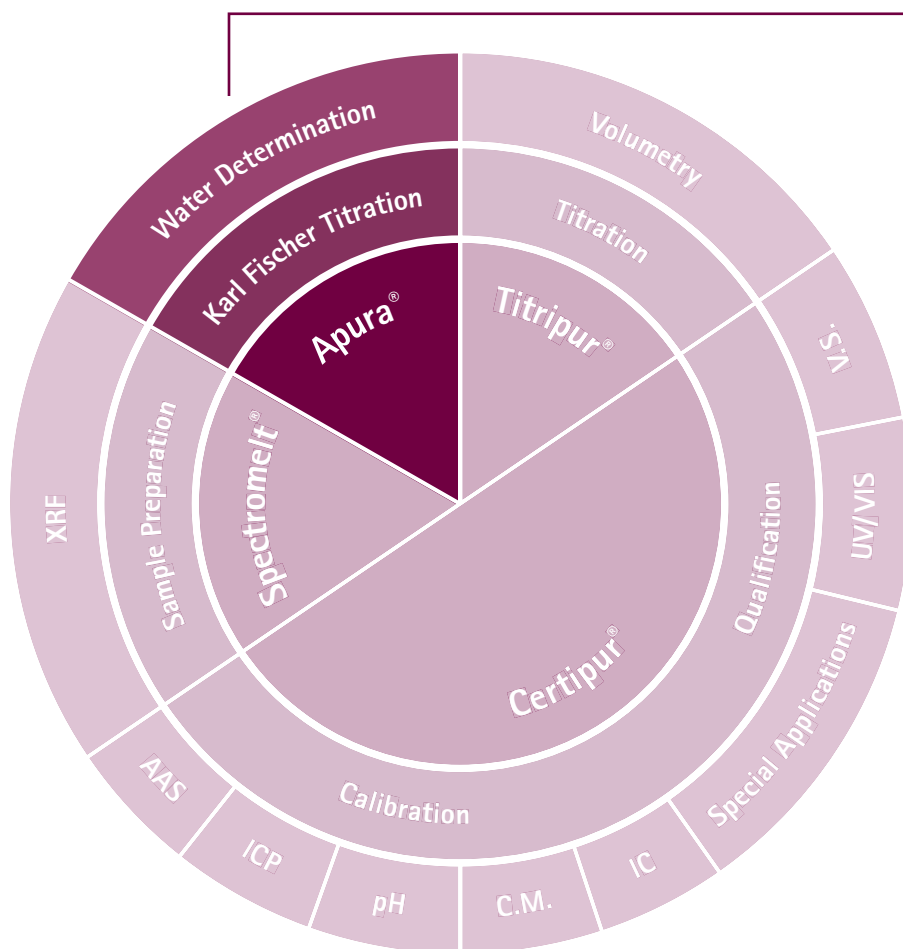


## More information

► [www.merckmillipore.com/applicationfinder-apura](http://www.merckmillipore.com/applicationfinder-apura)

# Apura® – our quality standard for water determination

The significance of Karl Fischer titration is emphasized by the fact that it has been included in the most important Pharmacopoeias, ASTM (American Standard Methods), German industrial norm DIN EN ISO 9001/2008 and other guidelines. Together with our Apura® standards the Karl Fischer product line from Merck Millipore is always reliable, rapid, accurate and globally available to facilitate international product transfer.



## Specification / Traceability

<b>ASTM</b>	American Standard Methods
<b>ISO</b>	International Organization for Standardization
<b>NIST</b>	National Institute of Standards and Technology, USA

## Apura® quality for your individual needs

### Apura®

Karl Fischer reagents and standards for sophisticated, precise and consistent water determination. Excellent quality distinguishes our Apura® range.

### Karl Fischer titration

Since their development in the 1930s, Karl Fischer titrations have found use worldwide. With this method the water contents of a large variety of materials can be determined over a wide concentration range from 1 ppm to 100 %. In contrast to other methods, the Karl Fischer titration is based on a chemical reaction with water, so that water is exclusively determined. The Karl Fischer titration has a wide spectrum of applications and is used in a broad range of fields, for example water determination in foodstuffs, chemicals, pharmaceuticals, cosmetics and mineral oils.

### Water determination | Volumetry | Coulometry | Standards

Two methods are available for the determination of water using the Karl Fischer method: a volumetric and a coulometric method. The method selected depends primarily on the amount of water to be determined.

**Volumetry |** In the case of higher levels of water (0.1 – 100 %), the volumetric method should be used. For volumetric titration, we supply both one component and two component reagents.

**Coulometry |** For very low levels of water (<1 %) or for water determination of very expensive substances with small sample amount, the coulometric method should be used. In this case, a difference is made between cells with and without a diaphragm. For both cell types, the appropriate Apura® reagents are available.

**Standards |** The Apura® range is rounded off with water standards for monitoring and qualification of Karl Fischer instruments, for checking measuring results and titer determination.

# The right method for any application

Benefit from our experience



## Volumetry

See page 154

0.1 – 100 %  
water level

## Titrants

CombiTitrant 5  
[188005]

Titrant 5  
[188010]

CombiTitrant 5 Keto  
[188006]

CombiTitrant 2  
[188002]

Titrant 2  
[188011]

CombiTitrant 1  
[188001]

## Coulometry

See page 164

<1 %  
water level

CombiCoulomat frit  
[109255]

CombiCoulomat fritless  
[109257]

## Standards

See page 168

Standards

For further information and details please visit  
[www.merckmillipore.com/applicationfinder-apura](http://www.merckmillipore.com/applicationfinder-apura) and  
have a look at our application finder.

For support please contact us: [apura@merckgroup.com](mailto:apura@merckgroup.com)



To meet the requirements of modern laboratories Merck Millipore supplies a broad range of different Karl Fischer reagents in its Apura® line. It covers the whole range of volumetric and coulometric Karl Fischer reagents together with water standards.

Thus the user can choose the Karl Fischer reagents most suitable for his purposes, depending on his requirements and the available Karl Fischer instrument. The choice of the »right« reagent is a decisive factor in obtaining correct and reproducible results. It depends on the type of sample and the matrix in which the water is encapsulated. Important is that the sample is dissolved or dispersed completely in the Karl Fischer solvent or to make sure that all the water is extracted. The overview of the table offers advice regarding the correct choice and combination of reagents.

## Solvents

Samples dissolving in Ethanol	Samples dissolving in Methanol	Samples dissolving in Methanol	Samples containing aldehydes + ketones	Mineral oils	Oils + fats in food	Samples of long-chain hydrocarbons
CombiSolvent [188008]	CombiMethanol [188009]	Solvent [188015]	CombiSolvent Keto [188007]	CombiSolvent oils [188020]	CombiSolvent fats [188021]	Solvent oils & fats [188016]
•	•	•		•	•	•
		•				•
			•			
•	•	•		•	•	•
		•				•
•	•	•		•	•	•
Can be used for anode and cathode compartment in cells with diaphragm						
Can be used for cells with and without diaphragm						
Water standard: 0.01 % / 0.1 % / 1 % / oven 1 % / oil 15 – 30 ppm / 5 mg/ml   Lactose standard 5 %   Sodium tartrate dihydrate 15.66 %						

# Apura<sup>®</sup> Water determination according to Karl Fischer

## Volumetric titration

### Apura<sup>®</sup> volumetric reagents

Page

- One component reagents 156
- Two component reagents 158
- Solvents for oils and fats 160
- Reagents for aldehydes and ketones 162
- Buffer solutions 163

### Advantages

- High titration rate
- For water content from 0.1 % – 100 %
- Accurate and reliable results



## Volumetry

This method is preferably used for water contents in samples between 0.1 and 100 %. The unknown water content of the sample is determined by measuring the required volume of Karl Fischer Titrant to reach the titration endpoint. The sample is completely dissolved or dispersed in a suitable solvent with strict exclusion of atmospheric moisture and titrated with the Karl Fischer Titrant. The titration end point is indicated by an excess of iodine and is determined potentiometrically.

# One component reagents

## CombiTitrant | CombiSolvent | CombiMethanol

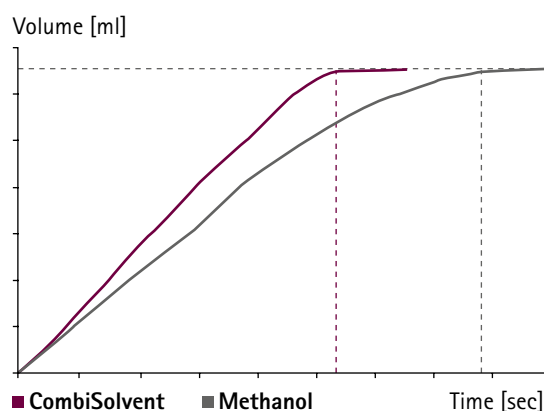
### CombiTitrant

In one component volumetric Karl Fischer analysis, the titrant contains all ingredients required by the Karl Fischer reaction: iodine, base, sulfur dioxide, and an alcohol. Apura® CombiTitrants and CombiSolvent are free of toxic alcohols and available in packaging compatible with all major brands of titrators. The range includes titrants with nominal titer values of 1, 2, 5 mg H<sub>2</sub>O/ml to cover a wide range of practical applications.

### CombiSolvent

The Apura® CombiSolvent is an innovative methanol-free solvent for one component volumetric titration. This ethanol-based solvent is also without toxic alcohols and used in conjunction with the Apura® CombiTitrants allows a non toxic titration. This means more safety for the laboratory staff as well as easy storage of the reagents.

**Titration curve:** The Apura® CombiSolvent is a methanol-free solvent for the one component system. This solvent brings about a higher titration rate and a more distinct endpoint.



### CombiMethanol

Methanol – with a low water content – is the solvent typically used in one component titration for standard applications. The quality of methanol used for the Karl Fischer Titration is critical to minimize both pretitration, and interfering side reactions. Apura® CombiMethanol is optimized specifically for use in Karl Fischer titrations by strictly limited key impurities and water content.



## One component reagents advantages

- High titration rate for fast analyses
- Distinct endpoint to ensure confidence in results
- Ensured constant and consistent high quality for comparable results
- No toxic alcohols in CombiTitrant and CombiSolvent for more safety for lab assistants
- More flexibility – the solvent can be suited to the sample matrix
- Unlimited water capacity – more titrations are possible than with two component reagents

## Ordering information

Product	Content	Packaging	Ord. No.
Apura®   CombiTitrant 5   approx. 5 mg H <sub>2</sub> O/ml	500 ml	Glass bottle	1.88005.0500
	1 l	Glass bottle	1.88005.1000
	2.5 l	Glass bottle	1.88005.2500
Apura®   CombiTitrant 2   approx. 2 mg H <sub>2</sub> O/ml	1 l	Glass bottle	1.88002.1000
Apura®   CombiTitrant 1   approx. 1 mg H <sub>2</sub> O/ml	1 l	Glass bottle	1.88001.1000
Apura®   CombiSolvent   methanol-free solvent	1 l	Glass bottle	1.88008.1000
	2.5 l	Glass bottle	1.88008.2500
Apura®   CombiMethanol   dried methanol for Karl Fischer titration max. 0.01 % water	1 l	Glass bottle	1.88009.1000
	2.5 l	Glass bottle	1.88009.2500

For water determinations in oils and fats we recommend CombiSolvent oils, (188020) and CombiSolvent fats (188021), for more information see page 161.

# Two component reagents

## Titrant | Solvent

Unlike one component Karl Fischer reagents, in two component reagent systems, the titrant contains only iodine and methanol, while the solvent contains the other Karl Fischer reaction components – sulfur dioxide and a suitable base dissolved in methanol. It is used as the working medium in the Karl Fischer cell. Apura® Titrants are available with concentrations of 2 and 5 mg H<sub>2</sub>O/ml together with Apura® Solvent.

Two component reagents are distinguished by greater long term stability and a slightly faster titration time in comparison to one component reagents. This is due to the fact that the Karl Fischer reaction components are divided in between the two reagents making each of the reagent less susceptible to slow side reactions over time.

Faster titration rates result from the initial availability of sulfur dioxide and base in the solvent to which the sample to be analyzed is added.



## Two component reagents advantages

- Slightly faster titration in comparison to one component titration
- High accuracy for reliable results
- Better buffer capacity
- Higher titer stability than one component reagents
- Ensured consistent high quality for comparable results

## Ordering information

Product	Content	Packaging	Ord. No.
Apura®   Titrant 5   approx. 5 mg H <sub>2</sub> O/ml	500 ml	Glass bottle	1.88010.0500
	1 l	Glass bottle	1.88010.1000
	2.5 l	Glass bottle	1.88010.2500
Apura®   Titrant 2   approx. 2 mg H <sub>2</sub> O/ml	1 l	Glass bottle	1.88011.1000
Apura®   Solvent   solvent for the two component titration	1 l	Glass bottle	1.88015.1000
	2.5 l	Glass bottle	1.88015.2500
<b>Karl Fischer Test Kit for Karl Fischer Titration without instruments</b>			
Apura®   Test Kit for water determination according to Karl Fischer   Set	1 set	Fibre carton	1.88025.0001
1 set consisting of: 100 ml Titrant (Glass bottle), 500 ml Solvent (Glass bottle), 1 Syringe, 1 Measuring flask			
Apura®   Test Kit Titrant for water determination acc. to Karl Fischer   Refill pack	100 ml	Glass bottle	1.88027.0001
Apura®   Test Kit Solvent for water determination acc. to Karl Fischer   Refill pack	500 ml	Glass bottle	1.88026.0001

For water determinations in oils and fats we recommend Solvent oils & fats (188016) which has been developed especially for this application. See page 161.

# Solvents for oils and fats

CombiSolvent oils | CombiSolvent fats | Solvent oils & fats

When determining the exact water content in oils and fats it is important that the samples are completely dissolved or dispersed. If the sample is not dissolved or dispersed completely, the water is not all extracted during determination. Depending on the type of oil or fat to be determined, different solvents are suited for this purpose.



*CombiSolvent fats is based on decanol, butyl acetate, and methanol, and is recommended for volumetric Karl Fischer analysis of water in fatty food, such as butter, margarine, vegetable fats, chocolate, mayonnaise, etc.*



## CombiSolvent oils | CombiSolvent fats

Mineral oils are primarily a mixture of long-chain hydrocarbons with aromatic compounds. Fats consist primarily of glycerol esters of higher fatty acids. The two classes of substance have different dissolution properties requiring different dissolution aids. We have therefore developed appropriate solvents for one component titration in both applications: CombiSolvent oils for mineral oils and CombiSolvent fats for fats in foodstuffs. Both are used in combination with CombiTitrants.

## Solvent oils & fats

Solvent oils & fats is a universal solvent for long-chain, nonpolar substances as well as light fats and oils. It can be used with two component titrants, as well as with CombiTitrants.

## Solvents for oils and fats advantages

- Good solubility of oils and fats in the corresponding solvent
- No addition of dissolution aids necessary – immediately ready for use
- Constant and consistently high quality
- Without chloroform

## Ordering information

Product	Content	Packaging	Ord. No.
Apura®   Solvent oils & fats   for long-chain substances	1 l	Glass bottle	1.88016.1000
Apura®   CombiSolvent oils   for mineral oils	1 l	Glass bottle	1.88020.1000
Apura®   CombiSolvent fats   for fats in foodstuffs	1 l	Glass bottle	1.88021.1000

Solvent oils & fats can be used in combination with two component Titrant (188010), but also in combination with CombiTitrant (188005). For titration of oils and fats with a very low water content we recommend our titrants with the factor 2 and 1, respectively: CombiTitrant 1 (188001), CombiTitrant 2 (188002) and Titrant 2 (188011).

# Reagents for aldehydes and ketones

## CombiTitrant 5 Keto | CombiSolvent Keto

CombiTitrant 5 Keto and CombiSolvent Keto are two products of the Apura® line. When performing water determinations with the Karl Fischer method in samples containing aldehydes and ketones it must be taken into account that these determinations are influenced by side reactions if methanol is used as a solvent.

### CombiTitrant 5 Keto

CombiTitrant 5 Keto is a one component titrant – all reactive components required for the Karl Fischer reaction:  $\text{SO}_2$ ,  $\text{I}_2$  and the base dissolved in a long-chain alcohol, are contained in a single reagent system.

### CombiSolvent Keto

CombiSolvent Keto is a solvent based upon a mixture of alcohol suppressing to a large extent the impact of side reactions with aldehydes and ketones. At the same time, its composition ensures optimum conditions for titration according to the Karl Fischer method with respect to stoichiometry, reaction rate and indication of the endpoint.

*CombiTitrant 5 Keto together with CombiSolvent Keto are designed for samples containing aldehydes and ketones.*



## Reagents for aldehydes and ketones advantages

- Fast titration rate
- No toxic alcohol contained
- Improved accuracy and reproducibility of the results
- Suppression of side reactions
- Consistently high quality

## Ordering information

Product	Content	Packaging	Ord. No.
Apura®   <b>CombiTitrant 5 Keto</b>   approx. 5 mg H <sub>2</sub> O/ml for aldehydes and ketones	1 l	Glass bottle	<b>1.88006.1000</b>
Apura®   <b>CombiSolvent Keto</b>   methanol-free solvent for aldehydes and ketones	1 l	Glass bottle	<b>1.88007.1000</b>

CombiTitrant 5 Keto and CombiSolvent Keto must always be used in combination as both components are specifically complementary to one another.

# Buffer solutions

Of decisive importance for the water determination according to Karl Fischer is on the one hand the complete dissolution of the sample and on the other hand the pH optimum between pH 5–7. When strong acids or alkalis are used as samples, the pH value can be out of equilibrium. By the addition of special buffer solutions the Karl Fischer reaction can proceed in the correct pH range. The two ready-to-use buffer solutions are used in the Karl Fischer titration method, particularly in connection with samples that may disturb the pH optimum for the Karl Fischer reaction. Normally the buffering of the reaction medium by the Karl Fischer reagent is sufficient. With some samples, however, such as strong bases or strong acids, the pH is shifted into the acid or alkaline range. In such cases additional buffer solution must be added to maintain the pH in the optimum range.

## Ordering information

Product	Content	Packaging	Ord. No.
Apura®   <b>Buffer solution for strong acids</b>   additive to the Karl Fischer solvent for titration of strong acids	500 ml	Glass bottle	<b>1.88035.0500</b>
Apura®   <b>Buffer solution for strong bases</b>   additive to the Karl Fischer solvent for titration of strong bases	500 ml	Glass bottle	<b>1.88036.0500</b>

# Apura<sup>®</sup> Water determination according to Karl Fischer

## Coulometric titration

### Apura<sup>®</sup> coulometric reagents

Page

- CombiCoulomat frit 166
- CombiCoulomat fritless 166

### Advantages

- For low water contents below 1 %
- Highly accurate and reliable reproducible results
- Same reagents for anode and cathode cell usable



# Coulometry

The coulometric Karl Fischer titration is preferred for water contents below 1 %. In coulometric Karl Fischer titration the iodine required for reaction is produced in the titration vessel itself by anodic oxidation at the generator electrode. The water content is accurately determined by calculation from the amount of current used over a specific time period. The measuring cell for coulometric determination consists of anode and cathode compartments which can be separated by a diaphragm.

# Coulometric reagents

## CombiCoulomat frit | CombiCoulomat fritless

Our combined coulometric reagents have long since proved to be excellently suited for water determinations according to the coulometric Karl Fischer method. They have the advantage that even in diaphragm cells only one reagent is required; this considerably simplifies the application and excludes mistaking an analyte for a catholyte.

### CombiCoulomat frit | CombiCoulomat fritless

The CombiCoulomat fritless can be used universally for cells with or without diaphragm. Both reagents, CombiCoulomat frit and CombiCoulomat fritless, are, of course, free from chlorinated hydrocarbons. The coulometric reagents Apura® CombiCoulomat frit and CombiCoulomat fritless are comparable to the volumetric one component reagents. All reaction components are contained in one solution. This makes handling easier for the user.

Compared with volumetric reagents, coulometric reagents do not contain iodine, but iodide. The iodine required for the Karl Fischer reaction to take place develops through electrochemical oxidation.

The coulometric method is primarily used for the determination of low water contents (<1 %).



## Coulometric reagents advantages

- No confusion between anode and cathode cell solutions, since only one solution is required
- Very accurate and reproducible results
- Cell very rapidly ready for use after the first filling
- For samples with low water contents – below 1 %

## Ordering information

Product	Content	Packaging	Ord. No.
<b>Apura®   CombiCoulomat frit</b>   for cells with diaphragm	500 ml	Glass bottle	<b>1.09255.0500</b>
<b>Apura®   CombiCoulomat fritless</b>   for cells with and without diaphragm	500 ml	Glass bottle	<b>1.09257.0500</b>
<b>Apura®   CombiCoulomat fritless</b>   for cells with and without diaphragm	2.5 l	Glass bottle	<b>1.09257.2500</b>

We recommend CombiCoulomat frit for coulometric devices with a diaphragm cell. For users working without a diaphragm or who frequently switch from cells with diaphragm to cells without diaphragm we recommend CombiCoulomat fritless. It can be used for both cell types.

# Apura<sup>®</sup> Water determination according to Karl Fischer

## Standards

### Apura<sup>®</sup> standards

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- Water standards in ampoules 170
- Water standard oven 1 % 170
- Water standard oil 15–30 ppm 170
- Lactose standard 5 % 171
- Sodium tartrate dihydrate 15.66 % 171
- Water standard 5 mg/ml 171

### Advantages

- Batch-specific Certificate of Analysis  
in the package for QM documentation
- Reliable and correct results



Within the European Union and even worldwide, increasing pressure demands that analytical results become more transparent and comparable. This is particularly true for water determinations according to Karl Fischer. In order to ensure this, reliable reference materials are necessary. The Apura® line offers a series of excellent standards. In addition to their use in monitoring Karl Fischer equipment and performing titer determination of volumetric Karl Fischer reagents, they can also be used for checking measuring results in order to evaluate their accuracy. To ensure the highest quality, our Apura® standards are manufactured under the strictest control and accurately measured using validated procedures.



# A series of excellent standards

## Water standards in ampoules

The Apura® range offers water standards in ampoules with different water contents. The standards consist of solvent mixtures with a defined water content. They are tested against standard reference material from NIST – National Institute of Standards and Technology, Gaithersburg, USA. Each package contains a batch-specific certificate with the exact measured water content of the batch, uncertainty data, measuring method, the NIST batch, and minimum shelf-life.

**Water standard 1 % is recommended for the use of titer determination with the volumetric method with one component and two component reagents. The two water standards 0.01 % and 0.1 % are used for the coulometric method.**

## Water standard oven 1 %

This standard is an entirely solid standard for the Karl Fischer oven method. In contrast to other solid standards like lactose, citrate or tartrate, this standard has a considerably lower water content of only 1 % and can be used over a wide temperature range from 140–400°C. The composition of the solid standard is based on an inorganic substance, which is stable even at high temperatures. In contrast, with organic substances decomposition reactions with formation of water may already set in at temperatures above 150°C, leading to erroneous results. The low water content of 1 % is particularly suited when using the Karl Fischer oven with a coulometer. Each package contains a batch-specific certificate with the exact measured water content of the batch, uncertainty data, measuring methods – Karl Fischer method and thermogravimetry – and minimum shelf-life.

## Water standard oil 15 – 30 ppm

This standard is especially designed for users who need to measure the water content in oil samples. The water standard exactly corresponds to the low water content and the matrix of oil samples and the exact value for each batch is stated in the certificate. Practical ampoules ensure ease of handling.



### Lactose standard 5 %

The Apura® lactose standard is a further solid standard with a water content of about 5 %. The batch-specific Certificate of Analysis states the exact value measured in the respective batch. The lactose standard can be applied universally. Due to its ease of solubility in methanol and its water content, this standard is suitable as a solid standard for coulometry, and also for volumetric Karl Fischer titrations. It is especially suitable if the working medium used consists of solvent mixtures in which sodium tartrate dihydrate is only slightly soluble. But it can also be used as an oven standard in a temperature range preferably from 140–160°C.

### Sodium tartrate dihydrate 15.66 %

Sodium tartrate dihydrate is the volumetric standard for Karl Fischer titration. Under normal conditions it is stable and non-hygroscopic. Sodium tartrate dihydrate has a stoichiometric water content of 15.66 % and is primarily used for titer determination in volumetry.

### Water standard 5 mg/ml

This liquid water standard is based on a long-chain alcohol. Under normal conditions the adjusted water content is maintained after opening the bottle. This water standard 5 mg/ml can be used for daily titer control, but is not recommended for exact titer determinations.

## Ordering information

Product	Content	Packaging	Ord. No.
Apura®   Water standard 0.01 %   1 g contains 0.10 mg H <sub>2</sub> O	10 x 8 ml	Glass ampoule	1.88050.0010
Apura®   Water standard 0.1 %   1 g contains 1.0 mg H <sub>2</sub> O	10 x 8 ml	Glass ampoule	1.88051.0010
Apura®   Water standard 1 %   1 g contains 10 mg H <sub>2</sub> O	10 x 8 ml	Glass ampoule	1.88052.0010
Apura®   Water standard oven 1 %   solid standard for KF oven method	5 g	Glass bottle	1.88054.0005
Apura®   Water standard oil   standard for oil samples for coulometric Karl Fischer titration (15–30 ppm)	10 x 8 ml	Glass ampoule	1.88055.0010
Apura®   Lactose standard 5 %   for volumetry and KF oven method	10 g	PE bottle	1.12939.0010
Apura®   Sodium tartrate dihydrate   volumetric standard for water determination acc. to Karl Fischer   contains 15.66 % H <sub>2</sub> O	100 g	PE bottle	1.06664.0100
Apura®   Water standard 5 mg/ml   1 ml contains 5 mg water	250 ml	Glass bottle	1.09259.0250

# Reference materials

## Certipur<sup>®</sup>

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.



Not all reference materials  
are the same ...

# Reference materials

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• ... in conductivity measurement	198
• ... in ion chromatography	202
• ... in UV-VIS spectroscopy	204
• ... in volumetry	206
• ... in special applications	208

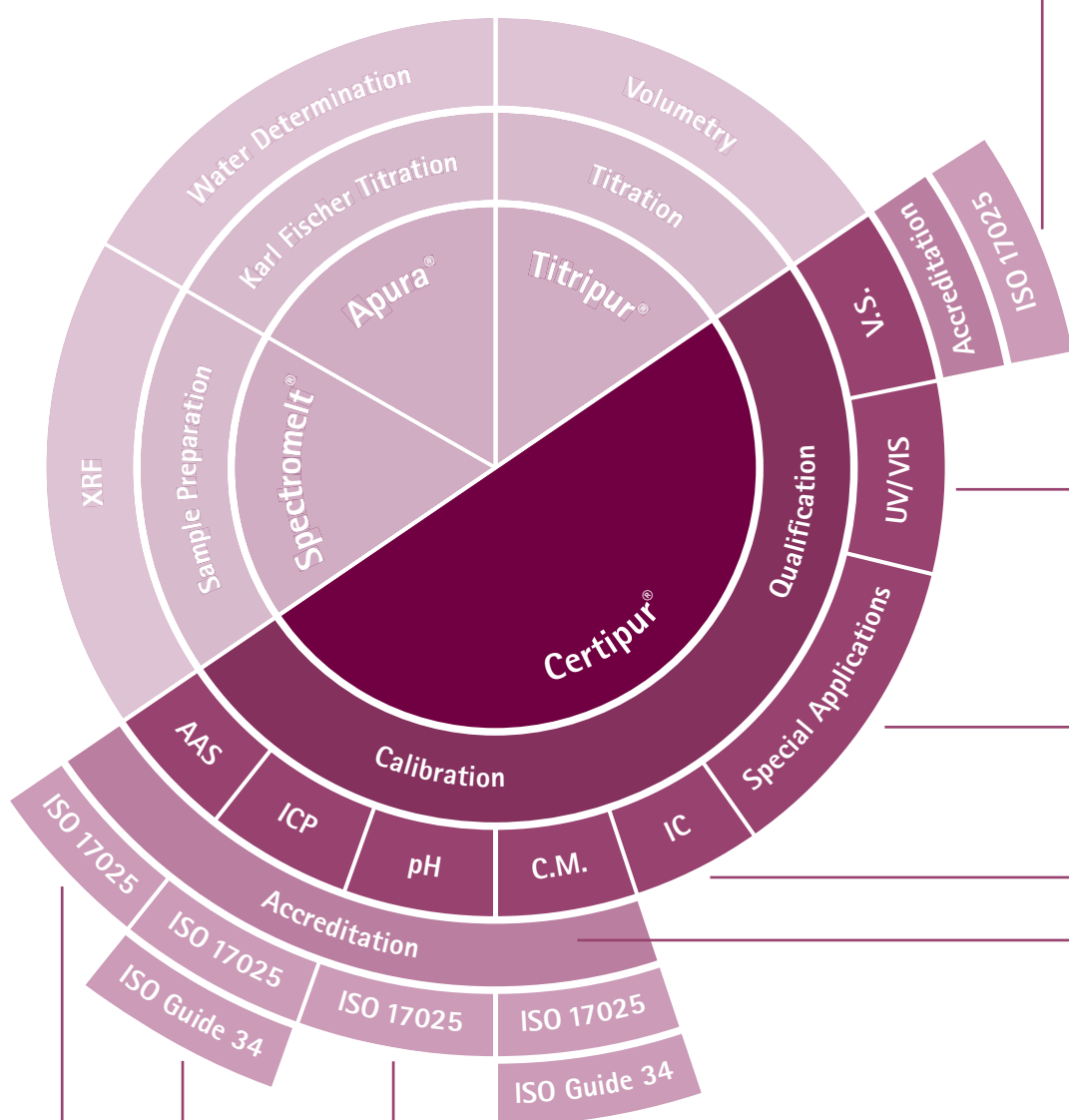
■ Advantages
• Outstanding, application-oriented quality
• Stringent quality management system
• Always reliable and reproducible results
• Accreditation according to ISO 17025
• Accreditation according to ISO Guide 34
• Traceability to standard reference material from NIST and PTB
• Strict specifications



[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

<b>ISO</b>	International Organization for Standardization
<b>NIST</b>	National Institute of Standards and Technology, USA
<b>PTB</b>	Physical Technical Institute, Germany
<b>Reag. Ph Eur</b>	Reagents specified by the European Pharmacopoeia
<b>USP</b>	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. Measured in Merck KGaA's accredited laboratory for mass fraction according to DIN EN ISO / IEC 17025.

### 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 | Hazen reference solution | Reference colour solutions according to Ph Eur | Refractive index Brix standards

### 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 DIN EN ISO / IEC 17025 and produced according to ISO Guide 34

### pH measurement [pH]

Buffer solutions and substances and buffer concentrates | Traceable to standard reference material from NIST and PTB | Measured in Merck KGaA's accredited laboratory for pH and conductivity measurement according to DIN EN ISO / IEC 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's accredited laboratory for mass fraction according to DIN EN ISO / IEC 17025 and produced according to ISO Guide 34

### 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's accredited laboratory for mass fraction according to DIN EN ISO / IEC 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 high sophisticated reference materials leads to avoid repeat analysis and save 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 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 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 DIN EN ISO / IEC 17025.

## ISO Guide 34

Certified reference materials according to ISO Guide 34 are for analytical labs that work to regulatory requirements. ISO Guide 34 is an 'umbrella' accreditation that consists of general guidelines for a producer of reference materials. It describes a set of stringent requirements that ensures all aspects of the production of our reference materials are carried out with measurable and traceable quality and competence. The guide covers the chain from the selection of the raw materials, the production, the characterization – which is the measurement method by the lab – to the storage and transportation. Furthermore, Merck Millipore is responsible for the assessment of the homogeneity and stability data. ISO Guide 34 means quality from start to finish. You can calibrate and monitor your equipment with complete confidence.

## 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

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## Advantages

- ICP standards according to ISO 17025 and ISO Guide 34
- Standards are traceable to primary standards
- ICP standards with an extensive Certificate of Analysis



**M**

## Certificate of Analysis

### Certipur® Certified Reference Material

**Product:** Merck KGaA, Frankfurt Str. 236, 65232 Darmstadt, Germany

**Accreditation:** Merck KGaA is accredited by the German accreditation authority DINAKS as registered reference material producer (D-RM-15193-01) in accordance with ISO Guide 34 and registered calibration laboratory (D-KL-05195-01-30) according to DIN EN ISO/IEC 17025.

**Ordering number:** 1.29126.0100

**Lot number:** HC061345

**Description of CRM:** Iron ICP Standard 1000 mg/l Fe

**Composition:** Fe(NO<sub>3</sub>)<sub>3</sub> in HNO<sub>3</sub>, 2.5% Suprapur®

**Certified value and uncertainty:** **992 mg/kg Fe ± 5 mg/kg Fe**  
Mass fraction w<sub>i</sub> of element with expanded uncertainty U<sub>95%</sub>

**Method of analysis:** Inductively coupled plasma optical emission spectrometry ICP-OES

**Traceability:** This reference material is directly traceable to the corresponding primary NIST SRM® 3133a, lot 681001. NIST National Institute of Standards and Technology, Gaithersburg, USA

**Preparation:** This reference material is prepared gravimetrically from high purity iron nitrate dissolved in nitric acid Suprapur® and diluted with filtered (0.22 µm high purity water (18 MΩ)). All balances are regularly calibrated.

**Storage:** Store at +15 °C to +25 °C tightly closed in the original container.

**Application and correct use:** This reference material is intended for use as a calibration standard in element analysis. Store and before use and never pipet directly from the original container. Caution concerning the nature of any hazard and appropriate precautions to be taken are provided in the material safety data sheet accompanying the material.

**Date of release:** 2013/04/09

**Minimum shelf life:** 2016/04/30

*A. Gildner*  
Dir. Ing. A. Gildner  
(Laboratory Manager)



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**Expanded uncertainty U<sub>95%</sub>:** The expanded uncertainty U<sub>95%</sub> is calculated as U<sub>95%</sub> = k · u<sub>95%</sub>, where k = 2 is the coverage factor for a 95% coverage probability and u<sub>95%</sub> is the combined standard uncertainty in accordance to ISO Guide 34.

**Model:**  $U_{95\%} = \sqrt{u_{\text{homogeneity}}^2 + u_{\text{repeatability}}^2 + u_{\text{matrix}}^2}$

The combined standard uncertainty u<sub>95%</sub> is obtained from the standard uncertainties of the characteristics, the homogeneity and the stability.

**Homogeneity:** is the uncertainty in accordance to DIN EN ISO/IEC 17025 which includes the contribution of the primary reference material, the homogeneity and the measuring system.

**Repeatability:** is the between-bottle variation in accordance to ISO Guide 34. The assessment of homogeneity is performed by analysis of a representative number of systematically chosen sample units.

**Matrix:** is the uncertainty obtained from short-term and long-term stability in accordance to ISO Guide 34. The stability studies are the basis for the quantification of the measured shift of the reference material for the unopened bottle.

The user should be aware of the additional effect of transition losses of solvent through the container walls of the unopened bottle. The effect leads to an increase of the mass fraction in the range of 0.543 mg/kg per month. It is the responsibility of the user to account for this effect by  $w_i(t) = w_i(0) \cdot (1 + k \cdot t)$

**W<sub>i</sub>:** = element mass fraction after storage time in months  
**t:** = storage in months of the unopened bottle  
**w<sub>i</sub>(t):** = element mass fraction at the time of certification

**Further information:**

**Density:** The density of the elemental standard solution is 1.015 g/cm<sup>3</sup> at 20 °C.

**Calculated mass concentration:** **A(t) = 1001 mg/l Fe**

**Trace impurities in µg/g:**

As	0.03	Co	0.02	Cr	0.01	Fe	0.03	Mo	0.01	Si	0.01
Al	0.01	Cu	0.02	F	0.02	Ca	0.01	Ni	0.01	Se	0.01
Ag	0.01	Er	0.01	K	0.01	P	0.01	Sr	0.01	Te	0.01
Ba	0.02	Gd	0.01	Li	0.01	Pb	0.01	Th	0.01	V	0.01
B	0.01	Hf	0.01	Lu	0.01	Pv	0.01	Na	0.02	W	0.01
Be	0.01	Ir	1	La	0.02	Re	0.02	Si	0.01	Zn	0.01
Br	0.01	Os	0.01	Mg	0.02	Rh	0.01	Sn	0.01		
Cd	0.01	Pr	0.01	Mn	0.02	Sb	0.02	Ta	0.01		
Ce	0.01	Sm	0.01	Na	0.02	Te	0.02	Tb	0.01		
Cl	0.01	Sr	0.01	Nb	0.01	Th	0.01	Te	0.01		
Cr	0.01	Ti	0.01	Ni	0.01	Th	0.01	Te	0.01		
Ca	0.01	Tl	0.01	Se	0.01	Th	0.01	Te	0.01		
Cu	0.01	U	0.01	Si	0.01	Th	0.01	Te	0.01		
D	0.01	Y	0.01	Sn	0.01	Th	0.01	Te	0.01		
E	0.01	Zn	0.01	Te	0.01	Th	0.01	Te	0.01		

All trace level elements were determined by ICP-AES / ICP-OES or graphite furnace AAS. The values are measured at the date of release and are subject to unavoidable systematic variations. Therefore they are not part of the product specification.

For more detailed information please visit the certification report on: [www.merckmillipore.com](http://www.merckmillipore.com).

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## 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.

## ICP single-element standards

The quality control of our ICP single-element standards is carried out by the accredited calibration laboratory according to DIN EN ISO / IEC 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.

Our ICP single-element standards are produced according to ISO Guide 34.



### Certipur® ICP standards A-M

Designation	Element	Composition	ICP 1000 mg/l Ord. No. [100 ml]	ICP 10000 mg/l Ord. 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	–
<b>C</b> Cadmium	Cd	Cd(NO <sub>3</sub> ) <sub>2</sub> in HNO <sub>3</sub> 2 – 3 %	1.70309.0100	–
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
<b>D</b> Dysprosium	Dy	Dy <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2 – 3 %	1.70315.0100	–
<b>E</b> Erbium	Er	Er <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2 – 3 %	1.70316.0100	–
Europium	Eu	Eu <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2 – 3 %	1.70317.0100	–
<b>G</b> Gadolinium	Gd	Gd <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 2 – 3 %	1.70318.0100	–
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 Ord. No. [100 ml]	ICP 10000 mg/l Ord. 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(NO <sub>3</sub> ) <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	–
	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	–
T	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	–
	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	ZrCl <sub>4</sub> in HCl 7 %	1.70370.0100	1.70390.0100

## Certipur® standards 10 mg/l

	Designation	Element	Composition	ICP 10 mg/l Ord. 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 Ord. No. 1.15474.0100	Multi-element standard IV 23 elements, 1000 mg/l Ord. No. 1.11355.0100	Multi-element standard VIII 24 elements, 100 mg/l Ord. No. 1.09492.0100	Multi-element standard IX toxic elements, Chromium VI Ord. No. 1.09494.0100	Multi-element standard X for surface water, equivalent to NIST SRM 1643d   Ord. No. 1.09493.0100	Multi-element standard XI for sewage sludge Ord. 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
G	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**

Certipur® Multi-element standards			ICP calibration standards	Multi-element standard XIII 15 elements Ord. No. 1.09480.0100	Multi-element standard XVI 21 elements Ord. No. 1.09487.0100	Multi-element standard XVII HCl soluble elements Ord. No. 1.09495.0100	ICP/MS calibration standards	Multi-element standard VI calibration in ICP MS, 30 elements Ord. No. 1.10580.0100	Multi-element standard XXI set, contains 274473 and 108623 Ord. No. 1.09498.0001	Tuning solution	Multi-element standard XXIV tuning solution 700 ES Ord. No. 1.09411.0500
Designation	Element										
A	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	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		-	
C	Boron	B	-	-	-		100 mg/l	-		-	
	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	
	Gallium	Ga	-	-	-		10 mg/l	10 mg/l		-	
	Hafnium	Hf	-	-	100 mg/l		-	-		-	
I	Indium	In	-	-	-		-	10 mg/l		-	
	Iridium	Ir	-	-	100 mg/l		-	-		-	
	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	
	Nickel	Ni	100 mg/l	100 mg/l	-		10 mg/l	10 mg/l		50 mg/l	
	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	
	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		-	-		-	
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	-	-	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	Multi-element standard XXIII for mass calibration Ord. No. 1.09410.0500	Graphit furnace AAS stand.	Multi-element standard XVIII for calibration Ord. No. 1.09500.0100	Wavelength calibration stand.	Multi-element standard V HCl soluble elements Ord. No. 1.10714.0500	Multi-element standard XIV HCl soluble elements Ord. 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		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		-		-	-
	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	-
	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>		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]	Ord. No.
A	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	Barium	Ba	BaCl <sub>2</sub> in 7 % HCl	1.09968.0001
C	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
F	Fluoride	F	KF in water	1.09869.0001
G	Gold	Au	H(AuCl <sub>4</sub> ) in 12.72 % HCl	1.09868.0001
I	Iron	Fe	FeCl <sub>3</sub> in 15 % HCl	1.09972.0001
L	Lead	Pb	Pb(NO <sub>3</sub> ) <sub>2</sub> in water	1.09969.0001
	Lithium	Li	LiCl in water	1.09934.0001
M	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
N	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
P	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
S	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
	Titanium	Ti	(NH <sub>4</sub> ) <sub>2</sub> TiF <sub>6</sub> in water	1.09829.0001
V	Vanadium	V	VOSO <sub>4</sub> in 8.6 % H <sub>2</sub> SO <sub>4</sub>	1.09994.0001
Z	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 in Merck KGaA, Darmstadt, Germany, accredited laboratory for mass fraction according to DIN EN ISO / IEC 17025. 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 Ord. No. [100 ml]	Concentration 1000 mg/l Ord. No. [500 ml]
<b>A</b>	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>B</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
	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
<b>C</b>	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
	Gold	Au	H(AuCl <sub>4</sub> ) in HCl 2 mol/l	1.70216.0100	1.70216.0500
	Indium	In	In(NO <sub>3</sub> ) <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.19504.0100	-
<b>I</b>	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
	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
<b>L</b>	Lithium	Li	LiNO <sub>3</sub> in HNO <sub>3</sub> 0.5 mol/l	1.70223.0100	1.70223.0500
	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
<b>M</b>	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
	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
<b>P</b>	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
	Scandium	Sc	Sc <sub>2</sub> O <sub>3</sub> in HNO <sub>3</sub> 1 mol/l	1.19513.0100	1.19513.0500
<b>S</b>	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
	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
<b>T</b>	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
	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
	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
<b>Z</b>	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	Ord. 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	Ord. 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	Ord. No. [2.5 l]
Standard oil for AAS (30–40 mPas)	1.13898.2500



# Certipur® reference materials for reliable calibration in pH measurement

## Certipur® products

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## Advantages

- Measured and certified 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



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 certified in our DIN EN ISO / IEC 17025 accredited laboratory for pH 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 and is accredited by the German accreditation body DAkkS (Deutsche Akkreditierungsstelle) 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**

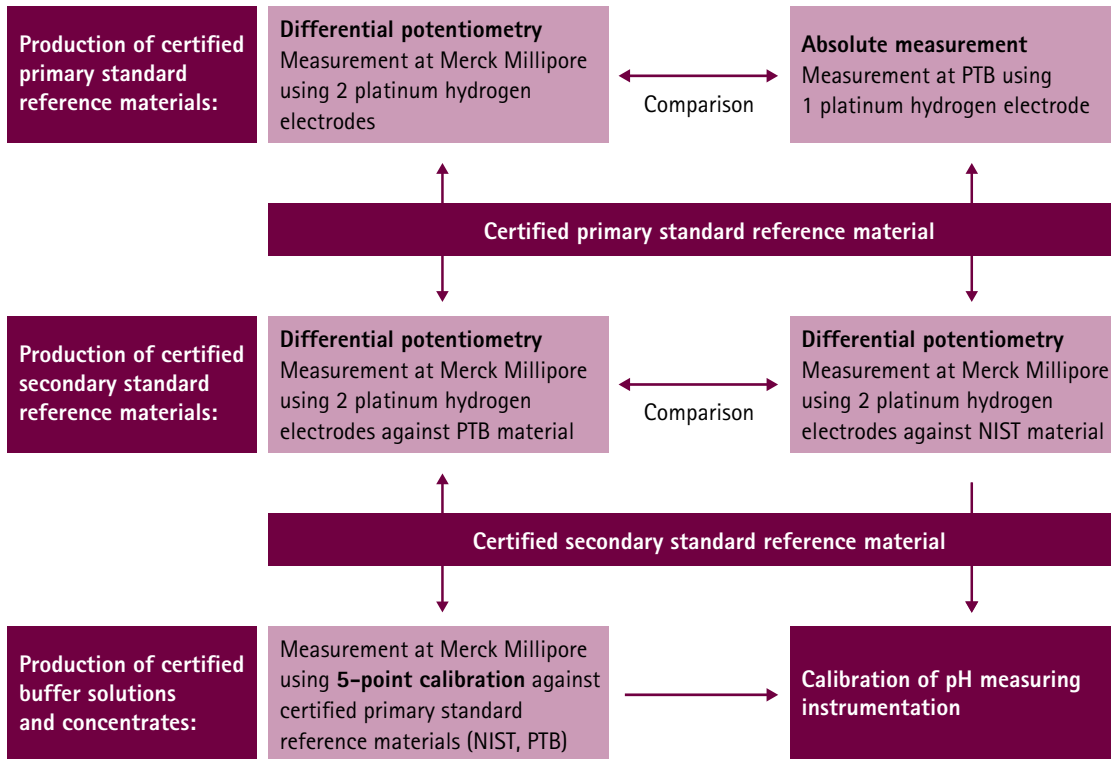
For certification of our secondary reference materials Merck Millipore produces its own primary reference materials, which are certified and characterized by the German Metrological Institute PTB (Physical Technical Institute, Braunschweig, Germany). Additionally our laboratory for pH measurement is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



Certified secondary reference buffer solutions

## Quality control of certified secondary reference buffers

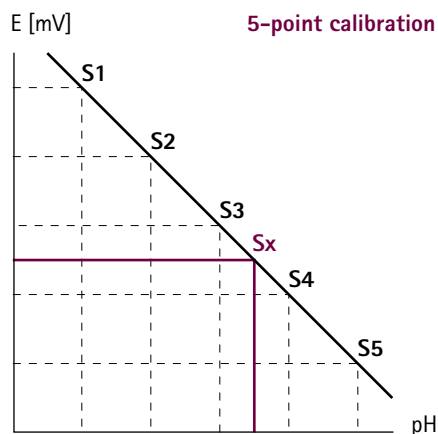
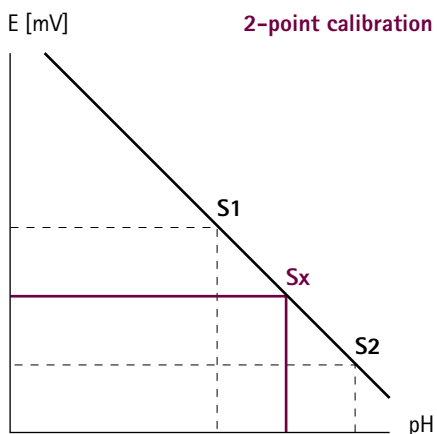
Merck Millipore offers certified secondary standard reference buffer solution and substances which are at most used for extremely precise calibration, qualifying and monitoring of pH instruments and testing other buffer solutions. These certified secondary reference materials are tested with two platinum hydrogen electrodes using differential potentiometry. The uncertainty of this measuring method is  $\pm 0.003$  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 Reference buffers are employed for precisely calibrating and monitoring of pH measurement instruments and buffer solutions. The uncertainty of those buffer solutions and substances is  $\pm 0.003$  pH units. Each buffer is accompanied by a Certificate of Analysis showing the relevant data for every quality management system and requirements. The quality control is carried out in the Merck Millipore's accredited calibration laboratory using differential potentiometry with two specially developed platinum hydrogen electrodes. This method allows the comparison of the certified secondary reference buffers to the corresponding primary reference materials by PTB (Physical Technical Institute, Germany) and NIST (National Institute of Standards and Technology, USA).

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

Designation	pH value [25°C]	Package size	Ord. 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	Ord. 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 according to DIN EN ISO / IEC 17025 with a combined glass electrode and 5-point calibration according to DIN 19268 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	Content	Packaging	Ord. No.
Certipur® buffer solution	1.00	Glycine, Sodium chloride, Hydrogen chloride	1000 ml	PE bottle	1.09432.1000
Certipur® buffer solution	2.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1000 ml	PE bottle	1.09433.1000
			4 l	Titripac®	1.09433.4000
			10 l	Titripac®	1.09433.9010
Certipur® buffer solution	3.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1000 ml	PE bottle	1.09434.1000
Certipur® buffer solution	4.00	Citric acid, Sodium hydroxide, Hydrogen chloride	1000 ml	PE bottle	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	PE bottle	1.07827.1000
Certipur® buffer solution	5.00	Citric acid, Sodium hydroxide	1000 ml	PE bottle	1.09436.1000
Certipur® buffer solution	6.00	Citric acid, Sodium hydroxide	1000 ml	PE bottle	1.09437.1000
			4 l	Titripac®	1.09437.4000
Certipur® buffer solution	6.88	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	1000 ml	PE bottle	1.07294.1000
Certipur® buffer solution	7.00	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	1000 ml	PE bottle	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	PE bottle	1.09460.1000
			4 l	Titripac®	1.09460.4000
Certipur® buffer solution	9.00	Boric acid, Sodium hydroxide, Potassium chloride	1000 ml	PE bottle	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	PE bottle	1.01645.1000
Certipur® buffer solution	10.00	Boric acid, Sodium hydroxide, Potassium chloride	1000 ml	PE bottle	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	PE bottle	1.09462.1000

## Certipur® buffer solutions [25°C]

Designation	pH value [25°C]	Composition	Content	Packaging	Ord. No.
Certipur® buffer solution	1.00	Glycine, Sodium chloride, Hydrogen chloride	500 ml	PE bottle	1.09441.0500
			4 l	Titripac®	1.09441.4000
Certipur® buffer solution	2.00	Citric acid, Sodium hydroxide, Hydrogen chloride	500 ml	PE bottle	1.09442.0500
			4 l	Titripac®	1.09442.4000
Certipur® buffer solution	3.00	Citric acid, Sodium hydroxide, Hydrogen chloride	500 ml	PE bottle	1.09444.0500
			4 l	Titripac®	1.09444.4000
Certipur® buffer solution	4.00	Citric acid, Sodium hydroxide, Hydrogen chloride	500 ml	PE bottle	1.09445.0500
			4 l	Titripac®	1.09445.4000
Certipur® buffer solution	4.01	Potassium hydrogen phthalate	500 ml	PE bottle	1.09406.0500
			1 l	PE bottle	1.09406.1000
			4 l	Titripac®	1.09406.4000
Certipur® buffer solution	5.00	Citric acid, Sodium hydroxide	500 ml	PE bottle	1.09446.0500
			4 l	Titripac®	1.09446.4000
Certipur® buffer solution	6.00	Citric acid, Sodium hydroxide	500 ml	PE bottle	1.99036.4000
			4 l	Titripac®	1.99036.0500
Certipur® buffer solution	7.00	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	500 ml	PE bottle	1.09407.0500
			1 l	PE bottle	1.09407.1000
			4 l	Titripac®	1.09407.4000
Certipur® buffer solution	8.00	Boric acid, Sodium hydrogen, Hydrogen chloride	500 ml	PE bottle	1.99038.0500
			4 l	Titripac®	1.99038.4000
Certipur® buffer solution	9.00	Boric acid, Sodium hydrogen, Potassium chloride	500 ml	PE bottle	1.09408.0500
			1 l	PE bottle	1.09408.1000
			4 l	Titripac®	1.09408.4000
Certipur® buffer solution	10.00	Boric acid, Sodium hydrogen, Potassium chloride	500 ml	PE bottle	1.09409.0500
			1 l	PE bottle	1.09409.1000
			4 l	Titripac®	1.09409.4000
Certipur® buffer solution	11.00	Boric acid, Sodium hydrogen, Potassium chloride	500 ml	PE bottle	1.99041.0500
			4 l	Titripac®	1.99041.4000
Certipur® buffer solution	12.00	di-Sodium hydrogen phosphate, Sodium hydroxide	4 l	Titripac®	1.99022.4000

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

Designation	pH value [20°C]	Composition	Content	Packaging	Ord. No.
Certipur® buffer solution	4.00 [red]	Citric acid, Sodium hydroxide, Hydrogen chloride	500 ml	PE bottle	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	PE bottle	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	PE bottle	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	PE bottle	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	Content	Packaging	Ord. No.
Certipur® buffer solution	4.00 [red]	Citric acid, Sodium hydroxide, Hydrogen chloride	500 ml	PE bottle	1.99054.0500
			4 l	Titripac®	1.99054.4000
Certipur® buffer solution	7.00 [yellow]	di-Sodium hydrogen phosphate, Potassium dihydrogen phosphate	500 ml	PE bottle	1.99057.0500
			4 l	Titripac®	1.99057.4000
Certipur® buffer solution	10.00 [blue]	Boric acid, Potassium chloride, Sodium hydrogen	500 ml	PE bottle	1.99050.0500
			4 l	Titripac®	1.99050.4000



## 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 19268 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	Ord. 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 19268 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	Ord. No.
Certipur® buffer solution	2.00	Citric acid, Sodium hydroxide, Hydrogen chloride	30 sachets x 30 ml	1.99012.0001
Certipur® buffer solution	4.00	Citric acid, Sodium hydroxide, Hydrogen chloride	30 sachets x 30 ml	1.99064.0001
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

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- Certipur<sup>®</sup> conductivity sachets 201

## Advantages

### 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 operates a comprehensive quality management system and is accredited by the German accreditation body to the current DIN EN ISO / IEC 17025 standard. Additionally we now also have the ISO Guide 34 accreditations as reference material producer for conductivity standards.



## Certified Secondary Reference Materials for conductivity measurement

Merck Millipore's calibration standards for conductivity measurement have a double accreditation according to DIN EN ISO / IEC 17025 and according to ISO Guide 34

For certification of our secondary reference materials for conductivity measurement Merck Millipore produces its own primary reference materials which are certified and characterized by the German Metrological Institute PTB (Physical Technical Institute, Braunschweig, Germany). Additionally the secondary conductivity standards are measured against the certified primary reference materials from PTB Physical Technical Institute, Germany) and NIST (National Institute of Standards and Technology, USA).



### Certipur® reference material for conductivity measurement

Designation	Nominal conductivity [mS/cm] at 25°C	Package size	Ord. 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 sachets 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 sachets 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	Ord. 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

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## Advantages

- 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	Ord. 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	Ord. 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	Ord. 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<sup>®</sup> reference materials for reliable calibration in UV-VIS spectroscopy

## Certipur<sup>®</sup> products

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- UV-VIS standards

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## Advantages

- 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	Ord. 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	Ord. 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

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

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## Advantages

- Secondary reference material for accurate titer determination
- Highly pure materials traceable to NIST
- In accordance to the reagents part of Pharmacopeias
- Measured in the ISO 17025 accredited laboratory



## Certipur® secondary reference materials in volumetry

Merck Millipore's laboratory for mass fraction is accredited according to DIN EN ISO / IEC 17025. 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 in our accredited laboratory according to DIN EN ISO / IEC 17025.

### Volumetric standards

Analysis	Designation	Package size	Ord. 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

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## Advantages

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





## 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	Ord. 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

### NEW: Brix Standards Certipur® for refractometer calibration

Brix Standards Certipur® are high quality sucrose calibration standards that can be used for the determination of the Brix value by all types of refractometers. Featuring extended certification as well as extended shelf life, they ensure unrivalled reliability and efficiency.

### Certipur® refractive index standards traceable to SRM from NIST and PTB

Designation	Package size	Ord. No.
Refractive index standard traceable to SRM from NIST and PTB 0° Brix	1 box with 5 x 8 ml ampoules	5.00400.0001
Refractive index standard traceable to SRM from NIST and PTB 5° Brix	1 box with 5 x 8 ml ampoules	5.00405.0001
Refractive index standard traceable to SRM from NIST and PTB 10° Brix	1 box with 5 x 8 ml ampoules	5.00410.0001
Refractive index standard traceable to SRM from NIST and PTB 20° Brix	1 box with 5 x 8 ml ampoules	5.00420.0001
Refractive index standard traceable to SRM from NIST and PTB 30° Brix	1 box with 5 x 8 ml ampoules	5.00430.0001
Refractive index standard traceable to SRM from NIST and PTB 40° Brix	1 box with 5 x 8 ml ampoules	5.00440.0001
Refractive index standard traceable to SRM from NIST and PTB 50° Brix	1 box with 5 x 8 ml ampoules	5.00450.0001
Refractive index standard traceable to SRM from NIST and PTB 60° Brix	1 box with 5 x 8 ml ampoules	5.00460.0001

## 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	Ord. 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



## 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): 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	Ord. 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	Ord. 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	Ord. No.
Hazen 500 color reference solution	250 ml	1.00246.0250

# Fluxes for XRF

## Spectromelt®

Spectromelt® materials for fluxing digestion or pressing of powder tablets are the perfect assistant for your X-ray fluorescence analysis (XRF). The purity of Spectromelt® borates gives the necessary degree of precision and our grinding aid materials are specially developed for automated sample preparation.



# Fluxes for XRF

■ Contents	Page
• Quality standards	214
• Reagents for sample preparation in XRF analysis	216
• Ordering information	218

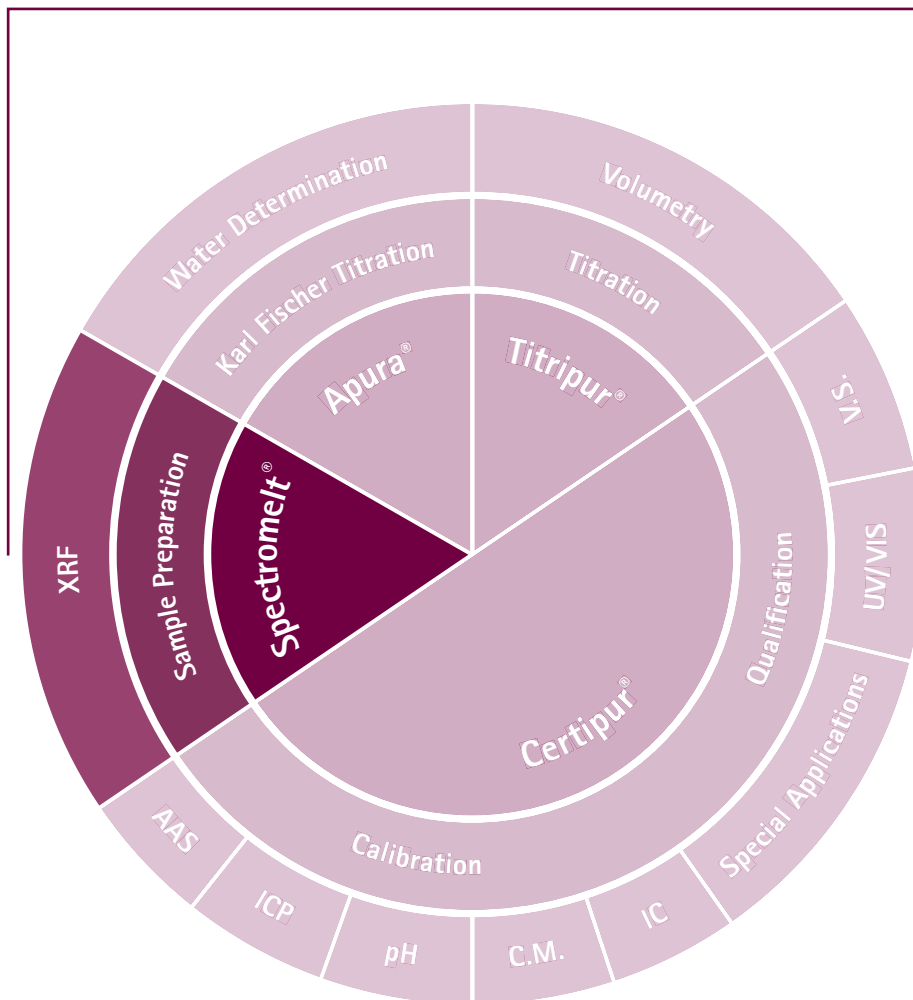
- | ■ Advantages   |
|--|
| <ul style="list-style-type: none"><li>• Spectromelt® for fluxing digestion as granulate or as fused material</li><li>• Spectromelt® tablets as grinding and tableting aid</li><li>• Spectromelt® tablets can be used for automated sample preparation</li><li>• High purity materials</li><li>• Batch-to-batch consistency</li><li>• Extensive specification of trace impurities</li></ul> |



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

# Spectromelt® – our quality standard in instrumental analysis

Choose Spectromelt® for your sample preparation and get the best results in XRF.  
Spectromelt® is suitable for fluxing and grinding techniques.



## Specification

**ISO** Standards of the International Organization for Standardization

## Quality grades for your individual needs

### Spectromelt®

Spectromelt® fluxes for XRF | High purity borates for fluxing | Tablets for automated sample preparation



# Reagents for sample preparation in X-ray fluorescence (XRF) analysis

Two techniques are used for XRF sample preparation: fluxing or grinding.

## Fluxing

Spectromelt® A-series is based on lithium borates, whereas Spectromelt® B-series is based on sodium borate. Fusion with our borates gives a high homogeneity of the sample. Interference of trace impurities in the sample can be reduced by using a high purity flux. All Spectromelt® fluxes with their extensive specifications are analyzed for inorganic trace impurities and have a high batch-to-batch consistency. This reduces necessary adjustments of the instruments and increases the accuracy of the measurement. We offer Spectromelt® in powder and fused quality. The fused particles are spherical, have a small particle size distribution and a higher bulk density. The material is easy to handle and has a low loss on ignition. Fluxes are also available with integrated non-wetting-agent, such as lithium bromide.





### Grinding

Tabletting the sample is an alternative to fusion. The Spectromelt® C-series is especially developed as a grinding and tabletting aid. In automated sample preparation of powder samples speed of analysis is an important factor. Spectromelt® C10, C15 and C20 are offered as tablets with a weight of 333 mg each. The tablets are robust, so the automated sample preparation will not be disturbed. Tablets made with Spectromelt® C10 are very stable for analysis and storage. Spectromelt® C10 is developed to have distinguishable adhesive properties. Spectromelt® C20 is compared to C10 less hygroscopic because of an adjusted composition. C20 is preferable for damp climate and its properties effect fewer residues in the grinder. The new Spectromelt® C15 combines the adhesive properties of C10 and the lower hygroscopy of C20. The improved homogenization of the sample gives more precise results in analysis. The new Spectromelt® C15 MP micropowder can be used as a grinding and tabletting aid. Hoechst Wax C can only be used as a tabletting aid.

# Ordering information Fluxes for XRF

## Spectromelt® A series Lithium borates

Product	Composition	Content	Packaging	Ord. No.
Spectromelt® A 10	Lithium tetraborate	1 kg	PE bottle	1.10783.1000
		5 kg	PE bottle	1.10783.5000
		25 kg	PE drum	1.10783.9025
Spectromelt® A 12 *	66 % Lithium tetraborate, 34 % lithium metaborate	1 kg	PE bottle	1.11802.1000
		5 kg	PE bottle	1.11802.5000
Spectromelt® A 14	51 % Lithium tetraborate, 27 % lithium metaborate, 12 % lanthanum (III) oxide, 10 % lithium fluoride	1 kg	PE bottle	1.11724.1000
Spectromelt® A 20 *	Lithium metaborate	1 kg	PE bottle	1.12996.1000
Spectromelt® A 22 *	22 parts lithium metaborate, 12 parts lithium tetraborate	1 kg	PE bottle	1.24001.1000
Spectromelt® A 50 *	50 % Lithium tetraborate, 50 % lithium metaborate	1 kg	PE bottle	1.17057.1000
Spectromelt® A 100 *	Lithium tetraborate	1 kg	PE bottle	1.12630.1000
		5 kg	PE bottle	1.12630.5000
Spectromelt® A 1000	Lithium tetraborate with 0.07 % lithium bromide	1 kg	PE bottle	1.13175.1000
		5 kg	PE bottle	1.13175.5000
* = Spectromelt® fused quality	During the production process of the Spectromelt® the material is molten to achieve high density particles. The particles are spherical and have a small particle size distribution. The fused material has a higher density than the granulated material. For the end-user the advantage is that the fused material is more easy to handle in the laboratory and has a lower loss on ignition.			

## Spectromelt® B series Sodium borates

Product	Composition	Content	Packaging	Ord. No.
Spectromelt® B 10	di-Sodium tetraborate	1 kg	PE bottle	1.06304.1000
		5 kg	PE bottle	1.06304.5000

## Spectromelt® C series Grinding aids

Product	Composition	Content	Packaging	Ord. No.
Spectromelt® C 10	Grinding and tableting aid Tablet weight: 333 mg	5 kg	PE bottle	1.13990.5000
Spectromelt® C 15	Grinding and tableting aid Tablet weight: 333 mg	5 kg	PE bottle	1.17062.5000
Spectromelt® C 15 MP	Grinding and tableting aid Micropowder	1 kg	PE bottle	1.17074.1000
Spectromelt® C 20	Grinding and tableting aid Tablet weight: 333 mg	5 kg	PE bottle	1.13934.5000
Hoechst wax C micropowder	Tableting aid	1 kg	PE bottle	1.09014.1000

## Additives for fluxing and grinding

Product	Content	Packaging	Ord. No.
Boric acid Suprapur®	50 g	PE bottle	1.00765.0050
	500 g	PE bottle	1.00765.0500
Lithium carbonate Suprapur®	50 g	PE bottle	1.05676.0050
	250 g	PE bottle	1.05676.0250
Sodium carbonate anhydrous Suprapur®	50 g	PE bottle	1.06395.0050
	500 g	PE bottle	1.06395.0500
Lithium bromide hydrate Suprapur®	50 g	PE bottle	1.05668.0050
	250 g	PE bottle	1.05668.0250
Lithium bromide solution w=25 %	50 ml	PE bottle	1.00884.0050
Potassium Iodide Suprapur®	50 g	PE bottle	1.05044.0050
	500 g	PE bottle	1.05044.0500
Sodium nitrate Suprapur®	50 g	PE bottle	1.06546.0050
Lithium nitrate Suprapur®	100 g	PE bottle	1.05653.0100
	500 g	PE bottle	1.05653.0500
Lithium Fluoride Suprapur®	50 g	PE bottle	1.05686.0050
	500 g	PE bottle	1.05686.0500
Lanthanum (III) Oxide <i>for atomic absorption spectroscopy</i>	25 g	Glass bottle	1.10982.0025

## Application notes for Spectromelt® fluxing and grinding

Spectromelt® type	Recommended for digestion of
A10, A 100, A1000	Basic oxides carbonates, ground samples, magnesite, aluminum silicates, bauxite, rare earth oxide, cement, sludges, phosphate
A 12, 14	Borax, cement, sludges, sand, chromium
A 20, A 22	Acidic oxides, silicates, sand, clay, spineless
B 10	Iron, iron-, chromium-, tin- and titanium ores, rare earth minerals
C 10, C 20	Ores, slags; in steel and cement analysis
LiBr, KI	Non wetting agent increases the surface tension of the melt and simplifies removal out of the crucible.

# High purity acids and bases

## Suprapur® | Ultrapur

Digestion with acids is often used during sample preparation. The reagents for sample preparation have an important impact on the outcome of the measurement. In modern instrumental trace analysis any impurity can disturb the measurement. Acids with low impurities should be used to minimize the interference on the instrument signal. High purity acids and bases Suprapur® and Ultrapur offer the most suitable purity of wet digestion materials and they have low impurities during the entire minimum shelf life.



# High purity acids and bases

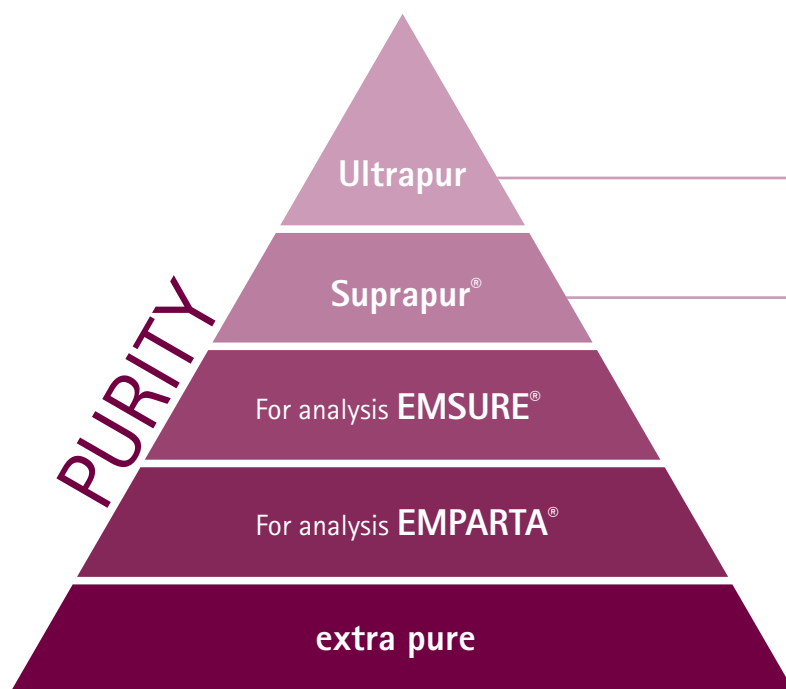
■	Contents	Page
	• Quality standards	222
	• Reagents for wet digestion	224
	• Ordering information	226
■	Advantages	
	• Choose your purity grade for instrumental trace analysis	
	• Suprapur® acids filled in borosilicate glass or extra pure PE material	
	• Ultrapur acids filled in PFA bottles	
	• Certificate of Analysis gives an extensive impurity profile	



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

# Different grades to meet your needs

Take a look at our high purity material for wet digestion Suprapur® and Ultrapur, especially for instrumental trace analysis whenever you are using an acid, you have to consider your application, your target and of course your budget. Each application is different and therefore we offer a wide range of acids in different grades and many different packaging sizes and materials. No matter if you need to perform a highly critical analysis or preparing basic lab applications, with our brand names you will always find the most suitable reagent.



## Quality grades for your individual needs

### Ultrapur

High purity acids, hydrogen peroxide | Highly sophisticated instrumental trace analysis, e.g. ICP-MS | Specified parameters in ppt range

### Suprapur®

High purity acids, hydrogen peroxide | Highly sophisticated instrumental trace analysis, e.g. AAS and ICP-OES | Specified parameters in ppb range

### Acids EMSURE® and EMPARTA®

- For classical analysis we offer a range of acids for analysis EMSURE® and EMPARTA®
- For further information please have a look in chapter »Acids for analysis«

### Acids extra pure

- For preparative lab applications and cleaning purposes
- For further information please have a look in chapter »Acids for analysis«

# Reagents for wet digestion

## Suprapur® | Ultrapur

The more sensitive the instrumental detection becomes, the more important it is to use highly pure reagents. Merck Millipore provides a whole range of standards and reagents that meet the demands of modern instrumental analysis. During the sample preparation it is important to know the blank values of the reagents. On the certificate you find the specification and actual batch values of the parameters.

**Certificate of Analysis**

1.01518.1000 Nitric acid 60% Ultrapur

Batch: 81004619

	Spec. Values	Batch Values	Method
Acidity (calculated)	100.0	100.0	
Ag (Silver)	≤ 0.20	≤ 0.1	ICP-MS
Al (Aluminum)	≤ 0.01	≤ 0.01	ICP-MS
As (Arsenic)	≤ 0.20	≤ 0.1	ICP-MS
Au (Gold)	≤ 0.20	≤ 0.1	ICP-MS
B (Boron)	≤ 1.00	≤ 1.00	ICP-MS
Br (Bromine)	≤ 0.20	≤ 0.1	ICP-MS
Ca (Calcium)	≤ 0.01	≤ 0.01	ICP-MS
Co (Cobalt)	≤ 0.01	≤ 0.01	ICP-MS
Cd (Cadmium)	≤ 0.01	≤ 0.01	ICP-MS
Ce (Cerium)	≤ 0.01	≤ 0.01	ICP-MS
Cr (Chromium)	≤ 0.01	≤ 0.01	ICP-MS
Cu (Copper)	≤ 0.01	≤ 0.01	ICP-MS
D (Deuterium)	≤ 0.01	≤ 0.01	ICP-MS
Fe (Iron)	≤ 0.01	≤ 0.01	ICP-MS
Fluoride	≤ 0.01	≤ 0.01	ICP-MS
Hg (Mercury)	≤ 0.01	≤ 0.01	ICP-MS
Li (Lithium)	≤ 0.01	≤ 0.01	ICP-MS
Mn (Manganese)	≤ 0.01	≤ 0.01	ICP-MS
N (Nitrogen)	≤ 0.01	≤ 0.01	ICP-MS
Ni (Nickel)	≤ 0.01	≤ 0.01	ICP-MS
P (Phosphorus)	≤ 0.01	≤ 0.01	ICP-MS
Pb (Lead)	≤ 0.01	≤ 0.01	ICP-MS
Se (Selenium)	≤ 0.01	≤ 0.01	ICP-MS
Si (Silicon)	≤ 0.01	≤ 0.01	ICP-MS
S (Sulfur)	≤ 0.01	≤ 0.01	ICP-MS
Sn (Tin)	≤ 0.01	≤ 0.01	ICP-MS
Te (Tellurium)	≤ 0.01	≤ 0.01	ICP-MS
Ti (Titanium)	≤ 0.01	≤ 0.01	ICP-MS
Tl (Thallium)	≤ 0.01	≤ 0.01	ICP-MS
U (Uranium)	≤ 0.01	≤ 0.01	ICP-MS
V (Vanadium)	≤ 0.01	≤ 0.01	ICP-MS
W (Tungsten)	≤ 0.01	≤ 0.01	ICP-MS
X (Xenon)	≤ 0.01	≤ 0.01	ICP-MS
Y (Yttrium)	≤ 0.01	≤ 0.01	ICP-MS
Zn (Zinc)	≤ 0.01	≤ 0.01	ICP-MS
Zr (Zirconium)	≤ 0.01	≤ 0.01	ICP-MS

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**Certificate of Analysis**

1.01518.1000 Nitric acid 60% Ultrapur

Batch: 81004619

	Spec. Values	Batch Values	Method
Acidity (calculated)	100.0	100.0	
Ag (Silver)	≤ 0.20	≤ 0.1	ICP-MS
Al (Aluminum)	≤ 0.01	≤ 0.01	ICP-MS
As (Arsenic)	≤ 0.20	≤ 0.1	ICP-MS
Au (Gold)	≤ 0.20	≤ 0.1	ICP-MS
B (Boron)	≤ 1.00	≤ 1.00	ICP-MS
Br (Bromine)	≤ 0.20	≤ 0.1	ICP-MS
Ca (Calcium)	≤ 0.01	≤ 0.01	ICP-MS
Co (Cobalt)	≤ 0.01	≤ 0.01	ICP-MS
Cd (Cadmium)	≤ 0.01	≤ 0.01	ICP-MS
Ce (Cerium)	≤ 0.01	≤ 0.01	ICP-MS
Cr (Chromium)	≤ 0.01	≤ 0.01	ICP-MS
Cu (Copper)	≤ 0.01	≤ 0.01	ICP-MS
D (Deuterium)	≤ 0.01	≤ 0.01	ICP-MS
Fe (Iron)	≤ 0.01	≤ 0.01	ICP-MS
Fluoride	≤ 0.01	≤ 0.01	ICP-MS
Hg (Mercury)	≤ 0.01	≤ 0.01	ICP-MS
Li (Lithium)	≤ 0.01	≤ 0.01	ICP-MS
Mn (Manganese)	≤ 0.01	≤ 0.01	ICP-MS
N (Nitrogen)	≤ 0.01	≤ 0.01	ICP-MS
Ni (Nickel)	≤ 0.01	≤ 0.01	ICP-MS
P (Phosphorus)	≤ 0.01	≤ 0.01	ICP-MS
Pb (Lead)	≤ 0.01	≤ 0.01	ICP-MS
Se (Selenium)	≤ 0.01	≤ 0.01	ICP-MS
Si (Silicon)	≤ 0.01	≤ 0.01	ICP-MS
S (Sulfur)	≤ 0.01	≤ 0.01	ICP-MS
Sn (Tin)	≤ 0.01	≤ 0.01	ICP-MS
Te (Tellurium)	≤ 0.01	≤ 0.01	ICP-MS
Ti (Titanium)	≤ 0.01	≤ 0.01	ICP-MS
Tl (Thallium)	≤ 0.01	≤ 0.01	ICP-MS
U (Uranium)	≤ 0.01	≤ 0.01	ICP-MS
V (Vanadium)	≤ 0.01	≤ 0.01	ICP-MS
W (Tungsten)	≤ 0.01	≤ 0.01	ICP-MS
X (Xenon)	≤ 0.01	≤ 0.01	ICP-MS
Y (Yttrium)	≤ 0.01	≤ 0.01	ICP-MS
Zn (Zinc)	≤ 0.01	≤ 0.01	ICP-MS
Zr (Zirconium)	≤ 0.01	≤ 0.01	ICP-MS

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Certificate of Analysis  
Nitric acid 60 % Ultrapur



**Suprapur® acids and bases are suitable for trace analysis in the ng/g (ppb) range.**

Suprapur® acids are filled in borosilicate or extra pure PE bottles. The material minimizes any elemental impurity of the acid, so the specification of the unopened bottle is kept during the minimum shelf life. The bottles are cleaned and pre-conditioned before filling. Quality control is done after filling. This gives you the assurance that the certified batch values are those values of the filled acid. Suprapur® reagents are packed in a stable outer-box.

Hydrogen peroxide Suprapur® is packed in a black bottle to protect it against light. The bottle is made of extra pure PE material to avoid any contamination. To make it more safe for you: hydrogen peroxide bottles are closed with the SafetyCap. The SafetyCap with the PTFE membrane releases the pressure, but avoids any contamination.

**Ultrapur reagents are preferred for ultra-trace analysis in the pg/g (ppt) range.**

Ultrapur reagents are produced by sub-boiling distillation. The slowly distilled reagents subsequently have the lowest possible trace-impurities. Ultrapur reagents are exclusively filled in pre-conditioned PFA (fluoropolymer) bottles. This material meets the highest demands of all users for ultra-trace instrumental analysis, e.g. ICP-MS. Ultrapur® reagents are packed in a stable outer-box.

**More information**

► See chapter »Packaging« on page 18 ► See chapter »Acids for analysis« on page 94



## Ordering information Suprapur®

High purity acids and bases Suprapur®

	Designation	Content	Packaging	Ord. No.	
A	Acetic acid 100 % Suprapur®	250 ml	Glass bottle	1.00066.0250	
		1 l	Glass bottle	1.00066.1000	
	Ammonia solution 25 % Suprapur®	250 ml	PE bottle	1.05428.0250	
		500 ml	PE bottle	1.05428.0500	
		1 l	PE bottle	1.05428.1000	
2.5 l		PE bottle	1.05428.2500		
B	Boric acid Suprapur®	50 g	PE bottle	1.00765.0050	
		500 g	PE bottle	1.00765.0500	
F	Formic acid 98 – 100 % Suprapur®	250 ml	Glass bottle	1.11670.0250	
		1 l	Glass bottle	1.11670.1000	
H	Hydrobromic acid 47 % Suprapur®	250 ml	Glass bottle	1.00306.0250	
		1 l	Glass bottle	1.00306.1000	
	Hydrochloric acid 30 % Suprapur®	250 ml	PE bottle	1.00318.0250	
		500 ml	PE bottle	1.00318.0500	
		1 l	PE bottle	1.00318.1000	
		2.5 l	PE bottle	1.00318.2500	
	Hydrofluoric acid 40 % Suprapur®	250 ml	PE bottle <sup>1</sup>	1.00335.0250	
		500 ml	PE bottle <sup>1</sup>	1.00335.0500	
		1 l	PE bottle	1.00335.1000	
		2.5 l	PE bottle	1.00335.2500	
	Hydrogen peroxide 30 % Suprapur®	250 ml	PE bottle <sup>2</sup>	1.07298.0250	
		500 ml	PE bottle <sup>2</sup>	1.07298.0500	
		1 l	PE bottle <sup>2</sup>	1.07298.1000	
	N	Nitric acid 65 % Suprapur®	250 ml	Glass bottle	1.00441.0250
			1 l	Glass bottle	1.00441.1000
O	Oxalic acid dihydrate Suprapur®	100 g	PE bottle	1.00489.0100	
P	Perchloric acid 70 % Suprapur®	250 ml	Glass bottle	1.00517.0250	
		1 l	Glass bottle	1.00517.1000	
	ortho-Phosphoric acid 85 % Suprapur®	250 ml	PE bottle	1.00552.0250	
		500 ml	PE bottle	1.00552.0500	
		1 l	PE bottle	1.00552.1000	
S	Sodium hydroxide solution 30 % Suprapur®	250 ml	PE bottle	1.05589.0250	
		500 ml	PE bottle	1.05589.0500	
		1 l	PE bottle	1.05589.1000	
		2.5 l	PE bottle	1.05589.2500	
	Sulphuric acid 96 % Suprapur®	250 ml	Glass bottle	1.00714.0250	
	1 l	Glass bottle	1.00714.1000		

<sup>1</sup> = HDPE dosage bottle >page 108. | <sup>2</sup> = PE bottle with SafetyCap >page 106. | Glass bottles for Suprapur® acids are made of borosilicate glass. | For further information have a look in chapter »Packaging«.



## Ordering information Ultrapur

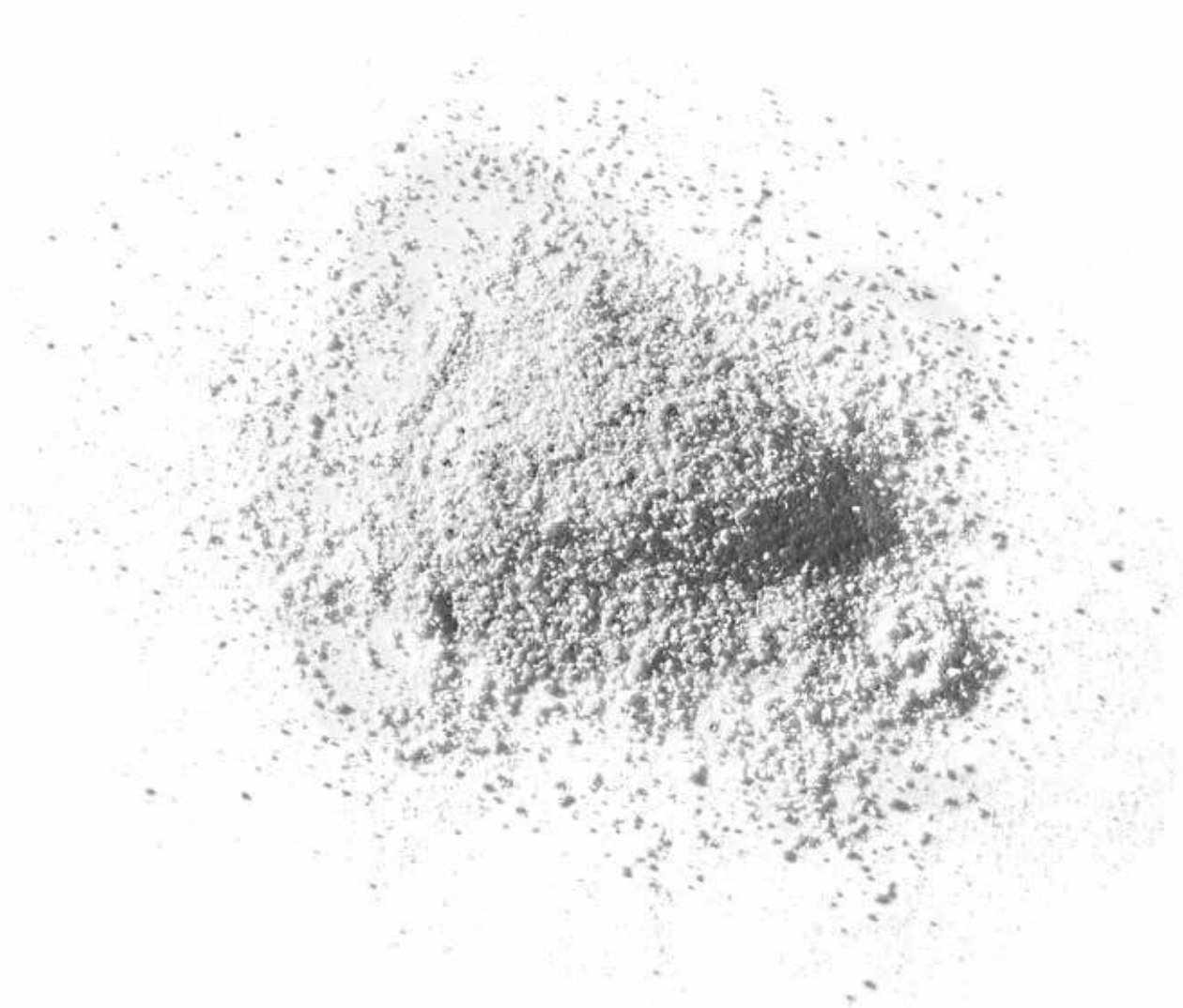
High purity acids and bases **Ultrapur**

Designation		Content	Packaging	Ord. No.
<b>H</b>	Hydrochloric acid 30 % Ultrapur	250 ml	PFA bottle	1.01514.0250
		500 ml	PFA bottle	1.01514.0500
		1 l	PFA bottle	1.01514.1000
	Hydrofluoric acid 48 % Ultrapur	1 l	PFA bottle	1.01513.1000
	Hydrogen peroxide 31 % Ultrapur	1 l	PFA bottle	1.06097.1000
<b>N</b>	Nitric acid 60 % Ultrapur	250 ml	PFA bottle	1.01518.0250
		500 ml	PFA bottle	1.01518.0500
		1 l	PFA bottle	1.01518.1000
<b>S</b>	Sulphuric acid 96 % Ultrapur	250 ml	PFA bottle	1.01516.0250
<b>W</b>	Water Ultrapur	500 ml	PE bottle	1.01262.0500
		1 l	PE bottle	1.01262.1000

# High purity salts

## Suprapur<sup>®</sup>

For instrumental analysis we offer high purity of inorganic salts for sample preparation. High purity salts are produced under strict conditions in a clean room area. Sophisticated production and crystallization ensure the purity and batch-to-batch consistency of our products. Quality management is done according to DIN EN ISO 9001.



# High purity salts

Contents	Page
• Quality grades	230
• Ordering information	232
• High purity material	233

Advantages
• Highest purity of salts
• Extensive impurity profile in the Certificate of Analysis
• High batch-to-batch consistency

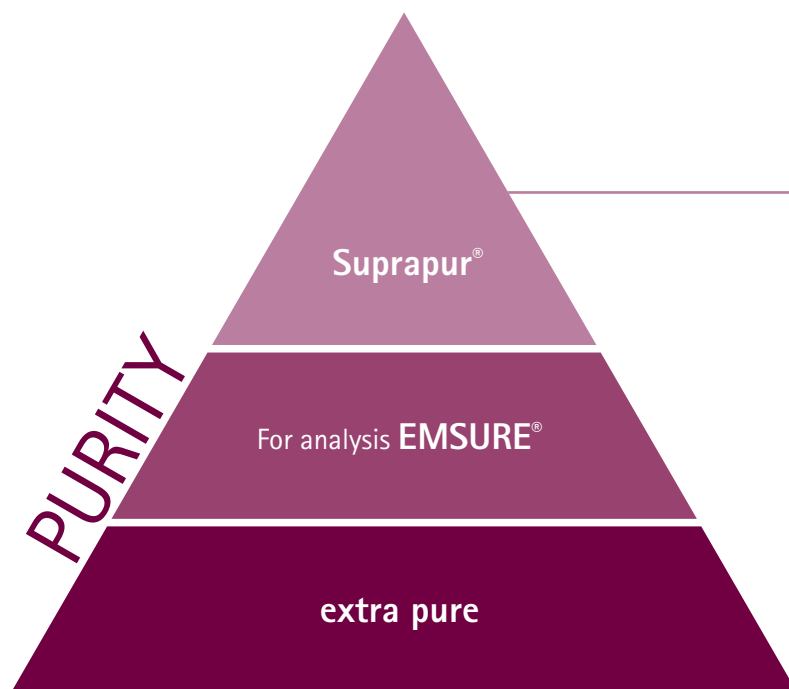


[www.merckmillipore.com/salts](http://www.merckmillipore.com/salts)

# Salts

## Suprapur<sup>®</sup>

Production and quality control is done in Darmstadt following modern and most sophisticated methods. This ensures the high purity of the salt. The purity of the salts are 99.99 % or higher up to 99.9999 %. For the products the Certificate of Analysis (CoA) gives an extensive profile of the impurities. The CoA is available on the internet: [www.merckmillipore.com](http://www.merckmillipore.com)



**Recommended storage instructions:** We recommend storing all inorganic salts in airtight containers in a dry place at room temperature when possible. Further storage instructions are included in our Safety Data Sheets.

**Higher water of crystallization content:** In case of temperature fluctuations, products with a higher water of crystallization content have a greater tendency to cake than anhydrous salts. In addition, many products tend to decompose when exposed to heat. These compounds should therefore be stored in a dry place that is as cool as possible or at room temperature (max. 25°C). Please follow the storage instructions on the labels of the products.

## Quality grades for your individual needs

### Suprapur®

High purity salts | Instrumental trace analysis, e.g. AAS | Specified parameters in ppm to ppb range

### Salts EMSURE®

- For classical analysis we offer a range of salts for analysis EMSURE®
- For further information please have a look in chapter »Salts for analysis«

### Salts extra pure

- For preparative lab applications
- For further information please have a look in chapter »Salts for analysis«



# Ordering information Suprapur®

## High purity salts Suprapur® A-P

	Product	Content	Packaging	Ord. No.
A	Ammonium chloride Suprapur®	50 g	PE bottle	1.01143.0050
		500 g	PE bottle	1.01143.0500
	Ammonium dihydrogen phosphate Suprapur®	50 g	PE bottle	1.01440.0050
	Ammonium sulfate Suprapur®	50 g	PE bottle	1.01209.0050
		500 g	PE bottle	1.01209.0050
B	Barium chloride Suprapur®	50 g	PE bottle	1.01716.0050
		500 g	PE bottle	1.01716.0500
	Barium fluoride Suprapur®	50 g	PE bottle	1.01722.0050
	Boric acid Suprapur®	50 g	PE bottle	1.00765.0050
		500 g	PE bottle	1.00765.0500
	di-Boron trioxide Suprapur®	250 g	PE bottle	1.00169.0250
C	Calcium carbonate Suprapur®	50 g	PE bottle	1.02059.0050
		500 g	PE bottle	1.02059.0500
	Calcium chloride tetrahydrate Suprapur®	100 g	PE bottle	1.02384.0100
	Calcium nitrate tetrahydrate Suprapur®	100 g	PE bottle	1.02123.0100
		500 g	PE bottle	1.02123.0500
	Cesium chloride Suprapur®	50 g	PE bottle	1.02039.0050
		250 g	PE bottle	1.02039.0250
	Lithium bromide hydrate Suprapur®	50 g	PE bottle	1.05668.0050
		250 g	PE bottle	1.05668.0250
	Lithium carbonate Suprapur®	250 g	PE bottle	1.05676.0250
L	Lithium chloride monohydrate Suprapur®	250 g	PE bottle	1.05677.0250
	Lithium fluoride Suprapur®	50 g	PE bottle	1.05686.0050
		500 g	PE bottle	1.05686.0500
	Lithium nitrate Suprapur®	100 g	PE bottle	1.05653.0100
		500 g	PE bottle	1.05653.0500
	Lithium sulfate monohydrate Suprapur®	50 g	PE bottle	1.05697.0050
	Magnesium nitrate hexahydrate Suprapur®	50 g	PE bottle	1.05855.0050
		500 g	PE bottle	1.05855.0500
P	Potassium bromide Suprapur®	100 g	PE bottle	1.04904.0100
		500 g	PE bottle	1.04904.0500
	Potassium carbonate-1.5-hydrate Suprapur®	50 g	PE bottle	1.04926.0050
		250 g	PE bottle	1.04926.0250
	Potassium chloride Suprapur®	50 g	PE bottle	1.04938.0050
		500 g	PE bottle	1.04938.0500
	Potassium dihydrogen phosphate anhydrous Suprapur®	50 g	PE bottle	1.05108.0050
		250 g	PE bottle	1.05108.0250
		500 g	PE bottle	1.05108.0500
	di-Potassium hydrogen phosphate anhydrous Suprapur®	100 g	PE bottle	1.05109.0100
		250 g	PE bottle	1.05109.0250
		500 g	PE bottle	1.05109.0500
	Potassium hydroxide hydrate Suprapur®	500 g	PE bottle	1.05002.0500
	Potassium iodide Suprapur®	50 g	PE bottle	1.05044.0050
		500 g	PE bottle	1.05044.0500
	Potassium nitrate Suprapur®	50 g	PE bottle	1.05065.0050
		500 g	PE bottle	1.05065.0500
	Potassium sulfate Suprapur®	100 g	PE bottle	1.05152.0100
		500 g	PE bottle	1.05152.0500



High purity salts **Suprapur®** O-Z

Product	Content	Packaging	Ord. No.
<b>S</b> Sodium acetate anhydrous Suprapur®	50 g	PE bottle	1.06264.0050
	500 g	PE bottle	1.06264.0500
Sodium bromide Suprapur®	100 g	PE bottle	1.06363.0100
	250 g	PE bottle	1.06363.0250
Sodium carbonate anhydrous Suprapur®	50 g	PE bottle	1.06395.0050
	500 g	PE bottle	1.06395.0500
Sodium chloride Suprapur®	50 g	PE bottle	1.06406.0050
	250 g	PE bottle	1.06406.0250
	500 g	PE bottle	1.06406.0500
Sodium dihydrogen phosphate anhydrous Suprapur®	50 g	PE bottle	1.06370.0050
	250 g	PE bottle	1.06370.0250
Sodium fluoride Suprapur®	25 g	PE bottle	1.06450.0025
di-Sodium hydrogen phosphate anhydrous Suprapur®	100 g	PE bottle	1.06566.0100
	500 g	PE bottle	1.06566.0500
Sodium hydroxide monohydrate Suprapur®	50 g	PE bottle	1.06466.0050
	500 g	PE bottle	1.06466.0500
Sodium iodide Suprapur®	100 g	PE bottle	1.06519.0100
	500 g	PE bottle	1.06519.0500
Sodium nitrate Suprapur®	50 g	PE bottle	1.06546.0050
Sodium sulfate anhydrous Suprapur®	50 g	PE bottle	1.06647.0050
	500 g	PE bottle	1.06647.0500
di-Sodium tetraborate anhydrous Suprapur®	25 g	PE bottle	1.06309.0025
	250 g	PE bottle	1.06309.0250
Sodium thiosulfate pentahydrate Suprapur®	100 g	PE bottle	1.06509.0100
	500 g	PE bottle	1.06509.0500
Strontium nitrate anhydrous Suprapur®	50 g	PE bottle	1.07871.0050
	250 g	PE bottle	1.07871.0250

High purity material **Suprapur®**

Also available as high purity materials for laboratory use are Bromine, Iodine and Mercury Suprapur®.

## Ordering information

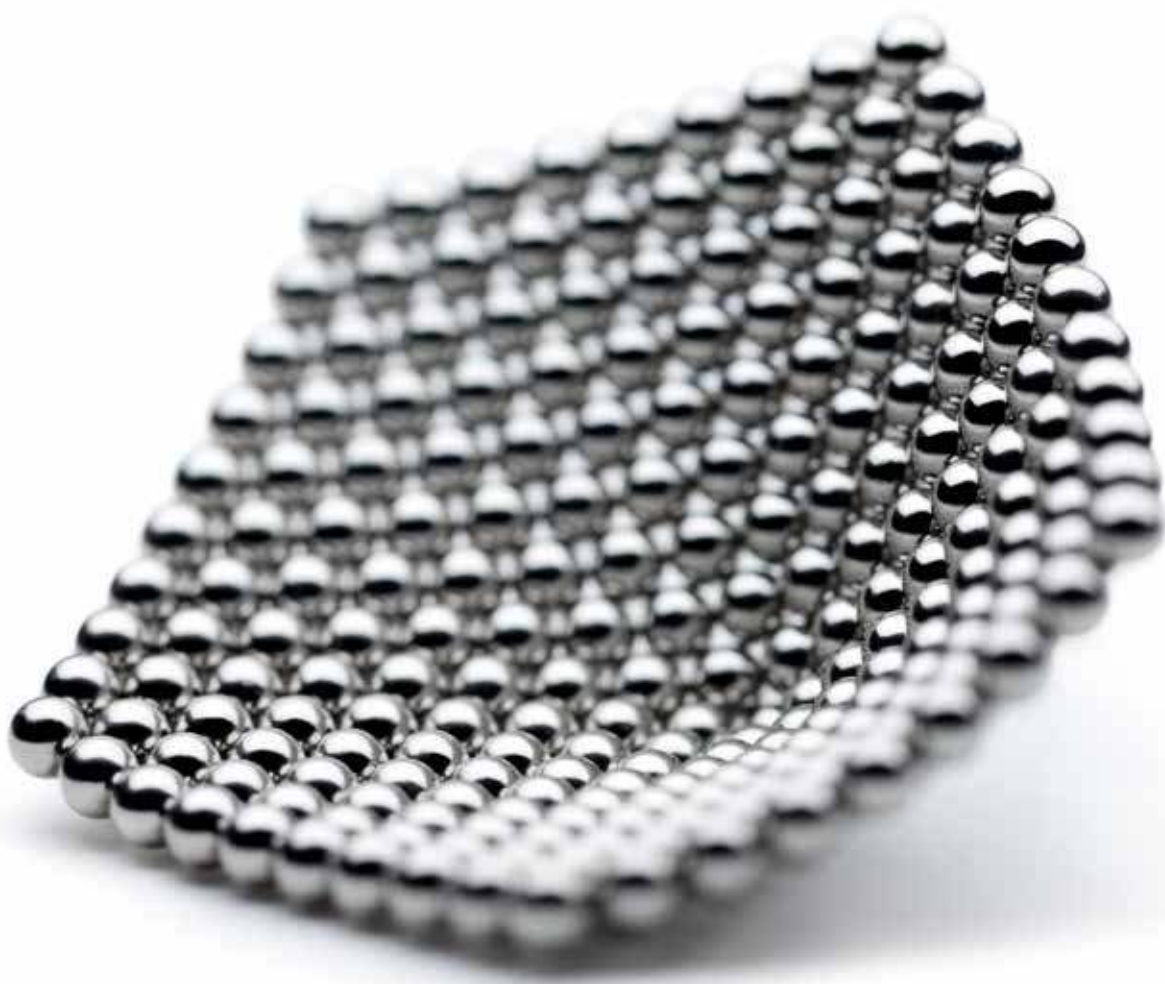
High purity material **Suprapur®**

Product	Content	Packaging	Ord. No.
<b>B</b> Bromine Suprapur®	250 g	Glass bottle	1.01947.0250
<b>I</b> Iodine Suprapur®	50 g	Glass bottle	1.04763.0050
	500 g	Glass bottle	1.04763.0500
<b>M</b> Mercury Suprapur® *	250 g	Glass bottle	1.04404.0250
	1 kg	Glass bottle	1.04404.1000

\* = only available within the EU.

# Safety products and general applications

Safety, simplicity and sustainability. Merck Millipore helps you achieve them all with our large variety of inorganic reagents. Using natural products wherever possible, our reagents conform to the highest quality standards to make your daily work not only safer but also simpler.



## Absorption and filtration

Page 236

Among the most important applications in laboratory practice are absorption, adsorption and filtration. To help ease your daily work, we offer several reagents as well as filter and clarification materials. Our products can be used for a wide variety of purposes, for example to dry, absorb or bind substances but also to decolorize, clarify or support filtration processes.



## Absorbents for spilled liquids

Page 244

When accidents happen Chemizorb® is there to help. The product range includes specific absorbents for different substances that efficiently absorb spilled aggressive liquids in the laboratory to ensure swift and safe handling.



## Drying agents

Page 250

Merck Millipore drying agents are the ideal choice whenever drying of gaseous, liquid or solid substances is required. Our diverse range of products helps protect your chemicals against moisture and mold formation during transportation, storage and in the laboratory.



## Auxiliaries for purification and sample preparation

Page 276

Routine laboratory work involves purifying, enriching and separating samples for analytical purposes. Merck Millipore products cover various chemical and physical methods as well as an array of other applications, such as removing residues from gases, decalcification, sealing, lubrication, separation, stabilization and as reaction and filling aids.



## Indicators

Page 286

Indicators are used in laboratories to observe chemical reactions. Whether for monitoring a chemical status, change of reaction or the end-point of a titration, you can rely on Merck Millipore's large portfolio of indicators for accurate results.



## Cleaning applications

Page 302

Thorough, residue-free cleaning is essential for reliable processes in laboratories. No matter what you need to clean or what contaminants you face, Merck Millipore has the ideal solutions for your laboratory and equipment. Discover our established Extran® laboratory cleansers.



# Absorption and filtration

Absorption, adsorption and filtration are among the most important applications in laboratory practice. In the Merck Millipore product range, you will find a wide variety of absorption and adsorption reagents as well as filter and clarification materials, such as activated charcoal, graphite, molecular sieves and sea sand. You can find chemical and physical data on our reagents in the Merck Millipore Chemicals and Reagents catalog and on our website: [www.merckmillipore.com](http://www.merckmillipore.com)



# Absorption and filtration

■ Contents	Page
• Safety and environment	238
• Definitions	239
• Ordering information	240


## ■ Advantages

- **Reliable:** Above all thanks to their reliable take-up capacity and purification of a wide range of substances, the premium Merck Millipore reagents for absorption, adsorption or filtration offer great reliability for the implementation of your application
- **Convenient:** The comprehensive Merck Millipore product range allows easy ordering, all from one place
- **Economical:** Merck Millipore offers packaging sizes of small and larger packages for individual needs, so that the exact quantity required can be easily achieved.



[www.merckmillipore.com/absorption-filtration](http://www.merckmillipore.com/absorption-filtration)

# Safety and environment



Many of the absorption and adsorption reagents and filter materials Merck Millipore offers for use in laboratories are natural reagents which are not harmful to the environment.

One example is Merck Millipore activated charcoal, which is produced from natural raw materials and, alongside laboratory applications, is also suitable for use in environmental protection.

Calcium oxide, which is used as a CO<sub>2</sub> absorbent among other things, is also one of the Merck Millipore products for the sustainable protection of people and the environment, since it is extracted from selected natural marble.

More information about sustainable protection  
[www.merckmillipore.com/protection](http://www.merckmillipore.com/protection)



# Definitions

**Absorption** [from Latin »absorbere«: to devour, swallow up] describes the take-up of gases or liquids by solid bodies. Solids with cavities of a defined pore size can be used for separation, purification or enrichment. In this way, mixtures – usually of gases – can be separated into their individual component parts as a result of their varying molecule sizes.

**Adsorption** [from Latin »adsorbere«: to suck in] describes the take-up of a substance on the surface of a solid without a chemical reaction. Due to adhesive forces, gaseous, liquid and, in rare cases, solid substances accumulate on the surface or interface of the adsorbent. This releases the bond energy in the form of heat. The larger the surface, the greater the adsorption capacity of a substance. The total surface is therefore often given in »m<sup>2</sup>/g« for specification. This adsorption strength is reduced by warming and increased by cooling.

**Filtration** is a mechanical separation process for the separation or purification of substances. The filter and clarification materials used for this are usually reagents with absorbent or adsorbent properties, although materials which work in a similar way to frits or which form capillaries as filter cake can be used to clarify solutions, to decolorize or to remove colloiddally dissolved substances.

## Safety and environment – characteristics

► For easy detection, safety and/or sustainable characteristics of our products are highlighted with this symbol.



## Ordering information Absorption

Absorption tubes		CAS No.	Content	Packaging	Ord. No.
Absorption tube for CO <sub>2</sub> (sodium hydroxide on support)		–	3 units	Plastic tube	1.01562.0003
Absorption tube for H <sub>2</sub> O (molecular sieve 0.3 nm with indicator)		–	3 units	Plastic can	1.06107.0003
Application advice	Drying of incoming or outgoing air or general gas absorption				
Additional information	Absorption tubes are 15 cm long and have a diameter of 2 cm. Hoses of various dimensions can also be connected: hoses with 3 mm external diameter can be pushed into the tube, while hoses with 8 – 12 cm internal diameter can be pushed over the opening. The tube must be opened on both sides before use by removing the two stoppers.				
Absorption tube for CO <sub>2</sub>					
Application advice	CO <sub>2</sub> absorption tubes are used to bond carbon dioxide, for example to keep the titer stable during titration with NaOH and to prevent the formation of Na <sub>2</sub> CO <sub>3</sub> through the CO <sub>2</sub> contained in the incoming air. The absorbent, which is placed on an inert carrier, also prevents caking after absorption. The air or gas can still flow through the absorption tube without a change in resistance.				
Additional information	CO <sub>2</sub> absorption tubes are filled with sodium hydroxide on an inert carrier material. The reagent in these absorption tubes has a significantly higher capacity than caustic alkali pellets. A »saturation display« shows the degree of depletion. In the case of CO <sub>2</sub> saturation, the indicator changes from dark gray to light gray. The capacity of the CO <sub>2</sub> absorption tube is around 15 g CO <sub>2</sub> = 1/3 Mol = 7 l CO <sub>2</sub> gas (NTP).				
Absorption tube for H <sub>2</sub> O					
Application advice	H <sub>2</sub> O absorption tubes are used to keep reagents or solvents dry, for example during Karl Fischer titration or when working with solvents from withdrawal systems.				
Additional information	In H <sub>2</sub> O absorption tubes, the filling also contains an indicator displaying the degree of depletion.				





Absorption tubes


Calcium oxide	CAS No.	Content	Packaging	Ord. No.
Calcium oxide from marble small lumps ~ 3 – 20 mm	1305-78-8	1 kg	Plastic bottle	1.02109.1000
		25 kg	Fibre carton	1.02109.9025
<b>Application advice</b>	Calcium oxide is used as a drying agent and absorbent for CO <sub>2</sub> and for the creation of calcium bonds, e.g. in the production of glass, paper, rubber and soda.			
<b>Information on sustainable protection</b>	Calcium oxide is obtained from selected natural marble.			





Charcoal activated	CAS No.	Content	Packaging	Ord. No.
Charcoal activated for analysis	7440-44-0	250 g	Metal can	1.02514.1000
		1 kg	Metal can	1.02514.5000
		20 kg	Fibre carton	1.02514.9025
Charcoal activated granular about 1.5 mm extra pure food grade	7440-44-0	1 kg	Plastic bag	1.02184.1000
		5 kg	Fibre carton	1.02184.5000
		25 kg	Fibre carton	1.02184.9020
Charcoal activated powder extra pure food grade	7440-44-0	5 kg	Fibre carton	1.02183.1000
		20 kg	Fibre carton	1.02183.9020
Charcoal activated for analysis	7440-44-0	1 kg	Plastic bag	1.02186.9020
		1 kg	Plastic bag	1.02186.0250
		20 kg	Fibre carton	1.02186.1000
Application advice	Activated charcoal is used among others for adsorption, decolorization and purification of e.g. gases and liquids and as well as a carrier for catalysts. Thanks to its very large internal surface area (800 to 1500 m <sup>2</sup> /g), activated charcoal adsorbs molecules of different sizes and has a wide variety of uses. Since the chemical substances have to diffuse into the pores during adsorption, powdered carbons are easier to »load« than granulated ones. Granulated carbons are more suitable for flow-through processes with gases as a result of their lower flow resistance.			
Additional information	Activated charcoal is used in the chemicals and food and beverage industries, and in environmental protection. Activated charcoal looks the same as charcoal, but a special »activation process« means that it has a porous, sponge-like structure with a larger internal surface area. The adsorption capacity resulting from this depends among other things on the starting material – fossil charcoal – and the activation process. Depending on the process, small cavities with a pore size of 1 to 25 nm (micro and macro pores) and a larger internal surface area of 800 to 1500 m <sup>2</sup> /g are formed.			
Information on sustainable protection	Activated charcoal is gained from natural raw materials (obtained from natural pine wood or mineral coal) and is used in the food and beverage industry and in environmental protection.			

Charcoal wood	CAS No.	Content	Packaging	Ord. No.
Charcoal wood powder	7440-44-0	1 kg	Plastic bag	1.02204.1000
		25 kg	Fibre carton	1.02204.9025
Application advice	Charcoal wood can be used for adsorption, filtration or clarification for many technical purposes.			
Additional information	The coking or carbonization – heating up to 400°C without air – of beech wood produces charcoal wood with a very large internal surface area.			
Information on sustainable protection	Natural production through the coking of beech wood.			

Graphite	CAS No.	Content	Packaging	Ord. No.
Graphite fine powder extra pure	7782-42-5	2.5 kg	Fibre carton	1.04206.2500
		25 kg	Fibre carton	1.04206.9025
Application advice	Graphite is used as an absorbent and lubricant at temperatures of up to around 350°C.			
Additional information	Graphite is a gray material which shines like metal, feels greasy and stains easily as a result of its flaky, easily divisible mass. It is manufactured from high quality coke, which is mixed with pitch and special tars and pressed into molded shapes. These shapes are then heated to up to 3000°C without oxygen. This gives graphite a high degree of purity, high capacity for conduction and lubrication and the typical layered hexagonal crystal structure. In order to create graphite in this powdered form, the shapes are broken and ground into this fine powder in a pebble mill in a time-consuming process.			
Information on sustainable protection	Graphite consists mainly of pure carbon.			


## Ordering information Absorption

Molecular sieve	CAS No.	Content	Packaging	Ord. No.
Molecular sieve 0.3 nm beads ~ 2 mm	1318-02-1	250 g	Plastic bottle	1.05704.0250
		1 kg	Plastic bottle	1.05704.1000
		10 kg	Bucket, plastic	1.05704.9010
Molecular sieve 0.3 nm beads, with moisture indicator ~ 2 mm <sup>1)</sup>	–	250 g	Plastic bottle	1.05734.0250
		1 kg	Plastic bottle	1.05734.1000
Molecular sieve 0.3 nm rods ~ 1.6 mm (1/16")	1318-02-1	250 g	Plastic bottle	1.05741.0250
		1 kg	Plastic bottle	1.05741.1000
		10 kg	Bucket, plastic	1.05741.9010
Molecular sieve 0.4 nm beads ~ 2 mm Reag. Ph Eur	1318-02-1	250 g	Glass bottle	1.05708.0250
		1 kg	Glass bottle	1.05708.1000
		10 kg	Bucket, plastic	1.05708.9010
Molecular sieve 0.4 nm beads, with moisture indicator ~ 2 mm	–	250 g	Glass bottle	1.05739.0250
		1 kg	Glass bottle	1.05739.1000
Molecular sieve 0.4 nm rods ~ 1.6 mm (1/16")	1318-02-1	1 kg	Plastic bottle	1.05743.1000
Molecular sieve 0.5 nm beads ~ 2 mm	1318-02-1	250 g	Glass bottle	1.05705.0250
		1 kg	Glass bottle	1.05705.1000
Molecular sieve 1.0 nm beads ~ 2 mm	1318-02-1	1 kg	Glass bottle	1.05703.1000
Application advice Molecular sieves are suitable for drying almost all gases and liquids				
► 1) Molecular sieves with 0.3 nm bead form (105704) and with indicator brown gel (105734) are suitable for use in Karl Fischer titrators.				

Sodalime	CAS No.	Content	Packaging	Ord. No.
Sodalime, granules appr. 1 – 2.5 mm with indicator for analysis	–	500 g	Plastic bottle	1.06733.0501
		2.5 kg	Plastic bottle	1.06733.2500
Sodalime pellets with indicator for analysis	–	1 l	Plastic bottle	1.06839.1000
		5 l	Plastic bottle	1.06839.5000
		25 l	Fibre carton	1.06839.9026
Application advice	Soda lime is used for the absorption of CO <sub>2</sub> from air and gases. Soda lime has a large internal absorption surface area. The absorption capacity is at least 25 %. In laboratories and technical facilities, soda lime can be used for both small and large absorption systems.			
Additional information	Soda lime contains an indicator which changes from beige to violet, although this may change back from violet to blue in periodic use or after a period of shutdown. This is the result of a back or balance reaction, in which hydroxide groups which have become active again are available on the surface. No CO <sub>2</sub> is released during this. Even if the indicator turns beige again, the soda lime does not have more absorption capacity than at the beginning. The CO <sub>2</sub> bonding which has already taken place reduces the remaining available capacity.			


## More information

► »Volumetric solutions« see page 132 ► »Karl Fischer reagents« see page 146 ► »Drying agents« see page 250

Aluminium oxide fibers	CAS No.	Content	Packaging	Ord. No.
Aluminium oxide fibers for gooch crucibles	–	100 g	Plastic bottle	1.15754.0100
		1 kg	Plastic bottle	1.15754.1000
Application advice	Aluminium oxide fibers are used as filtration and insulation agents as a result of their high melting point of 1700 to 1800°C. In contrast to asbestos fibers, they are not carcinogenic and can be easily disposed of.			
Information on sustainable protection	Aluminium oxide fibers from Merck Millipore are non-carcinogenic and can be easily disposed of.			

Glass wool	CAS No.	Content	Packaging	Ord. No.
Glass wool	65997-17-3	250 g	Metal can	1.04086.0250
		1 kg	Fibre carton	1.04086.1000
Application advice	Due to its chemical resistance even against strong acids, except hydrofluoric acid, glass wool is used as a filter material in analytical processes, and as a supporting substance for drying agents in drying towers, for example to prevent caking in phosphorus pentoxide. It can also be used for insulation up to around 500°C.			
Additional information	Glass wool is made of soda lime silicic acid glass fibers with a diameter of around 15 µm.			



Sea sand	CAS No.	Content	Packaging	Ord. No.
Sea sand extra pure	7631-86-9	1 kg	Plastic bottle	1.07711.1000
		5 kg	Plastic bottle	1.07711.5000
		25 kg	Fibre carton	1.07711.9025
Sea sand purified by acid and calcined for analysis	7631-86-9	1 kg	Plastic bottle	1.07712.1000
		5 kg	Plastic bottle	1.07712.5000
		10 kg	Plastic bottle	1.07712.9010
		25 kg	Fibre carton	1.07712.9025
Application advice	Sea sand is used e.g in laboratories for filtering and clarifying extremely contaminated water and solutions. In addition, sea sand is used as a grinding aid and heating bath (sand bath). To remove contamination which can be dissolved in acid, sea sand is boiled in hydrochloric acid and ignited for the carbonization of organic components to achieve the quality level necessary for laboratory use.			
Additional information	The grain size of sea sand is 0.1 to 0.3 mm.			
Information on sustainable protection	Sea sand is a natural product which consists predominantly of silicon oxide and small quantities of other metal oxides.			

# Absorbents for spilled liquids

## Chemizorb®

Mishaps and accidents happen. With Chemizorb®, however, you can remove spilled aggressive or other unpleasant liquids quickly and safely. Chemizorb® consists of porous mineral or synthetic copolymers that are chemically inert and, depending on the type, are capable of taking up 100 to 400 percent of their own weight in liquid material.



# Absorbents for spilled liquids

■ Contents	Page
• The »allrounders« Chemizorb® powder and granules	246
• The »all-in-one« Chemizorb® mercury set	247
• The »specialists« Chemizorb® alkalis, acid, hydrofluoric acid	248
• Handling and disposal	249

## ■ Advantages

With Chemizorb® you can remove spilled liquids:

- Easily
- Quickly
- Safely
- Environment-friendly



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

# The »allrounders«

## Chemizorb® powder

- Is insoluble in water and in all other media that are liquid at room temperature.
- The powder is characterized by an extremely high absorbance capacity.
- Due to its large surface area, it is capable of absorbing two to four times its own weight in aqueous solutions and one to two times its weight in organic solvents and viscous oils.

## Ordering information

Chemizorb® powder	Content	Packaging	Ord. No.
Chemizorb® powder absorbent for spilled liquids	500 g	PE bottle	1.02051.0500
	25 kg	Fibre carton	1.02051.9025



## Chemizorb® granules

Chemizorb® granules are insoluble in water and in all other media that are liquid at room temperature. The granules possess a slightly lower absorbance capacity than the powder: due to its rough granular form, it can absorb only up to 100 percent of its own weight; on the other hand, however, it is much easier to dose. The granule form is used in all those places where it is not suitable to use the powder form, for example in draughty rooms or outside. Just like the powder, the granules are suited for absorbing alkalis, acids, or also heating-bath liquids.

## Ordering information

Chemizorb® granules	Content	Packaging	Ord. No.
Chemizorb® granules absorbent for spilled liquids	1 kg	PE bottle	1.01568.1000
	5 kg	Bucket, plastic	1.01568.5000
	20 kg	Paper sack	1.01568.9020
	20 kg	PE drum	1.01568.9021



# The »all-in-one« set for mercury

## Chemizorb® Mercury

Chemizorb® Mercury is an all-inclusive set of reagents and auxiliaries for the safe and complete removal of drops of mercury and of traces of elementary mercury. The reagents included in the set are sufficient for the safe and simple decontamination of an area of roughly one square meter.



### Mode of use

- Any droplets of mercury are first suctioned off using the pipette.
- The contents of the pipette are then emptied into the mercury bottle.
- Any remaining mercury is then strewn with a layer of reagent 1.
- The covered area is then sprayed with reagent 2.
- After a reaction time of 15 to 30 minutes the mercury-containing absorbent is removed from the surface and put into a small tub using a small shovel and a spatula.
- Any remaining material can subsequently be simply cleaned away with a wipe.
- Afterwards all tools and working materials are stored safely in the large can.
- The mercury-containing waste material must be disposed of as special waste in accordance with the official regulations.

## Ordering information

Chemizorb® Hg	Content	Packaging	Ord. No.
Chemizorb® Hg Reagents and accessories for absorbent for mercury	1 set	PE case	1.12576.0001
1 set consisting of: 500 g of reagent 1, 100 ml of reagent 2, one small tub, one large disposal can, protective gloves, ...			
Chemizorb® Hg reagents refill pack for Ord. No. 1.12576.0001	1 set	PE can	1.01569.0001
1 set consisting of: 500 g reagent 1 and 100 ml reagent 2			



# The »specialists«

The absorbents for alkalis, acids, and hydrofluoric acid contain, in addition to the carrier material itself, also water-soluble neutralizers and pH indicators. The admixed pH indicators make it possible to keep track of the process of neutralization of the spilled acid or alkalis. It should be borne in mind that the neutralization reaction may involve the generation of heat and gas.

## Chemizorb® Alkalis

- Is a powder mixture that consists of a mineral copolymer as the absorbent, an acidic salt as the neutralizer, and a pH indicator.
- Upon contact with the alkalis the absorbent first turns blue in colour.
- After neutralization is complete, the blue colour becomes paler.
- About 100 to 120 g of Chemizorb® OH<sup>-</sup> is required to absorb and neutralize 100 ml of alkalis.



## Ordering information

Chemizorb® OH <sup>-</sup>	Content	Packaging	Ord. No.
Chemizorb® OH <sup>-</sup> absorbent and neutralizer for spilled alkalis, with indicator	1 kg	PE bottle	1.01596.1000

## Chemizorb® Acid

- NEW: Improved composition. Now easier to use and with higher absorption capacity.
- Powder mixture that consists of a mineral copolymer as the absorbent, an alkaline neutralizer, and a pH indicator. Suitable for all acid spills (except Hydrofluoric acid)
- The neutralization process results in the release of CO<sub>2</sub>. When the acid has been neutralized, the colour of the indicator changes from red back to yellow.
- About 100 g of Chemizorb® H<sup>+</sup> is required to absorb and neutralize 100 ml of acid.



## Ordering information

Chemizorb® H <sup>+</sup>	Content	Packaging	Ord. No.
Chemizorb® H <sup>+</sup> absorbent and neutralizer for spilled acids, with indicator	500 g	PE bottle	1.02491.0500
	2.5 kg	Bucket, plastic	1.02491.2500



### Chemizorb® Hydrofluoric Acid

- Is a powder mixture consisting of a synthetic copolymer as the absorbent, calcium salt as a neutralizer and precipitant, and a pH indicator.
- The neutralization process results in the release of CO<sub>2</sub>. When the hydrofluoric acid has been neutralized, the colour of the indicator changes from red to orange/yellow.
- About 150 g of Chemizorb® HF is required to absorb and neutralize 100 ml of hydrofluoric acid.



## Ordering information

Chemizorb® HF	Content	Packaging	Ord. No.
Chemizorb® HF absorbent and neutralizer for spilled hydrofluoric acid, with indicator	1 kg	PE bottle	1.01591.1000

# Handling and disposal

### Handling

All Chemizorb® products are handled in much the same way:

- Spilled liquids are covered with a sufficient amount of absorbent and, wherever necessary, mixed using a spatula, spoon, or small shovel.
- Wait until the neutralization and absorption processes are complete.
- After the absorbent has been collected, the contaminated surface is cleaned thoroughly with plenty of water.

A specific set of instructions for use is given on the label of each respective product package.

### Disposal

The contaminated material – Chemizorb® and absorbed chemicals – is collected in a polyethylene bag and forwarded for disposal in accordance with the company regulations and national guidelines for the hazardous products in question.

# Dry and safe

## Drying agents from Merck Millipore

Merck Millipore drying agents help protect your valuable goods! Products and goods must often be protected against moisture and mould formation, both on long transport routes as well as during their storage. Merck Millipore offers a comprehensive selection of different drying agents for this purpose and many other applications in laboratories.



# Drying agents

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## Advantages

- **Reliable:** Merck Millipore drying agents help to minimize the effects of moisture on products. This maintains the original condition and prevents follow-up costs caused by any damage.
- **Convenient:** Merck Millipore drying agents are user-friendly and easy to handle. This prevents time being wasted.
- **Economical:** Protection using Merck Millipore drying agents increases the longevity of your products. This helps to reduce costs.



[www.merckmillipore.com/drying-agents](http://www.merckmillipore.com/drying-agents)

# Safety and reliability

## Safety and environment

In the drying agents product group, too, Merck Millipore offers products which support the goal of sustainable environmental protection and safety. For example, silica gels with or without orange or brown gel indicators are offered as an alternative to silica gel with blue gel indicator, which is presumably carcinogenic.

## Safety information

When using drying agents, one must be aware of the potential dangers involved. Both acid and basic drying agents can be corrosive and magnesium perchlorate can explode, as can sodium and potassium on contact with certain organic substances resp. with water or chlorinated hydrocarbons. In the case of drying agents that develop hydrogen during the drying process, drying must be carried out in a well-ventilated fume chamber. Blue gel, due to the presence of cobalt chloride, can have a carcinogenic effect (R-phase 49 – may cause cancer by inhalation). Filling and emptying should thus always be carried out in a fume chamber.

## Drying rate

The intensity only indicates the theoretically achievable residual value for water; it may take a long time for equilibrium to be reached. Thus, if a high degree of efficiency is to be achieved, rapid water uptake is important.

The uptake rate is determined by the following steps:

- The  $\text{H}_2\text{O}$  molecules must be able to leave the material to be dried and must traverse a path to the drying agent.
- The molecules must be able to diffuse into the reactive centers of the drying agent.

Whilst the user can influence the first two points with his experimental setup, the manufacturer of the drying agent must take the following parameters into account if the third point is to be optimized:

- Particle size,
- Pore size and pore distribution,
- Prevention of deactivation of the surface during the drying process.

The ideal drying agents are those where the above parameters do not significantly change during the water adsorption process, e.g. SICAPENT®, magnesium perchlorate, molecular sieves, silica gel, aluminium oxide and calcium hydride. However, many drying agents tend to clump during the water absorption process, disintegrate or form a syrupy layer over unused product. This is a disadvantage when working with gases in drying towers; they tend to become blocked or channels are formed through which the gas flows but in an incompletely dried state.

## Capacity

The capacity of a drying agent is defined by the mass of water adsorbed per 100 g anhydrous substance.

Example: 1 kg drying agent of capacity 20 % can adsorb 200 g of water. The residual water content of heavily loaded drying agent is higher than that of less loaded agent. On the other hand, drying agents are more heavily loaded by gases or liquids with higher water content.

Exception: drying agents such as  $\text{CuSO}_4$  which form defined hydrates maintain a constant water vapor partial pressure until the next hydrate stage is formed, independent of the mass of water adsorbed.

## Applications

The user-friendly drying agents from Merck Millipore are suitable for a wide range of laboratory applications, for example for drying gases, liquids and solids. With such a wide variety of grain and packaging sizes, you are sure to find the suitable drying agent, either for the classic method of static or dynamic drying processes.

Products with no tendency towards clumping are particularly suited for the dynamic drying process including, for example, calcium hydride, magnesium perchlorate, aluminium oxide, silica gel, or molecular sieves.

## Regeneration

Some drying agents can be regenerated. To do this, the drying agent is heated to restore its equilibrium. Due to the fact that water is absorbed rapidly, regenerated drying agents must be filled and stored well away from moisture.

More information about sustainable protection  
[www.merckmillipore.com/protection](http://www.merckmillipore.com/protection)

## Safety and environment – characteristics

► For easy detection, safety and/or sustainable characteristics of our products are highlighted with this symbol.



# Drying methods

## Drying methods

Non-sensitive solids can be dried at higher temperatures in a drying cabinet. However, drying at room temperature in a desiccator or at higher temperatures using a drying pistol is more gentle. Application of a vacuum facilitates the diffusion of the water molecules from the solid to the drying agent; the drying rate is hence somewhat faster.

## Static drying

In the classical drying of liquids, the drying agent is added, the whole allowed to stand, stirred (e.g. with a magnetic stirrer), shaken or boiled under reflux (details can be found in relevant textbooks of organic chemistry). It is important that the liquid is moved in such a way that it comes into contact with the drying agent.

The liquid is then filtered or decanted. Should compounds be formed due to reaction with the water, these must be subsequently removed by distillation.

The frequently used drying agents calcium chloride, potassium carbonate, sodium sulfate and calcium sulfate have a medium drying effect only on solvents when used statically. Drying agents such as sodium or the earth-alkaline oxides, however, are not as efficient as often thought due to their reactive surfaces being relatively small and in addition covered by a coating that hinders access of water molecules. In addition, as laboratory accidents are relatively frequent with these materials, they should not be used for this purpose.



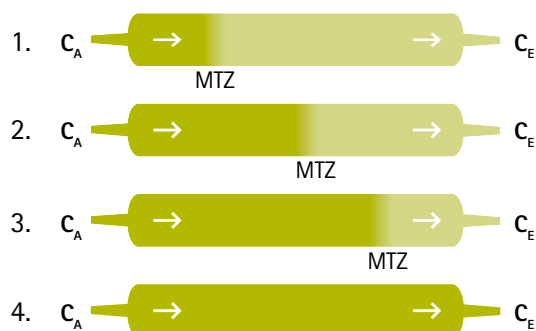


## Dynamic drying

In order to increase the drying rate and to achieve better utilization of the drying agent, liquids and gases can be passed through drying towers or drying tubes filled with a drying agent. However, if diffusion and flow rate are not to be hindered, the drying agents used should not be susceptible to clumping or deliquescence. For this reason, drying agents such as calcium hydride, magnesium perchlorate, aluminium oxide, silica gel and molecular sieves are particularly suitable. Untreated phosphorus pentoxide tends to clump when in contact with water and is thus normally unsuitable for dynamic drying. SICAPENT®, however, is a drying agent where  $P_2O_5$  has been coupled to an inert carrier; it remains flowable also when loaded 100 % and allows gases to flow through without resistance.

The drying process can be optimized by using a drying agent of small particle size. In this way, the surface area can be significantly increased and hence the column length and packing decreased. However, it should be taken into account that the flow rate is reduced due to the greater flow resistance in the column.

The diagram shows a drying process for gases using silica gel in a drying column: An orange gel turns colorless when loaded with water. The moist gas enters the column at the left hand side with water content  $C_A$  and leaves it on the right in a dry condition  $C_E$ ; however, at this point, the gas contains more than the minimum residual water achievable with the drying agent in question. The drying agent in the left hand part of the column is already loaded to the maximum with water and is in equilibrium with the moist gas entering. The actual drying process – the transfer of water from gas to silica gel – takes place in the segment known as the »Mass Transfer Zone – MTZ«. Over the drying period, the MTZ migrates towards the right hand side of the column (steps 2, 3, 4) until it reaches the end and the moist gas leaves. In order to avoid the gas leaving, the gas flow is interrupted well in time; this has the effect that a small part of the column remains unutilized. However, such dynamic drying procedures are mostly better than static ones. (This is shown in the general calculation on the next page.)



*Drying process for gases using silica gel in a drying column.*

# Calculations

**General calculation of relative humidity of the atmosphere:** The absorptivity of the atmosphere for humidity increases with the temperature until saturation. 1 m<sup>3</sup> air at 11°C is saturated with 10.0 g water, at 20°C with 17.3 g, at 30°C with 30.4 g and at 40°C with 51.2 g.

**Calculation of the amount of drying agent required:** 1000 l gas containing 10 mg/l water are to be dried at 25°C to a residual water content of 1 mg H<sub>2</sub>O/l.  
 $1000 \text{ l} \times 10 \text{ mg H}_2\text{O/l} - 1000 \text{ l} \times 1 \text{ mg H}_2\text{O/l} = 9 \text{ g H}_2\text{O}$  are to be adsorbed.

**Calculation of the required amount of drying agent for static drying:** At the end of the drying process, the residual water content of the gas is in equilibrium with the drying agent. The loading of the silica gel necessary to achieve the desired residual water content can be taken from the table in the ordering information of silica gel, page 272: 1 mg H<sub>2</sub>O/l residual water  $\hat{=}$  loading of 5.2 g H<sub>2</sub>O / 100 g silica gel.  
To absorb 9 g H<sub>2</sub>O,  $9/5.2 \times 100 \text{ g} = \text{about } 200 \text{ g}$  silica gel are required.

**Calculation of the required amount of drying agent for dynamic drying:** In this case, the greater part of the drying agent is in equilibrium with the water content of 10 mg/l of the gas flowing into the column. Thus, a higher loading – about 20 g H<sub>2</sub>O / 100 g silica gel – is possible than in the case of static drying where the entire drying agent is in equilibrium with the low residual water content. Even if in the case of dynamic drying half of the drying agent remains unutilized, 100 g are sufficient compared with 200 g for static drying.

As the flowing gas has much less contact with the drying agent than with the static method, the much lower values for residual water content as cited in the literature for static drying are not quite achieved. If such low residual water content is to be achieved, it is necessary to connect a further column with a more effective drying agent. If the gas is circulated over a drying column in a closed room, even if dynamic, only the capacity of a static method can of course be achieved.

**Calculation of the column diameter:** Based on the flow rate and the given volume flow (volume/time unit), the smallest allowable column cross-section can be calculated.  
Example: 3.6 l of 2-propanol per hour are to be dried (= 3600 ml / 60 min).  
At a flow rate of 10 cm/min\* the minimum cross-sectional area is 6 cm<sup>2</sup> corresponding to approx. 30 mm diameter.

\* Experimentally determined value



# Definitions

## Column dimensions

In order to be able to utilize the drying agent to the full, the Mass Transfer Zone [MTZ] and the length of non-utilized column must be kept to a minimum.

Narrow columns have proved to be of advantage in this case:

- For gases, a ratio for length to diameter of greater than 5 is recommended. Columns filled with beads or granular silica gel should be at least 1 m long.
- For liquids, columns of 60 cm in length and 2 – 3 cm in diameter to 2 m and 6 cm respectively are recommended (for further details, see »drying of solvents«).

To determine the necessary column volume, the required amount of drying agent should be divided by the bulk density. Example: 100 g silica gel of bulk density of 70 g / 100 ml have a volume of 143 ml.

## Flow rate

However, the ratio length to cross-section should not be so large that high flow rates result as this would lengthen the MTZ considerably. Recommended flow rates (bases on the free cross-section of the column) for gases: 5 – 15 m per minute, for liquids: 2.5 – 30 cm per minute. These values have been established experimentally as being optimal.

## Drying gases

Gases should be dried using the dynamic method (see »drying methods«). Very moist gases should first be dried using a drying agent of high capacity:  $\text{CaH}_2$ ,  $\text{CaSO}_4$ ,  $\text{Mg}(\text{ClO}_4)_2$ , molecular sieve,  $\text{H}_2\text{SO}_4$ , or silica gel. Fine drying can then be attained using phosphorus pentoxide, SICAPENT®,  $\text{CaH}_2$ ,  $\text{Mg}(\text{ClO}_4)_2$  or molecular sieve. Further details are contained in the section describing the relevant drying agents.

# Drying agents

for solvents with low water absorption capacity

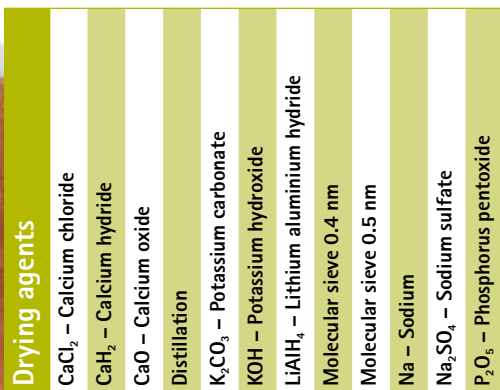
Solvents with a low water-absorbing capacity can generally be dried using static methods; they should be allowed to stand in their reservoirs for up to several days with occasional shaking in contact with a suitable drying agent (e.g. 100 – 200 g molecular sieve (MS) per liter solvent).

The residual water content that can be attained with molecular sieves (MS) is less than  $10^{-4}$  percent by weight corresponding to 1 ppm = 1 mg  $H_2O$  = approx. 0.05 mmol  $H_2O$  per liter solvent. 250 g molecular sieve can dry more than 10 l hydrophobic solvent whilst becoming 14 – 18 % loaded with  $H_2O$ . Of course, dynamic drying as described in textbooks can also be used.

When drying hydrophobic solvents dynamically with aluminium oxide, silica gel or molecular sieve, the flow rate should be up to 30 cm per minute. In this way, using a column of diameter 2.5 cm and 5 cm<sup>2</sup> cross-section, up to 6 l per hour can pass through. Columns of diameter 2.5 cm and a length of 60 cm containing some 200 g of molecular sieve have proven useful for such applications.

**For many applications, the specially dried SeccoSolv® solvent is suitable.**

More information ► »Accuracy you can count on. Tailor-made solvents in tailor-made packaging« W.282105

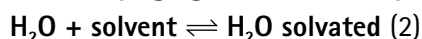
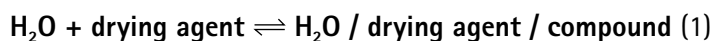


A	n-Amyl acetate
	n-Amyl alcohol
	Aniline
	Anisole
B	Benzene
	Benzyl alcohol
	Bromobenzene
	Bromoform
	tert-Butyl methyl ether
C	Carbon disulfide
	Carbon tetrachloride
	Chlorobenzene
	Chloroform
	Cyclohexane
	Cyclopentane
D	n-Decane
	1,2-Dichlorobenzene
	Dichloromethane
	Dichloroethane
	Diethyl ether
	Diethyl ketone
	Diethylene glycol dibutyl ether
	Diisoamyl ether
	Diisopropyl ether
	Dipropyl ether
E	Ethyl methyl ketone
H	n-Heptane
	n-Hexane
I	Isoamyl alcohol
	Isobutyl methyl ketone
	Isooctane
N	Nitrobenzene
	Nitropropane
P	n-Pentane
	Petroleum ether, petroleum, petroleum benzene
T	Tetrachloroethylene
	Toluene
	1,1,1-Trichlorethane
	Trichloroethylene
	1,1,2-Trichlorotrifluoroethane
X	Xylene

X	Xylene	•	•	•		•	•	
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# Drying agents

for solvents with medium to unlimited water adsorption capacity



Due to the competitive reactions (2) and (3), the attainable residual water contents are some 1000 times higher than in air – unless drying agents such as calcium hydride are used where no equilibrium exists due to one of the products (in this case  $\text{H}_2$ ) leaving the equation.

In general, residual water values of  $10^{-3}$  % by weight are adequate. Further drying is no longer meaningful, in particular if the dried solvent is refilled under air: even if poured quickly, the  $\text{H}_2\text{O}$  content increases from  $1 \cdot 10^{-3}$  to  $2\text{--}4 \cdot 10^{-3}$  %. A further source of contamination with water is e.g. non-greased ground glass, e.g. in desiccators, through which significant amounts of water vapor can diffuse. Suitable drying agents are recommended in the listing below. As conventional drying with chemical agents is adequately described in textbooks of preparative organic chemistry, only dynamic drying with the help of water-miscible solvents and molecular sieves (MS) is described here.

The following values can be attained using this method:

**Residual water content:** 0.001 – 0.005 % weight  $\text{H}_2\text{O}$  in the solvent

**Capacity:** at a desired residual water content of max. 0.001 %, the molecular sieve used may not be loaded greater than:

Diethyl ether	14 g $\text{H}_2\text{O}$ / 100 g molecular sieve
Ethyl acetate	6 g $\text{H}_2\text{O}$ / 100 g molecular sieve
Dioxane	4 g $\text{H}_2\text{O}$ / 100 g molecular sieve
Pyridine	2 g $\text{H}_2\text{O}$ / 100 g molecular sieve

**Loading:** depends on the reaction equation (2) of solvents

Solvents A-M			Water adsorption [g H <sub>2</sub> O/100 g solvent]	Drying agent	Ca – Calcium	CaCl <sub>2</sub> – Calcium chloride	CaH <sub>2</sub> – Calcium hydride	CaO – Calcium oxide	CuSO <sub>4</sub> – Calcium sulfate	Distillation	K <sub>2</sub> CO <sub>3</sub> – Potassium carbonate	KOH – Potassium hydroxide	Mg – Magnesium	MgO – Magnesium oxide	MgSO <sub>4</sub> – Magnesium sulfate	Molecular sieve 0.3 nm	Molecular sieve 0.4 nm	Molecular sieve 0.5 nm	Na – Sodium	Na <sub>2</sub> SO <sub>4</sub> – Sodium sulfate	P <sub>2</sub> O <sub>5</sub> – Phosphorus pentoxide
<b>A</b>	Acetic acid		∞						•												
	Acetone		∞								•					•					
	Acetonitrile		∞			•					•					•					•
	Acetylacetone		∞								•						•				
	tert-Amyl alcohol		14					•										•			
<b>B</b>	1-Butanol		20							•	•						•				
	2-Butanol		44							•	•							•			
	tert-Butanol		∞					•										•			
	n-Butyl acetate		2.9												•		•				
<b>C</b>	Cyclohexanol		11					•										•			
	Cyclohexanone		8.7								•							•			
<b>D</b>	Diethylene glycol		∞							•							•			•	
	Diethylene glycol diethyl ether		∞			•	•											•	•		
	Diethylene glycol dimethyl ether		∞			•	•											•	•		
	Diethylene glycol monobutyl ether		∞			•	•											•	•		
	Diethylene glycol monoethyl ether		∞			•	•											•	•		
	Diethylene glycol monomethyl ether		∞			•	•											•	•		
	N,N-Diethylformamide		∞				•			•									•		
	N,N-Dimethylformamide		∞				•			•								•			
	Dimethyl sulfoxide		∞				•			•						•					
	1,4-Dioxane		∞			•	•										•		•		
<b>E</b>	Ethanol		∞					•					•	•		•					
	Ethanolamine		∞									•				•					
	(2-Ethoxyethyl)-acetate		6.5								•						•			•	•
	Ethyl acetate		9.8								•						•			•	•
	Ethylene glycol dimethyl ether		∞				•			•							•				
	Ethylene glycol		∞							•							•			•	
	Ethylene glycol monobutyl ether		∞							•											
	Ethylene glycol monoethyl ether		∞							•											
	Ethylene glycol monomethyl ether		∞							•											
	Ethyl formate		∞												•		•			•	
<b>F</b>	Formamide		∞					•								•				•	
<b>G</b>	Glycerol		∞							•											
<b>H</b>	1,1,1,3,3,3-Hexafluoro-2-propanol		∞														•				
<b>I</b>	Isobutanol		15		•			•			•		•				•				
<b>M</b>	Methanol		∞					•					•	•		•					
	Methyl acetate		8					•			•						•				
	Methyl formate		24								•						•			•	•
	Methyl propyl ketone		3.6								•						•				
	Methyl pyridine		∞									•					•				

Solvents N-Z		Water adsorption [g H <sub>2</sub> O/100 g solvent]	Drying agent	Ca – Calcium	CaCl <sub>2</sub> – Calcium chloride	CaH <sub>2</sub> – Calcium hydride	CaO – Calcium oxide	CuSO <sub>4</sub> – Calcium sulfate	Distillation	K <sub>2</sub> CO <sub>3</sub> – Potassium carbonate	KOH – Potassium hydroxide	Mg – Magnesium	MgO – Magnesium oxide	MgSO <sub>4</sub> – Magnesium sulfate	Molecular sieve 0.3 nm	Molecular sieve 0.4 nm	Molecular sieve 0.5 nm	Na – Sodium	Na <sub>2</sub> SO <sub>4</sub> – Sodium sulfate	P <sub>2</sub> O <sub>5</sub> – Phosphorus pentoxide
P	1,2-Propanediol	∞					•					•	•			•				
	1,3-Propanediol	∞					•					•	•			•				
	1-Propanol	∞					•					•	•			•				
	2-Propanol	∞					•					•		•						
	Pyridine	∞					•					•	•		•					
T	Tetraethylene glycol	∞									•					•				
	Tetrahydrofuran	∞				•					•					•				
	Triethanolamine	∞									•						•			
	Triethylene glycol	∞							•							•			•	
	Triethylene glycol dimethyl ether	∞							•											

### Water absorption rate of some drying agents

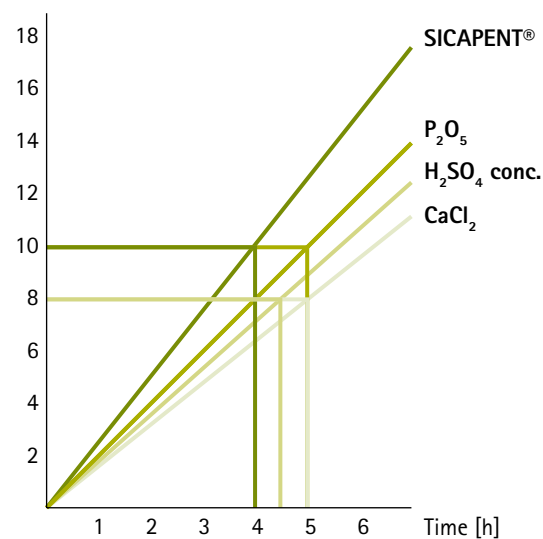
Experimental: 100 g SICAPENT® or 75 g of other drying agents were placed in a vacuum desiccator alongside a dish of water. After 1 h the increase in weight of the drying agents were established using gravimetric analysis. The results obtained are shown in the figure.

### Examples of flow rate

The flow rate for water-miscible solvents should be less than 10 cm/minute. This corresponds to max. flow rates of:

Flow rate	Column diameters
50 ml/min	25 mm
70 ml/min	30 mm
200 ml/min	50 mm

H<sub>2</sub>O adsorption [g]



Solvent	Initial water content [ % by weight]	Residual water content [ % by weight]	Quantity of solvent dried [l]	Type [nm]
Acetonitrile	0.05 – 0.2	0.003	3 – 4	0.3
Benzene	0.07	0.003	>10	0.4
Chloroform	0.09	0.002	>10	0.4
Cyclohexane	0.009	0.002	>10	0.4
Dichloromethane	0.17	0.002	>10	0.4
Diethyl ether	0.12	0.001	10	0.4
Diisopropyl ether	0.03	0.003	10	0.4
Dimethylformamide	0.06 – 0.3	0.006	4 – 5	0.4
1,4-Dioxane	0.08 – 0.3	0.002	3 – 10	0.5
Ethanol	0.04	0.003	10	0.3
Ethyl acetate	0.015 – 0.2	0.004	8 – 10	0.4
Methanol	0.04	0.005	10	0.3
2-Propanol	0.07	0.006	7	0.3
Pyridine	0.03 – 0.3	0.004	2 – 10	0.4
Carbon tetrachloride	0.01	0.002	>10	0.4
Tetrahydrofuran	0.04 – 0.2	0.002	7 – 10	0.5
Toluene	0.05	0.003	>10	0.4
Xylene	0.045	0.002	>10	0.4

- Dynamic drying of solvents with molecular sieves using a column of 25 x 600 mm (250 g molecular sieve) or of 50 x 2,000 mm (2 kg molecular sieve).

### Amount of solvent dried

The amount of dry solvent obtainable for solvents that are readily miscible with water cannot be accurately given as this is dependent on the initial water content which is mostly unknown. However, if the solvent is dried statically to a low H<sub>2</sub>O content (e.g. with approx. 100 g of molecular sieve, enough for 1 l of solvent), the subsequent dynamic process can be used to dry 10 l of the solvent to 0.001 – 0.002 % weight using 200 g of molecular sieve. For drying the strongly hygroscopic alcohols methanol, ethanol and 2-propanol to 0.002 % weight of residual water, however, some 2 kg of 0.3 nm molecular sieve is necessary. Column dimensions: ø 50 mm, length 2 m. An overview of the attainable drying effect with a series of water-saturated solvents is given in the table above.

### Practical procedure

It should initially be checked whether, in addition to water, the solvent to be dried is adsorbed by the molecular sieve. To do this, place 10–20 beads in a test tube along with several ml of the solvent. Significant increase in temperature – in certain circumstances even boiling – indicates co-adsorption according to (3). If this is the case, either a molecular sieve of smaller pore size, where there is no co-adsorption, should be used or the flow rate should be reduced to max. 2.5 cm per minute. The appropriate pore sizes where no further co-adsorption takes place are given in the table.

Initially the solvent should be applied to the column slowly until the entire column has been wetted within 15–30 minutes. As a rule, the first fraction collected contains an increased water content; this should either be discarded or re-applied to the column. In the case of fresh molecular sieve, the first fraction may contain some particles and be somewhat turbid; this fraction should either be disposed of or filtered.

## Ordering information **Drying agents A-C**

Absorption tube	CAS No.	Content	Packaging	Ord. No.
Absorption tube for H <sub>2</sub> O (molecular sieve 0.3 nm with indicator)	–	3 units	Plastic can	1.06107.0003



Calcium [Ca]	CAS No.	Content	Packaging	Ord. No.
Calcium granular particle size about 2 – 6 mm	7440-70-2	100 g	Glass bottle	1.02053.0100
		500 g	Glass bottle	1.02053.0500

<b>For drying</b>	Alcohols
<b>Application</b>	During the drying process, insoluble metal hydroxide is initially formed followed by metal alcoholate, which is soluble in alcohol. Hence, subsequent to drying, the solution must be distilled.
<b>Capacity</b>	Stoichiometric

Calcium chloride [CaCl <sub>2</sub> ]	CAS No.	Content	Packaging	Ord. No.
Calcium chloride anhydrous powder Reag. Ph Eur	10043-52-4	500 g	Plastic bottle	1.02378.0500
		2.5 kg	Plastic bottle	1.02378.2500
Calcium chloride anhydrous, granular ~ 1 – 2 mm	10043-52-4	1 kg	Plastic bottle	1.02379.1000
		5 kg	Plastic bottle	1.02379.5000
Calcium chloride anhydrous, granular ~ 2 – 6 mm	10043-52-4	1 kg	Plastic bottle	1.02391.1000
		5 kg	Fibre carton	1.02391.5000
		25 kg	Fibre carton	1.02391.9025
Calcium chloride anhydrous, granular ~ 6 – 14 mm	10043-52-4	1 kg	Plastic bottle	1.02392.1000
		5 kg	Fibre carton	1.02392.5000
		25 kg	Fibre carton	1.02392.9025

<b>For drying</b>	Acetone, ethers, numerous esters, aliphatic, olefinic, aromatic and halogenated hydrocarbons, neutral gases.
<b>Unsuitable for drying</b>	Alcohols, ammonia, amines, aldehydes, phenols, several esters and ketones: these compounds are bound by CaCl <sub>2</sub> .
<b>Application</b>	Drying of liquids, filling drying tubes; not suitable for the drying of fast-flowing gases as pore diffusion is hindered due to deliquescence during water uptake.
<b>Residual water content in air</b>	0.14 mg H <sub>2</sub> O/l to 16 % H <sub>2</sub> O content   0.7 mg H <sub>2</sub> O/l to 32 % H <sub>2</sub> O content   1.4 mg H <sub>2</sub> O/l to 65 % H <sub>2</sub> O content
<b>Capacity</b>	98 %
<b>Regeneration</b>	At 250°C in a drying oven



Calcium hydride [CaH <sub>2</sub> ]	CAS No.	Content	Packaging	Ord. No.
Calcium hydride for synthesis, ~ 1–10 mm	7789-78-8	100 g	Glass bottle	8.02100.0100
		500 g	Glass bottle	8.02100.0500
For drying	Gases, organic solvents, including ketones and esters.			
Unsuitable for drying	Compounds with active hydrogen, ammonia, alcohols.			
NB	Can explode in reaction with water!			
Application	<p>As calcium hydride is a very effective drying agent and reacts vigorously with water, the substances to be dried should contain only low amounts of water. In reaction with water, hydrogen is released (always work in a fume hood!) according to the equation <math>\text{CaH}_2 + \text{H}_2\text{O} \rightarrow 2 \text{H}_2 + \text{CaO}</math>.</p> <p>The fine voluminous powder formed may block drying towers. CaH<sub>2</sub> is superior to sodium as a drying agent as it possesses a much larger surface area. The CaO formed does not adhere to the CaH<sub>2</sub> surface and itself acts as a drying agent. <math>\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2</math>.</p>			
Disadvantage	Due to the higher activity and reactivity than Na, CaH <sub>2</sub> is less stable if stored incorrectly. Hence, once the package has been opened, it should be stored in a desiccator.			
Residual water content in air	<0.00001 mg H <sub>2</sub> O/l			
Capacity	Stoichiometric			

Calcium oxide [CaO]	CAS No.	Content	Packaging	Ord. No.
Calcium oxide from marble small lumps ~ 3 – 20 mm	1305-78-8	1 kg	Plastic bottle	1.02109.1000
		25 kg	Fibre carton	1.02109.9025
For drying	Neutral and basic gases, amines, alcohols, ethers.			
Unsuitable for drying	Acids, acid derivatives, aldehydes, ketones, esters.			
Residual water content in air	0.003 mg H <sub>2</sub> O/l			
Capacity	Limited as the surface is coated with a less permeable layer, especially in the presence of CO <sub>2</sub> .			

Copper sulfate [CuSO <sub>4</sub> ]	CAS No.	Content	Packaging	Ord. No.
Copper(II) sulfate anhydrous for analysis EMSURE®	7758-98-7	250 g	Plastic bottle	1.02791.0250
		1 kg	Plastic bottle	1.02791.1000
For drying	Low fatty acids, alcohols, esters.			
Unsuitable for drying	Amines, nitriles, ammonia.			
Residual water content in air	1.4 mg H <sub>2</sub> O/l			
Regeneration	Above 50°C under vacuum.			
Advantage	Can be used as indicator: Colorless anhydrous copper(II)sulfate becomes blue as copper(II)sulfate 5-hydrate.			

## Ordering information **Drying agents D-M**

Desiccant sachets [SiO <sub>2</sub> ]	CAS No.	Content	Packaging	Ord. No.
Desiccant sachet 10 g silica gel with humidity indicator (orange gel) sachet: 7 x 9 cm	–	50 units	Metal can	1.03804.0001
Desiccant sachet 100 g silica gel with humidity indicator (orange gel) sachet: 15 x 14 cm	–	10 units	Metal can	1.03805.0001
Desiccant sachet 250 g silica gel with humidity indicator (orange gel) sachet: 15 x 20.5 cm	–	10 units	Metal can	1.03806.0001
Desiccant sachet 3 g silica gel with humidity indicator (orange gel) sachet: 4 x 7 cm	–	100 units	Metal can	1.03803.0001
		1000 units	Fibre carton	1.03803.0002
► Further desiccant sachets, e.g. 500 g, on request.				
<b>For drying</b>	Humidity			
<b>Application</b>	Sachets filled with silica gel protect valuable and sensitive products from the effects of moisture. Packed along with sensitive machine components and tools, they prevent corrosion during storage and transport. Sachets maintain the function of sensitive optical, electrical and electronic components and instruments.			
<b>Capacity</b>	Silica gel has a high adsorptive capacity for moisture: 20 % of its own weight at 25°C and 80 % relative humidity.			
<b>Indicator change in orange gel</b>	At approx. 7–10 g adsorbed H <sub>2</sub> O / 100 g silica gel, the color change is from orange to colorless.			
<b>Regeneration</b>	Silica gel (orange gel) can be regenerated in a drying oven at 130 – 140°C. Desiccant sachet only up to 80°C, because the adhesive of the bag can melt.			



*Desiccant sachets*

Lithium aluminium hydride [Li(AlH <sub>4</sub> )]	CAS No.	Content	Packaging	Ord. No.
Lithium aluminium hydride – powder, for synthesis	16853-85-3	25 g	Metal can	8.18875.0025
Lithium aluminium hydride – tablets, for synthesis	16853-85-3	25 g	Metal can	8.18877.0025
<b>For drying</b>	Hydrocarbons, ethers.			
<b>Unsuitable for drying</b>	Acids, acid derivatives (chlorides, anhydrides, amides, nitriles), aromatic nitro compounds.			
<b>Application</b>	Li(AlH <sub>4</sub> ) reacts vigorously, on occasion explosively, with water whilst releasing hydrogen. Hence, the solvents to be dried should have a very low initial water content.			
<b>Capacity</b>	Stoichiometric			

Magnesium [Mg]	CAS No.	Content	Packaging	Ord. No.
Magnesium, turnings acc. to Grignard for synthesis	7439-95-4	250 g	Metal can	8.05817.0250
		1 kg	Metal can	8.05817.1000
Magnesium powder particle size about 0.06 – 0.3 mm	7439-95-4	1 kg	Metal can	1.05815.1000
For drying	Alcohols			
Application	Magnesium turnings must be activated with iodine prior to use. During the drying process insoluble metal hydroxide is initially produced, followed by metal alcoholate, which is soluble in alcohol. Thus after drying, distillation is necessary.			
Capacity	Stoichiometric			

Magnesium oxide [MgO]	CAS No.	Content	Packaging	Ord. No.
Magnesium oxide for analysis	1309-48-4	100 g	Plastic bottle	1.05865.0100
		500 g	Plastic bottle	1.05865.0500
For drying	Alcohols, hydrocarbons, basic liquids.			
Unsuitable for drying	Acid compounds.			
Residual water content in air	0.008 mg H <sub>2</sub> O/l			
Regeneration	At 800°C			

Magnesium perchlorate [Mg(ClO <sub>4</sub> ) <sub>2</sub> ]	CAS No.	Content	Packaging	Ord. No.
Magnesium perchlorate hydrate [about 83 % Mg(ClO <sub>4</sub> ) <sub>2</sub> ], desiccant, about 1 – 4 mm	64010-42-0	500 g	Metal can	1.05873.0500
For drying	Inert gases, air; adsorbs ammonia as strongly as water.			
Unsuitable for drying	Numerous solvents in which it is soluble, e.g. acetone, dimethyl formamide, dimethyl sulfoxide, ethanol, methanol, pyridine, organic compounds.			
Application	In drying towers for the drying of rapid flowing gases; with increasing H <sub>2</sub> O loading the packing becomes looser. Mg(ClO <sub>4</sub> ) <sub>2</sub> can be removed easily as it does not stick to the walls.			
Residual water content in air	0.0005 mg H <sub>2</sub> O/l to 10 % H <sub>2</sub> O content   0.002 mg H <sub>2</sub> O/l to 32 % H <sub>2</sub> O content			
Capacity	48 %, corresponding to 6 moles crystal water.			
Safety information	Explosion risk when in contact with a reducing atmosphere, in particular in the presence of acids or compounds that can be hydrolyzed to form acids. Mg(ClO <sub>4</sub> ) <sub>2</sub> may only be heated in vessels made of inorganic materials.			
Regeneration	At 240°C under vacuum.			

Magnesium sulfate [MgSO <sub>4</sub> ]	CAS No.	Content	Packaging	Ord. No.
Magnesium sulfate anhydrous for analysis EMSURE®	7487-88-9	1 kg	Glass bottle	1.06067.1000
		25 kg	Plastic drum	1.06067.9025
For drying	Almost all compounds including acids, acid derivatives, aldehydes, esters, nitriles and ketones.			
Residual water content in air	1.0 mg H <sub>2</sub> O/l			
Regeneration	At 200°C in a drying oven.			

## Ordering information **Drying agents M**

Molecular sieves	CAS No.	Content	Packaging	Ord. No.
Molecular sieve 0.3 nm beads ~ 2 mm <sup>1)</sup>	1318-02-1	250 g	Plastic bottle	<b>1.05704.0250</b>
		1 kg	Plastic bottle	<b>1.05704.1000</b>
		10 kg	Bucket, plastic	<b>1.05704.9010</b>
Molecular sieve 0.3 nm beads, with moisture indicator ~ 2 mm <sup>1)</sup>	–	250 g	Plastic bottle	<b>1.05734.0250</b>
		1 kg	Plastic bottle	<b>1.05734.1000</b>
Molecular sieve 0.3 nm rods ~ 1.6 mm (1/16")	1318-02-1	250 g	Plastic bottle	<b>1.05741.0250</b>
		1 kg	Plastic bottle	<b>1.05741.1000</b>
		10 kg	Bucket, plastic	<b>1.05741.9010</b>
Molecular sieve 0.4 nm beads ~ 2 mm Reag. Ph Eur	1318-02-1	250 g	Glass bottle	<b>1.05708.0250</b>
		1 kg	Glass bottle	<b>1.05708.1000</b>
		10 kg	Bucket, plastic	<b>1.05708.9010</b>
Molecular sieve 0.4 nm beads, with moisture indicator ~ 2 mm	–	250 g	Glass bottle	<b>1.05739.0250</b>
		1 kg	Glass bottle	<b>1.05739.1000</b>
Molecular sieve 0.4 nm rods ~ 1.6 mm (1/16")	1318-02-1	1 kg	Plastic bottle	<b>1.05743.1000</b>
Molecular sieve 0.5 nm beads ~ 2 mm	1318-02-1	250 g	Glass bottle	<b>1.05705.0250</b>
		1 kg	Glass bottle	<b>1.05705.1000</b>
Molecular sieve 1.0 nm beads ~ 2 mm	1318-02-1	1 kg	Glass bottle	<b>1.05703.1000</b>
► 1) Molecular sieves with 0.3 nm bead form (105704) and with indicator brown gel (105734) are suitable for use in Karl Fischer titrators.				

Molecular sieves are suitable for drying practically all gases and liquids. They can be used in desiccators, drying tubes, for keeping absolute solvents dry, filling columns for drying gases or solvents and for selective adsorption. (e.g. phosgene from chloroform).

### Advantages

- Easy-to-use: Practically chemically inert, non-toxic, no disposal problems, dried liquids can be decanted.
- High adsorption capacity even with low water content of the substance to be dried.
- High adsorption capacity even at high temperatures.
- High adsorption affinity for polar and unsaturated organic molecules; however, H<sub>2</sub>O is always preferentially adsorbed.
- Selective adsorption: only molecules that can pass through the pores are adsorbed.



## Molecular sieves – continued

Temperature	Molecular sieves absorb H <sub>2</sub> O whilst essentially maintaining their capacity at temperatures where both aluminium oxide and silica gel begin to release water. Between 0 and 150°C, the capacity decreases gradually from 23 to 7 % with a residual water content of 10 mg H <sub>2</sub> O/l.			
Residual water content in air	Min. 0.0001 mg H <sub>2</sub> O/l at 25°C. The less loaded a molecular sieve is the more intensively it dries. The supplied original packed molecular sieve contains approx. 1 – 2 % water. This tends not to interfere with the drying process. However, if the requirements of the drying process are high, the substance must be activated as described under »regeneration«.			
Typical values for molecular sieve 0.4 nm	Loading [g H <sub>2</sub> O/100 g molecular sieve]	Residual water content [mg H <sub>2</sub> O/l]		
	1	0.0001		
	3	0.001		
	6	0.01		
	15	0.1		
	20	0.5		
Capacity	15 – 24 % at 25°C. If low residual water content is to be attained, the capacity can only be partially utilized (see table above): At a desired residual water content of 0.01 mg H <sub>2</sub> O/l, the loading may not exceed 6 g H <sub>2</sub> O / 100 g molecular sieve.			
Indicator	The indicator (brown gel) changes from brown to yellowish at a H <sub>2</sub> O uptake of approximately 7 – 10 g / 100 g molecular sieve.			
Regeneration	This can be carried out as often as required; the max. regeneration temperature is 450°C. Molecular sieves can be dried in a drying oven above 250°C to a water content of 2 – 3 g / 100 g. The remaining water can be removed at 300 – 350°C using a vacuum oil pump (10 <sup>-1</sup> -10 <sup>-3</sup> mbar), whereby, as is usual, a cold trap containing carbon dioxide coolant or liquid air should be connected. Water pumps, due to their high partial water vapor pressure, are completely unsuitable for this purpose. For safety reasons, molecular sieves that have been used to dry solvents should be freed from possible solvent by mixing with water prior to regeneration. Molecular sieves with moisture indicator should not be heated above 150°C.			
Chemical and physical properties	Molecular sieves are crystalline, synthetic zeolites. Their crystal gratings are similar to a cage with numerous hollow spaces. The cavities are accessible from all sides by pores of exactly defined dimensions: depending on the type of molecular sieve, these can be 0.3, 0.4, 0.5 or 1.0 nm in diameter. If, due to heating, the water in the hollow spaces is removed, the material becomes an extremely active adsorbent. However, only those molecules are adsorbed that are small enough to pass through the pores (sieve effect).			
	Pore diameter	Type	Composition	Structure
	0.3 nm	3A	Potassium sodium aluminium silicate	Zeolite
	0.4 nm	4A	Sodium aluminium silicate	Zeolite
	0.5 nm	5A	Sodium and calcium aluminium silicate	Zeolite
	1.0 nm	13A/X	Sodium aluminium silicate	Zeolite
Physical properties	The molecular sieve crystallites obtained by hydrothermal manufacture are formed into rods and beads using 1 – 2 % clay as a binding agent. Vibration caused by transport may bring about some abrasion which collects in the first fraction during dynamic drying.			
	Bulk density	0.75 kg/l		
	Surface (BET)	800 m <sup>2</sup> /g		
	Form supplied	Powder, beads (~ 2 mm), rods (~ 1.6 mm, ~ 3.2 mm)		
	Effective pore diameter depending on type	0.3, 0.4, 0.5 or 1.0 nm		
	Hollow space volume	0.3 cm <sup>3</sup> /g		
	Specific heat	>0.8 KJ/kg		
	Heat of absorption per kg adsorbed water	4200 KJ		

## Ordering information **Drying agents P-S**

Phosphorus pentoxide [P <sub>2</sub> O <sub>5</sub> ]	CAS No.	Content	Packaging	Ord. No.
di-Phosphorus pentoxide extra pure	1314-56-3	1 kg	Glass bottle	<b>1.00540.1000</b>
		25 kg	Plastic drum	<b>1.00540.9025</b>
di-Phosphorus pentoxide for analysis ACS, ISO, Reag. Ph Eur	1314-56-3	100 g	Glass bottle	<b>1.00570.0100</b>
		500 g	Glass bottle	<b>1.00570.0500</b>
<b>For drying</b>	Neutral and acid gases, saturated aliphatic and aromatic hydrocarbons, nitriles, alkyl and aryl halogenides and carbon disulfide.			
<b>Unsuitable for drying</b>	Alcohols, amines, acids, ketones, ethers, chlorinated and fluorinated hydrocarbons.			
<b>Residual water content in air</b>	0.00002 mg H <sub>2</sub> O/l to 25 % water absorption with SICAPENT®, corresponding to 2 mole H <sub>2</sub> O per mole P <sub>2</sub> O <sub>5</sub> .			
<b>Capacity</b>	P <sub>2</sub> O <sub>5</sub> : 40 % SICAPENT®: 33 %			
<b>Application note</b>	On adsorbing water, phosphorus pentoxide becomes covered with a film of polymetaphosphoric acid which hinders the diffusion of H <sub>2</sub> O molecules. This effect can be avoided by using SICAPENT® as the polymetaphosphoric acid formed from P <sub>2</sub> O <sub>5</sub> and water is immediately adsorbed by the carrier substance. As a result, the drying agent is available as a fine, flowable granulate.			
<b>Regeneration</b>	Not possible			

Potassium carbonate [K <sub>2</sub> CO <sub>3</sub> ]	CAS No.	Content	Packaging	Ord. No.
Potassium carbonate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	584-08-7	500 g	Plastic bottle	<b>1.04928.0500</b>
		1 kg	Plastic bottle	<b>1.04928.1000</b>
Potassium carbonate for analysis EMSURE® ACS, ISO, Reag. Ph Eur	584-08-7	50 kg	Fibre carton	<b>1.04928.9050</b>
<b>For drying</b>	Ammonia, amines, acetone, nitriles, chlorinated hydrocarbons.			
<b>Unsuitable for drying</b>	Acids, substances that tend to react when exposed to water-removing basic conditions.			
<b>Application</b>	Drying liquids.			
<b>Regeneration</b>	At 160°C; becomes finely powdered from 100°C.			


Potassium hydroxide [KOH]	CAS No.	Content	Packaging	Ord. No.
Potassium hydroxide pellets for analysis EMSURE®	1310-58-3	500 g	Plastic bottle	<b>1.05033.0500</b>
		1 kg	Plastic bottle	<b>1.05033.1000</b>
		5 kg	Plastic bottle	<b>1.05033.5000</b>
		25 kg	Fibre carton	<b>1.05033.9025</b>
		50 kg	Fibre carton	<b>1.05033.9050</b>
<b>For drying</b>	Basic liquids, e.g. amines and inert and basic gases.			
<b>Unsuitable for drying</b>	Acids, acid derivatives (chlorides, anhydrides, amides, nitriles).			
<b>Application</b>	Drying liquids. Not suitable for drying fast-flowing gases as this hinders diffusion due to deliquescence. Can be used for drying gases if, apart from moisture, acid gas should be adsorbed.			
<b>Residual water content in air</b>	0.002 mg H <sub>2</sub> O/l			



di-Phosphorus pentoxide

SICAPENT®	CAS No.	Content	Packaging	Ord. No.
SICAPENT® with indicator (phosphorus pentoxide drying agent for desiccators) on inert carrier material	–	500 ml	Glass bottle	1.00543.0500
		2.8 l	Glass bottle	1.00543.2800
Composition	25 % inert inorganic carrier substance and 75 % phosphorus pentoxide.			
Particle size of carrier	0.1 – 1.6 mm			
Bulk density	approx. 300 g/l			
Flowable up to	100 % water uptake			
Indicator content	0.1 %			
Water content / Indicator color	H <sub>2</sub> O content [ %]		Indicator color of drying agent	
	0		Colorless	
	20		Green	
	27		Blue-green	
	33		Blue	
Application note	The main advantage of using granulated drying agents is the ease of use. Even after significant water uptake (approx. 100 % of its own weight) the substance remains in particle form. Hence, subsequent to the drying process the drying agent can easily be removed from the vessel. SICAPENT® dries well due to its large surface area; it is some 20 % faster than simple phosphorus pentoxide. In other terms, 20 % more water is adsorbed in the same time.			
Application	Drying liquids, filling drying tubes. Due to its high intensity and granulate form, it is particularly suitable for drying fast-flowing gases in drying tubes.			
Safety information	On opening the bottle, fine particles of drying agent may spray out; hence when opening the bottle adhere to the instructions on the label and open carefully whilst wearing safety spectacles.			

## Ordering information Drying agents S

Silica gel [SiO <sub>2</sub> ]	CAS No.	Content	Packaging	Ord. No.
Silica gel granules, desiccant ~ 0.2 – 1 mm	7631-86-9	1 kg	Plastic bottle	1.01905.1000
Silica gel granules, desiccant ~ 2 – 5 mm	7631-86-9	1 kg	Plastic bottle	1.01907.1000
		5 kg	Plastic drum	1.01907.5000
Silica gel with moisture indicator (brown gel) desiccant ~ 1 – 4 mm	–	1 kg	Plastic bottle	1.01972.1000
		5 kg	Plastic bottle	1.01972.5000
		25 kg	Plastic drum	1.01972.9025
Silica gel with indicator (orange gel), granulate ~ 1 – 3 mm	–	1 kg	Plastic bottle	1.01969.1000
		5 kg	Plastic bottle	1.01969.5000
		25 kg	Plastic drum	1.01969.9025
Silica gel beads, desiccant ~ 2 – 5 mm	7631-86-9	1 kg	Plastic bottle	1.07735.1000
For drying	Practically all gases and liquids.			
Unsuitable for drying	Alkaline liquids (bases and amines). Orange gel: strong acid and basic gases, organic solvents.			
Application	In a desiccator, for protecting moisture-sensitive substances during storage and transport and for maintaining the dryness of anhydrous solvents, packing drying towers for gases or solvents.			
Application temperature	Up to approx. 65°C the capacity is practically temperature-independent. At higher temperatures the capacity decreases significantly.			
Advantages of white gel	Practically chemically inert, non-toxic, no disposal problems, easy-to-handle. Dried liquids can simply be decanted.			
Residual water content in air	Min. 0.02 mg H <sub>2</sub> O/l, corresponding to a dew point of -55°C. The less loaded silica gel is with water, the more intensive it dries and the lower the residual water content.			
	Loading in g H <sub>2</sub> O / 100 g		Residual water content mg H <sub>2</sub> O/l	
	1		0.003	
	1.5		0.1	
	3.2		0.5	
	5.2		1	
	14		5	
	23		10	
	30		13	
Capacity	20 – 27 % at 25°C. If low residual water contents is to be attained, the capacity may only be partly utilized (see table above): if the desired residual water content of 1 mg/l is to be attained, the loading may not exceed 5.2 g H <sub>2</sub> O / 100 g silica gel.			



Silica gel [SiO <sub>2</sub> ] – continued		
Indicator change in orange gel	At approx. 7 – 10 g adsorbed H <sub>2</sub> O / 100 g silica gel, the color change is from orange to colorless.	
Indicator change in brown gel	At approx. 7 – 10 g adsorbed H <sub>2</sub> O / 100 g silica gel, the color change is from brown to yellowish.	
Regeneration	<b>Regeneration Silica Gel</b>	<b>Temperature / duration in a drying oven</b>
	White-Gel	Approx. 100 – 180°C / approx. 3 hours
	Orange-Gel	Approx. 130 – 140°C / approx. 3 hours
	Brown-Gel	Approx. 120 – 150°C / approx. 3 hours
	Silica gel is no longer capable of drying	Above 500°C
Typical chemical and physical data	<b>Analytical data</b>	98 % SiO <sub>2</sub> , remainder Al <sub>2</sub> O <sub>3</sub> , TiO <sub>2</sub> , Fe <sub>2</sub> O <sub>3</sub>
	Indicator in orange gel	Iron salt
	Indicator in brown gel	Iron salt
	Bulk density	Approx. 0.7 kg/l
	Surface (BET)	700 m <sup>2</sup> /g
	Particle size	0.2 – 1 mm, 1 – 3 mm, 2 – 5 mm
	Pore size	2.0 – 2.5 nm
	Specific heat	Approx. 1 KJ/kg°C
	Heat of adsorption per kg adsorbed water	3200 KJ



## Ordering information **Drying agents S-Z**

Sodium [Na]	CAS No.	Content	Packaging	Ord. No.
Sodium rod diameter 2.5 cm (protective liquid: paraffin oil)	7440-23-5	250 g	Glass bottle	<b>1.06260.0250</b>
		1 kg	Glass bottle	<b>1.06260.1000</b>
Sodium rods (protective liquid: paraffin oil) for synthesis	7440-23-5	250 g	Glass bottle	<b>8.22284.0250</b>
		1 kg	Glass bottle	<b>8.22284.1000</b>
<b>For drying</b>	Ethers, saturated aliphatic and aromatic hydrocarbons, tertiary amines.			
<b>Unsuitable for drying</b>	Acids, acid derivatives, alcohols, aldehydes, ketones, alkyl and aryl halogenides; these can give rise to extremely vigorous, explosive reactions.			
<b>Application</b>	As sodium wire using a sodium press for drying liquids. Caution! Sodium reacts explosively with water. Sodium waste should be disposed of using a high-boiling alcohol e.g. tert-butanol.			
<b>Capacity</b>	Stoichiometric			
<b>NB</b>	Practically all solvents which can be dried with sodium can also be more intensively dried with calcium hydride.			

Sodium hydroxide [NaOH]	CAS No.	Content	Packaging	Ord. No.
Sodium hydroxide pellets for analysis EMSURE® ISO	1310-73-2	500 g	Plastic bottle	<b>1.06498.0500</b>
		1 kg	Plastic bottle	<b>1.06498.1000</b>
		5 kg	Plastic bottle	<b>1.06498.5000</b>
		25 kg	Fibre carton	<b>1.06498.9025</b>
		50 kg	Fibre carton	<b>1.06498.9050</b>
<b>For drying</b>	Basic liquids, e.g. amines and inert and basic gases.			
<b>Unsuitable for drying</b>	Acids, acid derivatives (chlorides, anhydrides, amides, nitriles).			
<b>Application</b>	Drying liquids. Not suitable for drying fast-flowing gases as pore diffusion is hindered by deliquescence. Can be used for drying gases if acid gas also has to be adsorbed.			
<b>Residual water content in air</b>	0.002 mg H <sub>2</sub> O/l			

Sodium sulfate [Na <sub>2</sub> SO <sub>4</sub> ]	CAS No.	Content	Packaging	Ord. No.
Sodium sulfate anhydrous granulated for organic trace analysis EMSURE®	7757-82-6	500 g	Glass bottle	<b>1.06639.0500</b>
Sodium sulfate anhydrous, coarse granules for analysis 0.63 – 2.0 mm EMSURE® ACS	7757-82-6	500 g	Plastic bottle	<b>1.06637.0500</b>
		1 kg	Plastic bottle	<b>1.06637.1000</b>
		25 kg	Fibre carton	<b>1.06637.9025</b>
Sodium sulfate anhydrous for analysis EMSURE® ACS, ISO, Reag. Ph Eur	7757-82-6	500 g	Plastic bottle	<b>1.06649.0500</b>
		1 kg	Plastic bottle	<b>1.06649.1000</b>
		5 kg	Plastic bottle	<b>1.06649.5000</b>
		25 kg	Fibre carton	<b>1.06649.9025</b>
<b>For drying</b>	Almost all compounds including fatty acids, aldehydes, ketones and alkyl and aryl halogenides.			
<b>Application</b>	Drying liquids; of average effect.			
<b>Regeneration</b>	At 150°C in a drying oven.			

Sulfuric acid [H <sub>2</sub> SO <sub>4</sub> ]	CAS No.	Content	Packaging	Ord. No.
Sulfuric acid 95 – 97 % for analysis EMSURE® ISO	7664-93-9	1 l	Glass bottle	1.00731.1000
		1 l	Plastic bottle	1.00731.1011
		2.5 l	Glass bottle	1.00731.2500
		2.5 l	Safebreak btl.	1.00731.2510
		2.5 l	Plastic bottle	1.00731.2511
		25 l	Plastic container	1.00731.9025
For drying	Air, gases such as hydrogen chloride, chlorine, carbon monoxide, sulfur dioxide, hydrocarbons and inert gases.			
Unsuitable for drying	Oxidizing gases such as hydrogen sulfides and hydrogen iodides and unsaturated and numerous other organic compounds.			
Application	Sulfuric acid is used in wash bottles for drying gases or in open dishes in desiccators. To increase the surface area and to avoid the risk of burns.			



# Auxiliaries for purification and sample preparation

Purifying, enriching and separating samples for analytical purposes are routine processes in laboratories. Solid, liquid and gaseous substances must also be purified in production. A wide range of methods can be used for this, including: Absorption, adsorption, distillation, extraction, filtration, crystallization and drying.

In the product range of reagents for sample preparation, Merck Millipore offers many laboratory chemicals for a wide variety of purification methods. Many of these products, however, are not only suitable for purification, but can also be used for example as reaction auxiliaries, filtration aids, fillers, additives or active ingredient carriers.

The final part of the Merck Millipore product range is classic laboratory aids – such as heating bath media, joint greases or boiling chips – which are indispensable for many reactions and distillations. You can find chemical and physical data on our reagents in the Merck Millipore Chemicals and Reagents catalog and on our website: [www.merckmillipore.com](http://www.merckmillipore.com)



# Purification and preparation

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## ■ Advantages

- **Reliable:** Above all thanks to their reproducible results, the premium Merck Millipore reagents for purification, separation and enrichment offer extremely high batch consistency and thus great reliability for the implementation of your application.
- **Convenient:** The comprehensive Merck Millipore product range is easy to order, all from one place.
- **Economical:** Merck Millipore offers packaging sizes for the smallest laboratories and larger packages for testing and production facilities, so that the exact quantity required can be easily obtained.



[www.merckmillipore.com/purification-preparation](http://www.merckmillipore.com/purification-preparation)

# Safety and environment

## Safety and environment

Merck Millipore pays attention to ensure that chemical reagents for sample preparation are manufactured in an eco-friendly way, without potentially harmful additives. In the manufacture of Merck Millipore decalcification solution, for example, the use of surfactants and any potentially allergenic aromas or colorings is consciously avoided. In contrast to other mineral oil heating baths, the Merck Millipore heating bath fluid is toxicologically harmless and biodegradable.

Our range of selected natural products such as quartz sand and kaolin, a natural, fine and well-crystallized clay material, underlines our strategic goal of protecting people and the environment sustainably. The selected natural product is tested for organic impurities and various anions and cations in the Merck Millipore chemical analysis laboratory and specified in laboratory quality.

## Safety and environment – characteristics

► For easy detection, safety and/or sustainable characteristics of our products are highlighted with this symbol.



Further information about sustainable protection  
[www.merckmillipore.com/protection](http://www.merckmillipore.com/protection)

# Definitions

## Absorption reagents

Absorption [from Latin »absorbere«: to devour, swallow up] describes the take-up of gases or liquids by solid bodies. Solids with cavities of a defined pore size can be used for separation, purification or enrichment. In this way, mixtures – usually of gases – can be separated into their individual component parts as a result of their varying molecule sizes.

## Adsorption reagents

Adsorption [from Latin »adsorbere«: to suck in] describes the take-up of a substance on the surface of a solid without a chemical reaction. Due to adhesive forces, gaseous, liquid and, in rare cases, solid substances accumulate on the surface or interface of the adsorbent. This releases the bond energy in the form of heat. The larger the surface, the greater the adsorption capacity of a substance. The total surface is therefore often given in »m<sup>2</sup>/g« for specification. This adsorption strength is reduced by warming and increased by cooling.

## Filter and clarification materials

The filter and clarification materials are usually reagents with absorbent or adsorbent properties, although materials which work in a similar way to frits or which form capillaries as filter cake can also be used to clarify solutions, to decolorize or to remove colloiddally dissolved substances.

## Reaction auxiliaries

Reagents can be involved in a reaction or method directly or indirectly, for example as a filler or additive.

## Joint greases

To lubricate ground glass joints, taps, desiccator lids etc, grease (e.g. silicone or special desiccator grease) is usually applied. A thin, even layer of grease prevents glass components from »caking«. In order for the greases to remain in the joint and close it tightly even at high temperatures or in a vacuum, they must be chemically inert, temperature-resistant and highly viscous.

## Drying agents

Drying agents are not only used for the removal of water or other (not chemically bonded) liquids, but are also effective absorbents. They are used both in sample preparation and in product purification, for the drying of gases, solvents, synthetics or for the storage of sensitive products under consistently dry conditions.


## More information

► »Absorption and filtration« see page 236 ► »Drying agents« see page 250

## Ordering information Purification and preparation

Boiling chips [Distillation]		CAS No.	Content	Packaging	Ord. No.
Boiling chips granules ~ 1 – 2 mm		–	250 g	Plastic bottle	1.07912.0250
Boiling chips granules ~ 2 – 8 mm		–	100 g	Plastic bottle	1.07913.0100
			500 g	Plastic bottle	1.07913.0500
Application advice	In liquids, for example during distillation, boiling chips prevent »superheating«, which occurs when the liquid is heated above its boiling point.				
Additional information	Boiling chips made from aluminium oxide or silicate ceramics are available in different grain sizes, depending on the medium and requirements.				
Boiling chips granules ~ 1 – 2 mm					
Application advice	Boiling chips with a grain size of under 2 mm are used for heating liquids in very small vessels.				
Boiling chips granules ~ 2 – 8 mm					
Application advice	Due to their porous structure, boiling chips made from silicate ceramics are best for use in watery solutions and solvents.				

BTS catalyst [Cleaning]	CAS No.	Content	Packaging	Ord. No.
BTS catalyst (about 5 x 3 mm) for gas purification	–	1 kg	Glass bottle	1.04182.1000
<b>Application advice</b>	A BTS catalyst is used for the removal of oxidizing or reducing contaminants from gases and mixtures thereof, for example for cleaning noble gases, nitrogen, hydrogen, oxygen, carbon monoxide, carbon dioxide, methane, ethane, propane, ethyls, propyls and inert gas mixtures with a wide range of compositions.			
<b>Additional information</b>	The BTS catalyst consists of around 30 % copper. It is provided in oxidized form and can be used without further preliminary treatment for the removal of reducing contaminants from inert gases. The oxidized form is black, the reduced form grey, although the change in color is relatively weak. Return to the oxide form occurs with the help of an oxygen-nitrogen mixture, ideally at a temperature between 120 and 200°C: $2 \text{ Cu} + \text{O}_2 \rightarrow 2 \text{ CuO}$			

Decalcification solution [Decalcification]	CAS No.	Content	Packaging	Ord. No.
Decalcification solution base: citric acid about 19 %	–	1 l	Plastic bottle	1.00240.1000
<b>Application advice</b>	Decalcification solution with a citric acid base is used e.g. in laboratories for the decalcification of, e.g., faucets, boilers, heating coils, coolers, containers and pipes in which drinking or process water of medium or high hardness is used. It can also be used as a complexing agent and buffer solution.			
<b>Additional information</b>	This decalcification solution with a citric acid base, 19 % concentration, can easily be made into the necessary concentration (1 to 5 %) by dilution and is thus easier to handle than organic acids in powder or crystal form. The use of a citric acid base also makes it less aggressive than other organic or diluted inorganic acids.			
<b>Information on sustainable protection</b>	The use of surfactants, aromas and colorings was consciously avoided during production.			




Glass beads	CAS No.	Content	Packaging	Ord. No.
Glass beads 2 mm	–	500 g	Plastic bottle	1.04014.0500
Glass beads 3 mm	–	500 g	Plastic bottle	1.04015.0500
Glass beads 4 mm	–	500 g	Plastic bottle	1.04016.0500
Glass beads 5 mm	–	500 g	Plastic bottle	1.04017.0500
Glass beads 6 mm	–	500 g	Plastic bottle	1.04018.0500
<b>Application advice</b>	<b>Glass beads of size 2 to 6 mm can be used in a wide range of ways in laboratories and technical facilities:</b> For filling distillation columns (the size of the glass beads determines the distillation speed and separation); As agitator and mixing beads e.g. when mixing solutions which tend to settle or substances which are difficult to dissolve; For the prevention of superheating during distillation, especially in highly pure solvents or acids; In the concentration or vaporization of solutions (prevents change in weight, even in aggressive substances and at high temperatures. The vaporization or evaporation dish can be reweighed with glass beads.			
<b>Additional information</b>	Glass beads are made from colorless soda lime silica glass. It is the most widely used material for glass applications and is produced by melting quartz sand, natrite and lime at a temperature of over 1200°C.			

Glass beads 6 mm




Graphite	CAS No.	Content	Packaging	Ord. No.
Graphite fine powder extra pure	7782-42-5	2.5 kg	Fibre carton	1.04206.2500
		25 kg	Fibre carton	1.04206.9025

Heating bath fluid [Auxiliary]	CAS No.	Content	Packaging	Ord. No.
Heating bath fluid for heating baths up to approx. 170°C	31694-55-0	2.5 l	Plastic bottle	1.15265.2500
<b>Application advice</b>	Heating bath fluid is used to allow chemical reactions at a higher temperature.			
<b>Additional information</b>	Heating bath fluids can be used up to a temperature of around 170°C. The colorless heating bath fluid consists of a mixture of polyhydric aliphatic alcohols. It can be mixed with water without limitation, and is toxically harmless and biodegradable. In contrast to other mineral oil heating baths, reaction vessels can easily be washed out with water. Even if water gets into the hot heating bath unintentionally, there is usually no splashing.			
<b>Information on sustainable protection</b>	Toxically harmless and biodegradable.			

Iron (II) sulfide [Analysis]	CAS No.	Content	Packaging	Ord. No.
Iron(II) sulfide sticks Ø ~ 1 cm	1317-37-9	1 kg	Plastic bottle	1.03956.1000
		25 kg	Fibre carton	1.03956.9025
<b>Application advice</b>	Used in laboratories for the production of hydrogen sulfide.			
<b>Additional information</b>	Iron (II) sulfide is dark gray or black, metal-like pieces, plates or sticks, which are usually contaminated with excess Fe-extra pure, crystalline FeS would be light tombac brown. FeS is insoluble in water, but dissolves in acids, developing hydrogen sulfide. Since there is non-converted Fe in FeS, the nitrogen sulfide obtained in this way is contaminated with hydrogen.			

## Ordering information Purification and preparation

Kaolin	CAS No.	Content	Packaging	Ord. No.
<b>Kaolin powder</b>	1332-58-7	2.5 kg	Plastic bottle	<b>1.04440.2500</b>
<b>Application advice</b>	Kaolin can be used e.g. as an adsorbent, filler, polisher or carrier. As an adsorbent, kaolin can bond cations among other things.			
<b>Additional information</b>	Due to the structure of aluminium silicate, kaolin, also known as china clay, kaolinite, porcelain clay etc., swells significantly when taking up water, and can absorb up to 80 % water.			
<b>Information on sustainable protection</b>	The kaolin offered here is a selected natural product which is tested for organic impurities and various anions and cations and provided in laboratory quality.			

Magnesia rods [Reaction detection]	CAS No.	Content	Packaging	Ord. No.
<b>Magnesia rods for the phosphorus salt pearls</b>	–	100 units	Plastic bottle	<b>1.05809.0100</b>
<b>Application advice</b>	Magnesia rods are used e.g. for the detection of certain elements through characteristic flame color and for reactions with borax and phosphoric salt pearls. The magnesia rods are also used as a carrier or digestion agent for certain substances that can be fused when held into a flame.			
<b>Additional information</b>	Magnesia rods are formed from ignited magnesium oxide which, due to its high melting point of over 2600°C, does not melt even in the hottest flame and does not show its own flame color. The rods are around 14 cm long and have a diameter of around 2 mm.			



Marble granular [Analysis]	CAS No.	Content	Packaging	Ord. No.
<b>Marble granular for producing CO<sub>2</sub></b>	471-34-1	1 kg	Plastic bottle	<b>1.05986.1000</b>
<b>Marble granular for producing CO<sub>2</sub></b>	471-34-1	5 kg	Plastic bottle	<b>1.05986.5000</b>
<b>Application advice</b>	Marble granular is used for the determination of carbon dioxide in water, which attacks lime. CO <sub>2</sub> can be produced from the effect of hydrochloric acid on marble.			
<b>Additional information</b>	Marble granular is formed from calcium carbonate.			

Oil bath filling [Additive]	CAS No.	Content	Packaging	Ord. No.
<b>Oil bath filling for oil baths up to about 250°C</b>	8002-74-2	1 l	Alu bottle	<b>1.06900.1000</b>
		5 l	Alu bottle	<b>1.06900.5000</b>
		25 l	Steel barrel	<b>1.06900.9026</b>
<b>Application advice</b>	Oil bath fillings are used up to a temperature of around 250°C.			
<b>Additional information</b>	Oil bath filling consists of mineral oils which boil at high temperatures and are free from resin and acid. When used for the first time, the oil bath filling should be heated to the operating temperature for a while in a fume hood, in order to remove low-molecular components. If high temperatures are maintained for a long time, there is a risk of thermal decomposition. Due to unpleasant odors, the oil bath filling should generally only be used in a fume hood.			

Paraffin	CAS No.	Content	Packaging	Ord. No.
Paraffin 42-44, in block form	8002-74-2	1 kg	Plastic bottle	1.07150.1000
		2.5 kg	Plastic bottle	1.07150.2500
		25 kg	Fibre carton	1.07150.9025
Paraffin 46-48, in block form	8002-74-2	1 kg	Plastic bottle	1.07151.1000
		25 kg	Fibre carton	1.07151.9025
Paraffin 51-53, in pastille form Ph Eur, BP, NF	8002-74-2	1 kg	Plastic bottle	1.07157.1000
		2.5 kg	Plastic bottle	1.07157.2500
		25 kg	Fibre carton	1.07157.9025
Paraffin 52-54, in pastille form Ph Eur, BP, NF	8002-74-2	1 kg	Plastic bottle	1.07300.1000
		20 kg	Fibre carton	1.07300.9020
Paraffin 56-58, in pastille form Ph Eur, BP, NF	8002-74-2	1 kg	Plastic bottle	1.07337.1000
		2.5 kg	Plastic bottle	1.07337.2500
		20 kg	Fibre carton	1.07337.9020
Paraffin 57-60, in pastille form Ph Eur, BP, NF	8002-74-2	1 kg	Plastic bottle	1.07158.1000
		25 kg	Fibre carton	1.07158.9025
Paraffin liquid Reag. Ph Eur	8012-95-1	1 l	Plastic bottle	1.07162.1000
		2.5 l	Plastic bottle	1.07162.2500
		25 l	Plastic container	1.07162.9025
Paraffin viscous Ph Eur, BP, USP	8012-95-1	1 l	Plastic bottle	1.07160.1000
		2.5 l	Plastic bottle	1.07160.2500
		25 l	Plastic container	1.07160.9026
<b>Application advice</b>	Paraffins have a wide range of uses and applications, e.g. as a heating bath medium, as a waxing agent and lubricant or as an additive. Due to their high flashpoint and ignition temperature, paraffins can be used up to a temperature of around 200°C.			
<b>Additional information</b>	Paraffins (alkanes) consist of saturated aliphatic hydrocarbon and may be in liquid or solid form, depending on the chain length. Paraffin is not a single organic bond, but rather a mixture of hydrocarbons of varying chain lengths. This also defines the condition of aggregation and the defined melting range.			

Polyvidone	CAS No.	Content	Packaging	Ord. No.
Polyvidone 25 Ph Eur, BP	9003-39-8	100 g	Plastic bottle	1.07443.0100
		1 kg	Plastic bottle	1.07443.1000
<b>Application advice</b>	Polyvidone, also known as polyvinylpyrrolidone (PVP), is used as a protective colloid, stabilizer and binding agent.			
<b>Additional information</b>	Polyvidone is a hygroscopic, amorphous, white-yellow powder, a polymer of 1-vinylpyrrolidone-(2), and forms a viscous colloidal solution with water. Its amorphous structure means that PVP has no melting point, but rather a glass transition temperature depending on the level of polymerization between around 110 and 180°C. PVP dissolves in water and in a wide range of other organic solvents.			

## Ordering information Purification and preparation

Polyvinyl alcohol [Auxiliary]	CAS No.	Content	Packaging	Ord. No.
<b>Polyvinyl alcohol protective colloid for argentometric titration</b>	9002-89-5	100 g	Plastic bottle	<b>1.14266.0100</b>
<b>Application advice</b>	Polyvinyl alcohol or PVA or PVOH is a man-made thermoplastic plastic which is used, for example, as an adhesive and thickening agent.			

Quartz fine granular

Quartz [Filler and additive]	CAS No.	Content	Packaging	Ord. No.
<b>Quartz fine granular, washed and calcined for analysis</b>	14808-60-7	250 g	Plastic bottle	<b>1.07536.0250</b>
		1 kg	Plastic bottle	<b>1.07536.1000</b>
		5 kg	Plastic bottle	<b>1.07536.5000</b>
<b>Application advice</b>	As a result of its chemical indifference, quartz sand is used as a filler, filtration aid and as a catalyst carrier or pulverization agent in laboratory analysis.			
<b>Additional information</b>	The grain size of quartz is 0.2 to 0.8 mm.			
<b>Information on sustainable protection</b>	Quartz sand is a selected natural product which is treated in a similar way to sea sand.			



Silicic acid [Filler and additive]	CAS No.	Content	Packaging	Ord. No.
<b>Silicic acid precipitated extra pure heavy</b>	10279-57-9	1 kg	Plastic bottle	<b>1.00656.1000</b>
		20 kg	Fibre carton	<b>1.00656.9020</b>
<b>Silicic acid precipitated extra pure light DAB</b>	10279-57-9	1 kg	Fibre carton	<b>1.00657.1000</b>
		10 kg	Fibre carton	<b>1.00657.9010</b>
<b>Application advice</b>	Synthetic, highly chemically pure silicic acid may be used in laboratories as a filler, additive, flow aid and adsorbent.			

Silicone anti-foaming agents [Anti-foaming agent]	CAS No.	Content	Packaging	Ord. No.
<b>Silicon anti-foaming agent</b>	-	100 g	Plastic bottle	<b>1.07743.0100</b>
		500 ml	Plastic bottle	<b>1.07743.0500</b>
<b>Application advice</b>	Silicone anti-foaming agents prevent the unwanted formation of foam through substances which are active on the surface of watery solutions, such as e.g. emulsifiers. In defoaming processes in laboratories and technical facilities, the quantity used depends on the composition of the substance to be defoamed and the foaming agent itself. Very low dosages are usually necessary – in normal cases around 2 to 10 ppm and in water solutions containing wetting agents, 200 to 1000 ppm. The best amount to use in individual cases can only be found by trial.			
<b>Additional information</b>	Silicone anti-foaming agents consist of a watery emulsion of substituted polysiloxanes with differing chain lengths which are extremely effective as a »foam suppressor«: their limited ability to mix with water (hydrophobia) means that they accumulate at the phase interface, thus reducing the surface activity of the foam-forming emulsifiers.			

Silicone grease [Sealing]	CAS No.	Content	Packaging	Ord. No.
Silicone grease	–	100 g	Fibre case	1.07746.0100
Silicone high vacuum grease heavy	–	100 g	Fibre case	1.07921.0100
Application advice	Silicone grease is used in a similar way to desiccator or stopcock grease for the lubrication of moving parts and for sealing a vacuum in jointed apparatus.			
Additional information	Silicone greases are highly viscous polysiloxanes characterized by great chemical resistance. The difference between the various grease types is their viscosity, as can be derived from the additional designation. The higher the viscosity, the more reliable the seal in a vacuum, even at temperatures over 200°C.			

Silicone oil [Auxiliary]	CAS No.	Content	Packaging	Ord. No.
Silicone oil for oil baths up to 250°C	68083-14-7	100 ml	Plastic bottle	1.07742.0100
		1 l	Plastic bottle	1.07742.1000
Application advice	Silicone oil is used as a heat transfer medium. As a result of the wide operating temperature range of -45 to +230°C, it is also used as thermostat liquid.			
Additional information	Silicone oil is a methylphenylpolysiloxane and an almost colorless liquid, and cannot be mixed with water.			

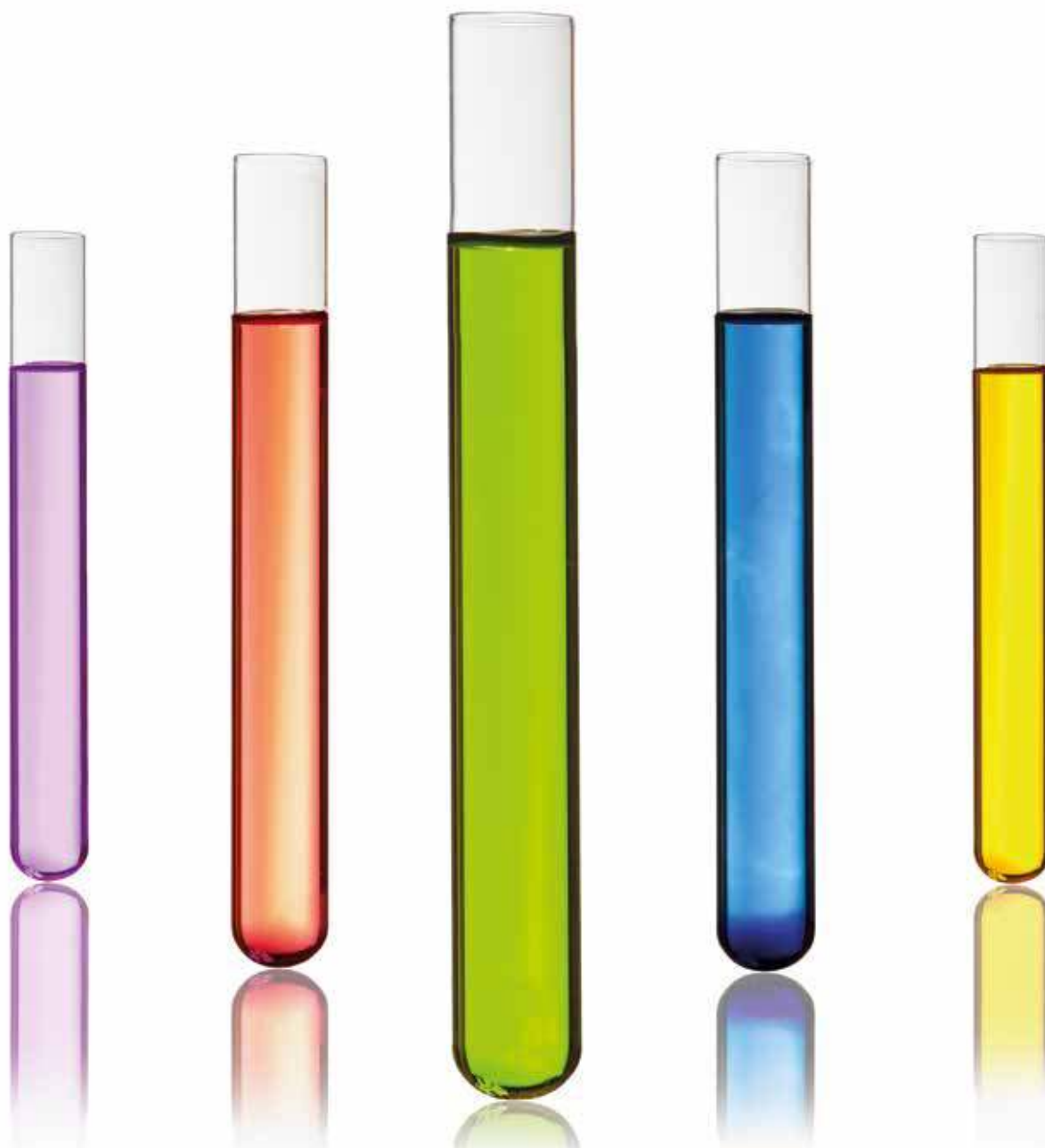
Stopcock grease [Sealing]	CAS No.	Content	Packaging	Ord. No.
Stopcock grease melting point 45 – 53°C	–	250 g	Plastic can	1.04318.0250
Application advice	Desiccator grease is used for standard applications in the laboratory, e.g. for sealing joints in laboratory equipment made of glass.			
Additional information	It consists of beeswax and vaseline.			

Triton®	CAS No.	Content	Packaging	Ord. No.
Triton® X-100 for analysis	9036-19-5	1 l	Glass bottle	1.08603.1000
		2.5 l	Glass bottle	1.08603.2500

Water detection paste	CAS No.	Content	Packaging	Ord. No.
Water detection paste N	–	150 g	Alu tube	1.08641.0001
Application advice	This paste can be used to detect water in containers that are filled with fuel, heating oil or other water-immiscible fluids. The level water will be reflected by a color change. A well-defined color change does not only enable to show the presence of water, but also allows to measure the level of the water.			
Additional information	If stored in a cool and dry place with the tube firmly closed, the water detection paste can be kept indefinitely. When using in cool weather, the paste's spreading ability can be improved by warming the tube slightly.			

# Indicators

The word »indicators« is derived from the Latin »indicare« meaning »show« – which corresponds to the function of these products. They help, for example, to display certain information when used in laboratories, and are thus most often used for titration purposes. Chemical reactions and the status of a reaction can be monitored by changes in the color of the indicators. Merck Millipore offers a large portfolio of highly accurate indicators depending on the type of chemical or physical conditions and reactions.



# Indicators

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## ■ Advantages

- **Reliable:** Our exceptional high-quality analytics and technical expertise allow us to offer you a consistently high level of quality and reliability for your analyses.
- **Convenient:** Our wide range of indicators in various packaging sizes enables you to obtain all the indicators you need for your application from a single source. This saves you the effort of searching around and therefore saves valuable time, which you can use for important applications.
- **Economical:** Merck Millipore indicators allow you to precisely define the end-point for a wide range of titration types, thereby supporting your financial and scientific activities.
- **High quality:** The high standard of quality of the Merck Millipore indicators tested by means of extensive analyses ensure reproducible results.



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

# Acid-alkali indicators or pH indicators

An acid-alkali indicator or pH indicator is a coloring agent which changes color to display whether an aqueous solution reacts as an acid or an alkali. In contrast to pH-indicator strips or indicator papers, which are mainly used to find the current pH value, the main use of pH indicators in laboratory applications is for the quantitative definition of the acid or alkali content of a solution (end-point indication / titration). When used as a rapid end-point indicator of an acid-base titration, the indicator shows a different color at the equivalence point compared to before it. This allows the user to visually recognize the end-point of the titration.

## How does the change in color occur?

pH indicators are organic coloring agents with an acidic or alkaline character, which exhibit a different color and constitution in their undissociated condition than in the ionic form. When an acid or alkali is added, the color does not change immediately, but continuously within a pH range. In every titration, it is important to determine the equivalence point. As a result of hydrolytic processes, this does not always coincide with the neutral point (pH 7), but can lie in either the acidic or alkaline range. It is therefore necessary to select an indicator for the titration whose transition point has the same or similar pH value to the equivalence point of the system being titrated.

## The pH-Indicator-Selector. An intelligent tool

On our website, we offer you a clever and convenient tool that helps you quickly find the right pH indicator for your particular application. You simply need to enter the pH value required and you will immediately receive an overview of the suitable indicators, along with color information, transition intervals and other useful product information.

To explore our practical application assistant, please visit:  
[www.merckmillipore.com/ph-indicator-selector](http://www.merckmillipore.com/ph-indicator-selector)

## More information

► [www.merckmillipore.com/ph-indicator-selector](http://www.merckmillipore.com/ph-indicator-selector)



# The pH-Indicator-Selector

pH-indicators	pH 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Malachite green oxalate	green		green-blue									blue		colorless	
Brilliant green	yellow		green												
Eosin Y	yellow		green fluorescence												
Erythrosine B	orange		red												
Methyl green	yellow		blue												
Cresol red	pink		yellow-orange				yellow		purple						
Crystal violet	yellow		blue-violet												
m-Cresol purple	pink		yellow				yellow-orange		purple						
Thymol blue	red		yellow-orange				yellow-green		blue						
Eosin B	colorless		pink fluorescence												
Quinaldine red	colorless		pink												
Bromocresol green sodium salt			yellow-green				blue								
Dimethyl yellow			red		yellow-orange										
Bromophenol blue			yellow		blue-violet										
Congo red			blue		yellow-orange										
Methyl orange			red		yellow-orange										
Methyl orange solution			red		yellow-orange										
Bromocresol green			yellow		blue										
Mixed indicator 4.5 acc. to Mortimer					red		blue								
Methyl red					red		yellow-orange								
Methyl red sodium salt					red		yellow-orange								
Mixed indicator 5					red-violet		green								
Bromocresol purple					yellow		purple								
Bromophenol red					yellow-orange		purple								
4-Nitrophenol					colorless		yellow								
Bromothymol blue sodium salt					yellow		blue								
Bromothymol blue					yellow		blue								
Phenol red							yellow		violet-red						
Phenol red sodium salt							yellow		violet-red						
3-Nitrophenol							colorless		yellow-orange						
Neutral red							blue-red		yellow-orange						
1-Naphtholphthalein							brown		blue-green						
Phenolphthalein							colorless		red-violet						
Phenolphthalein solution (1 % in ethanol)							colorless		red-violet						
Phenolphthalein solution (0.375 % in methanol)							colorless		red-violet						
Thymolphthalein									colorless		blue				
Alkali blue											blue-violet		pink		
Indigo carmine											blue		yellow		
Titan yellow												yellow		red	

The pH ranges and color shades shown are approximations

# Ordering information

## Acid-alkali indicators | pH indicators A-D

	Product	CAS No.	End-point (pH / color change)		Content	Packaging	Ord. No.
			from	to			
A	Alizarin red s mono sodium salt [C.I. 58005] for analysis and indicator 1st transition range (pH 4.3 – pH 6.3) 2nd transition range (pH 9.4 – pH 12.0)	130-22-3	4.3	6.3	25 g	Glass bottle	1.06278.0025
			yellow	pink	100 g	Glass bottle	1.06278.0100
			9.4	12.0			
			brown-orange	violet			
	Alkali blue [C.I. 42765] indicator	1324-76-1	11.5	13.0	25 g	Glass bottle	1.09196.0025
	Alkali blue solution indicator	–	blue-violet	pink	1 l	Glass bottle	1.09198.1000
			blue-violet	pink	2.5 l	Glass bottle	1.09198.2500
B	Brilliant green (hydrogen sulfate) [C.I. 42040] for microbiology	633-03-4	0.0	2.6	50 g	Glass bottle	1.01310.0050
	Bromocresol green indicator ACS, Reag. Ph Eur	76-60-8	yellow	green			
			3.8	5.4	1 g	Glass bottle	1.08121.0001
			yellow	blue	5 g	Glass bottle	1.08121.0005
					25 g	Glass bottle	1.08121.0025
	Bromocresol green sodium salt indicator water-soluble ACS	62625-32-5	3.8	5.4	10 g	Glass bottle	1.01541.0010
	Bromocresol purple indicator ACS, Reag. Ph Eur	115-40-2	yellow-green	blue			
			5.2	6.8	5 g	Glass bottle	1.03025.0005
	Bromophenol blue indicator ACS, Reag. Ph Eur	115-39-9	yellow	purple	25 g	Glass bottle	1.03025.0025
			3.0	4.6	5 g	Glass bottle	1.08122.0005
	Bromophenol red indicator	2800-80-8	yellow	blue-violet	25 g	Glass bottle	1.08122.0025
			5.2	6.8	5 g	Glass bottle	1.03023.0005
	Bromothymol blue indicator ACS, Reag. Ph Eur	76-59-5	orange-yellow	purpur			
			6.0	7.6	5 g	Glass bottle	1.03026.0005
	Bromothymol blue sodium salt indicator water-soluble ACS	34722-90-2	yellow	blue	25 g	Glass bottle	1.03026.0025
			5.8	7.6	10 g	Glass bottle	1.01895.0010
C	Chlorophenol red indicator	4430-20-0	4.8	6.4	10 g	Glass bottle	1.03024.0010
	Congo red [C.I. 22120] indicator Reag. Ph Eur	573-58-0	yellow	purple			
			3.0	5.2	25 g	Glass bottle	1.01340.0025
	m-Cresol purple indicator 1st transition range (pH 1.2 – pH 2.8)  2nd transition range (pH 7.4 – pH 9.0)	2303-01-7	blue	yellow-orange			
			1.2	2.8	5 g	Glass bottle	1.05228.0005
			pink	yellow			
	Cresol red indicator Reag. Ph Eur 1st transition range (pH 0.5 – pH 2.5)  2nd transition range (pH 6.5 – pH 8.5)	1733-12-6	7.4	9.0			
			yellow-orange	purple			
			0.5	2.5	5 g	Glass bottle	1.05225.0005
	Crystal violet [C.I. 42555] indicator ACS, Reag. Ph Eur	548-62-9	pink	yellow-orange	25 g	Glass bottle	1.05225.0025
			6.5	8.5			
			yellow	purple			
D	Dimethylyellow [C.I. 11020] indicator	60-11-7	0.8	2.6	25 g	Glass bottle	1.01408.0025
			yellow	blue-violet	100 g	Glass bottle	1.01408.0100
					1 kg	Glass bottle	1.01408.1000
			2.9	4.0	10 g	Glass bottle	1.03055.0010
			red	yellow-orange			

## Acid-alkali indicators | pH indicators E-N

	Product	CAS No.	End-point (color change)		Content	Packaging	Ord. No.
			from	to			
E	Eosin B (bluish) [C.I. 45400] for microscopy Certistain®	548-24-3	1.4	2.4	25 g	Glass bottle	1.15934.0025
			colorless	rose fluorescence	100 g	Glass bottle	1.15934.0100
	Eosin Y (yellowish) [C.I. 45380] for microscopy Certistain®	17372-87-1	0.0	3.0	25 g	Glass bottle	1.15935.0025
			yellow	green fluorescence	100 g	Glass bottle	1.15935.0100
	Erythrosine B [C.I. 45430] for microscopy Certistain®	16423-68-0	0.0	3.6	10 g	Glass bottle	1.15936.0010
orange			red	25 g	Glass bottle	1.15936.0025	
I	Indigo carmine [C.I. 73015] for analysis	860-22-0	11.5	13.0	25 g	Glass bottle	1.04724.0025
M	Malachite green oxalate [C.I. 42000] for microscopy and for microbiology	2437-29-8	0.0	2.0	25 g	Glass bottle	1.01398.0025
			green	green-blue	100 g	Glass bottle	1.01398.0100
					1 kg	Glass bottle	1.01398.1000
	Metanil yellow Reag. Ph Eur	587-98-4	2.3	1.2	10 g	Glass bottle	1.59267.0010
			orange-yellow	violet-red			
	Methyl green zinc chloride double salt [C.I. 42590] for microscopy Certistain®	7114-03-6	0.1	2.3	25 g	Glass bottle	1.15944.0025
			yellow	blue			
	Methyl orange [C.I. 13025] indicator ACS, Reag. Ph Eur	547-58-0	3.1	4.4	25 g	Glass bottle	1.01322.0025
			red	yellow-orange	100 g	Glass bottle	1.01322.0100
					1 kg	Metal can	1.01322.1000
	Methyl orange solution 0.1 % indicator pH 3.1-4.4 (red yellow-orange)	-	3.1	4.4	250 ml	PE bottle	1.01323.0250
			red	yellow-orange	1 l	PE bottle	1.01323.1000
	Methyl red [C.I. 13020] indicator ACS, Reag. Ph Eur	493-52-7	4.4	6.2	25 g	Glass bottle	1.06076.0025
			red	yellow-orange	100 g	Glass bottle	1.06076.0100
					1 kg	Metal can	1.06076.1000
Methyl red sodium salt [C.I. 13020] water-soluble ACS	845-10-3	4.4	6.2	25 g	Glass bottle	1.06078.0025	
		red	yellow-orange	100 g	Glass bottle	1.06078.0100	
Mixed indicator 4.5 acc. to Mortimer	-	4.3	5.2	250 ml	PE bottle	1.01359.0250	
		red	blue				
Mixed indicator 5 for ammonia titrations <sup>1)</sup>	-	4.4	5.8	250 ml	Glass bottle	1.06130.0250	
		red-violet	green	1 l	Glass bottle	1.06130.1000	
N	1-Naphtholphthalein indicator	596-01-0	7.1	8.3	1 g	Glass bottle	1.06246.0001
			brownish	blue-green	5 g	Glass bottle	1.06246.0005
	1-Naphtholbenzein indicator Reag. Ph Eur	145-50-6	8.0	9.6	5 g	Glass bottle	1.06202.0005
			orange-brown	blue			
	Neutral red [C.I. 50040] indicator and for microbiology <sup>1)</sup>	553-24-2	6.8	8.0	25 g	Glass bottle	1.01369.0025
			blue-red	yellow-orange	100 g	Glass bottle	1.01369.0100
	3-Nitrophenol indicator	554-84-7	6.6	8.6	25 g	Glass bottle	1.06794.0025
		colorless	yellow-orange				
4-Nitrophenol indicator	100-02-7	5.4	7.5	25 g	Glass bottle	1.06798.0025	
		colorless	yellow	100 g	Glass bottle	1.06798.0100	
► 1) pH and redox indicator							

# Ordering information

## Acid-alkali indicators | pH indicators O-Z

	Product	CAS No.	End-point (color change)		Content	Packaging	Ord. No.
			from	to			
<b>O</b>	<b>Oracet blue 2R [C.I. 61110] indicator for titration in non-aqueous solvents</b> Reag. Ph Eur	4395-65-7	pink	blue	5 g	Glass bottle	<b>1.01487.0005</b>
<b>P</b>	<b>Phenol red Reag. Ph Eur</b>	143-74-8	6.8	8.4	1 g	Glass bottle	<b>1.59375.0001</b>
			yellow	red-violet	100 g	Glass bottle	<b>1.59375.0100</b>
	<b>Phenol red indicator ACS</b>	143-74-8	6.4	8.2	5 g	Glass bottle	<b>1.07241.0005</b>
					25 g	Glass bottle	<b>1.07241.0025</b>
					100 g	Glass bottle	<b>1.07241.0100</b>
					1 kg	Metal can	<b>1.07241.1000</b>
	<b>Phenol red sodium salt indicator ACS</b>	34487-61-1	6.4	8.2	5 g	Glass bottle	<b>1.11748.0005</b>
	<b>Phenol red solution indicator</b>	–	6.4	8.2	100 ml	Glass bottle	<b>1.07242.0100</b>
			yellow	red-violet			
	<b>Phenolphthalein indicator ACS, Reag. Ph Eur</b>	77-09-8	8.2	9.8	25 g	Glass bottle	<b>1.07233.0025</b>
					100 g	Glass bottle	<b>1.07233.0100</b>
					500 g	Glass bottle	<b>1.07233.0500</b>
	<b>Phenolphthalein solution 0.375 % in methanol indicator</b>	–	8.2	9.8	250 ml	Glass bottle	<b>1.07238.0250</b>
					1 l	Glass bottle	<b>1.07238.1000</b>
	<b>Phenolphthalein solution 1 % in ethanol indicator pH 8.2 – 9.8</b>	–	8.2	9.8	250 ml	Glass bottle	<b>1.07227.0250</b>
					1 l	Glass bottle	<b>1.07227.1000</b>
	<b>pH-Indicator solution pH 0.0 – 5.0 with color card</b>	–	0.0	5.0	100 ml	PE bottle	<b>1.09177.0100</b>
	<b>pH-Indicator solution pH 4.0 – 10.0 Universal Indicator with color card</b>	–	4.0	10.0	100 ml	PE bottle	<b>1.09175.0100</b>
					1 l	PE bottle	<b>1.09175.1000</b>
	<b>PH-Indicator solution pH 9.0 – 13.0 with color card</b>	–	9.0	13.0	100 ml	Fibre case	<b>1.09176.0100</b>
<b>Q</b>	<b>Quinaldine red indicator</b> Reag. Ph Eur	117-92-0	1.4	3.2	5 g	Glass bottle	<b>1.02282.0005</b>
<b>S</b>	<b>SUDAN III, [C.I. 26100]</b>		blue	red	25 g	Glass bottle	<b>1.11747.0025</b>
<b>T</b>	<b>Thymol blue indicator ACS, Reag. Ph Eur</b> 1st transition range (pH 1.2 – pH 2.8) 2nd transition range (pH 7.8 – pH 9.5)	76-61-9	1.2	2.8	5 g	Glass bottle	<b>1.08176.0005</b>
			red	yellow-orange	25 g	Glass bottle	<b>1.08176.0025</b>
			7.8	9.5	2.5 kg	Metal can	<b>1.08176.2500</b>
			yellow-green	blue			
	<b>Thymolphthalein indicator ACS, Reag. Ph Eur</b>	125-20-2	9.3	10.5	5 g	Glass bottle	<b>1.08175.0005</b>
					25 g	Glass bottle	<b>1.08175.0025</b>
					100 g	Glass bottle	<b>1.08175.0100</b>
	<b>Titan yellow [C.I. 19540] indicator</b> Reag. Ph Eur	1829-00-1	12.0	13.0	25 g	Glass bottle	<b>1.01307.0025</b>
			yellow	red			



### Application advice

The following rules must be observed when using pH indicators for titration purposes:

- When titrating strong acids with strong bases, a broad range of indicators can be used whose end-points lie in the weakly acidic, in the neutral, or in the weakly alkaline range.
- Weak acids can be titrated with strong bases by using indicators whose end-points lie in the weakly alkaline range.
- Weak bases can be titrated with strong acids by using indicators whose end-points lie in the weakly acidic range.
- The titration of weak bases with weak acids and vice versa produces inaccurate results. Only very few indicators – which have to be specifically determined according to the case – are suitable for this particular type of titration, and then only when a reference solution is titrated at the same time.

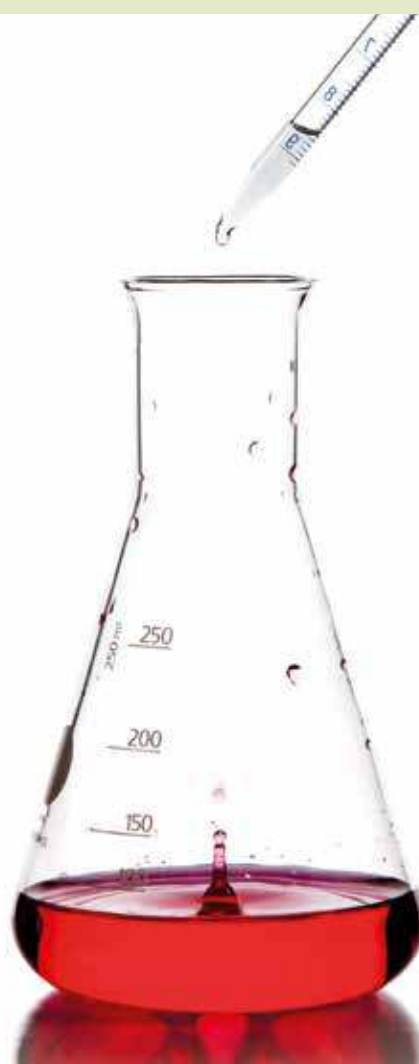
# Indicator solution

## Acid-alkali indicators | pH indicators A-M

	Product	Indicator solution
<b>A</b>	Alizarin red s mono sodium salt [C.I. 58005] for analysis and indicator	0.1 – 0.2 g in 100 ml water
	Alkali blue [C.I. 42765] indicator	0.1 g in 100 ml ethanol (96 %)
<b>B</b>	Brilliant green (hydrogen sulfate) [C.I. 42040] for microbiology	0.1 g in 100 ml water
	Bromocresol green indicator ACS, Reag. Ph Eur	0.1 g in 100 ml Ethanol (20 %) or 0.04 g in 0.58 ml sodium hydroxide solution dilute 0.1 mol/l and fill up to 100 ml with water
	Bromocresol green sodium salt indicator water-soluble ACS	0.1 g in 100 ml water
	Bromocresol purple indicator ACS, Reag. Ph Eur	0.1 g in 100 ml Ethanol (20 %) or 0.04 g in 0.74 ml sodium hydroxide solution dilute 0.1 mol/l and fill up to 100 ml with water
	Bromophenol blue indicator ACS, Reag. Ph Eur	0.04 g in 100 ml Ethanol (20 %) or 0.04 g in 0.69 ml sodium hydroxide solution dilute 0.1 mol/l and fill up to 100 ml with water
	Bromophenol red indicator	0.1 g in 100 ml Ethanol (20 %) or 0.04 g in 0.94 ml sodium hydroxide solution dilute 0.1 mol/l and fill up to 100 ml with water
	Bromothymol blue indicator ACS, Reag. Ph Eur	0.1 g in 100 ml Ethanol (20 %) or 0.04 g in 0.64 ml sodium hydroxide solution dilute 0.1 mol/l and fill up to 100 ml with water
	Bromothymol blue sodium salt indicator water-soluble ACS	0.1 g in 100 ml water
	Chlorophenol red indicator	0.1 g in 100 ml Ethanol (20 %) or 0.04 g in 0.94 ml sodium hydroxide solution dilute 0.1 mol/l and fill up to 100 ml with water
	Congo red [C.I. 22120] indicator Reag. Ph Eur	0.2 g in 100 ml water
<b>C</b>	m-Cresol purple indicator	0.04 g in 100 ml Ethanol (20 %) or 0.04 g in 1.05 ml sodium hydroxide solution dilute 0.1 mol/l and fill up to 100 ml with water
	Cresol red indicator Reag. Ph Eur	0.1 g in 100 ml Ethanol (20 %) or 0.04 g in 1.05 ml sodium hydroxide solution dilute 0.1 mol/l and fill up to 100 ml with water
	Crystal violet [C.I. 42555] indicator ACS, Reag. Ph Eur	0.1 g in 100 ml Ethanol (70 %)
	Dimethyl yellow [C.I. 11020] indicator	0.1 – 0.5 g in 100 ml Ethanol (90 %)
<b>E</b>	Eosin B (bluish) [C.I. 45400] for microscopy Certistain®	0.1 g in 100 ml water
<b>E</b>	Eosin Y (yellowish) [C.I. 45380] for microscopy Certistain®	0.1 g in 100 ml water
	Erythrosine B [C.I. 45430] for microscopy Certistain®	0.1 g in 100 ml water
	Indigo carmine [C.I. 73015] for analysis	0.25 g in 100 ml Ethanol (50 %) or 1 g in 100 ml water
<b>M</b>	Malachite green oxalate [C.I. 42000] for microscopy and for microbiology	0.1 g in 100 ml water
<b>M</b>	Metanil yellow Reag. Ph Eur	0.1 g in 100 ml water
	Methyl green zinc chloride double salt [C.I. 42590] for microscopy Certistain®	0.1 g in 100 ml water
	Methyl orange [C.I. 13025] indicator ACS, Reag. Ph Eur	0.4 g in 100 ml Ethanol (20 %) or 0.04 g in 100 ml water
	Methyl orange solution 0.1 % indicator pH 3.1–4.4 (red yellow–orange)	Ready to use indicator solution
	Methyl red [C.I. 13020] indicator ACS, Reag. Ph Eur	0.1 g in 100 ml Ethanol (96 %)
	Methyl red sodium salt [C.I. 13020] water-soluble ACS	0.1 g in 100 ml water
	Mixed indicator 4.5 acc. to Mortimer	Ready to use indicator solution
	Mixed indicator 5 for ammonia titrations	Ready to use indicator solution

## Acid-alkali indicators | pH indicators N-Z

	Product	Indicator solution
N	1-Naphtholphthalein indicator	0.1 g in 100 ml Ethanol (96 %)
	1-Naphtholbenzein indicator Reag. Ph Eur	0.1 – 1.0 g in 100 ml 2-propanol
	Neutral red [C.I. 50040] indicator and for microbiology	0.3 g in 100 ml Ethanol (70 %)
	3-Nitrophenol indicator	0.3 g in 100 ml Ethanol (96 %) or 0.08 g in 100 ml water
	4-Nitrophenol indicator	0.2 g in 100 ml Ethanol (96 %) or 0.08 g in 100 ml water
O	Oracet blue 2R [C.I. 61110] indicator for titration in non-aqueous solvents Reag. Ph Eur	0.1 – 0.5 g in 100 ml glacial acetic acid
P	Phenol red Reag. Ph Eur	0.1 g in 100 ml ethanol
	Phenol red indicator ACS	0.1 g in 100 ml Ethanol (20 %) or 0.04 g in 1.3 ml sodium hydroxide solution dilute 0.1 mol/l and fill up to 100 ml with water
	Phenol red sodium salt indicator ACS	0.04 g in 100 ml water
	Phenolphthalein indicator ACS, Reag. Ph Eur	0.1 g in 100 ml Ethanol (96 %)
	Phenolphthalein solution 0.375 % in methanol indicator	Ready to use indicator solution
	Phenolphthalein solution 1 % in ethanol indicator pH 8.2 – 9.8	Ready to use indicator solution
Q	Quinaldine red indicator Reag. Ph Eur	0.1 g in 100 ml Ethanol (60 %)
S	SUDAN III, [C.I. 26100]	0.1 – 0.5 g in 100 ml glacial acetic acid
T	Thymol blue indicator ACS, Reag. Ph Eur	0.04 g in 100 ml Ethanol (20 %) or 0.04 g in 0.86 ml sodium hydroxide solution to be filled up to 100 ml
	Thymolphthalein indicator ACS, Reag. Ph Eur	0.1 g in 100 ml Ethanol (50 %)
	Titan yellow [C.I. 19540] indicator Reag. Ph Eur	0.1 g in 100 ml Ethanol (20 %)





# Redox indicators

Redox indicators are reducible or oxidizable materials in which the reduced and oxidized forms of the material have different colors. Redox indicators are used in laboratories to track redox reactions, to determine approximate redox potentials, and to indicate the end-point of a redox titration (in oximetry). In this, the color does not change at a particular pH value, but instead at a particular redox potential, which should be close to the redox potential of the equivalence point.

If an oxidizing volumetric solution is used, the redox potential of the indicator must be higher than the potential of the solution. In the case of a reducing volumetric solution, the redox potential of the indicator must be lower than that of the solution.





# Ordering information

## Redox indicators A-Z

	Product	CAS No.	Redoxpotential		Color change [form]		Content	Packaging	Ord. No.
			E <sub>o</sub> [pH 0]	E <sub>m</sub> [pH 7]	[oxidized]	[reduced]			
<b>A</b>	Amido black 10 B [C.I. 20470] for electrophoresis	1064-48-8	+ 0.57	+ 0.84	yellow-brown	blue	25 g	Glass bottle	1.01167.0025
<b>B</b>	2,2'-Bipyridine for analysis (reagent for iron(II) and molybdenum) ACS	366-18-7	+ 1.03	–	light blue	red	5 g	Glass bottle	1.03098.0005
							25 g	Glass bottle	1.03098.0025
	Brilliant cresyl blue zinc chloride double salt for microscopy Certistain®	51716-96-2	+ 0.58	+ 0.05	blue	colorless	25 g	Glass bottle	1.01368.0025
<b>D</b>	2,6-Dichlorophenol-indophenol sodium salt dihydrate for analysis for the determination of ascorbic acid	620-45-1	+ 0.67	+ 0.23	blue	colorless	5 g	Glass bottle	1.03028.0005
							25 g	Glass bottle	1.03028.0025
	N,N-Dimethyl-1,4-phenylene-diammonium dichloride for analysis	536-46-9	+ 0.751	–	dark blue	colorless	25 g	Glass bottle	1.03067.0025
	3,3'-Dimethylnaphthidine metal indicator	13138-48-2	+ 0.78	–	purple red	colorless	1 g	Glass bottle	1.03122.0001
	Diphenylamine-4-sulfonic acid sodium salt redox indicator	6152-67-6	+ 0.84	–	red-violet	colorless	10 g	Glass bottle	1.03590.0010
	Diphenylamine-4-sulfonic acid barium salt redox indicator	6211-24-1	+ 0.84 <sup>1)</sup>	–	red-violet	colorless	5 g	Glass bottle	1.00255.0005
<b>F</b>	Ferroin solution (1,10-phenanthroline iron(II) sulfate) 1/40 mol/l redox indicator	–	+ 1.06	–	blue	orange-red	100 ml	Glass bottle	1.09193.0100
							500 ml	Glass bottle	1.09193.0500
	Ferroin indicator solution for waste water analysis	–	+ 1.06	–	blue	red	100 ml	Glass bottle	1.09161.0100
							500 ml	Glass bottle	1.09161.0500
<b>I</b>	Indigo carmine [C.I. 73015] for analysis <sup>2)</sup>	860-22-0	+ 0.29	– 0.11	blue	yellowish	25 g	Glass bottle	1.04724.0025
<b>M</b>	Methylene blue [C.I. 52015] for microscopy Certistain®	–	+ 0.53	+ 0.01	blue	colorless	25 g	Glass bottle	1.15943.0025
							100 g	Glass bottle	1.15943.0100
	Methylene blue [C.I. 52015] Reag. Ph Eur	–	+ 0.53	+ 0.01	blue	colorless	10 g	Glass bottle	1.59270.0010
							100 g	Glass bottle	1.59270.0100
<b>N</b>	Neutral red [C.I. 50040] indicator and for microbiology <sup>2)</sup>	553-24-2	+ 0.24	– 0.29	violet-red	colorless	25 g	Glass bottle	1.01369.0025
							100 g	Glass bottle	1.01369.0100
	Nile blue (hydrogen sulfate) [C.I. 51180] for microscopy Certistain®	3625-57-8	+ 0.4	– 0.12	blue-red	colorless	25 g	Glass bottle	1.15946.0025
<b>P</b>	1,10-Phenanthroline monohydrate for analysis and redox indicator	5144-89-8	+ 1.14	+ 1.06	light blue	red	5 g	Glass bottle	1.07225.0005
							10 g	PE bottle	1.07225.0010
							100 g	PE bottle	1.07225.0100
<b>S</b>	Safranin O [C.I. 50240] for microscopy Certistain®	477-73-6	+ 0.24	– 0.29	blue-violet	colorless	25 g	Glass bottle	1.15948.0025
<b>T</b>	Thionine (acetate) [C.I. 52000] for microscopy Certistain®	78338-22-4	+ 0.56	+ 0.06	violet	colorless	25 g	Glass bottle	1.15929.0025
<b>Z</b>	Zinc iodide starch solution for analysis <sup>3)</sup>	–	–	–	colorless	blue	500 ml	PE bottle	1.05445.0500
▶ 1) in sulfuric acid 1 mol/l ▶ 2) pH and redox indicator ▶ 3) Intensive blue inclusion compound of iodide starch solution									

# Complex or metal indicators

Complex or metal indicators are organic materials that are capable of forming colored complexes with metal ions. In this, the free indicator has a different color to that of the complexed form. For the detection of the end-point of a complexometric titration, it is essential to use one of the metal indicators that form complexes with metal ions which differ in color from the indicators themselves. In addition, the reagent properties must be suited to the sensitivity and the acid-base characteristics of the indicator. Complex or metal indicators are used, for example, in the volumetric analytical determination of the concentration of metal ions, e.g. in complexometric titrations. Determination of water hardness is a common application.

## Ordering information

### Complex indicators | Metal indicators A-E

	Product	CAS No.	For determination of	Content	Packaging	Ord. No.
A	Alizarin-3-methylamine-N,N-diacetic acid dihydrate for the spectrophotometric determination of fluoride	–	–	5 g	Glass bottle	1.01010.0005
	Arsenazo III metal indicator	1668-00-4	Lanthanide, Th, Y	5 g	Glass bottle	1.10107.0005
	Aurin tricarboxylic acid ammonium salt for analysis (reagent for aluminium) ACS	569-58-4	Al, Ca, Fe, Mg	10 g	Glass bottle	1.00128.0010
C	Calcein indicator for metal determination	1461-15-0	Ba, Ca, Cr, Cu, Mg, Sr	5 g	Glass bottle	1.02315.0005
	Calcon [C.I. 15705] metal indicator	2538-85-4	Ca, Cd, Mg, Zn	50 g	Glass bottle	1.04594.0050
	Calconcarboxylic acid metal indicator	–	Ca	5 g	Glass bottle	1.04595.0005
D				25 g	Glass bottle	1.04595.0025
	1,8-Dihydroxy-2-(4-sulfophenylazo)naphthalene-3,6-disulfonic acid trisodium salt for analysis (reagent for fluoride, zirconium, thorium)	23647-14-5	Th, Zr	25 g	Glass bottle	1.07998.0025
	3,3'-Dimethylnaphthidine metal indicator	13138-48-2	Cd, Zn	1 g	Glass bottle	1.03122.0001
	Dimethylyellow [C.I. 11020] indicator	60-11-7	For production of mixed indicators	10 g	Glass bottle	1.03055.0010
	1,5-Diphenylcarbazide for analysis and redox indicator ACS, Reag. Ph Eur	140-22-7	Hg, Ni, Pb, V	25 g	Glass bottle	1.03091.0025
				100 g	Glass bottle	1.03091.0100
	1,5-Diphenylcarbazone (cont. 50 % Diphenylcarbazid) ACS, Reag. Ph Eur	–	–	5 g	PE bottle	1.03087.0005
				25 g	PE bottle	1.03087.0025
	Dithizone for analysis	60-10-6	Ag, Au, Bi, Cd, Co, Cu, Fe, Hg, In, Mn, Ni, Pb, Sn, Zn	5 g	Glass bottle	1.03092.0005
	(1,5-diphenylthiocarbazone) Reag. Ph Eur			25 g	Glass bottle	1.03092.0025
E	Eriochrome black T [C.I. 14645] indicator for complexometry ACS, Reag. Ph Eur	1787-61-7	Ba, Ca, Cd, Hg, In, Lanthanide, Mg, Mn, Pb, Zn, Zr	25 g	Glass bottle	1.03170.0025
				100 g	Glass bottle	1.03170.0100
	Eriochrome blue-black B [C.I. 14640] metal indicator	3564-14-5	Ca, Cd, Mg, U, Zn, Zr <sub>2</sub>	25 g	Glass bottle	1.03168.0025
	Eriochrome cyanine R [C.I. 43820] for analysis (reagent for aluminium)	3564-18-9	Al, Ca, Cu, Fe, Mg, Th, Zr	25 g	Glass bottle	1.03164.0025

# Ordering information

## Complex indicators | Metal indicators H-Z

	Product	CAS No.	For determination of	Content	Packaging	Ord. No.
H	Hematoxylin cryst. [C.I. 75290] for microscopy	517-28-2	Al, Bi, Cu, Th, Zr	25 g	Glass bottle	1.04302.0025
				100 g	Glass bottle	1.04302.0100
	Hydroxynaphthol blue metal (pM) indicator	63451-35-4	Ca	25 g	Glass bottle	1.04593.0025
I	Indicator buffer tablets for the determination of water hardness with Titriplex® solutions	–	Ca, Zn	500 g	PE can	1.08430.0500
				1 kg	PE can	1.08430.1000
M	Magnesium reagent acc. to Mann and Yoe (reagent for magnesium)	14936-97-1	Mg	5 g	Glass bottle	1.08712.0005
	Methylthymol blue sodium salt metal indicator	1945-77-3	Ba, Bi, Ca, Cd, Cu, Fe, Hg, In, Lanthanide, Mg, Mn, Pb, Sc, Sn, Th, Ti, Zn, Zr	1 g	Glass bottle	1.06084.0001
				5 g	Glass bottle	1.06084.0005
	Murexide (ammonium purpurate) metal indicator ACS, Reag. Ph Eur	3051-09-0	Ag, Ca, Co, Cu, Mn, Ni, Sc, Th, Zn	5 g	Glass bottle	1.06161.0005
				25 g	Glass bottle	1.06161.0025
N	Naphthol green B [C.I. 10020] indicator	19381-50-1	–	25 g	Glass bottle	1.01306.0025
P	Phthalein purple metal indicator Reag. Ph Eur	2411-89-4	Ba, Ca, Cd, Mg, Sr	1 g	Glass bottle	1.07297.0001
				10 g	Glass bottle	1.07297.0010
	1-(2-Pyridylazo)-2-naphthol (PAN) metal indicator Reag. Ph Eur <sup>1)</sup>	85-85-8	Al, Bi, Cd, Co, Cu, Fe, Ga, Hg, In, Mn, Ni, Pb, Th, Ti, U, V, Zn	5 g	Glass bottle	1.07531.0005
	4-(2-Pyridylazo)resorcinol monosodium salt monohydrate metal indicator Reag. Ph Eur	16593-81-0	Al, Bi, Cd, Cu, Fe, Ga, Hg, In, Lanthanide, Mn, Ni, Pb, Sr, Th, Ti, Zn	5 g	Glass bottle	1.07533.0005
	3,5-Pyrocatecholdisulfonic acid disodium salt monohydrate (tiron) metal indicator	149-45-1	Fe: blue-green to yellow	100 g	Glass bottle	1.01922.0100
	Pyrogallolred metal indicator	32638-88-3	Bi, Pb, Ni, Co	1 g	Glass bottle	1.07534.0001
				5 g	Glass bottle	1.07534.0005
R	Rhodizonic acid disodium salt indicator for sulfate titration	523-21-7	–	5 g	Cardboard box	1.06595.0005
T	Thorin indicator for sulfate titration	3688-92-4	Bi, Li, Sc, Th, U, Y	5 g	Glass bottle	1.08294.0005
X	Xylenol orange tetrasodium salt metal indicator ACS, Reag. Ph Eur	3618-43-7	Bi, Ca, Cd, Co, Cu, Fe, Hg, In, Lanthanide, Mg, Mn, Pb, Sc, Th, Ti, U, V, Y, Zn, Zr	1 g	Glass bottle	1.08677.0001
				5 g	Glass bottle	1.08677.0005
Z	Zincon for the photometric determination of copper and zinc	62625-22-3	Cd, Hg, Pb, Zn	1 g	Glass bottle	1.08739.0001
				5 g	Glass bottle	1.08739.0005

► 1) Application as metal indicator: 0.01–0.1 % Ethanol (96 %)



# Fluorescence indicators

Substances, whose fluorescent properties in solution are influenced by a change in the hydrogen-ion concentration, oxidation potential, or metal-ion concentration, are used as fluorescence indicators. Fluorescence indicators are essential for end-point determination of precipitation titration, in which a well-defined change in one of these properties occurs at the equivalence point. When the reagent is added, the analyte forms a precipitate that is hardly soluble.

Fluorescent dyes are also used to stain and visualize cells, cell components, chromosomes and bacteria, as well as to detect antigen-antibody reactions.

## Ordering information

### Fluorescence indicators A-U

	Product	CAS No.	End-point (color change)		Content	Packaging	Ord. No.
			from	to			
<b>A</b>	Acridine orange zinc chloride double salt [C.I. 46005] for microscopy Certistain®	10127-02-3	8.4 no fluorescence	10.4 yellow-green	25 g	Glass bottle	1.15931.0025
<b>C</b>	Calcein indicator for metal determination	1461-15-0	8.0 no fluorescence	10.0 yellow-green	5 g	Glass bottle	1.02315.0005
	Chromotropic acid disodium salt dihydrate for analysis ACS, Reag. Ph Eur	5808-22-0	3.1 no fluorescence	4.4 light blue	25 g	Glass bottle	1.02498.0025
<b>D</b>	2',7'-Dichlorofluorescein indicator ACS, Reag. Ph Eur	76-54-0	4.0 blue-green	6.6 no fluorescence	5 g	Glass bottle	1.09676.0005
<b>E</b>	Eosin Y (yellowish) [C.I. 45380] for microscopy Certistain®	17372-87-1	0.0 no fluorescence	3.0 green	25 g 100 g	Glass bottle Glass bottle	1.15935.0025 1.15935.0100
	Erythrosine B [C.I. 45430] for microscopy Certistain®	16423-68-0	2.5 no fluorescence	4.0 light green	10 g 25 g	Glass bottle Glass bottle	1.15936.0010 1.15936.0025
<b>F</b>	Fluorescein sodium [C.I. 45350] indicator Reag. Ph Eur	518-47-8	4.0 rose	4.5 green	50 g 250 g	Glass bottle Glass bottle	1.03887.0050 1.03887.0250
	Fluorescent indicator F <sub>254</sub>	68611-47-2	fluor. green	colorless	50 g	PE bottle	1.09182.0050
<b>N</b>	2-Naphthol for analysis	135-19-3	8.5 no fluorescence	9.5 blue	100 g 500 g	PE bottle PE bottle	1.06234.0100 1.06234.0500
<b>P</b>	1,2-Phenylenediamine for analysis	95-54-5	3.1 green	4.4 no fluorescence	50 g	Glass bottle	1.07243.0050
	Phloxin B [C.I. 45410] for microscopy Certistain®	587-98-4	2.5 no fluorescence	4.0 light green	25 g	Glass bottle	1.15926.0025
<b>U</b>	Uranine AP [C.I. 45350] concentrated for the examination of subterranean waters	518-47-8	–	–	100 g 1 kg	Glass bottle Metal can	1.08462.0100 1.08462.1000



*Uranine fluorescent dye: the best and most commonly used tracer dye for determining water flow.*

## Indicators for special application

In addition to the previously mentioned indicators, Merck Millipore also offers special indicators tailored to your exact requirements. For further information and consultation, please contact your regional Merck Millipore office.

### Ordering information

#### Indicators for special application

Product	CAS No.	Indicator group	Color change		Content	Packaging	Ord. No.
			from	to			
Dimidium Bromide for surfactant tests <sup>1)</sup>	518-67-2	Tenside indicator	pink	blue	1 g	Glass bottle	1.12130.0001
					5 g	Glass bottle	1.12130.0005
Disulfine blue vn 150 [C.I. 42045] for surfactant tests <sup>2)</sup>	129-17-9	Tenside indicator	pink	blue	25 g	Glass bottle	1.12144.0025
Iodine indicator	–	Indicator for iodometry	blue	colorless	100 g	PE bottle	1.04764.0100

► Application advice for a two-phase titration 1) mixed with Disulfine blue 2) mixed with Dimidium Bromide

# Cleaning applications

## Extran®

Extran® laboratory cleansers are the perfect solution for cleaning your laboratory utensils to Merck Millipore's well-known quality standards. Reliable processes in laboratories and product facilities are only possible with thorough, residue-free cleaning. Only in this way is it possible to ensure proper scientific working procedures. Everything that comes into contact with chemicals or biological substances must be free of impurities, both before and after use. Merck Millipore's high-quality Extran® cleaning agents have fulfilled these requirements for over 25 years.



# Cleaning applications

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<b>Ordering information</b>	
• Manual washing	308
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## ■ Advantages

- Reliable and residue-free cleaning with Extran®.
- Extran® is free from NTA protecting the health of the laboratory staff.
- Extran® is free from scents and dyestuffs and does not contain chlorine or other toxic ingredients.
- The active ingredients in Extran® are biodegradable.
- Extran® is the ideal all-purpose cleaner.



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

# Safety and environment

## Efficient, safe and environment-friendly

Extran® cleans reliably, leaving no residues. This prevents residues from being transferred into the next analysis or test. Merck Millipore provides a practical and easy-to-use application aid to prove the freedom from residues of nonionic surfactants after the cleaning process by means of a photometric test. This helps you in preparing your own individual cleaning validation, saving you time and money.

Extran® is free from scents and dyestuffs and does not contain chlorine or other toxic ingredients. It thus prevents odors, protecting the health of the laboratory staff in the process. Our laboratory cleansers are also free of silicones and oxidants.

## Biodegradable

The active ingredients in Extran® are biodegradable and Extran® is manufactured under stringently controlled production conditions and fulfils the requirements of environmental protection. In almost all cases, Extran® makes the use of chromosulfuric acid, which is still common on the market, unnecessary. It is thus gentle on the environment and on the health of staff.

More information about sustainable protection  
[www.merckmillipore.com/protection](http://www.merckmillipore.com/protection)



### The ideal all-purpose cleaner

Depending on the type of contamination and the material to be cleaned, the Extran® range of products offers the ideal solution for the cleaning of your laboratory utensils and production locations. Put your trust in over 25 years of Extran® experience from Merck Millipore and use our detergents for manual cleaning or machine cleaning in laboratory washing machines. Both processes generally require different detergents. You can find more details on this later on in this chapter.

For further information, new additions to the range, Safety Data Sheets and of course our certificates of analysis, please see our website.

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



# Cleaning application examples

		Cleaning applications A-O															
		Manual washing				Sodium hydroxide solution				Machine washing							
		Decalcification solution	Extran® MA 01	Extran® MA 02	Extran® MA 05		Extran® AP 11	Extran® AP 12	Extran® AP 13	Extran® AP 16	Extran® AP 17	Extran® AP 21	Extran® AP 22	Extran® AP 33	Extran® AP 41		
A	Alkyd resins		•		•			•									
	Aluminum			•													
	Amines	•										•	•				
	Analytical laboratories		•	•	•		•			•							
B	Balsam resin		•		•			•			•						
	Bitumen		•		•												
	Blood		•		•			•									
	Brass			•	•												
	Breweries		•	•		•	•	•		•					•		
	Bronze			•													
C	Calcareous deposits on equipment	•										•	•				
	Carbonates	•										•					
	Cells			•													
	Chemical glassware		•	•	•		•			•							
	Culture media							•			•						
D	Dairies		•	•	•	•	•	•	•		•						
	Distillation residues		•		•				•		•						
E	Enzyme test receptacles		•	•	•		•	•	•	•	•	•	•	•	•		
F	Fat residues		•		•				•								
	Felt-tip pen		•	•	•		•	•	•	•	•						
	Foam														•		
	Food industry		•	•	•	•	•	•	•		•						
	Food waste		•	•			•	•	•	•	•						
G	Glass and porcelain equipment		•	•				•			•						
	Grease for joints		•					•	•		•						
H	Heavy oils		•					•			•						
	Hydroxides	•										•	•				
L	Laboratory floors		•			•											
	Lenses for glasses			•													
M	Metal equipment			•			•			•							
	Mucus														•		
N	Neutralization	•										•	•				
	Nickel		•	•	•		•	•	•	•	•	•	•	•	•		
O	Oil		•					•			•						

## Cleaning applications P-Z

Cleaning applications P-Z		Manual washing				Sodium hydroxide solution	Machine washing							
		Decalcification solution	Extran® MA 01	Extran® MA 02	Extran® MA 05		Extran® AP 11	Extran® AP 12	Extran® AP 13	Extran® AP 16	Extran® AP 17	Extran® AP 21	Extran® AP 22	Extran® AP 33
P	Petri dishes	•	•	•	•		•	•	•	•	•	•	•	•
	Phosphate analysis equipment				•									
	Pipettes			•			•		•					
	Plaster residues	•	•	•			•	•						
	Plastic equipment						•		•					
	Precision equipment			•										
	Protein residues		•		•			•		•				
	Proteins		•		•			•		•				
Q	Quartz equipment			•										
R	Rubber			•			•		•					
S	Saliva		•		•									•
	Silicones (oils, greases, resins)		•					•	•		•			
	Stainless steel	•	•	•	•	•	•	•	•	•	•	•	•	•
T	Thin film plates		•		•		•		•					
	Tiles in laboratory		•			•								
	Tough residues					•		•		•				
U	Ultrasound		•	•	•									
W	Wax		•		•									
Z	Zinc			•										

# Manual washing

The Extran® MA types for manual washing are universally applicable concentrates for the production of water baths which work reliably and residue-free.

## General application advice

- Water is used to prepare the cleaning solution. If slight sedimentation of the hardener occurs, more Extran® must be added. De-mineralized water boosts the cleaning effect.
- For cleaning, the items to be cleaned are simply immersed completely in the solution.
- Once cleaning is finished, they are rinsed first with tap water and then with demineralized water.
- The baths can be used for a longer time without a noticeable decrease in the cleaning effect.
- If necessary, the rinsing liquid can be supplemented with fresh Extran®.
- The length of application is less than 2 hours.
- For »difficult cases« such as plaster, blood or heavy oil, the items to be cleaned are simply left in the bath a little longer.
- Heat speeds up the cleaning process.
- Extran® is also ideally suited to ultrasound cleaning.





# Ordering information Extran® MA types for manual washing

## Extran® MA 01

Extran® MA 01 liquid, alkaline		Content	Packaging	Ord. No.
Extran® MA 01 alkaline		1 l	Plastic bottle	1.07555.1000
		2.5 l	Plastic bottle	1.07555.2500
		5 l	Plastic bottle	1.07555.5000
		10 l	Plastic container	1.07555.9010
		25 l	Plastic container	1.07555.9025
Ingredients	Ionic and non-ionic surfactants, phosphates, excipient in low quantities			
Application advice	Universal cleaner for the removal of heavy contamination. In wiping tables, tiles, floors. In soaking for the automated cleaning of laboratory equipment. Do not use on alkali-sensitive materials such as aluminium.			
Properties	Liquid   alkaline   chlorine-free   free from odorants / dyestuffs			
Dosing	The ideal dosage depends on the hardness of the water and the level of contamination of the item to be cleaned.			
	<b>Recommended application concentrations</b>			
	For normal contamination: 2 %			
	For heavier contamination: 5 %			
	For very tough stains up to 20 %			
pH value	pH = 11.6 [in a 2 % solution]			
	pH = 12.0 [in a 5 % solution]			
Accessories	Dosing feeder made from PP, 20–28 ml for 1 l Extran® bottle			9.57571.1020

### The advantages of the 1 l bottle Extran® MA 01 for you

More convenient:	The 1 l bottle, onto which the separately available dosing unit can be easily mounted, is easy to handle and thus allows increased convenience when cleaning.
Cost effectiveness:	Modern dosing systems are a prerequisite for top cleaning results and optimum profitability. Precise and accurate dosing is the basis of cost effectiveness, made possible using the measuring unit tailored to the 1 l bottle.
Safety:	The dosing unit makes repeatable dosing and better control over the concentration possible. This ensures workplace safety and the health of staff.

## Extran® MA 02

Extran® MA 02 liquid, neutral		Content	Packaging	Ord. No.
Extran® MA 02 neutral		2.5 l	Plastic bottle	1.07553.2500
		5 l	Plastic bottle	1.07553.5000
		10 l	Plastic container	1.07553.9010
		25 l	Plastic container	1.07553.9025
Ingredients	Ionic and non-ionic surfactants, phosphates, excipient in low quantities			
Application advice	Universal cleaner for the gentle cleaning of appliances made from alkali-sensitive metals such as aluminum, zinc and alloys with similar behavior. Suitable for metal appliances and precision measuring devices made from glass and quartz such as burettes, pipettes, cells, blood gas analyzers and other medical equipment which is sensitive to aggressive detergents and also rarely has problematic contamination.			
Properties	Liquid   neutral   chlorine-free   free from odorants / dyestuffs			
Dosing	The ideal dosing depends on the hardness of the water and the level of contamination of the item to be cleaned.			
	<b>Recommended application concentrations</b>			
	For normal contamination: 2 %			
	For heavier contamination: 5 %			
pH value	pH = 7.5 [in a 5 % solution]			

## Extran® MA 05

Extran® MA 05 liquid, alkaline, phosphate-free		Content	Packaging	Ord. No.
Extran® MA 05 liquid, alkaline, phosphate-free concentrate		2.5 l	Plastic bottle	1.40000.2500
		5 l	Plastic bottle	1.40000.5000
		10 l	Plastic container	1.40000.9010
		25 l	Plastic container	1.40000.9025
Ingredients	Anionic and non-ionic surfactants, alkalescent additives, free of NTA (nitrilotri acetic acid)			
Application advice	<p>Universal cleaner for the removal of tough stains. Unlimited use also possible with very hard water.</p> <p>Do not use on alkali-sensitive materials such as aluminum. Use is especially recommended everywhere where micro-phosphate tests are carried out.</p>			
Properties	Liquid   alkaline   phosphate-free   chlorine-free   free from odorants / dyestuffs   NTA-free			
Dosing	The ideal dosage depends on the hardness of the water and the level of contamination of the item to be cleaned.			
	<b>Recommended application concentrations</b>			
	For normal contamination: 2 %			
	For heavier contamination: 5 %			
pH value	pH = 11.6 [in a 2 % solution]			
	pH = 12.0 [in a 5 % solution]			

# Automated cleaning

The various types of Extran® AP were created in cooperation with leading appliance manufacturers especially for use in laboratory washing machines and tested in these machines for suitability. As well as a distinctive cleaning power with extensive universal effects, the very low formation of foam is also an important property. The good solubility in water of all components minimizes residues on appliances which have been cleaned.

To neutralize displaces alkali residues and remove remaining traces of alkali, an acid rinser should be used after every main wash cycle.

**All neutralizing agents are suitable.**

- Extran® AP 21 acidic with phosphoric acid
- Extran® AP 22 acidic with citric acid







1.40001.2500

Extran® AP-16

flüssig mild alkalisch  
liquid mildly alkaline  
liquide faiblement alcalin  
liquido ligeramente alcalino  
liquido debolmente alcalino  
vloeibaar zwaar alkalisch

2.5l



# Ordering information Extran® AP types for automated cleaning

## Extran® AP 11

Extran® AP 11 powder, mild alkaline		Content	Packaging	Ord. No.
Extran® AP 11 mildly alkaline		2 kg	Plastic bottle	1.07558.2000
		10 kg	Bucket, plastic	1.07558.9010
		25 kg	Fibre carton	1.07558.9025
Ingredients	Phosphates, alkali salts			
Application advice	Universal cleaning agent for the gentle cleaning of alkali-sensitive items. Cleaning of items which cannot be tainted with allergenic detergents, such as jewelry, glasses. A corrosion inhibitor is included for the intensive prevention of corrosion of glass and ceramics. Extran® AP 11 mild alkaline does not foam even during heavy agitation of the solution in a washing machine.			
Properties	In powder form   mild alkaline   surfactant-free   chlorine-free   contains a corrosion inhibitor   free from odorants / dyestuffs			
Dosing	The ideal dosage depends on the hardness of the water and the level of contamination of the item to be cleaned.			
	<b>Recommended application concentrations</b>			
	For normal conditions: 0.2 – 0.4 %, i.e. 20 – 40 g of Extran® AP 11 are used for around 10 l of water			
pH value	pH = 11.3 [in a 0.3 % solution when ready for use]			

## Extran® AP 12

Extran® AP 12 powder, alkaline		Content	Packaging	Ord. No.
Extran® AP 12 alkaline		2 kg	Plastic bottle	1.07563.2000
		10 kg	Bucket, plastic	1.07563.9010
		25 kg	Plastic drum	1.07563.9025
Ingredients	Phosphates, sodium hydroxide, alkali salts			
Application advice	Active universal cleaning agent for the main wash cycle, which cleans even heavily soiled items and removes dried or burned-on residues. Particularly suitable for the removal of starch and protein residues. Extran® AP 12 alkaline does not foam even during heavy agitation of the solution in a washing machine.			
Properties	In powder form   alkaline   surfactant-free   chlorine-free   free from odorants / dyestuffs			
	Extran® AP 12 is free from organic surfactants and emulsifiers, but contains complexing agents and can therefore be used in both soft and hard water.			
Dosing	The ideal dosage depends on the hardness of the water and the level of contamination of the item to be cleaned.			
	<b>Recommended application concentrations</b>			
	For normal conditions: 0.2 – 0.4 %, i.e. 20 – 40 g of Extran® AP 12 are used for around 10 l of water			
pH value	pH = 12.3 [in a 0.3 % solution when ready for use]			

## Extran® AP 13

Extran® AP 13 powder, alkaline with detergents		Content	Packaging	Ord. No.
Extran® AP 13 alkaline with detergents		2 kg	Plastic bottle	1.07565.2000
		10 kg	Fibre carton	1.07565.9010
		25 kg	Plastic drum	1.07565.9025
Ingredients	Non-ionic surfactants, phosphates, sodium hydroxide, alkali salts			
Application advice	Intensive cleaning agent for the main wash cycle. Particularly effective against grease and oil deposits. Other organic and inorganic residues are also removed.			
Properties	In powder form   alkaline   chlorine-free   contains a corrosion inhibitor   free from odorants / dyestuffs			
	Extran® AP 13 contains organic surfactants and emulsifiers and foams little. The product contains complexing agents and can therefore be used even in hard water without further additions.			
Dosing	The ideal dosage depends on the hardness of the water and the level of contamination of the item to be cleaned.			
	<b>Recommended application concentrations</b>			
	For normal conditions: 0.2 – 0.4 %, i.e. 20 – 40 g of Extran® AP 13 are used for around 10 l of water			
pH value	pH = 12.3 [in a ready-to-use solution]			

# Ordering information Extran® AP types for automated cleaning

## Extran® AP 16

Extran® AP 16 liquid, mild alkaline		Content	Packaging	Ord. No.
Extran® AP 16 liquid, mild alkaline concentrate		2.5 l	Plastic bottle	1.40001.2500
		5 l	Plastic bottle	1.40001.5000
		10 l	Plastic container	1.40001.9010
		25 l	Plastic container	1.40001.9025
Ingredients	Complexing agents, alkali salts, free from NTA			
Application advice	<p>Universal cleaning agent for the gentle cleaning of alkali-sensitive items. Cleaning of items which cannot be tainted with allergenic detergents, e.g. jewelry, glasses.</p> <p>Extran® AP 16 mild alkaline does not foam even during heavy agitation in a washing machine.</p>			
Properties	<p>Liquid   mild alkaline   phosphate-free   surfactant-free   chlorine-free   free from odorants / dyestuffs   NTA-free</p> <p>Extran® AP 16 mild alkaline is a liquid main cleaning agent with mild alkaline properties for automatic dosage.</p>			
Dosing	The ideal dosage depends on the hardness of the water and the level of contamination of the item to be cleaned.			
	<b>Recommended application concentrations</b>			
	For normal conditions: 0.3 – 0.5 %, i.e. 30 – 50 ml of Extran® AP 16 are used for around 10 l of water			
pH value	pH = 11.2 [in a 0.3 – 0.5 % solution]			
Accessories	Adapter made from PP, for 10 l and 25 l Extran® cans			9.67212.0001

## Extran® AP 17

Extran® AP 17 liquid, alkaline		Content	Packaging	Ord. No.
Extran® AP 17 liquid, alkaline concentrate		2.5 l	Plastic bottle	1.40006.2500
		5 l	Plastic bottle	1.40006.5000
		10 l	Plastic container	1.40006.9010
Ingredients	Complexing agent, sodium hydroxide solution, free from NTA			
Application advice	<p>Active universal cleaning agent for the main wash cycle which cleans and removes even heavily soiled items.</p> <p>Particularly suitable for the removal of starch and protein residues.</p> <p>Extran® AP 17 alkaline does not foam even during heavy agitation in a washing machine.</p>			
Properties	<p>Liquid   alkaline   phosphate-free   surfactant-free   chlorine-free   free from odorants / dyestuffs   NTA-free</p> <p>Extran® AP 17 is free from organic surfactants and emulsifiers, but contains complexing agents and can therefore be used in both soft and hard water.</p>			
Dosing	<p>The ideal dosage depends on the hardness of the water and the level of contamination of the item to be cleaned.</p> <p><b>Recommended application concentrations</b></p> <p>For normal conditions: 0.3 – 0.5 %, i.e. 30 – 50 ml of Extran® AP 17 are used in around 10 l of water</p>			
pH value	pH = 12.2 [in a 0.3 solution]			
Accessories	Adapter made from PP, for 10 l and 25 l Extran® cans			9.67212.0001

## Extran® AP 21

Extran® AP 21 liquid, acidic with phosphoric acid		Content	Packaging	Ord. No.
Extran® AP 21 acidic with phosphoric acid		2.5 l	Plastic bottle	1.07559.2500
		10 l	Plastic container	1.07559.9010
		25 l	Plastic container	1.07559.9025
Ingredients	Phosphoric acid			
Application advice	<p><b>The acid special cleaner can be used both as a pre-wash agent and a rinsing agent with a neutralizing effect.</b></p> <p><b>Pre-wash agent:</b> When used as a pre-wash agent, it primarily dissolves carbonates and hydroxides from the residues. Protein substances and organic bases, such as amines, are often removed better in an acidic pre-wash as in an alkaline main wash cycle.</p> <p><b>Rinsing agent:</b> As a rinsing agent, i.e. after the alkaline main wash cycle, it is especially suitable for removing remaining traces of alkali on the cleaned material or, in the case of solution carry-over, for neutralization. This acidic cleaning agent is also well suited to the removal of calcareous deposits in the washing machine.</p>			
Properties	<p>Liquid   acidic   surfactant-free   chlorine-free   free from odorants / dyestuffs</p> <p>Extran® AP 21 is an acidic pre-wash and neutralization agent with a phosphoric acid base.</p>			
Dosing	<p>Added automatically using a dosing device or manually.</p> <p><b>Recommended application concentrations</b></p> <p>Around 0.1 – 0.3 %, i.e. 10 – 30 ml of Extran® AP 21 are added to around 10 l of water</p>			
pH value	pH = 2.0 [in a ready-to-use solution]			
Accessories	Adapter made from PP, for 10 l and 25 l Extran® cans			9.67212.0001

# Ordering information Extran® AP types for automated cleaning

## Extran® AP 22

Extran® AP 22 liquid, acidic with citric acid		Content	Packaging	Ord. No.
Extran® AP 22 acidic with citric acid		2.5 l	Plastic bottle	1.07561.2500
		10 l	Plastic container	1.07561.9010
		25 l	Plastic container	1.07561.9025
Ingredients	Citric acid, non-ionic surfactants, low levels of excipient, phosphate-free			
Application advice	<p><b>The acidic special cleaner can be used both as a pre-wash agent and a rinsing agent with a neutralizing effect.</b></p> <p><b>Pre-wash agent:</b> When used as a pre-wash agent, it primarily dissolves hydroxides from the residues. Protein substances and organic bases, such as amines, are often removed better in an acidic pre-wash as in an alkaline main wash cycle.</p> <p><b>Rinsing agent:</b> As a rinsing agent, i.e. after the alkaline main wash cycle, it is especially suitable for removing remaining traces of alkali on the cleaned material or, in the case of solution carry-over, for neutralization. This acidic cleaning agent is also well suited to the removal of calcareous deposits in the washing machine. The product is recommended for cases in which gentle conditions must be maintained for particular reasons. Particularly suitable for the gentle removal of calcareous deposits, e.g. on taps or sensitive metal and glass surfaces.</p>			
Properties	Extran® AP 22 is an acidic pre-wash and neutralization agent with a citric acid base.			
Dosing	<p>Added automatically using a dosing device or manually.</p> <p><b>Recommended application concentrations</b></p> <p>Around 0.1 – 0.3 %, i.e. 10 – 30 ml Extran® AP 22 are used for around 10 l of water</p>			
pH value	pH = 3.0 [in a ready-to-use solution]			
Accessories	Adapter made from PP, for 10 l and 25 l Extran® cans			9.67212.0001

## Extran® AP 33

Extran® AP 33 Defoamer		Content	Packaging	Ord. No.
Extran® AP 33 liquid, anti-foaming agent		2.5 l	Plastic bottle	1.40007.2500
Ingredients	Inorganic polymers, low levels of excipient, contains silicon, produced without added formaldehyde			
Application advice	If the residues to be removed foam significantly themselves, the development of foam is prevented by adding this special defoamer. Strong foamers include all kinds of emulsifiers, e.g. soaps, which sometimes only develop during the wash cycle due to the saponification of fats, and numerous protein stains.			
Dosing	0.5 – 3 ml per 10 l wash cycle			

## Extran® AP 41

Extran® AP 41 powder, enzymatic	Content	Packaging	Ord. No.
Extran® AP 41 enzymatic	2 kg	Plastic bottle	1.07570.2000
	25 kg	Plastic drum	1.07570.9025
<b>Ingredients</b>	Enzymes, phosphates, alkali salts		
<b>Application advice</b>	Alkaline cleaning agent for use in washing machines. Especially for the removal of dried tissue and saliva residues, of mucus, protein and blood, in catheters, breathing tubes, breathing bags etc. Ideal conditions for cleaning are between 55 and 65°C, since the enzymes do not work above 70°C. We recommend Extran® AP 22 acidic with citric acid as an acidic rinsing agent.		
<b>Dosing</b>	<b>Recommended application concentrations</b> 0.3 %, i.e. 30 g of Extran® AP 41 are used for each 10 l wash cycle		
<b>pH value</b>	pH = 11.4 [in a ready-to-use solution]		



### More information

► Please note the information on the Safety Data Sheet.



# Ordering information

## General cleaning applications

Chromosulfuric acid		Content	Packaging	Ord. No.
Chromosulfuric acid for cleaning glass vessels		1 l	Glass bottle	1.02499.1000
		2.5 l	Glass bottle	1.02499.2500
General information	Chromosulfuric acid is an excellent cleaning agent for tough cases, for example when working with carcinogenic substances. Carcinogenic residues can be oxidative destroyed by treatment with chromosulfuric acid. The effect is based on the chromium(VI) oxide $\text{CrO}_3$ , a very strong oxidation agent. During the oxidation process, the red-brown chromium(VI) oxide is reduced to the green trivalent state of chromium. The depletion level can thus be assessed from the change in color without further testing: fresh chromosulfuric acid is red-brown, used is green in color.			
Safety advice	Extreme care must be taken when working with chromosulfuric acid due to its corrosive and highly oxidizing properties and the possibility of the formation of poisonous chromium(VI) vapor. Due to the large amount of heat generated when mixed with water, chromosulfuric acid must never be diluted by adding water (strongly corrosive splashes!). If dilution is necessary, this can only be done by adding the acid to water while stirring. The equally very poisonous chromium(VI) oxide chloride (chromylchloride) is formed when chlorides are present in the residues to be removed. For all these reasons, cleaning procedures using chromosulfuric acid should only be undertaken in a well-ventilated area. Furthermore, protective clothing, impermeable gloves and protective goggles are to be worn. Instructions for safe use are printed on the label of every pack.			
Removal of residues	Chromium solutions must be treated as special waste and their disposal left to a company responsible for this. Neutralize any spilled acid with sodium hydrogen carbonate or lime sand. Never mop up with wadding, pulp, textiles or sawdust.			

Decalcification solution citric acid base around 19 %		Content	Packaging	Ord. No.
Decalcification solution base: citric acid about 19 %		1 l	Plastic bottle	1.00240.1000
Ingredients	Citric acid, other organic acids in small quantities			
Application advice	The product is recommended for cleaning instances in which particularly gentle conditions have to be maintained. Particularly suitable for the gentle removal of calcareous deposits, for example on taps or sensitive metal and glass surfaces. The decalcification solution is made from pharmacopoeic raw materials and thus satisfies the highest quality standards.			
Properties	Liquid   acidic   phosphate-free			
Dosage	The concentration for application is around 1 – 5 %, i.e. 100 – 500 ml of decalcification solution is added to around 10 l of water. The decalcification process can be accelerated by applying a little heat. Do not use on corrosive materials.			

Sodium hydroxide solution		Content	Packaging	Ord. No.
Sodium hydroxide solution about 32 % extra pure		2.5 l	Plastic bottle	1.05587.2500
		5 l	Plastic bottle	1.05587.5000
		25 l	Plastic container	1.05587.9025
		200 l	Plastic barrel	1.05587.9200
Ingredients	Sodium hydroxide			
Application advice	Basic cleaning agent for cleaning applications in which residues from surfactants or complexation agents are to be avoided. Through the use of these prepared solutions, the time-consuming and dangerous breakdown of solid sodium hydroxide can be avoided.			
Properties	Liquid   strongly alkaline   chlorine-free			



Accessories

Adapter for canister	Content	Packaging	Ord. No.
Adapter composed of PP for 10 l and 25 l Extran® canister	1 piece	Plastic bag	9.67212.0001

One for all: The universal adapter

Larger packing units, such as the 10 l and 25 l cans, are used for cleaning equipment. In this, it is important for workplace safety that the cans are connected tightly to the machines so that no spraying can occur. Around the world, various types of cleaning apparatus are used with very individual connection systems. Merck Millipore has developed a universal adapter especially for this. With its help, different types of machine can be safely connected to the detergent containers. This avoids detergent being lost, while simultaneously enabling reliable cleaning.

The advantages of the universal adapter for 10 l and 25 l cans for you

- Safety:** If the can is connected tightly to the machine, spillage is avoided and the health and personal safety of the staff is thus protected.
- Reliability:** External contamination (from the air) can be avoided, thus preventing analytical results from being corrupted or influenced and ensuring reliable and exact results.

Dosing aid	Content	Packaging	Ord. No.
Dosing aid made of PP, 20 ml, 28 mm, natural for Extran®, AWH	1 piece	Plastic bag	9.57571.1020

It all comes down to the dosage

For cleaning to be effective and reliable, the detergent must be dosed precisely. This also ensures that the agent is used economically: too little cleans insufficiently, too much leaves residues. That is why Merck Millipore offers 1 l bottles with dosing aids, which ensure efficient dosing and are safe to handle when cleaning manually. The dosing aid can also be ordered separately if required and can be reused again and again.



# Service

New possibilities and information tools for further dimensions.

Discover the multimedia world of Merck Millipore Chemicals and enjoy the benefits of a service that is focused on you – our valued customer! In addition to the information provided in this catalog, we also publish a wealth of online and print media regarding our inorganic reagents. Our specialized product brochures give details of our individual product groups, their applications and your advantages in using them.

Please visit our [www.merckmillipore.com/inorganic-reagents](http://www.merckmillipore.com/inorganic-reagents) website, where you will find detailed information about our products as well as useful tools to simplify your routine work.

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## Online media

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## Print media

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## Periodic system

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# Online media

[www.merckmillipore.com/inorganic-reagents](http://www.merckmillipore.com/inorganic-reagents)

You can explore our broad product range by visiting our website. Our individual inorganic reagents are classified under the following three principal subject categories:

- Classic inorganic analysis
- Instrumental inorganic analysis
- Safety products and general applications



**Quick links** Try out our Quick links! These take you directly to individual product groups of interest and to videos and useful tools in the Service center.

**Videos** Featuring various products for inorganic analysis, our fascinating videos cover potential applications, filling and production processes, and much more! Discover more about Merck Millipore [salts](#), [acids](#), [reference materials](#) and [products for titration](#) by watching our quick videos!

**Service center** Our Service center offers you a selection of extremely practical tools.

[Website guide](#) will help you navigate through our web pages quickly and easily.

[Analytical application finder](#) presents you a list of applications from which you can choose the most appropriate substance or substance group covering your particular needs.

[pH-Indicator-Selector](#) displays a table of pH indicators and their ranges so you can make a quick, informed decision about which one to use for your specific analysis.

[Concentration density finder](#) tells you the precise density and molarity at 20°C of any solution selected from the dropdown menu.

[LabTools booklet](#) and [periodic table of the elements](#) are tools that support you in your laboratory work. The LabTools booklet provides useful advice on how to handle and work with chemicals in the laboratory and is a useful source of information on preventing application errors.

Access to detailed information, as our [Merck Millipore Safety Data Sheets](#) as well as [Regulations & Requirements](#) information.

Online form to contact us directly, if you have any questions!

# Online media

[www.merckmillipore.com/inorganic-reagents](http://www.merckmillipore.com/inorganic-reagents)

Find the right tool for your needs.

**Search** Our »Search« function allows you to search directly via product name, a six-digit catalog number, a CAS number or a keyword.

**Quick search** »Quick search« gives you convenient access to Material Safety Data Sheets (MSDS) and Certificates of Analysis (CoA), which you can easily download.

**Advanced search** We also provide an »Advanced search« facility offering numerous additional features. For example, you can find your required product by performing a structure search or by initiating a document search in our extensive document database. If you have already purchased Merck Millipore products, you can locate information on how to use them according to the new European legislation on chemical substances by selecting »REACH use information for your products«.

**Online magazines** Not only our products are tailored to your exact needs; our services are, too, which is why we give you the option of reading our »Labmail« and »Pharmail« either online or in a printed version.

**Labmail** Labmail contains information about new developments and trends, and features analytical tests, chemicals and reagents that are important for quality control, in-process control and R&D. [www.merckmillipore.com/labmail](http://www.merckmillipore.com/labmail)

**Pharmail** Pharmail reports regularly on the latest trends in the pharmaceutical and biopharmaceutical industries. [www.merckmillipore.com/pharmail](http://www.merckmillipore.com/pharmail)



**Apps** Have you already seen our »Periodic table of the elements« app? Why not download it to your iPhone, iPad or iPod touch\*? Merck Millipore's state-of-the-art »Periodic table of elements« app tells you everything you need to know about the chemical elements – in a user-friendly, pocket-sized format. [www.merckmillipore.com/apps](http://www.merckmillipore.com/apps)

#### More information

► [www.merckmillipore.com/apps](http://www.merckmillipore.com/apps) ► [www.merckmillipore.com/periodic-table](http://www.merckmillipore.com/periodic-table)

\* = iPhone, iPad and iPod are registered trademarks of Apple Inc.

# Print media

To help you use our products to your advantage, we offer a selection of brochures that cover specific product groups, their benefits, special usage advice and details of our services. Precise instructions on using the individual products are given to simplify your laboratory work, help avoid application errors and save you time and money – all leading to greater efficiency. On the following page is a selection of special product brochures on our inorganic reagents together with their catalog numbers.





## Classic inorganic analysis

- Acids for analysis EMSURE® | W.281145
- Inorganic salts | W.281127
- Just in Case | W.281115
- Made by Merck Millipore – Caustic alkalis and alkaline solutions of high purity and defined quality | W.281122
- New Quality in Pharmacopoeia Analysis – High audit rates require reliable solutions | W.281130

## Instrumental inorganic analysis

- Apura® – Water determination according to Karl Fischer | W.283125
- Certipur® – Not all reference materials are the same | W.283120
- The Magic Box – Titripac® for volumetric solutions and buffer solutions | W.283143
- Titripur® – The measure of all things – Titration Guide for titer determination | W.281136
- Titripur® – The measure of all things – Volumetric Solutions from Merck Millipore | W.281144

## Product safety and general applications

- Drying Agents | W.283123
- Extran® detergents – The perfect solution for cleaning your laboratory utensils | W.283119
- Chemizorb® – Absorbents for spilled liquids | W.283137

These and other brochures can be ordered from your regional Merck Millipore office and are also available online as PDF files, which you can download from the relevant product page. Please contact your local Merck Millipore representative or visit [www.merckmillipore.com/inorganic-reagents](http://www.merckmillipore.com/inorganic-reagents)

## Magazines

Our »lab mail« and »phar mail« magazines keep you up to date with the latest developments and trends in the industry. You can either subscribe to them free of charge by contacting the Merck Millipore Group in your area, or enjoy the electronic version online.

### More information

► [www.merckmillipore.com/inorganic-reagents](http://www.merckmillipore.com/inorganic-reagents)

# Glossary

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## Inorganic Reagents for laboratory use

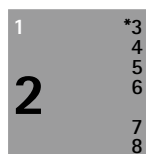
- Classic inorganic analysis
- Instrumental inorganic analysis
- Safety products and general applications



# Periodic table of the elements

The periodic table of the elements is a tool that support you in your laboratory work. You can have a look at the pericodic table on the next page or visit our website to discover the features of the interactive periodic table of the elements. Merck Millipore's innovative information tools are tailored to meet the interests of the new chemist generation. Try it out yourself!

## Legend of the periodic table



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- 1 Atomic number
- 2 Element symbol
- 3 Relative atomic mass [g/mol]
- \* most stable isotope
- 4 Melting point [°C]
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- 6 Electronegativity [Allred, Rochow]
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- Nonmetals
- Halogens
- Inert gases
- Alkaline-earth metals
- Alkali metals
- Transition metals
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- Other metals
- Semi metals



[www.merckmillipore.com/periodic-table](http://www.merckmillipore.com/periodic-table)

	1	2	3	4	5	6	7	8	9	
1	1 1.0079 −259.14 −252.87 2.20 −1, 1 1s1 <b>H</b>									
2	3 6.941 180.54 1342 0.97 1 [He] 2s1 <b>Li</b>	4 9.0122 1287 2469 1.47 2 [He] 2s2 <b>Be</b>								
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## Lanthanides

## Actinides

57 138.91 920 3464 1.08 3 [Xe] 5d16s2 <b>La</b>	58 140.12 795 3443 1.08 3, 4 [Xe] 4f15d16s2 <b>Ce</b>	59 140.91 935 3520 1.07 3, 4 [Xe] 4f36s2 <b>Pr</b>	60 144.24 1024 3074 1.07 3 [Xe] 4f46s2 <b>Nd</b>	61 *144.91 1042 3000 1.07 3 [Xe] 4f56s2 <b>Pm</b>	62 150.36 1072 1794 1.07 2, 3 [Xe] 4f66s2 <b>Sm</b>	63 151.96 826 1529 1.01 2, 3 [Xe] 4f76s2 <b>Eu</b>
89 *227.03 1050 3198 1.00 3 [Rn] 6d17s2 <b>Ac</b>	90 *232.04 1842 4788 1.11 4 [Rn] 6d27s2 <b>Th</b>	91 *231.04 1568 4027 1.14 4, 5 [Rn] 5f26d17s2 <b>Pa</b>	92 *238.03 1132 4131 1.22 3, 4, 5, 6 [Rn] 5f36d17s2 <b>U</b>	93 *237.05 644 4000 1.22 3, 4, 5, 6 <b>Np</b>	94 *244.06 639.4 3228 1.22 3, 4, 5, 6 <b>Pu</b>	95 *243.06 1176 2607 1.20 3, 4, 5, 6 <b>Am</b>

10	11	12	13	14	15	16	17	18
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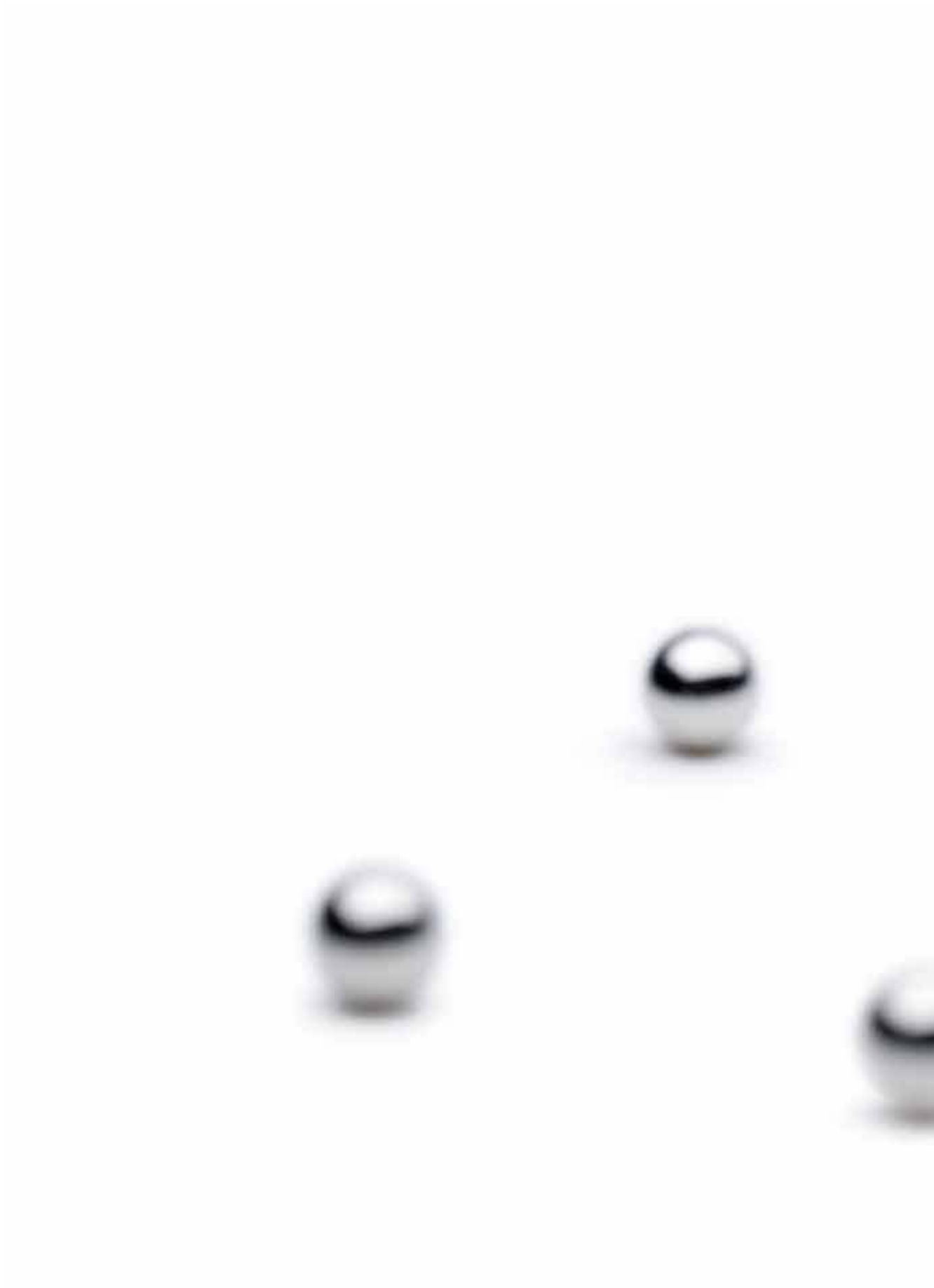
2	4.0026 −272.2 −268.93
He	1s <sup>2</sup>

5	10.811 2075 3927 2.01	6	12.011 3550 4827 2.50	7	14.007 −210 −195.8 3.07	8	15.999 −218.79 −182.96 3.50	9	18.998 −219.62 −188.12 4.10	10	20.18 −248.59 −246.08
B	3 [He] 2s <sup>2</sup> 2p <sup>1</sup>	C	−4, 2, 4 [He] 2s <sup>2</sup> 2p <sup>2</sup>	N	−3, 2, 3, 4, 5 [He] 2s <sup>2</sup> 2p <sup>3</sup>	O	−2, −1 [He] 2s <sup>2</sup> 2p <sup>4</sup>	F	−1 [He] 2s <sup>2</sup> 2p <sup>5</sup>	Ne	[He] 2s <sup>2</sup> 2p <sup>6</sup>
13	26.982 660.32 2519 1.47	14	28.086 1414 3265 1.74	15	30.974 1415 277 2.06	16	32.065 115.21 444.6 2.44	17	35.453 −101.5 −34.04 2.83	18	39.948 −189.35 −185.85
Al	3 [Ne] 3s <sup>2</sup> 3p <sup>1</sup>	Si	−4, 4 [Ne] 3s <sup>2</sup> 3p <sup>2</sup>	P	−3, 3, 5 [Ne] 3s <sup>2</sup> 3p <sup>3</sup>	S	−2, 2, 4, 6 [Ne] 3s <sup>2</sup> 3p <sup>4</sup>	Cl	−1, 1, 3, 5, 7 [Ne] 3s <sup>2</sup> 3p <sup>5</sup>	Ar	[Ne] 3s <sup>2</sup> 3p <sup>6</sup>

28	58.693 1455 2913 1.75	29	63.546 1084.62 2562 1.75	30	65.409 419.53 907 1.66	31	69.723 29.76 2204 1.82	32	72.64 938.25 2833 2.02	33	74.922 subl. 615 subl. 615 2.20	34	78.96 221 685 2.48	35	79.904 −7.3 58.8 2.74	36	83.798 −157.36 −153.22
Ni	0, 2, 3 [Ar] 3d <sup>8</sup> 4s <sup>2</sup>	Cu	1, 2 [Ar] 3d <sup>10</sup> 4s <sup>1</sup>	Zn	2 [Ar] 3d <sup>10</sup> 4s <sup>2</sup>	Ga	3 [Ar] 3d <sup>10</sup> 4s <sup>2</sup> 4p <sup>1</sup>	Ge	4 [Ar] 3d <sup>10</sup> 4s <sup>2</sup> 4p <sup>2</sup>	As	−3, 3, 5 [Ar] 3d <sup>10</sup> 4s <sup>2</sup> 4p <sup>3</sup>	Se	−2, 4, 6 [Ar] 3d <sup>10</sup> 4s <sup>2</sup> 4p <sup>4</sup>	Br	−1, 1, 3, 5, 7 [Ar] 3d <sup>10</sup> 4s <sup>2</sup> 4p <sup>5</sup>	Kr	2, 4 [Ar] 3d <sup>10</sup> 4s <sup>2</sup> 4p <sup>6</sup>
46	106.42 1554.9 2963 1.30	47	107.87 961.78 2162 1.42	48	112.41 321.07 767 1.46	49	114.82 156.6 2072 1.49	50	118.71 231.93 2602 1.72	51	121.76 630.63 1587 1.82	52	127.60 449.51 988 2.01	53	126.90 113.7 184.3 2.21	54	131.29 −111.7 −108.12
Pd	0, 2, 4 [Kr] 4d <sup>10</sup>	Ag	1, 2 [Kr] 4d <sup>10</sup> 5s <sup>1</sup>	Cd	2 [Kr] 4d <sup>10</sup> 5s <sup>2</sup>	In	3 [Kr] 4d <sup>10</sup> 5s <sup>2</sup> 5p <sup>1</sup>	Sn	2, 4 [Kr] 4d <sup>10</sup> 5s <sup>2</sup> 5p <sup>2</sup>	Sb	−3, 3, 5 [Kr] 4d <sup>10</sup> 5s <sup>2</sup> 5p <sup>3</sup>	Te	−2, 4, 6 [Kr] 4d <sup>10</sup> 5s <sup>2</sup> 5p <sup>4</sup>	I	−1, 1, 3, 5, 7 [Kr] 4d <sup>10</sup> 5s <sup>2</sup> 5p <sup>5</sup>	Xe	2, 4, 6 [Kr] 4d <sup>10</sup> 5s <sup>2</sup> 5p <sup>6</sup>
78	195.08 1768.3 3825 1.42	79	196.97 1064 2856 1.42	80	200.59 −38.83 356.73 1.44	81	204.38 304 1473 1.44	82	207.2 327.46 1749 1.55	83	208.98 271.5 1564 1.67	84	*208.98 254 962 1.76	85	*209.99 302 337 1.96	86	*222.02 −71 −61.7
Pt	0, 2, 4 [Xe] 4f <sup>14</sup> 5d <sup>9</sup> 6s <sup>1</sup>	Au	1, 3 [Xe] 4f <sup>14</sup> 5d <sup>10</sup> 6s <sup>1</sup>	Hg	1, 2 [Xe] 4f <sup>14</sup> 5d <sup>10</sup> 6s <sup>2</sup>	Tl	1, 3 [Xe] 4f <sup>14</sup> 5d <sup>10</sup> 6s <sup>2</sup> 6p <sup>1</sup>	Pb	2, 4 [Xe] 4f <sup>14</sup> 5d <sup>10</sup> 6s <sup>2</sup> 6p <sup>2</sup>	Bi	3, 5 [Xe] 4f <sup>14</sup> 5d <sup>10</sup> 6s <sup>2</sup> 6p <sup>3</sup>	Po	2, 4, 6 [Xe] 4f <sup>14</sup> 5d <sup>10</sup> 6s <sup>2</sup> 6p <sup>4</sup>	At	−1, 1, 3, 5, 7 [Xe] 4f <sup>14</sup> 5d <sup>10</sup> 6s <sup>2</sup> 6p <sup>5</sup>	Rn	2 [Xe] 4f <sup>14</sup> 5d <sup>10</sup> 6s <sup>2</sup> 6p <sup>6</sup>
110	*281	111	*280	112	*285												
Ds		Rg		Cn													

64	157.25 1312 3273 1.11	65	158.93 1356 3230 1.10	66	162.50 1407 2567 1.10	67	164.93 1461 2720 1.10	68	167.26 1529 2868 1.11	69	168.93 1545 1950 1.11	70	173.04 824 1196 1.06	71	174.97 1652 3402 1.14
Gd	3 [Xe] 4f <sup>7</sup> 5d <sup>1</sup> 6s <sup>2</sup>	Tb	3, 4 [Xe] 4f <sup>9</sup> 6s <sup>2</sup>	Dy	3 [Xe] 4f <sup>10</sup> 6s <sup>2</sup>	Ho	3 [Xe] 4f <sup>11</sup> 6s <sup>2</sup>	Er	3 [Xe] 4f <sup>12</sup> 6s <sup>2</sup>	Tm	2, 3 [Xe] 4f <sup>13</sup> 6s <sup>2</sup>	Yb	2, 3 [Xe] 4f <sup>14</sup> 6s <sup>2</sup>	Lu	3 [Xe] 4f <sup>14</sup> 5d <sup>1</sup> 6s <sup>2</sup>
96	*247.07 1340 3110 1.20	97	*247.07 1050	98	*251.08 900	99	*252.08 860	100	*257.1 1527	101	*258.10 827	102	*259.10 827	103	*262.11 1627
Cm	3, 4	Bk	1.20 3, 4	Cf	1.20 3, 4	Es	1.20 3	Fm	1.20 3	Md	1.20 3	No	1.20 2, 3	Lr	3







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