SLOVENSKI STANDARD
SIST EN 888:2005

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Nadomešča:
SIST EN 888:2000

Kemikalije, ki se uporabljajo za pripravo pitne vode - Železov (III) klorid

Chemicals used for treatment of water intended for human consumption - Iron (III) chloride

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Eisen(III) chlorid

Produits chimiques utilisés pour le traitement de l'eau destinée a la consommation humaine - Chlorure de fer (III)

Ta slovenski standard je istoveten z: **EN 888:2004**

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English version

Chemicals used for treatment of water intended for human consumption - Iron (III) chloride

Produits chimiques utilisés pour le traitement de l'eau destinée à la consommation humaine - Chlorure de fer (III)

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Eisen(III)chlorid

This European Standard was approved by CEN on 30 September 2004.

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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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Contents

Foreword

This document (EN 888:2004) 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of an identical text or by endorsement, at the latest by May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.

This document supersedes EN 888:1998.

Significant technical differences between this edition and EN 888:1998 are as follows:

a) replacement of the reference to EU Directive 80/778 of 15 July 1980 with the latest Directive in force (see[1]);

b) expansion of annex A by addition of A.2 "Quality of commercial product";

c) deletion of annex E.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and 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 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 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 document is subject to regulation or control by National Authorities.

1 Scope

This document is applicable to iron (III) chloride (a), iron (III) chloride hexahydrate (b), iron (III) chloride solution (c) used for treatment of water intended for human consumption. It describes the characteristics and specifies the requirements and the corresponding analytical methods for iron (III) chlorides (a), (b) and (c) (analytical methods are given in Annex B) and gives information for their use in water treatment.

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

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

ISO 5790: 1979, *Inorganic chemical products for industrial use – General method for the determination of chloride content- Mercurimetric method*

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

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

(a) iron (III) chloride ($FeCl_3$).

(b) iron (III) chloride hexahydrate ($FeCl_3 . 6 H_2O$).

(c) iron (III) chloride solution.

3.1.2 Synonym or common names

(a) Ferric chloride, water free ferric chloride.

(b) Ferric chloride hexahydrate.

(c) Ferric chloride solution.

3.1.3 Relative molecular mass

(a) 162,21.for $FeCl_3$

(b) 270,31.for $FeCl_3 . 6 H_2O$

3.1.4 Empirical formula

(a) $FeCl_3$.

(b) $FeCl_3 . 6 H_2O$.

3.1.5 Chemical formula

(a) $FeCl_3$.

(b) $FeCl_3 . 6 H_2O$.

3.1.6 CAS Registry Number [1)]

(a) and (c) 7705-08-0.

(b) 10025-77-1.

3.1.7 EINECS reference [2)]

231-729-4.

3.2 Commercial forms

Iron (III) chloride (a) is available as a crystalline powder.

Iron (III) chloride hexahydrate (b) is available as crystalline granules.

Liquid forms of iron (III) chloride (c) are available as solutions.

3.3 Physical properties

3.3.1 Appearance

Iron (III) chloride (a) is an hygroscopic, dark grey crystalline powder with a greenish sheen.

Iron (III) chloride hexahydrate (b) is an hygroscopic, yellow deliquescent crystalline granular material.

Liquid forms of iron (III) chloride (c) are dark brown solutions.

3.3.2 Density

The density of iron (III) chloride (a) is equal to 2,89 g/cm^3 at 20 °C.

The density of iron (III) chloride hexahydrate (b) is equal to 1,8 g/cm^3 at 20 °C.

The density of solutions of iron (III) chloride(c) is equal to 1,43 g/ml at 20 °C for a mass fraction of 40 % of $FeCl_3$.

The bulk density of the products (a) and (b) is about 1,0 kg/dm^3.

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1) Chemical Abstracts Service Registry Number

2) European Inventory of Existing Commercial Chemical Substances

3.3.3 Solubility (in water)

The solubility at 20 °C for the products

(a) and (b) is approximately up to a mass fraction of 47 % of $FeCl_3$.

The products (a), (b) and (c) can be diluted down to about a mass fraction of 1 % of $FeCl_3$. Below this concentration, hydrolysis and formation of iron hydroxide will occur.

3.3.4 Vapour pressure

For the product (a) 0,1 kPa at 20 °C.

3.3.5 Boiling point at 100 kPa [3)]

For the product (a) decomposition occurs at 315 °C.

For the product (b) decomposition starts at 160 °C.

3.3.6 Melting point

For the product (a) 304 °C (point of sublimation).

For the product (b) 37 °C.

For the product (c) the melting and crystallization points depending on concentration are given in Table 1.

Table 1 – Melting point

Solution concentration Mass fraction of $FeCl_3$ in %	Melting, crystallization point °C
34	-52
40	-12
45	+10

3.3.7 Specific heat

For the product (a) 600 kJ/kg.K.

For the product (b) not known.

For the product (c) not applicable.

3.3.8 Viscosity (dynamic)

For the products (a) and (b) it is not applicable.

For the product (c) the viscosity is about 10 mPa.s for a solution of a mass fraction of 40 % of $FeCl_3$ at 20 °C.

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3) 100 kPa = 1 bar

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 solutions of iron (III) chloride (a) and iron (III) chloride hexahydrate of (b), and the liquid forms of iron (III) chloride (c) are acidic and highly corrosive. Very diluted solutions hydrolyse and form a precipitate of iron hydroxide.

4 Purity criteria

4.1 General

This document specifies the minimum purity requirements for iron (III) chloride 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 these products should check the national regulations in order to clarify whether it is of appropriate purity for treatment of water intended for human consumption, taking account raw water quality, required dosage, contents of other impurities and additives used in the products 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 lead to significant quantities of impurities, by-products or additives being present, this shall be notified to the user.

4.2 Composition of commercial product

The concentration of active matter in the product expressed as mass fraction in % of $FeCl_3$ or Fe (III) shall be within ± 3 % of the manufacturer's declared values.

The products shall conform to the following minimum requirements given in Table 2.

Table 2 – Minimum concentration of active matter

Commercial form	$FeCl_3$ Mass fraction in %	Fe (III) Mass fraction in %
Solid (a)	99	34
Solid (b)	59	20,3
Solution (c)	40	13,7

The concentration of the solutions (c) shall be within the manufacturer's specifications.

4.3 Impurities and main by-products

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

The concentration limits refer to Fe (III).

Table 3 – Impurities

Impurity		Limit Mass fraction of Fe (III) content in %		
		Grade 1	Grade 2	Grade 3
Manganese	max.	0,5	1	2
Iron(II)[a]	max.	2,5	2,5	2,5
Insoluble matters[b]	max.	0,2	0,2	0,2

[a] Fe (II) has a lower coagulant efficiency compared to Fe (III).

Also hydrolysis of Fe (II) starts at pH value 8, and therefore Fe (II) can remain into the water at lower pH values.

[b] an excess of insoluble matters indicates the presence of foreign matter Iron is a component of the product will usually be removed in the treatment process.

4.4 Chemical parameters

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

The concentration limits are specified in milligrams per kilogram of Fe (III).

Table 4 – Chemical parameters

Parameter		Limit mg/kg of Fe (III)		
		type 1	type 2	type 3
Arsenic (As)	max.	20	20	50
Cadmium (Cd)	max.	1	25	50
Chromium (Cr)	max.	50	350	500
Mercury (Hg)	max.	0,3	5	10
Nickel (Ni)	max.	60	350	500
Lead (Pb)	max.	35	100	400
Antimony (Sb)	max.	10	20	60
Selenium (Se)	max.	10	20	60
NOTE Cyanide (CN^-), pesticides and polycyclic aromatic hydrocarbons are not relevant since the raw materials used in the manufacturing process are free of them. For maximum impact of iron (III) chloride on trace metal content in drinking water see A.2.				

5 Test methods

5.1 Sampling

5.1.1 General

Observe the general recommendations in ISO 3165 and take into account ISO 6206.

5.1.2 Solid

Prepare the laboratory sample required by the relevant procedure described in ISO 8213.

5.1.3 Liquid

5.1.3.1 Sampling from drums and bottles

5.1.3.1.1 General

5.1.3.1.1.1 Mix the contents of each 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.

5.1.3.1.1.2 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 5.1.3.1.1.3.