BS EN 15077:2013

BSI Standards Publication

Chemicals used for treatment of swimming pool water — Sodium hypochlorite

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National foreword

This British Standard is the UK implementation of EN 15077:2013. It supersedes BS EN 15077:2006 which is withdrawn.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.

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Date	Text affected

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EN 15077

May 2013

ICS 71.100.80

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English Version

Chemicals used for treatment of swimming pool water - Sodium hypochlorite

Produits chimiques utilisés pour le traitement de l'eau des piscines - Hypochlorite de sodium

Produkte zur Aufbereitung von Schwimm- und Badebeckenwasser - Natriumhypochlorit

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Foreword

This document (EN 15077:2013) 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of an identical text or by endorsement, at the latest by November 2013, and conflicting national standards shall be withdrawn at the latest by November 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 15077:2006.

Significant technical differences between this edition and EN 15077:2006 are as follows:

— Replacement of warning and safety precautions notes by labelling according to Regulation (EC) No 1272/2008 [3].

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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.

Introduction

In respect of potential adverse effects on the quality of water for swimming pools caused by the product covered by this European Standard, the following statements apply:

— 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.

— 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 1 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. Use of the product covered by this European Standard is subject to regulation or control by National Authorities.

NOTE 2 This product is a biocide and needs to comply with the relevant legislation in force. In the European Union, at the time of publication, this legislation is Directive 1998/8/EC [1].

1 Scope

This European Standard is applicable to sodium hypochlorite used directly or for the production of formulations for treating swimming pool water. It describes the characteristics of sodium hypochlorite and specifies the requirements and the corresponding test methods for sodium hypochlorite. It gives information on its use for treating swimming pool water and determines the rules relating to safe handling and use of sodium hypochlorite (see Annex B).

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 901, *Chemicals used for treatment of water intended for human consumption — Sodium hypochlorite*

3 Description

3.1 Identification

3.1.1 Chemical name

Sodium hypochlorite.

3.1.2 Synonym or common names

Liquid bleach, soda bleach, bleach lye.

3.1.3 Relative molecular mass

74,44.

3.1.4 Empirical formula

NaClO.

3.1.5 Chemical formula

NaClO.

3.1.6 CAS Registry Number[1)]

7681-52-9.

3.1.7 EINECS reference[2)]

231-668-3.

3.2 Commercial form

The product is supplied as an aqueous solution with an available (active) chlorine concentration up to a mass fraction of 18 %.

1) Chemical Abstracts Service Registry Number.

2) European Inventory of Existing Commercial Chemical Substances.

3.3 Physical properties

3.3.1 Appearance and odour

The product is a clear yellowish-green solution with a faint chlorinous odour.

3.3.2 Density

The density of the product varies between 1,13 g/ml and 1,30 g/ml at 20 °C.

3.3.3 Solubility in water

The product is capable of being mixed with water in any proportion.

3.3.4 Vapour pressure

Approximately 2,5 kPa at 20 °C.

3.3.5 Boiling point at 100 kPa[3)]

Not applicable.

3.3.6 Crystallisation and freezing point

At approximately -10 °C, crystallisation of $NaOCl.6H_2O$ starts.

Freezing of the concentrated product takes place between - 20 °C and - 30 °C.

3.3.7 Specific heat

The specific heat is 3,48 kJ/(kg.K) for a solution with an available active chlorine concentration of mass fraction between 14 % and 15 %.

3.3.8 Viscosity (dynamic)

2,6 mPa s 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

The product is an alkaline solution with a pH value greater than 11 at 20 °C.

It reacts with acids and acidic salts to form chlorine.

3) 100 kPa = 1 bar.

Vigorous reactions occur with reducing chemicals. It is a strong oxidant ($E°_{Red}$ for (ClO^-) = 0,89 V).

$$ClO^- + 2H^+ + 2e^- \rightarrow Cl^- + H_2O$$

4 Purity criteria

4.1 General

This European Standard specifies the minimum purity requirements for sodium hypochlorite used for treating water for swimming pools. 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, the user, and when necessary the relevant authorities, shall be notified.

Users of the product should check the national regulations to clarify whether it is of appropriate purity for treating water for swimming pools, taking into account raw water quality, required dosage, contents of other impurities and additives used in the product that are not stated in this product standard.

Limits have been given for impurities and chemical 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 the presence of significant amounts of impurities, by-products or additives, the user shall be notified.

4.2 Composition of commercial product

Sodium hypochlorite is available only in solutions with concentrations up to 18 % active chlorine at the time of delivery by the producer. Common concentrated products contain a minimum of 12 % active chlorine. Diluted solutions are also available.

The concentration of sodium hypochlorite shall be equal to or greater than the value specified by the manufacturer.

4.3 Impurities and main by-products

The product contains sodium chloride (NaCl) in equimolar amounts at minimum, and a small portion of sodium hydroxide (NaOH) which keeps the product alkaline. Therefore, a small amount of sodium carbonate (Na_2CO_3) can also be present.

The sodium chlorate ($NaClO_3$) content shall not exceed a mass fraction of 5,4 % of available chlorine at the time of delivery by the producer. The product shall be visibly free from deposits or suspended matter.

NOTE Sodium chlorate is a by-product of the manufacturing process and can be formed during storage (see 6.5.1).

4.4 Chemical parameters

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

Table 1 — Chemical parameters

Parameter		Limit in mg/kg of available chlorine	
		Type 1	**Type 2**
Arsenic (As)	max.	1	5
Antimony (Sb)	max.	20	25
Cadmium (Cd)	max.	2,5	5
Chromium (Cr)	max.	2,5	5
Lead (Pb)	max.	15	15
Mercury (Hg)	max.	3,5	5
Nickel (Ni)	max.	2,5	10
Selenium (Se)	max.	20	25
		Limit in g/kg of available chlorine	
Sodium bromate[a]	max.	2,5	5,0
[a] Sodium bromate is a by-product of the manufacturing process.			
NOTE Cyanide, which does not exist in a strong oxidising medium such as sodium hypochlorite, is not a relevant chemical parameter. Pesticides and polycyclic aromatic hydrocarbons are not by-products of the manufacturing process. For parametric values of sodium hypochlorite on trace metal content in drinking water, see [2].			

5 Test methods

The methods for sampling and analysis shall be those specified in EN 901.

6 Labelling - Transportation - Storage

6.1 Means of delivery

Sodium hypochlorite shall be delivered in:

a) containers of polyethylene or polyvinyl chloride (PVC) with external glass fibre reinforcement (GFR);

b) steel tank wagons lined with rubber or coated with suitable plastics.

The containers shall be closed in such a manner so that no pressure can build up inside and no liquid can escape. The closure shall be protected from unintentional opening.

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

6.2 Labelling according to EU legislation[4)]

The following labelling requirements shall apply to sodium hypochlorite at the date of the publication of this European Standard.

More than or equal to 5 % of active chlorine (mass fraction)

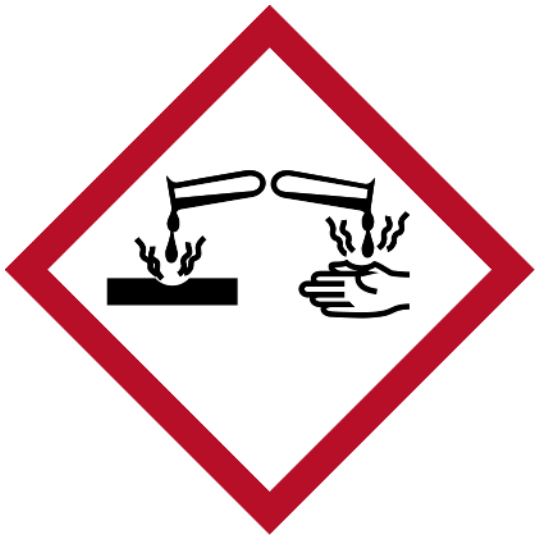

Figure 1 — GHS 05

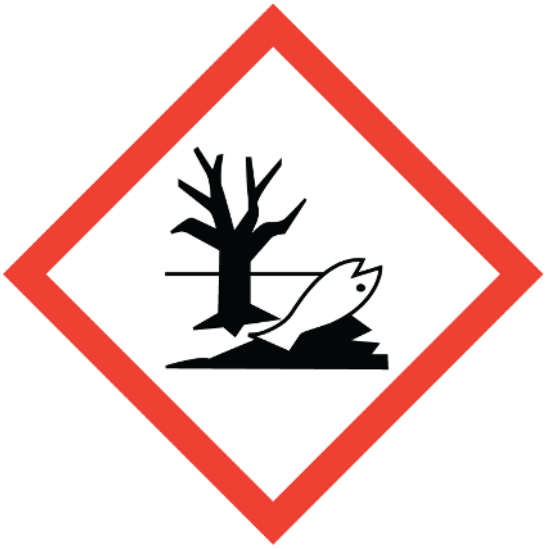

Figure 2 — GHS 09

— Signal word:

Danger

— Hazard statements:

H314: Causes severe skin burns and eye damage.

H400: Very toxic to aquatic life.

EUH031: Contact with acids liberates toxic gas (chlorine).

4) See [3].

The regulation [3], and its amendments for the purposes of its adaptation to technical and scientific progress, contains a list of substances classified by the EU. It contains only a single entry for classification and labelling of the substance however, which is not appropriate for the various solutions placed on the market, since the hazards vary at different concentrations depending on the individual content of free chlorine and free alkali. No classification therefore for diluted solutions can be given here. Diluted solutions and 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.

6.3 Transportation regulations and labelling

Sodium hypochlorite is listed as UN Number[5)] 1791.

RID[6)] ADR[7)]: class 8, classification code C9; packing group III.

IMDG[8)]: class 8.

IATA[9)]: class 8.

6.4 Marking

The marking shall include the following:

— name "sodium hypochlorite", trade name and type;

— net mass;

— name and address of supplier and/or manufacturer;

— statement "this product conforms to EN 15077".

6.5 Storage

6.5.1 General

Sodium hypochlorite shall be protected against light, particularly direct sunlight. It shall be stored in cool rooms in containers made from metal with internal coating or suitable plastics materials. In order to protect metal containers from corrosion, they shall be either rubber-lined or plastic-coated.

Suitable venting should be used to prevent any pressure build-up in the containers.

6.5.2 Long-term stability

The stability is greatly affected by heat, light, pH, and the presence of heavy metal ions. The solution gradually decomposes resulting in the reduction of the concentration of the available (active) chlorine and resulting in increased level of chlorates, e.g. 1 g/l of (active) chlorine per day under a storage temperature of 20 °C.

6.5.3 Storage incompatibilities

Contact with acids or acidic salts leads to the formation of chlorine.

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5) United Nations Number.

6) Regulations concerning International Carriage of Dangerous Goods by Rail.

7) European Agreement concerning the International Carriage of Dangerous Goods by Road.

8) International Maritime Transport of Dangerous Goods.

9) International Air Transport Association.

In the presence of a high concentration of ammonia, ammonium salts and derivatives, and isocyanurate derivatives, vigorous reaction occurs with the formation of highly explosive nitrogen trichloride.

Annex A
(informative)

General information on sodium hypochlorite

A.1 Origin

A.1.1 Raw materials

Sodium hypochlorite is manufactured from chlorine (Cl_2) and sodium hydroxide (NaOH).

A.1.2 Manufacturing process

Sodium hypochlorite is produced by reacting gaseous chlorine with a solution of sodium hydroxide.

A.2 Use

A.2.1 Function

Sodium hypochlorite is used for disinfecting swimming pool water.

A.2.2 Form in which it is used

The product is used as delivered or diluted if necessary, depending on the required dose and size of pool.

A.2.3 Treatment dose

The treatment dose depends on the composition of the water. The dose should be controlled to achieve the minimum free residual concentration that gives satisfactory disinfection.

A.2.4 Means of application

It is applied using a positive-displacement metering pump.

A.2.5 Secondary effects

The secondary effects include the following:

— slight increase in pH;

— slight increase in the chloride content;

— chlorination of organic compounds leading to formation of halogenated by-products (e.g. trihalomethanes);

— localised precipitation of carbonate at the injection point.

A.2.6 Removal of excess product

The most practical method is the use of a reducing agent such as an aqueous solution of a sulfite compound. Other methods can use activated carbon or hydrogen peroxide.

Annex B
(normative)

General rules relating to safety

B.1 Rules for safe handling and use

The supplier shall provide current safety instructions.

B.2 Emergency procedures

B.2.1 First aid

In case of skin contact, rinse with water and remove any contaminated clothing. In the event of eye contact, rinse immediately with water for at least 15 min and consult a doctor.

B.2.2 Spillage

Collect and store fluid in plastics container. Scrape contaminated earth or absorbing material (sand, etc.) and collect in plastic containers. Do not drain into wastewater piping.

Dilute with water and reduce the solution with sodium sulfite, sodium hydrogen sulfite, hydrogen peroxide or sodium thiosulfate. Disposal shall be carried out in accordance with local regulations.

B.2.3 Fire

Non-combustible, but poses an extra hazard with fires.

Cool fire-endangered containers with water.

Use water to extinguish fires.

Bibliography

[1] Directive 98/8/EC of the European Parliament and of the Council of 16 February 1998 concerning the placing of biocidal products on the market

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

[3] 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)

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