
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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consumption - Hydrochloric acid**

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destinée à la consommation humaine - Acide chlorhydrique

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menschlichen Gebrauch - Salzsäure

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

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Foreword

This document (prEN 939:2014) has been prepared by Technical Committee CEN/TC 164 “Water supply”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 939:2009.

The significant technical differences between this edition and EN 939:2009 are as follows:

- a) deletion of reference to EU Directive 67/548/EEC of June 27, 1967 in order to take into account the latest Regulation in force (see [1]);
- b) use of the changed classification and labelling (see [1]).

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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 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.

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

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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. It also determines the rules relating to safe handling and use of hydrochloric acid (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 1483, *Water quality — Determination of mercury — Method using atomic absorption spectrometry*

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

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

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

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

prEN 939:2014 (E)**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 mass fraction of 25 % to 38 % (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 at mass fraction 30 % depending on temperature is given in Table 1.

Table 1 — Vapour pressure of hydrochloric acid solutions

Temperature °C	p_{total} kPa	p_{HCl} kPa	$p_{\text{H}_2\text{O}}$ kPa
20	2,13	1,41	0,72
50	13,73	9,46	4,27

¹⁾ Chemical Abstracts Service Registry Number.

²⁾ European Inventory of Existing Commercial Chemical Substances.

3.3.5 Boiling point at 100 kPa

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

Table 2 — Boiling point of hydrochloric acid solutions

Concentration Mass fraction in %	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 Mass fraction in %	Melting or freezing point °C
38	– 27
25	– 75

3.3.7 Specific heat

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

3.3.8 Viscosity (dynamic)

The viscosity of a HCl at mass fraction 30 %, 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

4.1 General

This European Standard specifies the minimum purity requirements for hydrochloric acid used for the treatment of 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, this shall be notified to the user and when necessary to relevant authorities.

NOTE Users of this product should check the national regulations in order to clarify whether it is of appropriate purity for treatment of water intended for human consumption, taking into account raw water quality, required dosage, contents of other impurities and additives used in the product 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 leads to significant quantities of impurities, by-products or additives being present, this shall be notified to the user.

4.2 Composition of commercial product

As concentrated acid the concentration of HCl solution shall be at least at mass fraction of 25 %.

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

4.3 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 mass fraction 100 %
Iron (Fe)	max.	170
Halogenated organic compounds (as Cl)	max.	17

4.4 Chemical parameters

The product shall conform to the requirements specified in Table 5.

Table 5 — Chemical parameters

Parameter		Limit in mg/kg of HCl mass fraction 100 %	
		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 chemical parameter. For parametric values of hydrochloric acid on trace metal content in drinking water, see [2].

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 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 6685.

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.

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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

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

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

5.2.2.2.3.3 Hydrochloric acid (HCl) pure.

5.2.2.2.3.4 Sodium sulfate, (Na_2SO_4)

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

5.2.2.2.3.5 Heptane.

5.2.2.2.3.6 Oxygen, (O_2).

5.2.2.2.3.7 Hydrogen, (H_2).

5.2.2.2.3.8 Pentachlorophenol, ($\text{C}_6\text{Cl}_5\text{OH}$).

5.2.2.2.3.9 Halogen stock solution, $c(\text{Cl}) = 100 \text{ mg/l}$.

Weigh 15,0 mg of pentachlorophenol (5.2.2.2.3.8) into a 100 ml volumetric flask; make up to volume with heptane (5.2.2.2.3.5). This solution is stable for about one week.

5.2.2.2.3.10 Halogen standard solution, $c(\text{Cl}) = 10 \text{ mg/l}$.

Pipette 10 ml of the halogen stock solution (5.2.2.2.3.9) into a 100 ml volumetric flask and make up to volume with heptane (5.2.2.2.3.5). This solution is stable for about one week.

5.2.2.2.3.11 Sodium chloride, (NaCl).

5.2.2.2.3.12 Chloride stock solution, $c(\text{Cl}) = 100 \text{ mg/l}$:

Dissolve 0,165 g of sodium chloride (5.2.2.2.3.11) in water and make up to volume with water in a 1 000 ml volumetric flask.

5.2.2.2.3.13 Chloride standard solution, $c(\text{Cl}) = 1 000 \text{ } \mu\text{g/l}$

Pipette 10 ml of the chloride stock solution (5.2.2.2.3.12) into a 1 000 ml volumetric flask; make up to volume with water.

Prepare a fresh solution prior to using.

5.2.2.2.4 Apparatus**5.2.2.2.4.1 General**

Ordinary laboratory apparatus and the following:

5.2.2.2.4.2 Dispenser with selectable volume capacity 50 ml.