BS EN 1197:2014

BSI Standards Publication

Chemicals used for treatment of water intended for human consumption — Monozinc phosphate solution

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 1197:2014. It supersedes BS EN 1197:2006 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee CII/59, Chemicals for drinking water treatment.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 82883 6

ICS 13.060.20; 71.100.80

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2014.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1197

March 2014

ICS 71.100.80

Supersedes EN 1197:2006

English Version

Chemicals used for treatment of water intended for human consumption - Monozinc phosphate solution

Produits chimiques pour le traitement de l'eau destinée à la consommation humaine - Bis-dihydrogénophosphate de zinc en solution

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Monozinkphosphat-Lösung

This European Standard was approved by CEN on 5 January 2014.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword

This document (EN 1197:2014) has been prepared by Technical Committee CEN/TC 164 “Water supply”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2014 and conflicting national standards shall be withdrawn at the latest by September 2014.

This document supersedes EN 1197:2006.

Significant technical differences between this edition and EN 1197:2006 are as follows:

— replacement of warning and safety precautions notes by labelling according to REGULATION (EC) No 1272/2008.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

WARNING. The use of this standard may involve hazardous materials, operations and equipment. This standard does not purport to address all the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate health and safety practices and determine the applicability of regulatory limitations prior to use.

Introduction

In respect of potential adverse effects on the quality of water intended for human consumption, caused by the product covered by this European Standard:

a) this European Standard provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;

b) it should be noted that, while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

NOTE Conformity with this European Standard does not confer or imply acceptance or approval of the product in any of the Member States of the EU or EFTA. The use of the product covered by this European Standard is subject to regulation or control by National Authorities.

1 Scope

This European Standard is applicable to monozinc phosphate solution used for treatment of water intended for human consumption. It describes the characteristics of monozinc phosphate solution and specifies the requirements and the corresponding test methods for monozinc phosphate solution. It gives information on its use in water treatment.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1233, *Water quality - Determination of chromium - Atomic absorption spectrometric methods*

EN ISO 3696, *Water for analytical laboratory use - Specification and test methods (ISO 3696:1987)*

EN ISO 5961, *Water quality - Determination of cadmium by atomic absorption spectrometry (ISO 5961:1994)*

EN ISO 11885, *Water quality - Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007)*

EN ISO 11969, *Water quality - Determination of arsenic - Atomic absorption spectrometric method (hydride technique) (ISO 11969:1996)*

EN ISO 12846, *Water quality - Determination of mercury - Method using atomic absorption spectrometry (AAS) with and without enrichment (ISO 12846:2012)*

ISO 2997, *Phosphoric acid for industrial use — Determination of sulphate content — Method by reduction and titrimetry*

ISO 3165, *Sampling of chemical products for industrial use — Safety in sampling*

ISO 3360, *Phosphoric acid and sodium phosphates for industrial use (including foodstuffs) — Determination of fluorine content — Alizarin complexone and lanthanum nitrate photometric method*

ISO 3706, *Phosphoric acid for industrial use (including foodstuffs) — Determination of total phosphorus (V) oxide content — Quinoline phosphomolybdate gravimetric method*

ISO 6206, *Chemical products for industrial use — Sampling — Vocabulary*

ISO 6703-1, *Water quality — Determination of cyanide — Part 1: Determination of total cyanide*

ISO 8288:1986, *Water quality — Determination of cobalt, nickel, copper, zinc, cadmium and lead — Flame atomic absorption spectrometric methods*

ISO 9965, *Water quality — Determination of selenium — Atomic absorption spectrometric method (hydride technique)*

3 Description

3.1 Identification

3.1.1 Chemical name

Monozinc phosphate solution.

3.1.2 Synonym or common name

Not applicable.

3.1.3 Relative molecular mass

Not applicable.

3.1.4 Empirical formula

$Zn(H_2PO_4)_2$ (Solution).

3.1.5 Chemical formula

$Zn(H_2PO_4)_2$ (Solution).

3.1.6 CAS Registry Number [1)]

13598-37-3.

3.1.7 EINECS reference [2)]

237-067-2.

3.2 Commercial form

The monozinc phosphate is available as a solution; commonly used concentration is 500 g/l.

3.3 Physical properties

3.3.1 Appearance

The product is a clear solution.

3.3.2 Density

The density at 20 °C is 1,7 g/ml for a concentration of 500 g/l.

3.3.3 Solubility in water

Miscible in any proportion.

3.3.4 Vapour pressure

Not applicable.

3.3.5 Boiling point at 100 kPa [3)]

Not applicable.

---

1) Chemical Abstracts Service Registry Number.

2) European Inventory of Existing Commercial Chemical Substances.

3) 100 kPa = 1 bar

3.3.6 Melting point

Not applicable.

3.3.7 Specific heat

Not known.

3.3.8 Viscosity (dynamic)

180 mPa·s for a concentration of 500 g/l at 20 °C.

3.3.9 Critical temperature

Not applicable.

3.3.10 Critical pressure

Not applicable.

3.3.11 Physical hardness

Not applicable.

3.4 Chemical properties

Solutions of monozinc phosphate have acidic reactions.

The pH value of a solution containing 5 g/l of Zn $(H_2PO_4)_2$ is approximately 2,1.

4 Purity criteria

4.1 General

This European Standard specifies the minimum purity requirements for monozinc phosphate solution used for the treatment of water intended for human consumption. Limits are given for impurities commonly present in the product. Depending on the raw material and the manufacturing process other impurities may be present and, if so, this shall be notified to the user and when necessary to relevant authorities.

Users of this product should check the national regulations in order to clarify whether it is of appropriate purity for treatment of water intended for human consumption, taking into account raw water quality, required dosage, contents of other impurities and additives used in the products not stated in this product standard.

Limits have been given for impurities and chemicals parameters where these are likely to be present in significant quantities from the current production process and raw materials. If the production process or raw materials lead to significant quantities of impurities, by-products or additives being present, this shall be notified to the user.

4.2 Composition of commercial product

The product shall conform to the following requirements for the solution:

— phosphate content expressed as P_2O_5: mass fraction of (39 ± 2,0) %;

— zinc oxide content: mass fraction of (15 ± 1,0) %.

4.3 Impurities and main by-products

The product shall conform to the requirements specified in Table 1.

Table 1 — Impurities

Impurity		Limit in mg/kg of solution
Sulfate (SO_4^{2-})	max.	500
Fluoride (F^-)	max.	10

4.4 Chemical parameters

Content of various chemical parameters depends on the origin of the raw materials, most of these elements are present only as traces.

The product shall conform to the requirements specified in Table 2.

Table 2 — Chemical parameters

Parameter		Limit in mg/kg of solution
Antimony (Sb)	max.	3
Arsenic (As)	max.	3
Cadmium (Cd)	max.	3
Chromium (Cr)	max.	10
Cyanide (CN^-)	max.	5
Lead (Pb)	max.	10
Mercury (Hg)	max.	1
Nickel (Ni)	max.	10
Selenium (Se)	max.	3
NOTE Pesticides and polycyclic aromatic hydrocarbons are not relevant in monozinc phosphate solution. For parametric values of monozinc phosphate solution on trace metal content in drinking water, see[1].		

5 Test methods

5.1 Sampling

Observe the general recommendations of ISO 3165 and take account of ISO 6206.

5.1.1 Sampling from drums and bottles

5.1.1.1 General

Mix the contents of each container to be sampled by shaking the container, by rolling it or by rocking it from side to side, taking care not to damage the container or spill any of the liquid.

If the design of the container is such (for example, a narrow-necked bottle) that it is impracticable to use a sampling implement, take a sample by pouring after the contents have been thoroughly mixed.

Otherwise examine the surface of the liquid. If there are signs of surface contamination, take samples from the surface as described in 5.1.1.2. Otherwise, take samples as described in 5.1.1.3.

5.1.1.2 Surface sampling

Take a sample using a suitable ladle. Lower the ladle into the liquid until the rim is just below the surface, so that the surface layer runs into it. Withdraw the ladle just before it fills completely and allow any liquid adhering to the ladle to drain off. If necessary, repeat this operation so that, when the other selected containers have been sampled in a similar manner, the total volume of sample required for subsequent analysis is obtained.

5.1.1.3 Bottom sampling

Take a sample using an open sampling tube, or a bottom-valve sampling tube, suited to the size of container and the viscosity of the liquid.

When using an open sampling tube, close it at the top and then lower the bottom end to the bottom of the container. Open the tube and move it rapidly so that the bottom of the tube traverses the bottom of the container before the tube is filled. Close the tube, withdraw it from the container and allow any liquid adhering at the outside of the tube to drain off.

When using a bottom-valve sampling tube, close the valve before lowering the tube into the container and then proceed in a similar manner to that when using an open sampling tube.

5.1.2 Sampling from tanks and tankers

From each access point, take samples as follows:

a) from the surface of the liquid, using a ladle as described in 5.1.1.2;

b) from the bottom of the tank or tanker, using a sampling tube as described in 5.1.1.3 or using a specially designed bottom-sampling apparatus;

c) from one or more positions, depending on the overall depth, between the bottom and the surface using a weighted sampling can.

5.2 Analysis

5.2.1 Monozinc phosphate (main product)

5.2.1.1 Phosphate (main product)

The determination of the concentration of phosphate (P_2O_5) shall be carried out in accordance with ISO 3706.

5.2.1.2 Zinc oxide (main product)

5.2.1.2.1 Principle

Gravimetric determination of zinc oxide (ZnO). Zinc is precipitated as zinc ammoniumphosphate.

5.2.1.2.2 Reagents

All the reagents shall be of a recognised analytical grade and the water used shall conform to grade 3 in accordance with EN ISO 3696 and shall be boiled and cooled immediately before use.

5.2.1.2.2.1 Hydrochloric acid (HCl) concentrated, ρ = 1,18 g/ml

5.2.1.2.2.2 Ammonium hydroxide (NH_4OH) concentrated, ρ = 0,88 g/ml

5.2.1.2.2.3 Ammonium chloride (NH_4Cl)

5.2.1.2.2.4 Ammonium phosphate ($(NH_4)_2HPO_4$)

5.2.1.2.2.5 Determination

Weigh an amount of monozinc phosphate solution, equivalent to about 70 mg of zinc oxide, into a beaker glass of 400 ml of volume. Add 150 ml of water and then 5 ml of the hydrochloric acid (5.2.1.2.2.1). Add 5 g of solid ammonium chloride (5.2.1.2.2.3) and 2 g of ammonium phosphate (5.2.1.2.2.4) and warm up to 80 °C. At this temperature, adjust the pH to 6,5 with the ammonium hydroxide (5.2.1.2.2.2). Stir until room temperature is achieved and filter off the crystalline precipitate in a weighed filter crucible. Wash with water and dry at 105 °C for 1 h and reweigh.

5.2.1.2.3 Expression of results

The content of zinc oxide (ZnO), C_1, expressed as a mass fraction in % of the solution is given by the equation:

$$C_1 = \frac{m_1 \times f \times 100}{m_0} \quad (1)$$

where

m_1 is the mass, in grams, of the dried precipitate;

f is the dilution factor: 0,456 2;

m_0 is the mass, in grams, of the laboratory sample.

5.2.2 Impurities

5.2.2.1 Sulfate

The sulfate (SO_4^{2-}) content shall be determined in accordance with ISO 2997.

5.2.2.2 Fluoride

The fluoride (F^-) content shall be determined in accordance with ISO 3360.

5.2.3 Chemical parameters

5.2.3.1 Determination of antimony (Sb), arsenic (As), cadmium (Cd), chromium (Cr), lead (Pb), nickel (Ni), mercury (Hg), selenium (Se) and cyanide (CN^-)

5.2.3.1.1 Principle

The elements antimony, arsenic, cadmium, chromium, lead, nickel, mercury and selenium are determined by atomic absorption spectrometry. Cyanide is determined by molecular absorption spectrometry.

When preparing the monozinc phosphate solution for analysis, it is important to ensure that the chemical parameters are effectively dissolved. The concentration of the solution should be sufficient to permit adequate sensitivity in analysis of the chemical parameters and appropriate steps should be taken to compensate for any matrix interference caused by the concentration of monozinc phosphate solution.

5.2.3.1.2 Reagents

5.2.3.1.2.1 General

All reagents shall be of a recognised analytical grade and the water used shall conform to grade 3 specified in EN ISO 3696.

5.2.3.1.2.2 Hydrochloric acid, concentrated, ρ = 1,18 g/ml

5.2.3.1.3 Procedure

5.2.3.1.3.1 Test portion

Weigh, to the nearest 0,001 g, 2,5 g (*m*) from the laboratory sample into a 100 ml one-mark volumetric flask.

5.2.3.1.3.2 Test solution

Add to the test portion (5.2.3.1.3.1) approximately 20 ml of water and 2 ml of the hydrochloric acid (5.2.3.1.2.2), dissolve and make up to 100 ml with water.

5.2.3.1.3.3 Determination

Determine the content of elements in the test solution (5.2.3.1.3.2) in accordance with the following methods:

Ni and Pb	In accordance with ISO 8288:1986, method A;
Cd	In accordance with EN ISO 5961;
Cr	In accordance with EN 1233;
As	In accordance with EN ISO 11969;
CN^-	In accordance with ISO 6703-1;
Se	In accordance with ISO 9965;
Hg	In accordance with EN ISO 12846;
Sb	In accordance with EN ISO 11885.

These methods will provide an interim result (y) expressed in milligrams per litre which needs to be converted to give the final concentration according to the equation in 5.2.3.1.3.4.

5.2.3.1.3.4 Expression of results

From the interim result (*y*) determined (see 5.2.3.1.3.3), the content, c_2, of element in the laboratory sample, expressed in milligrams per kilogram of solution is given by the following equation:

$$c_2 = \frac{y \times V}{m} \qquad (2)$$

where

y is the interim result (5.2.3.1.3.3);

V is the volume, expressed in millilitres, of the test solution (5.2.3.1.3.2) (= 100 ml);

m is the mass, expressed in grams, of the test portion.

6 Labelling - Transportation - Storage

6.1 Means of delivery

In order that the purity of the products is not affected, the means of delivery shall not have been used previously for any different product or it shall have been specially cleaned and prepared before use.

6.2 Labelling according to the EU legislation [4)]

The following labelling requirements shall apply to monozinc phosphate solution at the date of the publication of this standard:

Hazard pictogram	– Signal word Warning – Classification - Hazard statements: H302: Harmful if swallowed

Figure 1 — GHS 07

The legislation,[2] and its amendments for the purposes of its adaptation to technical and scientific progress, contains a list of substances classified by the EU. Substances not listed in this regulation should be classified on the basis of their intrinsic properties according to the criteria in the regulation by the person responsible for the marketing of the substance.

Classification and labelling shall be carried out in compliance with [2].

6.3 Transportation regulations and labelling

Monozinc phosphate solution is not listed under a UN number [5)].

Monozinc phosphate solution is not classified as a dangerous product for road, rail, sea and air transportation.

6.4 Marking

The marking shall include the following:

— the name “monozinc phosphate solution”, trade name;

— the net mass;

— the name and the address of supplier and/or manufacturer;

— the statement “this product conforms to EN 1197”.

6.5 Storage

6.5.1 Material

Use plastics, avoid contact with metals.

6.5.2 Long term stability

Product is stable for at least one year if stored in closed containers.

4) See [2].

5) United Nations Number.

6.5.3 Storage incompatibilities

No special requirement.

Annex A
(informative)

General information on monozinc phosphate solution

A.1 Origin

A.1.1 Raw materials

Monozinc phosphate solution is manufactured from phosphoric acid and zinc oxide.

A.1.2 Manufacturing process

Zinc oxide is dissolved in phosphoric acid and filtered off.

A.2 Use

A.2.1 Function

Monozinc phosphate solution is mainly used for corrosion inhibition in water pipes consisting of cast iron, mild or galvanized steel, copper or lead.

A.2.2 Form in which it is used

Monozinc phosphate solution is mainly used after dilution within the range of mass fraction between 0,5 % to 20 %.

A.2.3 Treatment dose

The treatment dose is such that the phosphate content of the treated water should not exceed 5 mg/l expressed as P_2O_5.

A.2.4 Means of application

The solution is applied using a metering pump.

A.2.5 Secondary effects

The solution has no secondary effects.

A.2.6 Removal of excess product

Not applicable.

A.3 General rules relating to safety

A.3.1 Rules for safe handling and use

The supplier will provide current safety instructions.

A.3.2 Emergency procedures

A.3.2.1 First aid

In case of contact with eyes or skin, it is recommended to rinse immediately with plenty of water.

A.3.2.2 Spillage

It is recommended to remove mechanically as much as possible of the product, then to rinse the area with plenty of water.

A.3.2.3 Fire

Not applicable.

Bibliography

[1] 98/83/EC, Council Directive of 3 November 1998 on the quality of water intended for human consumption

[2] Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH)

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™