



# SLOVENSKI STANDARD

## SIST EN 15031:2014

01-januar-2014

Nadomešča:  
SIST EN 15031:2006

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**Kemikalije, ki se uporabljajo za pripravo bazenske vode - Strjevanje na osnovi aluminija**

Chemicals used for treatment of swimming pool water - Aluminium based coagulants

Produkte zur Aufbereitung von Schwimm- und Badebeckenwasser - Flockungsmittel auf Aluminiumbasis

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Produits chimiques utilisés pour le traitement de l'eau des piscines - Coagulants à base d'aluminium

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**Ta slovenski standard je istoveten z: EN 15031:2013**

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**ICS:**

13.060.25	Voda za industrijsko uporabo	Water for industrial use
71.100.80	Kemikalije za čiščenje vode	Chemicals for purification of water

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EUROPEAN STANDARD

**EN 15031**

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2013

ICS 71.100.80

Supersedes EN 15031:2006

English Version

## Chemicals used for treatment of swimming pool water - Aluminium based coagulants

Produits chimiques utilisés pour le traitement de l'eau des  
piscines - Coagulants à base d'aluminium

Produkte zur Aufbereitung von Schwimm- und  
Badebeckenwasser - Flockungsmittel auf Aluminiumbasis

This European Standard was approved by CEN on 21 March 2013.

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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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

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## Foreword

This document (EN 15031:2013) 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 November 2013, and conflicting national standards shall be withdrawn at the latest by November 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 15031:2006.

Significant technical differences between this edition and EN 15031:2006 are as follows:

— Updating of subclause 6.2 in line with current legislation..

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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## Introduction

In respect of potential adverse effects on the quality of water for swimming pools, caused by the products covered by this European Standard:

- a) this European Standard provides no information as to whether the products 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 these products remain in force.

NOTE Conformity with this European Standard does not confer or imply acceptance or approval of the products in any of the Member States of the EU or EFTA. The use of the products 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 aluminium based coagulants (aluminium sulfate, aluminium chloride (monomeric), aluminium chloride hydroxide (monomeric), aluminium chloride hydroxide sulfate (monomeric), sodium aluminate and polyaluminium chloride hydroxide and polyaluminium chloride hydroxide sulfate) used directly or for the production of formulations for treatment of water for swimming pools.

It describes the characteristics of aluminium based coagulants and specifies the requirements and the corresponding test methods for aluminium based coagulants. It gives information on their use in swimming pool water treatment. It also determines the rules relating to safe handling and use (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 1302, *Chemicals used for treatment of water intended for human consumption — Aluminium-based coagulants — Analytical methods*

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*

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**3 Description** <https://standards.iteh.ai/catalog/standards/sist/5be56caf-4e99-4d61-8fd2-3035ccd54c3e/sist-en-15031-2014>

### 3.1 Aluminium sulfate

#### 3.1.1 Identification

##### 3.1.1.1 Chemical name

Aluminium sulfate.

##### 3.1.1.2 Synonym or common names

Aluminium sulfate, cake alum, alum.

NOTE In English the generic term "alum" is imprecise and is deprecated and in German the term "Alaun" is misleading.

##### 3.1.1.3 Relative molecular mass

342,14 for  $\text{Al}_2(\text{SO}_4)_3$ .

##### 3.1.1.4 Empirical formula

$\text{Al}_2(\text{SO}_4)_3$ .

**EN 15031:2013 (E)****3.1.1.5 Chemical formula**

$$\text{Al}_2(\text{SO}_4)_3 \cdot n\text{H}_2\text{O}$$
**3.1.1.6 CAS Registry Number <sup>1)</sup>**

$$\text{Al}_2(\text{SO}_4)_3 : 10043-01-3.$$

$$\text{Al}_2(\text{SO}_4)_3 \cdot 16 \text{H}_2\text{O} : 16828-11-8.$$

$$\text{Al}_2(\text{SO}_4)_3 \cdot 18 \text{H}_2\text{O} : 7784-31-8.$$
**3.1.1.7 EINECS reference <sup>2)</sup>**

$$\text{Al}_2(\text{SO}_4)_3 : 233-135-0.$$
**3.1.2 Commercial forms**

Aluminium sulfate is available in solid hydrated forms, with different particle sizes (slabs, kibbled, ground, granulated) and in aqueous solutions.

**3.1.3 Physical properties****3.1.3.1 Appearance**

The product is a white solid or colourless to yellow, clear liquid.

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**3.1.3.2 Density**

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The density of a typical aluminium sulfate solution is given in Table 1 and varies depending on the concentration of the active matter (aluminium content), expressed in grams per kilogram of solution (Al g/kg).

**Table 1 — Density of solution**

Al g/kg of solution	Density at 15 °C g/ml
40,8	1,310
41,6	1,315
42,5	1,320
43,3	1,325
44,2	1,330
45,0	1,335

**3.1.3.3 Solubility**

The theoretical limit of active matter content for a typical solution is given in Table 2.

1) Chemical Abstracts Service Registry Number.

2) European Inventory of Existing Commercial Chemical Substances.



Table 2 — Solubility

Temperature °C	Active matter in Al g/kg of solution
- 1	44,7
24	44,8

The practical limit of solubility depends on the temperature and the device used for solubilisation of the solid form (slabs, kibbled, ground or granulated).

An indication of practical limits is given in Table 3.

Table 3 — Indication of practical limits of solubility

Temperature °C	Active matter Al g/kg of solution	Solubility in grams solid form (containing Al 90 g/kg of solid) per kilogram of solution
15	37	410

#### 3.1.3.4 Vapour pressure at 20 °C

Not known.

#### 3.1.3.5 Boiling point at 100 kPa<sup>3)</sup>

Not known.

#### 3.1.3.6 Crystallisation point

The crystallisation point of aluminium sulfate varies, depending on the concentration of the active matter.

For example:

— - 7 °C for a typical solution of aluminium content of 42,4 g/kg of solution.

#### 3.1.3.7 Specific heat

Not known.

#### 3.1.3.8 Viscosity (dynamic)

The viscosity of aluminium sulfate solution varies greatly, depending on the concentration of the active matter.

For a typical solution of aluminium content of 42,4 g/kg of solution, the viscosity is given in Table 4.

3) 100 kPa = 1 bar.

Table 4 — Viscosity

Temperature °C	Viscosity mPa.s
0	40,0
10	26,5
20	18,6
30	13,2
40	8,8

**3.1.3.9 Critical temperature**

Not applicable.

**3.1.3.10 Critical pressure**

Not applicable.

**3.1.3.11 Physical hardness**

Not applicable.

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**3.1.4 Chemical properties**

Aluminium sulfate is an acidic hydrated salt or solution. Very dilute solutions hydrolyse and form a precipitate of aluminium hydroxide.

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Since aluminium compounds are amphoteric in nature, the solubility of aluminium depends on the pH value and the product should be used within an appropriate pH range.

**3.2 Aluminium chloride (monomeric), aluminium chloride hydroxide (monomeric) and aluminium chloride hydroxide sulfate (monomeric)****3.2.1 Identification****3.2.1.1 Chemical name**

- a) aluminium chloride (monomeric);
- b) aluminium chloride hydroxide (monomeric);
- c) aluminium chloride hydroxide sulfate (monomeric).

**3.2.1.2 Synonym or common names**

- a) aluminium chloride;
- b) aluminium chloride hydroxide;
- c) aluminium chloride hydroxide sulfate.

**3.2.1.3 Relative molecular mass**

133,3 for  $\text{AlCl}_3$ .

**3.2.1.4 Empirical formula**

- a)  $\text{AlCl}_3$ ;
- b)  $\text{Al}(\text{OH})_a\text{Cl}_b$  with  $(a + b) = 3$  and  $a$  less than or equal to 1,05;
- c)  $\text{Al}(\text{OH})_a\text{Cl}_b(\text{SO}_4)_c$  with  $(a + b + 2c) = 3$  and  $a$  less than or equal to 1,05.

**3.2.1.5 Chemical formula**

Variable (see 3.1.4).

**3.2.1.6 CAS Registry Number <sup>4)</sup>**

- a) 7446-70-0;
- b)
  - 1)  $a$  and  $b$  variable: 1327-41-9 with  $a$  less than or equal to 1,05;
  - 2)  $a = 1, b = 2$ : 14215-15-7;
- c)  $a, b$  and  $c$  variable: 39290-78-3 with  $a$  less than or equal to 1,05.

**3.2.1.7 EINECS reference <sup>5)</sup>**

- a) 231-208-1;

b)

- 1) 215-477-2;
- 2) 238-071-7;

- c) 254-400-7.

**3.2.2 Commercial forms**

Aluminium chloride in the form of hexahydrate is available as crystals.

Liquid forms of aluminium chloride, aluminium chloride hydroxide and aluminium chloride hydroxide sulfate (monomeric) are available as solutions or suspensions.

**3.2.3 Physical properties****3.2.3.1 Appearance**

The product is colourless to yellow.

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4) Chemical Abstracts Service Registry Number.

5) European Inventory of Existing Commercial Chemical Substances.

**EN 15031:2013 (E)****3.2.3.2 Density**

The density depends on the particular composition, especially the aluminium ion content, expressed as mass fraction of aluminium (Al) in %.

Typical values for solutions:

- a) aluminium chloride: 1,3 g/ml for 5,8 % Al;
- b) aluminium chloride hydroxide: 1,35 g/ml to 1,40 g/ml for 9,5 % Al;
- c) aluminium chloride hydroxide sulfate:
  - 1,18 g/ml to 1,22 g/ml for 5,3 % Al;
  - 1,18 g/ml for 4,2 % Al.

**3.2.3.3 Solubility**

Aluminium chloride, aluminium chloride hydroxide and aluminium chloride hydroxide sulfate (monomeric) are fully miscible with water.

NOTE Depending on the particular product, dilute solutions can hydrolyze and form a precipitate.

**3.2.3.4 Vapour pressure** iTeh STANDARD PREVIEW  
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Not known.

**3.2.3.5 Boiling point at 100 kPa<sup>6)</sup>**

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Not known.

**3.2.3.6 Crystallisation point**

Typical values for solutions:

- a) aluminium chloride: - 20 °C for 5,8 % Al;
- b) aluminium chloride hydroxide:
  - ≤ - 20 °C for 9,5 % Al;
  - ≈ - 20 °C for 12,4 % Al;
- c) aluminium chloride hydroxide sulfate:
  - 10 °C to - 15 °C for 5,3 % Al;
  - 5 °C for 4,2 % Al.

**3.2.3.7 Specific heat**

Not known.

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6) 100 kPa = 1 bar.