



SLOVENSKI STANDARD

SIST EN 901:2007

01-julij-2007

Nadomešča:
SIST EN 901:2000

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

iTeh STANDARD PREVIEW
(standards.iteh.ai)

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

[SIST EN 901:2007](https://standards.iteh.ai/catalog/standards/sist/9aaa305-8002-40c3-81b9-fdb006c8429a/sist-en-901-2007)
<https://standards.iteh.ai/catalog/standards/sist/9aaa305-8002-40c3-81b9-fdb006c8429a/sist-en-901-2007>

Ta slovenski standard je istoveten z: EN 901:2007

ICS:

13.060.20	Pitna voda	Drinking water
71.100.80	Kemikalije za čiščenje vode	Chemicals for purification of water

SIST EN 901:2007

en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 901:2007](https://standards.iteh.ai/catalog/standards/sist/f9aaa305-8002-40c3-81b9-fdb006c8429a/sist-en-901-2007)

<https://standards.iteh.ai/catalog/standards/sist/f9aaa305-8002-40c3-81b9-fdb006c8429a/sist-en-901-2007>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 901

March 2007

ICS 71.100.80

Supersedes EN 901:1999

English Version

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

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

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Natriumhypochlorit

This European Standard was approved by CEN on 10 February 2007.

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 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 Management Centre has the same status as the official versions.

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

[SIST EN 901:2007](https://standards.iteh.ai/catalog/standards/sist/9aaa305-8002-40c3-81b9-fdb006c8429a/sist-en-901-2007)

<https://standards.iteh.ai/catalog/standards/sist/9aaa305-8002-40c3-81b9-fdb006c8429a/sist-en-901-2007>



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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

Page

Foreword.....	4
Introduction	5
1 Scope	6
2 Normative references	6
3 Description	6
3.1 Identification.....	6
3.1.1 Chemical name.....	6
3.1.2 Synonym or common names.....	6
3.1.3 Relative molecular mass.....	6
3.1.4 Empirical formula.....	6
3.1.5 Chemical formula.....	6
3.1.6 CAS Registry Number	7
3.1.7 EINECS reference	7
3.2 Commercial form	7
3.3 Physical properties.....	7
3.3.1 Appearance and odour.....	7
3.3.2 Density	7
3.3.3 Solubility in water	7
3.3.4 Vapour pressure	7
3.3.5 Boiling point at 100 kPa	7
3.3.6 Crystallization and freezing point	7
3.3.7 Specific heat.....	7
3.3.8 Viscosity (dynamic)	7
3.3.9 Critical temperature	8
3.3.10 Critical pressure.....	8
3.3.11 Physical hardness	8
3.4 Chemical properties	8
4 Purity criteria.....	8
4.1 General.....	8
4.2 Composition of commercial product.....	8
4.3 Impurities and main by-products	8
4.4 Chemical parameters	9
5 Test methods.....	9
5.1 Sampling.....	9
5.2 Analysis	9
5.2.1 Determination of available chlorine content (main product)	9
5.2.2 Impurities	12
5.2.3 Chemical parameters	18

6	Labelling - Transportation - Storage	20
6.1	Means of delivery	20
6.2	Risk and safety labelling according to the EU Directives	21
6.3	Transportation regulations and labelling.....	22
6.4	Marking.....	22
6.5	Storage	22
6.5.1	General	22
6.5.2	Long term stability	22
6.5.3	Storage incompatibilities.....	22
Annex A (informative)	General information on sodium hypochlorite.....	23
A.1	Origin	23
A.2	Use	23
Annex B (normative)	General rules relating to safety	25
B.1	Rules for safe handling and use	25
B.2	Emergency procedures.....	25
Annex C (normative)	Determination of arsenic, antimony and selenium (atomic absorption spectrometry hydride technique)	26
C.1	General principle	26
C.2	Interferences	26
C.3	Reagents.....	26
C.4	Apparatus	28
C.5	Procedure	30
C.6	Calculation	31
Annex D (normative)	Determination of bromate ion content in sodium hypochlorite by liquid chromatography of ions and UV detection.....	32
D.1	General	32
D.2	Interferences	32
D.3	Principle.....	32
D.4	Reagents.....	32
D.5	Apparatus	34
D.6	Procedure	34
Annex E (informative)	Results of inter-laboratory tests on sodium bromate determination in sodium hypochlorite commercial solutions	37
Annex F (informative)	Environmental, health and safety precautions within chemical laboratories.....	38
	Bibliography.....	39

EN 901:2007 (E)**Foreword**

This document (EN 901:2007) 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 2007, and conflicting national standards shall be withdrawn at the latest by September 2007.

This document supersedes EN 901:1999.

Significant technical differences between this edition and EN 901:1999 are as follows:

- a) deletion of the reference to EU Directive 80/778/EEC of 15 July 1980 in order to take account of the latest Directive in force (see [1]);
- b) addition of the limit of the impurity sodium bromate as defined in the EU Directive 98/83/EC and the method of determination.

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

SIST EN 901:2007

<https://standards.iteh.ai/catalog/standards/sist/9aaa305-8002-40c3-81b9-fdb006c8429a/sist-en-901-2007>

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

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 901:2007](https://standards.iteh.ai/catalog/standards/sist/9aaa305-8002-40c3-81b9-fdb006c8429a/sist-en-901-2007)

<https://standards.iteh.ai/catalog/standards/sist/9aaa305-8002-40c3-81b9-fdb006c8429a/sist-en-901-2007>

EN 901:2007 (E)**1 Scope**

This European Standard 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 standard 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 referenced documents are indispensable for the application 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 1483, *Water quality - Determination of mercury*

EN ISO 3696:1995, *Water for analytical laboratory use - Specifications and test methods (ISO 3696:1987)*

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*

[SIST EN 901:2007
https://standards.iteh.ai/catalog/standards/sist/9aaa305-8002-40c3-81b9-fdb006c8429a/sist-en-901-2007](https://standards.iteh.ai/catalog/standards/sist/9aaa305-8002-40c3-81b9-fdb006c8429a/sist-en-901-2007)

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 %.

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.

[SIST EN 901:2007](https://standards.iteh.ai/catalog/standards/sist/9aaa305-8002-40c3-81b9-fdb006c8429a/sist-en-901-2007)

<https://standards.iteh.ai/catalog/standards/sist/9aaa305-8002-40c3-81b9-fdb006c8429a/sist-en-901-2007>

3.3.5 Boiling point at 100 kPa ³⁾

Not applicable.

3.3.6 Crystallization and freezing point

At about – 10 °C crystallization of NaOCl . 6 H₂O 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.

¹⁾ Chemical Abstracts Service Registry Number.

²⁾ European Inventory of Existing Commercial Chemical Substances.

³⁾ 100 kPa = 1 bar.

EN 901:2007 (E)**3.3.9 Critical temperature**

Not applicable.

3.3.10 Critical pressure

Not applicable.

3.3.11 Physical hardness

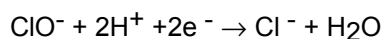
Not applicable.

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.

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

**4 Purity criteria**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

4.1 General

This European Standard 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.

NOTE Users of the product should check the national regulations to clarify whether it is of appropriate purity for treating water intended for human consumption, 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 in 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. Thus a little amount of sodium carbonate (Na_2CO_3) can be present, too.

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
<p>NOTE Cyanide, which does not exist in a strong oxidizing 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 [1].</p> <p>^a Sodium bromate is a by-product of the manufacturing process.</p>		

5 Test methods

5.1 Sampling

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

5.2 Analysis

5.2.1 Determination of available chlorine content (main product)

5.2.1.1 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 oxidizing agents being active in weak acidic solutions, i.e. hypochlorite/chlorine, iodate, and partially chloramines, Fe(III), etc. Not covered under these conditions are bromate and chlorate.

EN 901:2007 (E)

5.2.1.2 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.

NOTE The titration can also be carried out potentiometrically by the aid of titration automates; when this occurs, the addition of soluble starch is unnecessary.

5.2.1.3 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).

5.2.1.3.1 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.

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

5.2.1.3.3 Sodium thiosulfate standard volumetric solution, $c(\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}) = 0,1 \text{ mol/l}$.

Standard volumetric solutions are commercially available and eventually they have to be diluted.

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

Dissolve 24,8 g $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5 \text{H}_2\text{O}$ in a 1 000 ml one-mark volumetric flask in 0,75 l of water. After the temperature has equalized, 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 $c(1/6 \text{KIO}_3) = 0,1 \text{ mol/l}$). Place 200 ml of water in a 500 ml stoppered conical flask, add $(2 \pm 0,5)$ 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 (5.2.1.3.4). 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 ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$), expressed in moles/l is given by Equation (1):

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

where

c_1 is the concentration, expressed in moles/l, of the potassium iodate standard reference solution [$c(1/6 \text{KIO}_3) = 0,1 \text{ mol/l}$];

V is the volume, in ml, of the sodium thiosulfate standard volumetric solution used for the standardization ($V = 10 \text{ ml}$);

V_1 is the volume, in ml, of potassium iodate standard reference solution used in the titration.

5.2.1.3.4 Starch solution, mass fraction of 1 %:

Make a slurry with $(1 \pm 0,1)$ g of starch and (5 ± 1) ml of water. Add (90 ± 5) ml of boiling water to the slurry. Stir to dissolve it and cool the solution. This solution needs to be refrigerated to avoid the decomposition of the starch which results in a vague end point. Keep the solution cool and use it within 1 week.

NOTE Commercial indicators for iodine titration exist and can be used in place of the described starch solution, provided that their efficiency has been previously tested.

5.2.1.4 Apparatus

Ordinary laboratory apparatus and glassware.

5.2.1.5 Procedure**5.2.1.5.1 Test solution**

Weigh to the nearest 0,1 mg 1 g of the laboratory sample (record mass m_1 in grams) into a 250 ml conical flask and dilute with water up to 100 ml.

5.2.1.5.2 Determination

Add 10 ml of the potassium iodide solution (5.2.1.3.1) and 5 ml of concentrated acetic acid (5.2.1.3.2).

Titrate at once with the sodium thiosulfate standard volumetric solution (5.2.1.3.3) until the iodine colour is nearly gone. Add 3 ml of the starch indicator solution (5.2.1.3.4) and complete the titration until the disappearance of the blue-black colour. Record the volume V_1 of the sodium thiosulfate standard volumetric solution added.

5.2.1.6 Expression of results

The available chlorine (Cl_2) content, C_2 , expressed in mass fraction % (w/w), is given by Equation (2):

$$C_1 = (V_1 \times c \times 3,545) / (m_1) \quad (2)$$

where

V_1 is the volume, in millilitres, of the sodium thiosulfate standard volumetric solution (5.2.1.3.3);

c is the concentration in moles per litre, of the sodium thiosulfate standard volumetric solution (see 5.2.1.3.3);

3,545 is the mass in milligrams of chlorine (Cl_2) corresponding to 1 ml of sodium thiosulfate solution of $c(\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}) = 0,100$ mol/l;

m_1 is the mass in g of the laboratory sample used to prepare the test solution (5.2.1.5.1).