

# SLOVENSKI STANDARD

## SIST EN 12175:2014

01-januar-2014

Nadomešča:  
SIST EN 12175:2006

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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 -  
Hexafluorkieselsäure

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

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 12175**

May 2013

ICS 71.100.80

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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 - Hexafluorkieselsäure

This European Standard was approved by CEN on 28 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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COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Foreword

This document (EN 12175:2013) 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of an identical text or by endorsement, at the latest by November 2013, and conflicting national standards shall be withdrawn at the latest by November 2013.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 12175:2006.

Significant differences between this edition and EN 12175:2006 are as follows:

- The replacement of warning and safety precautions notes by labelling according to Regulation (EC) No 1272/2008.

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 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 document 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.

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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. It also determines the rules relating to safe handling and use of hexafluorosilicic 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 ISO 3696, *Water for analytical laboratory use — Specification and test methods (ISO 3696)*

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*

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## 3 Description

### 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>.

**EN 12175:2013 (E)****3.1.5 Chemical formula**

$\text{H}_2\text{SiF}_6$ .

**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**

The product is an aqueous solution.

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

The product is a clear, colourless liquid with a pungent odour.

**3.3.2 Density**

The density of a mass fraction 35 % solution at 25 °C is 1,35 g/ml.

The density of a mass fraction 20 % 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**

The product boils and decomposes at 110 °C.

**3.3.6 Crystallisation point**

A solution of mass fraction of 35 % crystallises at -30 °C and of a mass fraction of 20 % crystallises at -11,6 °C.

**3.3.7 Specific heat**

Not known.

**3.3.8 Viscosity dynamic**

A solution of a mass fraction of 20 % has a dynamic viscosity of 1,4 MPa.s at 25 °C.

1) Chemical Abstracts Service Registry Number.

2) European Inventory of Existing Commercial Chemical Substances.

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

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 and 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

### 4.1 General

This European Standard specifies the minimum purity requirements for hexafluorosilicic 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.

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 products not stated in this document.

Limits have been given for impurities and chemicals 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 product shall contain between a mass fraction of 20 % and 40 % hexafluorosilicic acid, the remainder being water.

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

### 4.3 Impurities and main by-products

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

**Table 1 — Impurities**

Impurity	Limit in mass fraction in % of commercial product
Phosphate as P <sub>2</sub> O <sub>5</sub> max.	0,75
Free hydrogen fluoride as HF max.	1,5

#### 4.4 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 are not relevant in hexafluorosilicic acid because the raw materials used in the manufacturing process are free of them. For parametric values of hexafluorosilicic acid on trace metal content in drinking water, see [1].		

## 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 of plastics (for example polyethylene or polytetrafluoroethylene (PTFE); avoid contact with glass.

### 5.2 Sampling

#### 5.2.1 General

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

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 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.

**5.2.2.1.2** 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 1 500 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, may 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 1 000 ml nominal capacity provided with a ground PTFE stopper. Stopper the bottle immediately after filling each with the 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

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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 Hexafluorosilicic acid (main product)

#### 5.3.1.1 Principle

##### 5.3.1.1.1 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.

