SLOVENSKI STANDARD
SIST EN 973:2002

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Kemikalije, ki se uporabljajo za pripravo pitne vode – Natrijev klorid za regeneracijo ionskih izmenjevalnikov

Chemicals used for treatment of water intended for human consumption - Sodium chloride for regeneration of ion exchangers

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Natriumchlorid zum Regenerieren von Ionenaustauschern

Produits chimiques utilisés pour le traitement de l'eau destinée a la consommation humaine - Chlorure de sodium pour la régénération des résines échangeuses d'ions

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Chemicals used for treatment of water intended for human consumption - Sodium chloride for regeneration of ion exchangers

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Foreword

This document (EN 973:2002) 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of an identical text or by endorsement, at the latest by February 2003, and conflicting national standards shall be withdrawn at the latest by February 2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

The annexes A, C and D are informative.

Annex B is normative.

Introduction

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

a) this 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.

1 Scope

This European Standard is applicable to sodium chloride intended for use only in water treatment apparatus, for the regeneration of ion exchangers, intended for water for human consumption. It describes the characteristics and specifies the requirements and the corresponding test methods for sodium chloride. It gives information on its use in water treatment.

2 Normative references

This European Standard incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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

ISO 2479, *Sodium chloride for industrial use – Determination of matter insoluble in water or in acid and preparation of principal solutions for other determinations.*

ISO 2480, *Sodium chloride for industrial use – Determination of sulfate content – Barium sulfate gravimetric method.*

ISO 2482, *Sodium chloride for industrial use – Determination of calcium and magnesium contents – EDTA complexometric method.*

ISO 2483, *Sodium chloride for industrial use – Determination of the loss of mass at 110 °C*.

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

ISO 6206, *Chemical products for industrial use – Sampling – Vocabulary*.

ISO 6227, *Chemical products for industrial use – General method for determination of chloride ions – Potentiometric method.*

ISO 8213, *Chemical products for industrial use – Sampling techniques – Solid chemical products in the form of particles varying from powders to coarse lumps*.

3 Description

3.1 Identification

3.1.1 Chemical name

Sodium chloride.

3.1.2 Synonym or common name

Salt.

3.1.3 Relative molecular mass

58,45.

3.1.4 Empirical formula

NaCl.

3.1.5 Chemical formula

NaCl.

3.1.6 CAS Registry Number[1)]

7647-14-5.

3.1.7 EINECS Reference[2)]

231-598-3.

3.2 Commercial forms

The product is available as rock salt, sea salt or evaporated salt, and it is supplied as free-flowing crystals or their compacted forms.

3.3 Physical properties

3.3.1 Appearance

The product is white and crystalline.

3.3.2 Density

The density of the solid crystal is 2,16 g/cm^3 at 20 °C.

The bulk density depends on the particle size distribution.

3.3.3 Solubility (in water)

The solubility of the product depends on the temperature as given in Figure 1.

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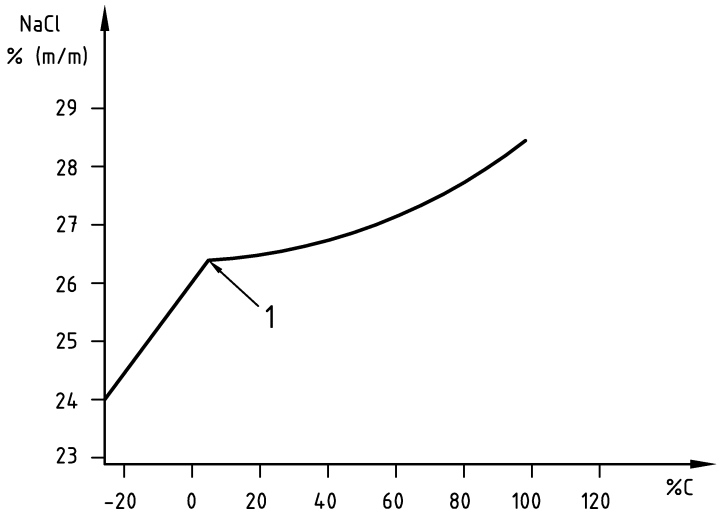
1) Chemical Abstract Service Registry Number.

2) European Inventory of Existing Commercial Chemical Substances.



Temperature °C	NaCl solution % (*m/m*)
- 10	25,0
0	26,34
10	26,35
20	26,43
30	26,56
40	26,71
50	26,89
60	27,09
70	27,30
80	27,53
90	27,80
100	28,12

Key

1 Transition point
NaCl → $NaCl.2H_2O$

Figure 1 - Solubility curve for sodium chloride in water

3.3.4 Vapour pressure

Not applicable.

3.3.5 Boiling point at 100 kPa[3)]

Not applicable.

3.3.6 Melting point

802 °C.

3.3.7 Specific heat

Approximately 850 J/(kg·K) at 25 °C for the solid.

3.3.8 Viscosity (dynamic)

The viscosity of the saturated solution at 20 °C is approximately 1,9 mPa·s.

3.3.9 Critical temperature

Not applicable.

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3) 100 kPa = 1 bar.

3.3.10 Critical pressure

Not applicable.

3.3.11 Physical hardness

The hardness of solid salt is given as 2 to 2,5 on the Mohrs' scale of hardness.

3.4 Chemical properties

Sodium chloride is stable, non-volatile and aqueous solutions have good electrical conductivity.

Sodium chloride is decomposed by a number of acids. It reacts with sulfuric acid, phosphoric acid and strong oxidizing agents. The reactions are often complex and require heat for completion.

NOTE Under certain conditions a sodium chloride solution can cause corrosion of metallic surfaces.

4 Purity criteria

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 a change in the production process or raw materials leads to significant quantities of other impurities or by-products being present, this shall be notified to the user.

4.1 Composition of commercial product

The content of sodium chloride in the dry product shall not be less than :

— grade A : 99,4 % (*m/m*) of dry NaCl ;

— grade B : 98,5 % (*m/m*) of dry NaCl.

NOTE An anticaking agent, sodium or potassium hexacyanoferrate [4], is allowed up to a maximum level in the final product of 20 mg/kg, expressed as the anhydrous hexacyanoferrate ion $[Fe(CN_6)]^{-4}$ and for the determination see B.3.

4) E number 535 or 536 (see [2]).

4.2 Impurities and main by-products

The product shall conform to the requirements specified in Table 1 and Table 2.

Table 1 – Impurities

Impurity	**Limit** % *(m/m)* **of NaCl** content		
Water-insoluble matter		Grade A	Grade B
	max.	0,05	0,35

Table 2 – Moisture content

Impurity	**Limit** % (*m/m*) **of NaCl** content		
Moisture content		Dry salt	Humid salt
	max	0,6	5

Potassium, calcium, magnesium and sulfate are natural impurities. Their contents are not relevant.

4.3 Chemical parameters

The product shall conform to the requirements specified in Table 3.

Table 3 – Chemical parameters

Parameter		**Limits in** mg/kg **of commercial product**
Arsenic (As)	max.	13
Cadmium (Cd)	max.	1,3
Chromium (Cr)	max.	13
Mercury (Hg)	max.	0,26
Nickel (Ni)	max.	13
Lead (Pb)	max.	13
Antimony (Sb)	max.	2,6
Selenium (Se)	max.	2,6
NOTE Other chemical parameters and indicator parameters as listed in EU Directive 98/83/EC (see [1] are not relevant in sodium chloride.		

5 Test methods

5.1 Sampling

A test sample of about 500 g shall be taken for analysis, ensuring that it is representative of the whole batch, and taking account of ISO 3165 and also ISO 6206. Prepare the laboratory sample(s) required in accordance with ISO 8213.

NOTE It should be ensured that no trace of the impurities to be determined is introduced in the sample during the sampling operations.

5.2 Analyses

5.2.1 Main product

The percentage by mass (% (*m*/*m*)) of sodium chloride (NaCl) shall be determined by calculation, on the basis of the results of the determinations of sulfate (according to ISO 2480), halogens (according to ISO 6227), calcium and magnesium (according to ISO 2482), potassium (see B.4) and loss of mass on drying (according to ISO 2483). Convert sulfate to calcium sulfate and unused calcium to calcium chloride, unless sulfate in sample exceeds the amount necessary to combine with calcium, in which case convert calcium to calcium sulfate and unused sulfate to first to magnesium sulfate and the remaining sulfate to sodium sulfate. Convert unused magnesium to magnesium chloride. Convert potassium to potassium chloride. Convert unused halogens to sodium chloride. Report the sodium chloride contents on a dry matter basis, multiplying the percentage of sodium chloride by 100/(100 - *P*), where *P* in the percentage mass by mass of the loss of mass on drying (see 5.2.2.2).

5.2.2 Impurities

5.2.2.1 Water-insoluble matter

The content of water- insoluble matter shall be determined in accordance with ISO 2479.

5.2.2.2 Moisture content

The loss of mass at 110 °C shall be determined in accordance with ISO 2483.

5.2.3 Chemical parameters

5.2.3.1 Arsenic, cadmium, chromium, nickel, lead, antimony, selenium

The contents of chemical parameters, except for mercury, shall be determined by inductively coupled plasma optical emission spectrometry (ICP/OES) (see B.1).

NOTE Alternatively the determination of contents of some chemical parameters can be carried out by atomic absorption spectrometry (AAS) and the analytical methods are given in annex C and annex D.

5.2.3.2 Mercury

The content of mercury shall be determined by cold vapour atomic absorption spectrometry (see B.2).

6 Labelling – Transportation - Storage

6.1 Means of delivery

Sodium chloride shall be delivered in bulk or in bags.

In order that the purity of the product 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 Risk and safety labelling in accordance with the EU directives

Sodium chloride is not subjected to labelling regulations.

6.3 Transportation regulations and labelling

Sodium chloride is not listed under a UN Number[5)] . Sodium chloride is not classified as a dangerous product for road, rail, sea and air transportation.

6.4 Marking

Each container shall be marked with at least the following information :

— the name "Sodium chloride, regeneration salt" or "sodium chloride, salt for water softening", "compacted dry salt" or "humid salt", trade name and grade ;

— the net mass ;

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

— the statement "this product conforms to EN 973, grade..... ".

6.5 Storage

6.5.1 Long term stability

Sodium chloride is stable during long term storage, providing it is kept in a dry place.

6.5.2 Storage incompatibilities

Sodium chloride shall be stored in hygienic and safe conditions so as to avoid any risk of contamination.

The product shall not be allowed to come into contact with sulfuric acid, phosphoric acid and strong oxidizing agents.

5) United Nations Number.

Annex A
(informative)

General information on sodium chloride

A.1 Origin

a) Rock salt : Salt produced by mining salt deposits of different geological formations derived from ancient seas.

b) Sea salt : Salt produced by sea water evaporation via the action of sun and wind.

c) Evaporated salt : Salt produced by evaporating water from a salt solution in a special evaporator leading to the recrystallization of the salt.

A.2 Use

A.2.1 Function

Regeneration of the resin in ion exchange apparatus is performed with a solution of sodium chloride.

A.2.2 Form in which the product is used

It is used in the form of a saturated solution that is diluted before being applied to the resin.

A.2.3 Consumption of salt for regeneration of resins

The consumption is variable and depends on the mineral content of water, the type of resin and the performance of the apparatus.

A.2.4 Means of application

An appropriate dosage device such as a metering pump controls the sodium chloride consumption.

A.2.5 Secondary effects in ion exchange apparatus

None.

A.2.6 Removal of excess product

Not applicable.

A.3 Rules for safe handling and use

No particular precaution is necessary.

A.4 Emergency procedures

A.4.1 First aid

Not applicable.

A.4.2 Spillage

The product should be collected, then the area should be rinsed with plenty of water

A.4.3 Fire

Sodium chloride is not combustible.

Annex B
(normative)

Analytical methods

B.1 Determination of antimony, arsenic, cadmium, chromium, lead, nickel and selenium (inductively coupled plasma optical emission spectrometry (ICP/OES))

B.1.1 General

The range covered for each element is given in the Table B.1

Table B.1 - Concentration range

Element	Concentration range, in mg/kg of commercial product
As	3 to 50
Cd	0,2 to 50
Cr	0,3 to 50
Ni	0,6 to 50
Pb	6 to 50
Sb	3 to 50
Se	2 to 50

NOTE Different types of ICP/OES instruments can have different performance levels. The performance depends also on the quality of the reagents. This means that the mentioned values should be considered as indicative values.

The limits quoted in Table B.1 are based on the equation $\mathrm{LOQ}\left(\text{limit of quantification}\right)=10\times s_{\mathrm{r}}$ where s_{r} is the repeatability standard deviation of test samples having concentrations near the expected LOQ.

B.1.2 Principle

Dissolution of the sample with nitric acid (0,1 mol/l) and direct nebulization of the acid solution into an inductively coupled argon plasma formed by a high frequency. Measurement of the radiation at specific wavelengths using background correction.

NOTE The use of reference element (internal standard) as scandium, yttrium, cobalt etc can improve the quality of the results especially using a simultaneous spectrometer. Every mention of this optional reagent (here scandium) is stated in brackets.

B.1.3 Reagents

All reagents shall be of recognized analytical grade and the water used shall conform to grade 3 in accordance with EN ISO 3696.

Store all prepared solutions in polyethylene or polytetrafluorethylene (PTFE) flasks to prevent contamination.

B.1.3.1 **Nitric acid** solution $\rho \approx 1{,}40$ g/ml, 65 % (*m/m*).

B.1.3.2 **Hydrochloric acid** solution $\rho \approx 1{,}19$ g/ml, 37 % (*m/m*).

B.1.3.3 **Sodium chloride** solution, *c*(NaCl) = 250 g/l.