



# SLOVENSKI STANDARD

## SIST EN 12175:2001

01-december-2001

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### Kemikalije, ki se uporabljajo za pripravo pitne vode - Heksafluorosilicijeva kislina

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

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch -  
Hexafluorokieselsäure

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

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#### **ICS:**

13.060.20	Pitna voda	Drinking water
71.100.80	Kemikalije za čiščenje vode	Chemicals for purification of water

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 12175**

August 2001

ICS 71.100.80

English version

## Chemicals used for treatment of water intended for human consumption - Hexafluorosilicic acid

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

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Hexafluorokieselsäure

This European Standard was approved by CEN on 23 June 2001.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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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 2002, and conflicting national standards shall be withdrawn at the latest by February 2002.

Annex A is informative.

Annex B is normative.

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.

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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 standard :

- a) 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 ;
- 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.

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## 1 Scope

This European Standard is applicable to hexafluorosilicic acid used for treatment of water intended for human consumption. It describes the characteristics of hexafluorosilicic acid and specifies the requirements and the corresponding test methods for hexafluorosilicic 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 (including amendments).

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 5440, *Sodium hexafluorosilicate for industrial use - Determination of phosphate content - Molybdovanadate spectrophotometric method*.

ISO 5993, *Sodium hydroxide for industrial use - Determination of mercury content - Flameless atomic absorption spectrometric method*.

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

ISO 6353-1, *Reagents for chemical analysis. Part 1: General test methods*.

## 3 Description

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### 3.1 Identification

#### 3.1.1 Chemical name

Hexafluorosilicic acid.

#### 3.1.2 Synonym or common names

Hydrofluosilicic acid.

Silicate -hexafluoro -dihydrogen.

Fluorosilicic acid,

HFSA.

#### 3.1.3 Relative molecular mass

144,09.

#### 3.1.4 Empirical formula

H<sub>2</sub>SiF<sub>6</sub>.

#### 3.1.5 Chemical formula

H<sub>2</sub>SiF<sub>6</sub>.

**EN 12175:2001 (E)****3.1.6 CAS-Registry Number<sup>1)</sup>**

16961-83-4.

**3.1.7 EINECS reference<sup>2)</sup>**

241-034-8.

**3.2 Commercial form**

Hexafluorosilicic acid is an aqueous solution.

**3.3 Physical properties****3.3.1 Appearance and odour**

Hexafluorosilicic acid is a clear, colourless liquid with a pungent odour.

**3.3.2 Density**

The density of a 35 % (*m/m*) solution at 25 °C is 1,35 g/ml.

The density of a 20 % (*m/m*) solution at 25 °C is 1,18 g/ml.

**3.3.3 Solubility (in water)**

The product is miscible in any proportion.

**3.3.4 Vapour pressure**

The vapour pressure at 20 °C is approximately 3 kPa<sup>3)</sup>.

**3.3.5 Boiling point at 100 kPa<sup>3)</sup>**

The product boils and decomposes at 110 °C.

**3.3.6 Crystallisation point**

A 35 % (*m/m*) solution crystallizes at -30 °C, a 20 % (*m/m*) solution crystallizes at -11,6 °C.

**3.3.7 Specific heat**

Not known.

**3.3.8 Viscosity dynamic**

A 20 % (*m/m*) solution has a dynamic viscosity of 1,4 MPa·s at 25 °C.

**3.3.9 Critical temperature**

Not applicable.

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<sup>1)</sup> Chemical Abstracts Service Registry Number.

<sup>2)</sup> European Inventory of Existing Commercial Chemical Substances.

<sup>3)</sup> 100 kPa = 1 bar.



### 3.3.10 Critical pressure

Not applicable.

### 3.3.11 Physical hardness

Not applicable.

## 3.4 Chemical properties

Hexafluorosilicic acid is only stable in an aqueous solution. On evaporation it decomposes to hydrogen fluoride (HF) and silicon tetrafluoride (SiF<sub>4</sub>).

It produces hydrogen on contact with metals, e.g. steel, nickel, aluminium. It is a strong acid and reacts violently with alkalis. It forms hydrogen fluoride (HF) on contact with concentrated acids. It attacks glass.

## 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 product shall contain between 20 percent by mass and 40 % (*m/m*) hexafluorosilicic acid, the remainder being water.

The concentration of hexafluorosilicic acid shall be within  $\pm 5$  % of the manufacturer's declared value.

[SIST EN 12175:2001](#)

### 4.2 Impurities and main by-products

The product shall conform to the requirements specified in Table 1.

Table 1 — Impurities

Impurity	Limit in % ( <i>m/m</i> ) commercial product
Phosphate as P <sub>2</sub> O <sub>5</sub> max.	0,75
Free hydrogen fluoride as HF max.	1,5

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## 4.3 Chemical parameters

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

Table 2 — Chemical parameters

Parameter		Limit mg/kg H <sub>2</sub> SiF <sub>6</sub> (100 %)
Antimony (Sb)	max.	80
Arsenic (As)	max.	400
Cadmium (Cd)	max.	40
Chromium (Cr)	max.	400
Lead (Pb)	max.	400
Mercury (Hg)	max.	10
Nickel (Ni)	max.	400
Selenium (Se)	max.	80

NOTE Other chemical parameters and indicator parameters -as listed in EU Directive 98/83/EEC (see [1])- are not relevant in hexafluorosilicic acid because the raw materials used in the manufacturing process are free of them.

## 5 Test methods

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## 5.1 General

**SAFETY PRECAUTIONS** Hexafluorosilicic acid shall be handled with extreme care, see B.1.

All equipment in contact with hexafluorosilicic acid shall be made in plastics (for example polyethylene or polytetrafluoroethylene (PTFE), avoid contact with the glass.

## 5.2 Sampling

## 5.2.1 General

Observe the general recommendations of ISO 3165 and take account of ISO 6206.

NOTE The sampling is carried out at the premises of the manufacturer of the hexafluorosilicic acid unless the customer has adequate facilities to carry out this operation safely at his own premises.

## 5.2.2 Sampling from drums and bottles

## 5.2.2.1 General

**5.2.2.1.1** 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.

**5.2.2.1.2** 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 5.2.2.1.3.

**5.2.2.1.3** Examine the surface of the liquid. If there are signs of surface contamination, take samples from the surface as described in 5.2.2.2; otherwise, take samples as described in 5.2.2.3.

### 5.2.2.2 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 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.

### 5.2.2.3 Procedure of sampling from a container

The samples for testing the hexafluorosilicic acid shall be taken by means of a sampling tube, for example. A tube made of polytetrafluoroethylene (PTFE), approximately 1500 mm long, with 14,5 mm inside diameter and 1,25 mm wall thickness tapering to an inside diameter of approximately 5 mm at one end, can be used for this ; fit a rubber tube approximately 200 mm long which can be closed by means of a pinch clip, to the other end. When taking the samples, insert the sampling tube as far as possible into the acid to be tested with the clip released.

Do this slowly so that the levels of liquid in the sampling tube and in the acid container are the same.

Close the clip, withdraw the sampling tube from the acid, allow any liquid adhering at the outside of the tube to drain off, and by releasing the clip discharge the contents of the sampling tube into a polytetrafluoroethylene (PTFE) bottle of 1000 ml nominal capacity provided with a ground PTFE stopper. Stopper the bottle immediately after filling with each content of the sampling tube. After shaking thoroughly, fill from the collective sample three PTFE bottles, each with a volume of approximately 250 ml and provided with a ground PTFE stopper. Stopper, seal and label the bottles. One of these samples is to be tested by the consignee, the other two shall be kept in case subsequent complaint requires further testing to be carried out.

### 5.2.3 Sampling from tanks and tankers

From each access point, take samples as follows :

- from the surface of the liquid, using ladle as described in 5.2.2.2 ;
- from the bottom of the tank or tanker, using a sampling tube as described in 5.2.2.3 or using specially designed bottom-sampling apparatus;
- from one or more positions, depending on the overall depth, between the bottom and the surface using a weighted sampling can.

## 5.3 Analyses

### 5.3.1 General

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

### 5.3.2 Determination of hexafluorosilicic acid

#### 5.3.2.1 Principle

##### 5.3.2.1.1 Cold reaction :

A saturated solution of potassium nitrate is added to an aliquot of the hexafluorosilicic acid which is cooled in ice and the liberated nitric acid is titrated with standard volumetric sodium hydroxide solution using bromothymol blue as the indicator.

