SLOVENSKI STANDARD
SIST EN 901:2025

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Kemikalije, ki se uporabljajo za pripravo pitne vode - Natrijev hipoklorit

Chemicals used for treatment of water intended for human consumption - Sodium hypochlorite

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Natriumhypochlorit

Produits chimiques utilisés pour le traitement de l'eau destinée à la consommation humaine - Hypochlorite de sodium

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13.060.20	Pitna voda	Drinking water
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EUROPEAN STANDARD
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English Version

Chemicals used for treatment of water intended for human consumption - Sodium hypochlorite

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

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European foreword

This document (EN 901:2024) 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of an identical text or by endorsement, at the latest by June 2025, and conflicting national standards shall be withdrawn at the latest by June 2025.

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

This document supersedes EN 901:2013.

EN 901:2024 includes the following significant technical changes with respect to EN 901:2013:

a) modification of 6.3 on transportation regulations and labelling, adding the sentence “The user shall be aware of the incompatibilities between transported products.”;

b) modification of 6.4 on marking, adding the note “at least the name and type of the product are clearly marked or displayed at viewing height on the means of delivery”.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

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

a) this document provides no information regarding whether the product may be used without restriction in any of the Member States of the EU or EFTA;

b) 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 document 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 document is subject to regulation or control by National Authorities.

NOTE 2 This product is a biocide. At the time of publication, Regulation EU 528/2012 [1] on biocide is in force.

1 Scope

This document is applicable to sodium hypochlorite used for treatment of water intended for human consumption. 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 in water treatment. It also determines the rules relating to safe handling and use of sodium hypochlorite (see Annex B).

NOTE While this document is not applicable to sodium hypochlorite generated *in situ* (see bibliographic reference [6]), the limits for impurities and chemical parameters apply.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. 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 3696:1995, *Water for analytical laboratory use — Specification and test methods (ISO 3696:1987)*

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

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

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

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Description

4.1 Identification

4.1.1 Chemical name

Sodium hypochlorite.

4.1.2 Synonym or common names

Liquid bleach, soda bleach, bleach lye.

4.1.3 Relative molecular mass

74,44.

4.1.4 Empirical formula

NaClO.

4.1.5 Chemical formula

NaClO.

4.1.6 CAS Registry Number

7681-52-9. [1]

4.1.7 EINECS reference

231-668-3. [2]

4.2 Commercial form

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

4.3 Physical properties

4.3.1 Appearance and odour

The concentrated products are a clear yellowish-green solution with a faint chlorinous odour, diluted products are visually colourless.

4.3.2 Density

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

4.3.3 Solubility in water

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

4.3.4 Vapour pressure

Approximately 2,5 kPa at 20 °C.

4.3.5 Boiling point at 100 kPa

Not applicable. [3]

4.3.6 Crystallization and freezing point

At about – 10 °C crystallization of $NaOCl \cdot 6\ H_2O$ starts from concentrated products.

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

4.3.7 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 %.

4.3.8 Viscosity (dynamic)

2,6 mPa.s at 20 °C.

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[1] Chemical Abstracts Service Registry Number.
[2] European Inventory of Existing Commercial Chemical Substances.
[3] 100 kPa = 1 bar.

4.3.9 Critical temperature

Not applicable.

4.3.10 Critical pressure

Not applicable.

4.3.11 Physical hardness

Not applicable.

4.4 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.

Vigorous reactions occur with reducing chemicals.

It is a strong oxidant ($E°_{Red}$ for (ClO^-) = 0,89 V at pH 14).

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

5 Purity criteria

5.1 General

This document specifies the minimum purity requirements for sodium hypochlorite used for treating 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, the user, and when necessary the relevant authorities, shall be notified.

When evaluating appropriate purity for treating water intended for human consumption, users should take into account raw water quality, required dosage, contents of other impurities and additives used in the product that are not stated in this document.

NOTE Regarding purity for treating water intended for human consumption, local regulations and requirements can apply.

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 the raw materials bring about the presence of significant amounts of impurities, by-products or additives, the user shall be notified.

5.2 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 supplier. 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.

5.3 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. Thus, a little amount of sodium carbonate (Na_2CO_3) can be present, too.

The sodium chlorate ($NaClO_3$) / chlorate (ClO_3) content shall not exceed a mass fraction of 5,4 % / 4,22 % of available chlorine at the time of delivery by the supplier.

Traces of sodium bromate ($NaBrO_3$) can be present depending on the content of bromine in the raw material chlorine.

The product shall be visibly free from deposits or suspended matter.

NOTE Sodium chlorate is a by-product of the manufacturing process and is also formed during transportation and storage (see 7.3.2).

5.4 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
		Limit in % of available chlorine	
Sodium chlorate [a]	max.	5,4	

[a] Compound 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 bibliographic reference [2].

6 Test methods

6.1 Sampling

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

6.2 Analysis

6.2.1 Determination of available chlorine content (main product)

6.2.1.1 General

This method applies to all commercial products with available chlorine contents within the range of 70 g/l to 170 g/l.

NOTE It detects all oxidising agents being active in weak acidic solutions, i.e. hypochlorite/chlorine, iodate, and partially chloramines, Fe(III), etc. Bromate and chlorate are not covered under these conditions.

6.2.1.2 Principle

Sodium hypochlorite reacts with potassium iodide to release iodine in the presence of acetic acid. The iodine is titrated with sodium thiosulfate standard volumetric solution in the presence of starch indicator solution.

The titration may also be carried out potentiometrically by the aid of titration automates, in which case the addition of soluble starch is unnecessary.

6.2.1.3 Reagents

All reagents shall be of a recognized analytical grade and the water used shall conform to grade 3, as specified in EN ISO 3696:1995 (de-ionized water for common laboratory purposes).

6.2.1.3.1 Potassium iodide solution, mass fraction 10 %

Weigh, to the nearest 0,1 mg, 100 g of potassium iodide, iodate-free, and dissolve in water and dilute to 1 l.

6.2.1.3.2 Acetic acid concentrated, of purity at least of mass fraction 99 %

6.2.1.3.3 Sodium thiosulfate standard volumetric solution, c(Na2S2O3·5H2O) = 0,1 mol/l

Standard volumetric solutions are commercially available, which might require dilution.

Alternatively, a standard volumetric solution may be prepared by the following procedure:

Dissolve 24,8 g $Na_2S_2O_3 \cdot 5H_2O$ in a 1 000 ml one-mark volumetric flask in 0,75 l of water. After the temperature has equalised, make up to the mark with water and mix thoroughly.

To standardize: Weigh, to the nearest 0,1 mg, 3,600 g (m) of dry potassium iodate. Dissolve in water in a 1 000 ml one-mark volumetric flask, make up to the mark with water and mix (standard reference solution c(1/6 KIO_3) = 0,1 mol/l). Place 200 ml of water in a 500 ml stoppered conical flask, add (2 ± 0,5) g of potassium iodide and stir to dissolve. Then introduce, by means of a pipette, 10,0 ml of sodium thiosulfate solution for standardization, add (15 ± 1) ml of hydrochloric acid solution (diluted 1 + 1 by volume) and (5 ± 1) ml of starch solution (6.2.1.3.4). Titrate immediately with the potassium iodate standard reference solution until the appearance of a blue coloration that persists for 30 s. Record the volume (V_1) of iodate used.

The actual concentration, c, of the sodium thiosulfate standard volumetric solution ($Na_2S_2O3 \cdot 5H_2O$), expressed in moles per litre is given by Formula (1):

$$c = \frac{V_1 \times c_1}{V} \quad (1)$$

where