

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

The European Standard EN 888:1998 has the status of a
British Standard

ICS 71.100.80

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National foreword

This British Standard is the English language version of EN 888:1998.

The UK participation in its preparation was entrusted to Technical Committee CII/59, Chemicals for drinking water treatment, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

The United Kingdom did not support this standard at the CEN Enquiry stage and voted against its acceptance at the Formal Vote stage. The principal UK objections were as follows.

- a) The limits for manganese, iron(II) and insoluble matter in Table 2 are expressed as percentages of the iron(III) content whereas the analytical methods described in annex B give the results as mg/kg of the product for manganese and a percentage by mass of the product for the other two impurities.
- b) The method for the determination of total iron, described in **B.1.1**, requires the use of mercury(II) chloride, which is classified as “acutely toxic”.
- c) Specifying deionized water in **B.3.3.1** is inappropriate: the water should conform to grade 3 in accordance with EN ISO 3696.
- d) No instructions are given in **B.4** for the preparation of the calibration curve for the determinations of arsenic, antimony and selenium. The standard additions technique, to which reference is made, is not relevant because any matrix interference is removed by conversion of the elements to gaseous hydrides.

Additional information

Article 8 of the Council of the European Community Directive 80/778/EEC relating to the quality of water intended for human consumption requires Member States to ensure that substances used in the preparation of drinking water do not cause any contravention of the maximum admissible concentrations prescribed in annex 1 to the Directive.

This requirement is given effect in England and Wales by regulation 25 of the Water Supply (Water Quality) Regulations 1989 (similar provisions apply in Scotland and Northern Ireland). Regulation 25 makes provision for attaching conditions of use to chemicals which are authorized for use in public water supplies.

Details of conditions of use are contained in the Secretary of State’s List of Approved Products published by the Drinking Water Inspectorate, Floor 2/A1, Ashdown House, 123 Victoria Street, London SW1E 6DE.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 16, an inside back cover and a back cover.

Amendments issued since publication

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Descriptors: potable water, water treatment, chemical compounds, iron chloride, description, physical properties, chemical properties, impurities, toxic substances, tests, labelling, storage, utilization

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 22 July 1998.

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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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CEN

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Comité Européen de Normalisation
Europäisches Komitee für Normung

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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 February 1999, and conflicting national standards shall be withdrawn at the latest by February 1999.

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.

Contents

	Page
Foreword	2
Introduction	3
1 Scope	3
2 Normative references	3
3 Description	3
3.1 Identification	3
3.2 Commercial forms	3
3.3 Physical properties	3
3.4 Chemical properties	4
4 Purity criteria	4
4.1 Composition of commercial product	4
4.2 Impurities and main by-products	4
4.3 Toxic substances	4
5 Test methods	5
5.1 Sampling	5
5.2 Analyses	5
6 Labelling — Transportation — Storage	6
6.1 Means of delivery	6
6.2 Risk and safety labelling according to the EU Directives	6
6.3 Transportation regulations and labelling	6
6.4 Marking	7
6.5 Storage	7
Annex A (informative) General information on iron(III) chloride	7
Annex B (normative) Analytical methods	7
Annex C (informative) Reduction of Fe(III) on a silver column	14
Annex D (informative) Determination of cadmium, chromium, nickel and lead [inductively coupled plasma optical emission spectrometry (ICP/OES)]	15
Annex E (normative) General rules relating to safety	16
Annex F (informative) Bibliography	16

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 iron(III) chloride (a), iron(III) chloride hexahydrate (b) and 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 test methods for iron(III) chlorides (a), (b) and (c) and 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 3165, *Sampling of chemical products for industrial use — Safety in sampling.*

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 ($\text{FeCl}_3 \cdot 6 \text{H}_2\text{O}$).
- 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
- b) 270,31

3.1.4 Empirical formula

- a) FeCl_3
- b) $\text{FeCl}_3 \cdot 6 \text{H}_2\text{O}$

3.1.5 Chemical formula

- a) FeCl_3
- b) $\text{FeCl}_3 \cdot 6 \text{H}_2\text{O}$

3.1.6 CAS Registry Number¹⁾

- a) and c) 7705-08-0
- b) 10025-77-1

3.1.7 EINECS reference²⁾

231-729-4

3.2 Commercial forms

- a) Crystalline powder.
- b) Crystalline granules.
- c) Aqueous solutions.

3.3 Physical properties

3.3.1 Appearance

- a) Hygroscopic, dark grey crystalline powder with a greenish sheen.
- b) Hygroscopic, yellow deliquescent crystalline granules.
- c) Dark brown liquids.

3.3.2 Density

- a) 2,89 g/cm³ at 20 °C.
- b) 1,8 g/cm³ at 20 °C.
- c) 1,43 g/ml at 20 °C for a concentration of 40 % (m/m) of FeCl_3 .

The bulk density of (a) and (b) is about 1,0 kg/dm³.

3.3.3 Solubility (in water)

At 20 °C:

- a) and b) approximately up to 47 % (m/m) of FeCl_3 .
- a), b) and c) dilutable down to about 1 % (m/m) of FeCl_3 . Below this concentration, hydrolysis and formation of iron hydroxide will occur.

3.3.4 Vapour pressure

- a) 0,1 kPa at 20 °C.

¹⁾ Chemical Abstracts Service Registry Number.

²⁾ European Inventory of Existing Commercial Chemical Substances.

3.3.5 Boiling point at 100 kPa³⁾

- a) Decomposition occurs at 315 °C.
- b) Decomposition starts at 160 °C.

3.3.6 Melting point

- a) 304 °C (point of sublimation).
- b) 37 °C.
- c) The melting and crystallization points depending on concentration are given in Table 1.

Table 1 — Melting point

Solution concentration % (m/m) FeCl ₃	Melting, crystallization point °C
34	−52
40	−12
45	+10

3.3.7 Specific heat

- a) 600 kJ/kg.K.
- b) Not known.
- c) Not applicable.

3.3.8 Viscosity (dynamic)

- a) and b) not applicable.
- c) about 10 mPa.s for a solution of 40 % (m/m) of FeCl₃ at 20 °C.

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

Solutions of (a) and of (b), and solution (c), are acidic and highly corrosive.

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

The products shall conform to the following minimum requirements for (a) and (b):

- expressed as FeCl₃: — (a) 99 % (m/m);
— (b) 59 % (m/m);
- expressed as Fe(III): — (a) 34 % (m/m);
— (b) 20,3 % (m/m).

The concentration of the solution (c) shall be within the manufacturer's specifications. The common concentration is:

- expressed as FeCl₃: 40 % (m/m);
- expressed as Fe(III): 13,7 % (m/m).

4.2 Impurities and main by-products

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

The concentration limits refer to Fe(III).

4.3 Toxic substances

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

The content of toxic substances shall conform to the requirements specified in Table 3.

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

Table 2 — Impurities

Impurity		Limit % (m/m) of Fe(III) content		
		Level 1	Level 2	Level 3
Manganese	max.	0,5	1	2
Iron(II) ¹⁾	max.	2,5	2,5	2,5
Insolubles ²⁾	max.	0,2	0,2	0,2

¹⁾ 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 in the water at lower pH values.

²⁾ An excess of insolubles indicates the presence of foreign matter.

³⁾ 100 kPa = 1 bar.