SLOVENSKI STANDARD
SIST EN 939:2000

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Kemikalije, ki se uporabljajo za pripravo pitne vode - Klorovodikova kislina

Chemicals used for treatment of water intended for human consumption - Hydrochloric acid

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Salzsäure

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

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EUROPEAN STANDARD

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English version

Chemicals used for treatment of water intended for human consumption - Hydrochloric acid

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

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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 Central Secretariat has the same status as the official versions.

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

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Contents

Foreword

This European Standard 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of an identical text or by endorsement, at the latest by April 2000, and conflicting national standards shall be withdrawn at the latest by April 2000.

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Annex A is informative.

The Annexes B and C are 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 :

1) 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 ;

2) 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 hydrochloric acid used for treatment of water intended for human consumption. It describes the characteristics of hydrochloric acid and specifies the requirements and the corresponding test methods for hydrochloric acid. It gives information on its use in water treatment.

2 Normative references

This European Standard incorporates by dated or 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.

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

ISO 904, *Hydrochloric acid for industrial use — Determination of total acidity — Titrimetric method.*

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

ISO 5666-1:1983, *Water quality — Determination of total mercury by flameless atomic absorption spectrometry — Part 1 : Method after digestion with permanganate-peroxodisulfate.*

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

ISO 6685, *Chemical products for industrial use — General method for determination of iron content — 1,10 – Phenanthroline spectrophotometric method.*

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

ISO 9174, *Water quality — Determination of total chromium — Atomic absorption spectrometric methods.*

ISO/R 909, *Hydrochloric acid for industrial use — Determination of iron content — 2,2'- bipyridyl spectrophotometric method.*

3 Description

3.1 Identification

3.1.1 Chemical name

Hydrochloric acid.

3.1.2 Synonym or common names

Muriatic acid, hydrogen chloride.

3.1.3 Relative molecular mass

36,46.

3.1.4 Empirical formula

HCl

3.1.5 Chemical formula

HCl

3.1.6 CAS Registry Number [1)]

7647-01-0.

3.1.7 EINECS reference [2)]

231-595-7.

3.2 Commercial forms

The product is supplied as aqueous solutions of hydrochloric acid with concentration of 25 percent by mass (%(*m/m*)) to 38 % (*m/m*) (concentrated acid).

Dilutions of these solutions are also available.

3.3 Physical properties

3.3.1 Appearance

The solution is colourless to yellow and slightly fuming to strongly fuming, depending on concentration.

3.3.2 Density

The density is between 1,135 g/ml and 1,185 g/ml at 20 °C, depending on concentration.

3.3.3 Solubility

The product is miscible with water in any proportion.

3.3.4 Vapour pressure

The vapour pressure for HCl 30 % (*m/m*) depending on temperature is given in Table 1.

Table 1 - Vapor pressure of hydrochloric acid solutions

Temperature °C	p total kPa	p HCl kPa	p H_2O kPa
20	2,13	1,41	0,72
50	13,73	9,46	4,27

3.3.5 Boiling point at 100 kPa

The boiling point of HCl depending on concentration is given in Table 2.

[1)] Chemical Abstracts Service Registry Number

[2)] European Inventory of Existing Commercial Chemical Substances

Table 2 - Boiling point of hydrochloric acid solutions

Concentration % (*m/m*)	Boiling point at 100 kPa [a] °C
25	104
30	90
38	50,5
[a] 100 kPa = 1 bar	

3.3.6 Melting or freezing point

The melting or freezing point of HCl depending on concentration is given in Table 3.

Table 3 - Melting or freezing point

Concentration % (*m/m*)	Melting or freezing point °C
38	- 27
25	- 75

3.3.7 Specific heat

3,14 kJ/(kg · K) at 18 °C for HCl 16,83 % (*m/m*).

3.3.8 Viscosity (dynamic)

The viscosity of a HCl 30 % (*m/m*) solution at 15 °C is 1,9 mPa.s.

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 solution of hydrochloric acid is a strong mineral acid.

4 Purity criteria

Limits have been given for impurities and toxic substances 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

As concentrated acid the concentration of HCl solution shall be at least 25 % (*m/m*).

More diluted solutions are commercially available, the concentration of hydrochlorid acid shall be equal to or greater than the manufacturer specified value.

4.2 Impurities and main by-products

The product shall conform to the requirements specified in Table 4.

Table 4 - Impurities

Impurity		Limit mg/kg of HCl 100 % *(m/m)*
Iron (Fe)	max.	170
Halogenated organic compounds (as Cl)	max.	17

4.3 Toxic substances

NOTE For the purpose of this standard, "toxic substances" are those defined in the EU Directive 80/778/EU of July 15, 1980 (see [1]).

The content of toxic substances shall conform to the requirements specified in Table 5.

Table 5 - Toxic substances

Parameter		Limit in mg/kg of HCl 100 % *(m/m)*	
		Type 1	Type 2
Arsenic (As)	max.	3	10
Cadmium (Cd)	max.	1	5
Chromium (Cr)	max.	3	10
Mercury (Hg)	max.	0,5	3
Nickel (Ni)	max.	3	10
Lead (Pb)	max.	3	20
Antimony (Sb)	max.	1	10
Selenium (Se)	max.	5	10
NOTE Pesticides and polycyclic aromatic hydrocarbons are not relevant in HCl. Cyanide which does not exist in a very acidic media, such as hydrochloric acid, is not a relevant toxic substance.			

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

5.1.1.1.1 Mix the contents of the 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.

5.1.1.1.2 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, proceed as described in 5.1.1.3.

5.1.1.1.3 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 to 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 Analyses

5.2.1 Determination of hydrochloric acid content (main product)

The determination of total acidity is carried out by titration in accordance with ISO 904.

5.2.2 Impurities

5.2.2.1 Determination of iron content

5.2.2.1.1 Preparation of the test solution

In accordance with ISO/R909.

5.2.2.1.2 Procedure

In accordance with ISO 6685.

5.2.2.2 Determination of content of halogenated organic compounds

5.2.2.2.1 General

Halogenated organic compounds are determined as the extractable organic halogens (EOX). This method applies to hydrochloric acid solutions with a content of EOX, expressed as chloride, exceeding 20 µg/l.

5.2.2.2.2 Principle

EOX are extracted from hydrochloric acid in two stages using heptane. The extract is burned in an oxy-hydrogen flame. The mineralization products occurring in the condensate are determined on the basis of an argentometric reaction or an equivalent method

5.2.2.2.3 Reagents

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

5.2.2.2.3.1 Sulfuric acid, (H_2SO_4), density (ρ) = 1,84 g/ml.

5.2.2.2.3.2 Hydrochloric acid (HCl) pure.

5.2.2.2.3.3 Sodium sulfate, (Na_2SO_4)

Heat for 1 h at 600 °C to remove organic halogen compounds.

5.2.2.2.3.4 Heptane.

5.2.2.2.3.5 Oxygen, (O_2).

5.2.2.2.3.6 Hydrogen, (H_2).

5.2.2.2.3.7 Pentachlorophenol, (C_6Cl_5OH).

5.2.2.2.3.8 Halogen stock solution, ρ(Cl) = 100 mg/l.

Weigh 15,0 mg of pentachlorophenol (5.2.2.2.3.7) into a 100 ml volumetric flask ; dilute to volume with heptane (5.2.2.2.3.4). This solution is stable for about one week.

5.2.2.2.3.9 Halogen standard solution, ρ(Cl) = 10 mg/l.

Pipette 10 ml of the halogen stock solution (5.2.2.2.3.8) into a 100 ml volumetric flask and dilute to volume with heptane (5.2.2.2.3.4). This solution is stable for about one week.

5.2.2.2.3.10 Sodium chloride, (NaCl).

5.2.2.2.3.11 Chloride stock solution, ρ(Cl) = 100 mg/l :

Dissolve 0,164 8 g of sodium chloride (5.2.2.2.3.10) in water and dilute to volume with water in a 1000 ml volumetric flask.

5.2.2.2.3.12 Chloride standard solution, ρ(Cl) = 1 000 µg/l

Pipette 10 ml of the chloride stock solution (5.2.2.2.3.11) into a 1 000 ml volumetric flask ; dilute to volume with water.