BS EN 12175:2013

BSI Standards Publication

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

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National foreword

This British Standard is the UK implementation of EN 12175:2013. It supersedes BS EN 12175:2006 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee CII/59, Chemicals for drinking water treatment.

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

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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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Contents

Page

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of an identical text or by endorsement, at the latest by November 2013, and conflicting national standards shall be withdrawn at the latest by November 2013.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.

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.

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*

3 Description

3.1 Identification

3.1.1 Chemical name

Hexafluorosilicic acid.

3.1.2 Synonym or commons names

Hydrofluosilicic acid.

Silicate-hexafluoro–dihydrogen.

Fluorosilicic acid.

HFSA.

3.1.3 Relative molecular mass

144,09.

3.1.4 Empirical formula

H_2SiF_6.

3.1.5 Chemical formula

H_2SiF_6.

3.1.6 CAS-Registry Number[1)]

16961-83-4.

3.1.7 EINECS reference[2)]

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[3)].

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.

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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_4).

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 ± 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_2O_5	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_2SiF_6 (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

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

From each access point, take samples as follows:

a) from the surface of the liquid, using ladle as described in 5.2.2.2;

b) 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;

c) 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.

$$H_2SiF_6 + 2KNO_3 \text{ ---> } 2HNO_3 + K_2SiF_6$$

$$\text{(Sample } A\text{) } 2HNO_3 + 2NaOH \text{ ---> } 2NaNO_3 + 2H_2O$$

5.3.1.1.2 Hot reaction

The solution is then brought to the boil and the liberated hydrofluoric acid is titrated with standard volumetric sodium hydroxide solution.

$K_2SiF_6 + 2H_2O \longrightarrow 2KF + SiO_2 + 4HF$

(Sample *B*) $4HF + 4NaOH \longrightarrow 4NaF + 4H_2O$

If free acid other than hexafluorosilicic acid is present, then sample *A* will exceed half sample *B*. If salts of hexafluorosilicic acid are present then sample *A* will be less than half sample *B*.

5.3.1.2 Reagents

All reagents shall be of a recognised analytical grade and the water used shall conform to the grade 3 specified in EN ISO 3696.

5.3.1.2.1 Ice prepared from grade 3 water

5.3.1.2.2 Potassium nitrate saturated solution

5.3.1.2.3 Sodium hydroxide standard volumetric solution, c(NaOH)=0,5 mol/l

5.3.1.2.4 Bromothymol blue solution, 2 g/l

5.3.1.3 Apparatus

5.3.1.3.1 Bottle, 50 ml

5.3.1.3.2 Safety pipette, 25 ml

5.3.1.3.3 One-mark volumetric flask, 500 ml

5.3.1.3.4 Beaker, 500 ml

5.3.1.3.5 Burette, 50 ml

5.3.1.3.6 Hot plate

5.3.1.4 Procedure

Using a safety pipette (5.3.1.3.2), transfer 25 ml of sample into a small weighed bottle (5.3.1.3.1) and reweigh. Transfer quantitatively to a 500 ml one-mark volumetric flask (5.3.1.3.3) and dilute to the mark with water. Place about 100 g of ice (5.3.1.2.1) in a 500 ml beaker (5.3.1.3.4) and add 25 ml of saturated potassium nitrate solution (5.3.1.2.2) followed by 25 ml of the diluted solution. Titrate immediately using the burette (5.3.1.3.5), with constant stirring, with the sodium hydroxide solution (5.3.1.2.3) using bromothymol blue (5.3.1.2.4) as the indicator until the blue colour persists for at least 30 s; note the volume, V_1.

NOTE The indicator will turn yellow after a while.

After the titration place the beaker on the hot plate (5.3.1.3.6) and bring the contents to the boil. Titrate the hot solution with sodium hydroxide standard volumetric solution (5.3.1.2.3) until the blue colour persists for 30 s and note the volume V_2.

5.3.1.5 Expression of results

5.3.1.5.1 Hexafluorosilicic acid

The content of hexafluorosilicic acid, W_1, expressed as mass fraction in %, is given from the following formula:

$$W_1 = \frac{V_2 \times 0,5 \times 0,036 \times 100 \times 500}{m_1 \times 25} \qquad (1)$$

where

V_2 is the volume, in millilitres, of sodium hydroxide solution used in the second titration (5.3.1.2.3);

m_1 is the mass in grams, of the test portion.

5.3.1.5.2 Free hydrofluoric acid

The content of fluoride other than hexafluorosilicic acid, W_2, expressed as mass fraction in % of HF, is given from the following formula:

$$W_2 = \frac{(V_1 - 0,5\,V_2) \times 0,5 \times 0,02 \times 100 \times 500}{m_1 \times 25} \qquad (2)$$

where

V_1 is the volume, in millilitres, of sodium hydroxide solution used in the first titration (5.3.1.2.3);

m_1 is the mass, in grams, of the test portion.

5.3.2 Impurities

5.3.2.1 Free hydrofluoric acid

The content of free hydrofluoric acid shall be determined in accordance with 5.3.1.5.2.

5.3.2.2 Phosphate

The content of phosphate shall be determined in accordance with ISO 5440.

5.3.3 Chemical parameters

5.3.3.1 General

The content of chemical parameters shall be determined using the procedures specified in Table 3.

Table 3 — Procedures for the determination of chemical parameters

Element	Reference	Method	Wavelength nm	Flame
As	See 5.3.3.3	Hydride AAS	193,7	n.a.
Sb	See 5.3.3.3	Hydride AAS	217,6	n.a.
Cd	ISO 6353-1 GM 29 See 5.3.3.2	AAS	228,8	air-acetylene
Cr	ISO 6353-1 GM 29 See 5.3.3.2	AAS	357,8	air-acetylene
Pb	ISO 6353-1 GM 29 See 5.3.3.2	AAS	217,0 or 283,3	air-acetylene
Ni	ISO 6353-1 GM 29 See 5.3.3.2	AAS	232,0	oxidising air-acetylene
Se	See 5.3.3.3	Hydride AAS	196,0	n.a.
Hg	In accordance with ISO 5993	flameless AAS	253,6	n.a.
AAS Atomic absorption spectrometry n.a. not applicable.				

5.3.3.2 Determination of cadmium (Cd), chromium (Cr), lead (Pb) and nickel (Ni)

5.3.3.2.1 Principle

The elements cadmium (Cd), chromium (Cr), lead (Pb) and nickel (Ni) are determined using atomic absorption spectrometry with standard additions method in taking account of ISO 6353-1.

5.3.3.2.2 Reagents

All reagents shall be of a recognised analytical grade and the water used shall conform to the grade 3 specified in EN ISO 3696.

5.3.3.2.2.1 Standard solution (100 µg/l Cd, Cr, Pb or Ni)

The standard solution shall be freshly prepared on the day of use by individual dilution of a stock solution. This stock solution with an Cd, Cr, Pb or Ni content of at least 1 mg/l shall be made by dilution of standard solutions of Cd, Cr, Pb and Ni which are available from all major suppliers of laboratory chemicals. This stock solution shall be kept in containers of tetrafluoroethylene-hexafluoropropylene copolymer (FEP), polytetrafluoroethylene (PTFE) or polyethylene (PE).

The stock solution should not be kept for longer than four weeks.

5.3.3.2.3 Apparatus

Ordinary laboratory apparatus and the following:

5.3.3.2.3.1 Atomic absorption spectrometer with the measurement parameters specified in Table 3.

5.3.3.2.4 Procedure

5.3.3.2.4.1 Test portion

Weigh 1 g to the nearest 0,01 mg of the laboratory sample into a 100 ml one-mark volumetric flask and make up to the mark at 20 °C with water.

5.3.3.2.4.2 Determination

The reference solutions shall be made by spiking the sample with the standard solutions, which contain stepwise increasing contents of the elements to be determined.

NOTE The amount of internal standard to be added can be estimated from a preliminary investigation, determining roughly the element content of the test sample from simple calibration.

The steps in which internal standards are added shall be at least as high as the estimated content of the test sample. With the spectrometer (5.3.3.2.3.1), carry out the measurement with the parameters specified in Table 3 in accordance with the manufacturer's instructions.

Repeat the procedure with all reagents and the same volume of standard solution to be added using water in place of the sample as a blank determination.

5.3.3.2.5 Expression of results

Prepare a calibration curve using the measured absorbencies of the spiked measurement solutions.

Read the concentration of each element in the test solution by extrapolation of the correlation line to absorbance A = 0 (see Figure 1). Similarly determine the element concentration of the blank solution (see Figure 2) and subtract from the result obtained for the test solution.

Alternatively, the evaluation may be carried out by linear regression. Additional dilution steps shall be compensated in the calculation.

This interim result (y) expressed in micrograms per litre which is converted to give the final concentration according to 5.3.3.2.6.

5.3.3.2.6 Calculation

From the interim result (y) determined (see 5.3.3.2.5) the content, W_3, of each element in the laboratory sample, expressed in milligrams per kilogram of 100 % hexafluorosilicic acid is given by the following formula:

$$W_3 = \frac{\mathrm{y} \times V_3 \times 100 \times 1000}{m_2 \times W_1} \tag{3}$$

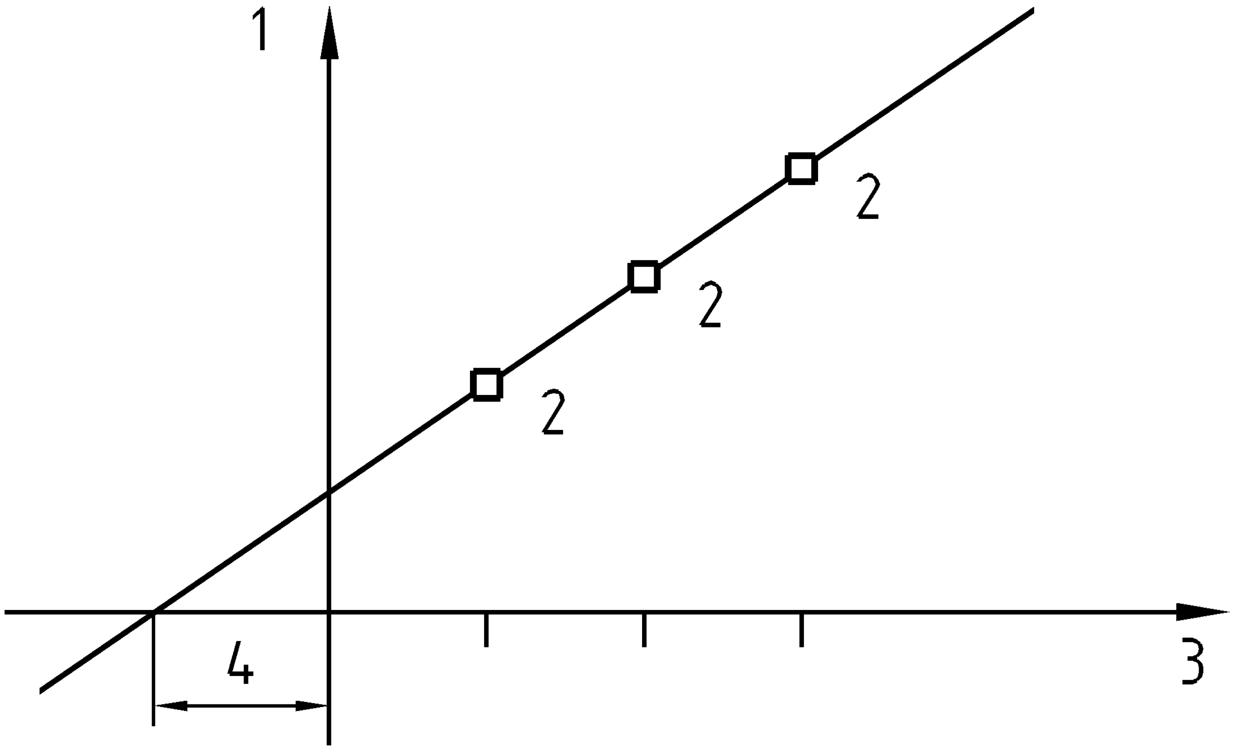
where

y is the interim result (5.3.3.2.5);

V_3 is the volume, expressed in millilitres, of the test solution;

m_2 is the mass, expressed in grams, of the test portion;

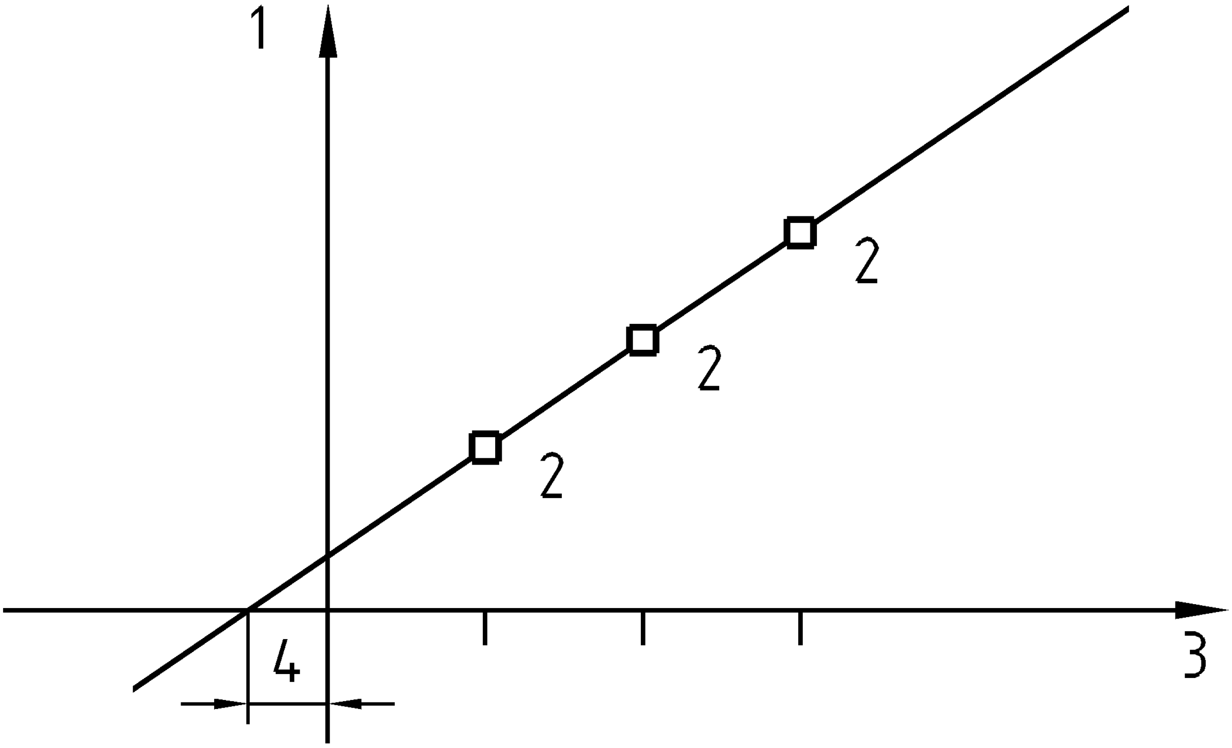
W_1 is the content, expressed in mass fraction in % of hexafluorosilicic acid (see 5.3.1.5.1).



Key

1 absorbance A
2 spiking
3 concentration of added standard in micrograms per litre
4 concentration in the test solution in micrograms per litre

Figure 1 — Calculation of the element concentration in the test solution



Key

1 absorbance A
2 spiking
3 concentration of added standard in micrograms per litre
4 concentration in the blank solution in micrograms per litre

Figure 2 — Calculation of the element concentration in the blank solution

5.3.3.3 Determination of arsenic (As), antimony (Sb) and selenium (Se)

5.3.3.3.1 Principle

The elements arsenic, antimony, and selenium are determined by hydride-atomic absorption spectrometry. The elements are reduced by reducing agents (sodium borohydride ($NaBH_4$)) to form the hydrides. These volatile compounds flow through the heated measuring cuvette of an atomic absorption spectrometer where the content of the individual element is determined.

5.3.3.3.2 Reagents

5.3.3.3.2.1 Hydrochloric acid, high purity analytical grade, 30 % (m/m), density ρ = 1,15 g/ml.

5.3.3.3.2.2 Preliminary reduction agent:

Dissolve 10 g sodium iodide and 100 g ascorbic acid, in 1 000 ml of water.

5.3.3.3.2.3 Reduction solution:

Dissolve in water $NaBH_4$ and NaOH in concentrations specified in the manufacturer's handbook for the spectrometer.

5.3.3.3.2.4 **Standard solution** (100 µg/l As, Sb or Se):

The standard solution shall be freshly prepared on the day of use by individual dilution of a stock solution. This stock solution with an As, Sb or Se content of at least 1 mg/l shall be made by dilution of standard solutions of Se, As and Sb which are available from all major suppliers of laboratory chemicals. This stock solution shall be kept in containers of tetrafluoroethylene-hexafluoropropylene copolymer (FEP), polytetrafluorethylene (PTFE) or polyethylene (PE).

The stock solution should not be kept for longer than four weeks.

5.3.3.3.3 Apparatus

5.3.3.3.3.1 **Three one-mark volumetric flasks**, 1 000 ml

5.3.3.3.3.2 **Nine one-mark volumetric flasks**, 10 ml

5.3.3.3.3.3 **Pipettes** 5ml, 10 ml, and 100 ml

5.3.3.3.3.4 **Micropipettes**, volume adjustable to maximum 500 µl

5.3.3.3.3.5 **Atomic absorption spectrometer** with the measurement parameters specified in Table 3.

The width of the slit, the measuring time, flushing with argon before and after the measurement and the reaction time shall be adjusted in accordance with the manufacturer's instructions. The background compensation shall be activated for the measurement of As and Sb, but not for the measurement of Se.

5.3.3.3.4 Procedure

For As (procedure for Sb and Se in parentheses if different from As procedure):

Weigh a test portion of 0,5 g to the nearest 0,1 mg and transfer it into a 1 000 ml one-mark volumetric flask (5.3.3.3.3.1) and make up to the mark at 20 °C with water. Pipette 10 ml (Sb, Se:100 ml) of this solution into a 1 000 ml one-mark volumetric flask and add 5 ml of HCl (5.3.3.3.2.1) and 5 ml of preliminary reduction agent (5.3.3.3.2.2). Do not add preliminary reduction agent to the flasks for Sb and Se determination. Allow 3 h for reaction to occur and fill to the mark with water. Pipette 5 ml of this solution into three 10 ml one-mark volumetric flasks (5.3.3.3.3.2) labelled A,B,C. Add 0,8 ml of HCl (5.3.3.3.2.1) to each flask. For the purpose of internal calibration add those quantities of standard solutions (5.3.3.3.2.4) as given in Table 4 to the flasks B and C.

With the spectrometer (5.3.3.3.3.5), carry out the measurement with addition of the reduction agent (5.3.3.3.2.3) and the parameters of measurement in accordance with the manufacturer's instructions for the spectrometer.

Repeat the procedure with all reagents and the same volume of standard solution to be added using water in place of the sample as a blank determination.

Table 4 — Standard solution

	Volume of standard solution to be added		
	As	Sb	Se
Flask B	200 µl	100 µl	200 µl
Flask C	500 µl	200 µl	500 µl

5.3.3.3.5 Expression of results

See 5.3.3.2.5.

5.3.3.3.6 Calculation

See 5.3.3.2.6.

6 Labelling - Transportation - Storage

6.1 Means of delivery

Hexafluorosilicic acid shall be delivered in suitable containers (not glass), e.g. polytetrafluoroethylene (PTFE) coated drums.

In order that the purity of the product is not affected, the means of delivery shall not have been used previously for any different product or it shall have been specially cleaned and prepared before use.

6.2 Labelling according to the EU legislation[4]

The following labelling requirements shall apply to hexafluorosilicic acid at the date of publication of this European Standard.

For concentrations of hexafluorosilicic acid above mass fraction 10 %:

Pictograms	
 **Figure 3 — GHS 05**	— Signal word : Danger — Hazard statements : H 314 Causes severe skin burns and eye damage

NOTE The regulation [2], and its amendments for the purposes of its adaptation to technical and scientific progress, contains a list of substances classified by the EU. Substances not listed in this regulation can be classified on the basis of their intrinsic properties according to the criteria in the regulation by the person responsible for the marketing of the substance.

6.3 Transportation regulations and labelling

Hexafluorosilicic acid is listed as UN Number[5] 1778.

- RID[6] /ADR[7]: class 8, classification code C1, packing group II.

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[4] See [2].

[5] United Nations Number.

[6] Regulations concerning International carriage of Dangerous Goods by rail.

[7] European Agreement concerning the International carriage of Dangerous Goods by road.

- IMDG[8]: class 8, packing group II.
- IATA[9]: class 8, packing group II.

6.4 Marking

The marking shall include the following:

- name "hexafluorosilicic acid", trade name;
- net mass;
- name and the address of supplier and/or manufacturer;
- statement "this product conforms to EN 12175".

6.5 Storage

6.5.1 Long term stability

The product is stable when stored in tightly closed containers in a cool well-ventilated place.

Hexafluorosilicic acid solutions of concentrations greater than mass fraction 22 % are less stable than those of lower concentration.

6.5.2 Storage incompatibilities

The product shall be kept away from metals, (e.g. steel, nickel, aluminium), glass, acids and alkalis.

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[8] International Maritime Transport of Dangerous Goods.

[9] International Air Transport Association.

Annex A
(informative)

General information on hexafluorosilicic acid

A.1 Origin

A.1.1 Raw materials

Hexafluorosilicic acid is manufactured from compounds and minerals containing both fluoride and silica (e.g. fluorite, apatite) and an acid (usually sulfuric acid).

A.1.2 Manufacturing process

The compounds and minerals containing fluoride are reacted with the acid.

A.2 Use

A.2.1 Function

Hexafluorosilicic acid is used for the fluoridation of drinking water to increase the resistance of consumers to dental decay.

A.2.2 Form in which it is used

Hexafluorosilicic acid is used as an aqueous solution either as supplied or diluted with potable water.

A.2.3 Treatment dose

A typical dose of hexafluorosilicic acid of mass fraction 20 % is 6,3 mg/l to achieve a final concentration of 1 mg/l as F^- in the drinking water. It is important to avoid overdosing. In the EU Directive 98/83/EC, the parameter value is 1,5 mg/l of fluoride.

A.2.4 Means of application

It is usually applied using a metering pump.

A.2.5 Secondary effects

None.

A.2.6 Removal of excess product

It is practically impossible to remove excess product.

Annex B
(normative)

General rules relating to safety

B.1 Rules for safe handling and use

The supplier shall provide current safety instructions.

NOTE H_2SiF_6 attacks glass; goggles are made of plastics or rubber.

B.2 Emergency procedures

B.2.1 First aid

Immediately remove all contaminated clothing.

In case of contact with the skin, wash immediately with plenty of water. Apply calcium gluconate gel to the affected area, rub in until locally free of pain and then continue for a further 15 min. Apply a dressing soaked with mass fraction of 20 % calcium gluconate solution.

If burns cover large areas, the patient shall be completely bathed in a calcium gluconate solution with a mass fraction of at least 1 %.

In case of contact with eyes, treat by irrigation with water with the eyelids held open. Consult a doctor (or eye specialist) immediately.

In case of inhalation, take six effervescent calcium pills (400 mg calcium per pill) dissolved in water.

In case of ingestion, immediately swallow a large quantity of calcium gluconate solution.

In all cases, obtain medical treatment as soon as possible.

B.2.2 Spillage

Confine any spillage with dry sand and cover with a suitable absorption agent. Trap escaping gases/vapours by spraying with water.

Do not empty into drains.

B.2.3 Fire

There is a risk of the container bursting if exposed to heat from a near by fire. In case of fire fighting, respirators are necessary.

There are no restrictions on extinguishing media in fire situations.

Bibliography

[1] 98/83/EC: Council Directive of 3 November 1998 on the quality of water intended for human consumption

[2] Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH)

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