

BS EN 12120:2012



BSI Standards Publication

# Chemicals used for treatment of water intended for human consumption — Sodium hydrogen sulfite

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**National foreword**

This British Standard is the UK implementation of EN 12120:2012. It supersedes BS EN 12120:2005 which is withdrawn.

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

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English Version

## Chemicals used for treatment of water intended for human consumption - Sodium hydrogen sulfite

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

Produkte zur Aufbereitung von Wasser für den menschlichen Gebrauch - Natriumhydrogensulfid

This European Standard was approved by CEN on 23 September 2012.

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## Foreword

This document (EN 12120:2012) 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of an identical text or by endorsement, at the latest by May 2013, and conflicting national standards shall be withdrawn at the latest by May 2013.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 12120:2005.

The significant technical differences between this edition and EN 12120:2005 are as follows:

- Modification of 6.2 on labelling, deletion of the reference to EU Directive 80/778/EEC of 15 July 1980 in order to take account of the latest Directive in force.

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 European Standard:

- a) this European 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.

NOTE Conformity with this European Standard 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 European Standard is subject to regulation or control by National Authorities.

## 1 Scope

This European Standard is applicable to sodium hydrogen sulfite used for treatment of water intended for human consumption. It describes the characteristics of sodium hydrogen sulfite and specifies the requirements and the corresponding test methods for sodium hydrogen sulfite. It gives information on its use in water treatment.

## 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 418, *Photography — Processing chemicals — Specifications for anhydrous sodium sulfite*

ISO 3165, *Sampling of chemical products for industrial use — Safety in sampling*

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*

ISO 9297, *Water quality — Determination of chloride — Silver nitrate titration with chromate indicator (Mohr's method)*

ISO 22743, *Water quality — Determination of sulphates — Method by continuous flow analysis (CFA)*

## 3 Description

### 3.1 Identification

#### 3.1.1 Chemical name

Sodium hydrogen sulfite.

#### 3.1.2 Synonym or common name

Sodium bisulfite.

#### 3.1.3 Relative molecular mass

104,6.

#### 3.1.4 Empirical formula

NaHSO<sub>3</sub>.

### 3.1.5 Chemical formula

NaHSO<sub>3</sub>.

### 3.1.6 CAS-Registry Number <sup>1)</sup>

7631-90-5.

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

231-548-0.

## 3.2 Commercial form

The product is an aqueous solution with an usual concentration of approximately a mass fraction of 40 % NaHSO<sub>3</sub>. This corresponds to 520 g NaHSO<sub>3</sub> per litre.

## 3.3 Physical properties

### 3.3.1 Appearance and odour

The product is a yellowish liquid with a slight odour of sulfur dioxide.

### 3.3.2 Density

The density of the product is 1,3 g/ml to 1,5 g/ml at 20 °C.

### 3.3.3 Solubility (in water)

The product is miscible with water.

### 3.3.4 Vapour pressure

The vapour pressure of a solution of mass fraction of 40 % NaHSO<sub>3</sub> is 4 kPa <sup>3)</sup> at 20 °C.

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

The product decomposes at 100 °C.

### 3.3.6 Crystallisation point

A solution of mass fraction of 40 % NaHSO<sub>3</sub> crystallises at 2 °C.

### 3.3.7 Specific heat

The specific heat of the product is 3,15 kJ/(kg K).

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1) Chemical Abstracts Service Registry Number.

2) European Inventory of Existing Commercial Chemical Substances.

3) 100 kPa = 1 bar.



### 3.3.8 Viscosity dynamic

The viscosity of a solution of mass fraction of 40 % NaHSO<sub>3</sub> is 4 mPa.s at 25 °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

The solution is weakly acid. The pH value of a commercial solution of mass fraction of 40 % is between 4,5 and 5,0.

NaHSO<sub>3</sub> exists in solution only; if the solution is evaporated the salt which is formed is sodium disulfite.

At elevated temperatures (> 100°C) sulfur dioxide is generated.

Sodium hydrogen sulfite reacts violently with oxidising agents; e.g. with sodium hypochlorite or hydrogen peroxide.

## 4 Purity criteria

### 4.1 General

This European Standard specifies the minimum purity requirements for sodium hydrogen sulfite 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 product standard.

Limits have been given for impurities and chemical 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 leads 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 commercial product has a concentration of NaHSO<sub>3</sub> of approximately 520 g/l, which relates to a content of mass fraction of 40 % NaHSO<sub>3</sub>, corresponding to a mass fraction of 25 % SO<sub>2</sub>.

The concentration of sodium hydrogen sulfite shall be within ± 5 % of the manufacturer's declared value.

### 4.3 Impurities and main by-products

The sum of the content of sodium sulfate and sodium chloride shall not exceed a mass fraction of 5 % of the commercial product, i.e. solution of mass fraction of 40 % NaHSO<sub>3</sub>.

### 4.4 Chemical parameters

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

**Table 1 — Chemical parameters**

Parameter		Limit
		mg/kg of commercial product (mass fraction of 40 % NaHSO <sub>3</sub> )
Antimony (Sb)	max	1
Arsenic (As)	max	1
Cadmium (Cd)	max	1
Chromium (Cr)	max	1
Lead (Pb)	max	5
Mercury (Hg)	max	1
Nickel (Ni)	max	1
Selenium (Se)	max	1
NOTE Other chemical parameters and indicator parameters are not relevant in sodium hydrogen sulfite because the raw materials used in the manufacturing process are free of them. For parametric values of sodium hydrogen sulfite on trace metal content in drinking water, see [1].		

## 5 Test methods

### 5.1 Sampling

#### 5.1.1 General

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

#### 5.1.2 Sampling from drums and bottles

##### 5.1.2.1 General

**5.1.2.1.1** 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.

**5.1.2.1.2** 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 5.1.2.1.3.

**5.1.2.1.3** Examine the surface of the liquid. If there are signs of surface contamination, take samples from the surface as described in 5.1.2.2. Otherwise, take samples as described in 5.1.2.3.

#### **5.1.2.2 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 just 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.

#### **5.1.2.3 Bottom sampling**

Take a sample using an open sampling tube, or a bottom-valve sampling tube, suited to the size of container and the viscosity of the liquid.

When using an open sampling tube, close it at the top and then lower the bottom end to the bottom of the container. Open the tube and move it rapidly so that the bottom of the tube traverses the bottom of the container before the tube is filled. Close the tube, withdraw it from the container and allow any liquid adhering to the outside of the tube to drain off.

When using a bottom-valve sampling tube, close the valve before lowering the tube into the container and then proceed in a similar manner to that when using an open sampling tube.

#### **5.1.3 Sampling from tanks and tankers**

From each access point, take samples as follows:

- a) from the surface of the liquid, using a ladle as described in 5.1.2.2;
- b) from the bottom of the tank or tanker, using a sampling tube as described in 5.1.2.3 or using a 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.

### **5.2 Analyses**

#### **5.2.1 General**

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

#### **5.2.2 Main product**

##### **5.2.2.1 General**

The sodium hydrogen sulfite content shall be determined by the method for sodium sulfite described in ISO 418.

NOTE Both methods, direct titration and back titration, can be used.

### 5.2.2.2 Back titration method

#### 5.2.2.2.1 Principle

Sodium hydrogen sulfite is oxidised with a fixed volume of iodine. The excess of added iodine is titrated with sodium thiosulfate. The determination includes other sulfites in addition to NaHSO<sub>3</sub>.

#### 5.2.2.2.2 Calculation

The sodium hydrogen sulfite content  $C_1$ , expressed as a mass fraction in %, is given by the following formula:

$$C_1 = \frac{5,2 ((50 \times c_3) - (V \times c_2))}{m} \quad (1)$$

where

$c_3$  is the actual concentration, in moles per litre, of the iodine solution;

$c_2$  is the actual concentration, in moles per litre, of the sodium thiosulfate solution;

$V$  is the volume, in millilitres, of the sodium thiosulfate solution used for the titration;

5,2 is a conversion factor for the mass of sodium hydrogen sulfite equivalent to 1 mole of iodine (i.e. 52,0) × the conversion factor for millilitres to litres, (i.e. 0,001) × 100 (for percentage);

50 is the volume, in millilitres, of the iodine solution added for total oxidation;

$m$  is the mass, in grams, of the test portion.

### 5.2.2.3 Direct titration method

#### 5.2.2.3.1 Principle

Sodium hydrogen sulfite is titrated with iodine. The consumption of iodine indicates the content of sulfites. The determination includes other sulfites in addition to NaHSO<sub>3</sub>.

#### 5.2.2.3.2 Calculation

The sodium hydrogen sulfite content  $C_1$ , expressed as a mass fraction in %, is given by the following formula:

$$C_1 = 5,2 \left( \frac{c_3 \times V_1}{m} \right) \quad (2)$$

where

$c_3$  is the actual concentration, in moles per litre, of the iodine solution;

$m$  is the mass, in grams, of the test portion;

$V_1$  is the volume in millilitres, of the iodine solution used for the titration;

5,2 is a conversion factor for the mass of sodium hydrogen sulfite equivalent to 1 mole of iodine (i.e. 52,0) × the conversion factor for millilitres to litres, (i.e. 0,001) × 100 (for percentage).

### 5.2.3 Impurities

#### 5.2.3.1 Sulfate

The sulfate content shall be determined in accordance with ISO 22743.

#### 5.2.3.2 Chloride

The chloride content shall be determined in accordance with ISO 9297.

### 5.2.4 Chemical parameters

#### 5.2.4.1 General

The content of chemical parameters shall be determined using the procedures specified in Table 2.

**Table 2 — Procedures for the determination of chemical parameters**

Element	Reference	Method	Wavelength nm	Flame
As	see 5.2.4.3	Hydride AAS	193,7	n.a.
Sb	see 5.2.4.3	Hydride AAS	217,6	n.a.
Cd	ISO 6353-1 GM 29 See 5.2.4.2	AAS	228,8	air-acetylene
Cr	ISO 6353-1 GM 29 See 5.2.4.2	AAS	357,8	air-acetylene
Pb	ISO 6353-1 GM 29 See 5.2.4.2	AAS	217,0 or 283,3	air-acetylene
Ni	ISO 6353-1 GM 29 See 5.2.4.2	AAS	232,0	oxidising air-acetylene
Se	see 5.2.4.3	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.

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

##### 5.2.4.2.1 General

The content of Cd, Cr, Pb and Ni shall be determined taking into account ISO 6353-1, modified as described in 5.2.4.2.2.

##### 5.2.4.2.2 Procedure

The elements Cd, Cr, Pb and Ni shall be determined using the standard addition method. The reference solutions shall be made by spiking the sample with standard solutions, which contain step-wise increasing contents of the elements to be determined. 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.

Carry out a blank determination by repeating the procedure using the same quantities of all reagents but omitting the test sample.

#### 5.2.4.2.3 Expression of results

Determine the correlation line by plotting the measured absorbencies of the spiked measurement solutions in relation to the element content. The spiked measurement solutions are produced by adding defined quantities of element to the measurement solution. They contain stepwise increasing contents of the elements to be determined.

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 can be carried out by linear regression. Additional dilution steps shall be compensated in the calculation.

This interim result ( $y$ ) expressed in micrograms per litre needs to be converted to give the final concentration according to the formula in 5.2.4.2.4.

#### 5.2.4.2.4 Calculation

From the interim result ( $y$ ) determined (see 5.2.4.2.3) the content,  $C_2$ , of each element in the laboratory sample, expressed in milligrams per kilogram of sodium hydrogen sulfite is given by the following formula:

$$C_2 = \frac{y \times V \times 100 \times 1\,000}{m \times C_1} \quad (3)$$

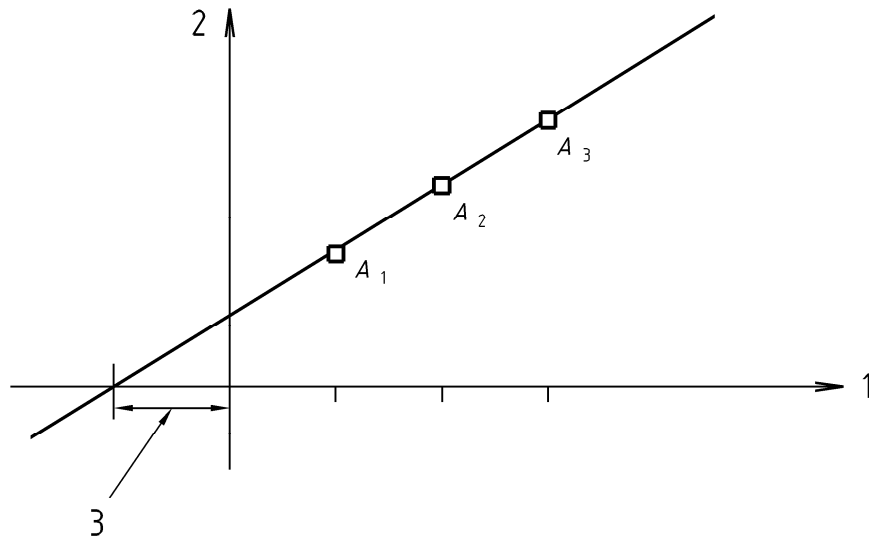
where

$y$  is the interim result (5.2.4.2.3);

$V$  is the volume, expressed in millilitres, of the test solution;

$m$  is the mass, expressed in grams, of the test portion;

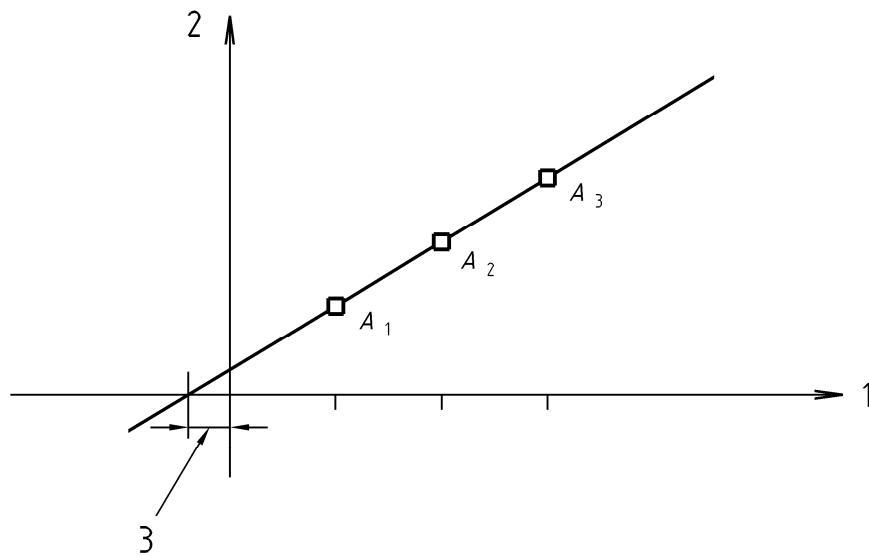
$C_1$  is the content, expressed in mass fraction in %, of sodium hydrogen sulfite (see 5.2.2.2.2).



**Key**

- 1 concentration of added standard in micrograms per litre
- 2 absorbance A
- 3 concentration in the test solution in micrograms per litre
- $A_1; A_2; A_3$  spiking

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



**Key**

- 1 concentration of added standard in micrograms per litre
- 2 absorbance A
- 3 concentration in the blank solution in micrograms per litre
- $A_1; A_2; A_3$  spiking

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

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

#### 5.2.4.3.1 Principle

The elements arsenic, antimony, and selenium are determined by hydride-atomic absorption spectrometry. The elements are reduced by sodium borohydride ( $\text{NaBH}_4$ ) 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.

#### 5.2.4.3.2 Reagents

**5.2.4.3.2.1 Hydrochloric acid**, high purity analytical grade, mass fraction 30 %, density  $\rho = 1,15$  g/ml.

**5.2.4.3.2.2 Preliminary reduction agent.**

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

**5.2.4.3.2.3 Reduction agent.**

Dissolve in water  $\text{NaBH}_4$  and NaOH in concentrations specified in the manufacturer's handbook for the spectrometer.

**5.2.4.3.2.4 Standard solution** (100  $\mu\text{g/l}$  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.

#### 5.2.4.3.3 Apparatus

Ordinary laboratory apparatus and:

**5.2.4.3.3.1 One one-mark volumetric flasks**, 100 ml.

**5.2.4.3.3.2 Nine one-mark volumetric flasks**, 10 ml.

**5.2.4.3.3.3 Pipettes**, 2,5 ml, 5 ml, 10 ml, and 20 ml.

**5.2.4.3.3.4 Three one-mark volumetric flasks**, 50 ml.

**5.2.4.3.3.5 Micropipettes**, volume adjustable to maximum 500  $\mu\text{l}$ .

**5.2.4.3.3.6 Atomic absorption spectrometer** with the measurement parameters specified in Table 2.

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.

#### 5.2.4.3.4 Procedure

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



Weigh a test portion of 1 g to the nearest 0,1 mg and transfer it into a 100 ml one-mark volumetric flask and make up to the mark at 20 °C with water. Pipette 10 ml (Sb, Se: 20 ml) of this solution into a 50 ml one-mark volumetric flask and add 5 ml of HCl and 5 ml of preliminary reduction agent. 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 2,5 ml (Se: 5 ml) of this solution into three 10 ml one-mark volumetric flasks labelled A, B, C. Add 0,8 ml of HCl (5.2.4.3.2.1) to each flask. For the purpose of internal calibration, add those quantities of standard solutions as given in Table 3 to the flasks B and C. Using the spectrometer (5.2.4.3.3.6) carry out the measurement with the addition of the reduction agent (5.2.4.3.2.3) and the parameters of measurement in accordance with the manufacturer's instructions for the spectrometer.

Carry out a blank determination by repeating the procedure using the same quantities of all reagents but omitting the test sample.

**Table 3 — Standard solution**

	Volume of standard solution to be added		
	As	Sb	Se
Flask B	50 µl	100 µl	200 µl
Flask C	100 µl	200 µl	500 µl

#### 5.2.4.3.5 Expression of results

See 5.2.4.2.3.

#### 5.2.4.3.6 Calculation

See 5.2.4.2.4.

## 6 Labelling — Transportation — Storage

### 6.1 Means of delivery

Sodium hydrogen sulfite shall be delivered in sealed drums or plastic containers.

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 <sup>4)</sup>

No labelling requirement applies to sodium hydrogen sulfite at the date of the publication of this European Standard.

The legislation [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 should 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

Sodium hydrogen sulfite is listed as UN Number <sup>5)</sup> 2693

4) See [2].

RID <sup>6)</sup>/ADR <sup>7)</sup>: class 8, classification code C1, packing group III.

IMDG <sup>8)</sup>: class 8, packing group III.

IATA <sup>9)</sup>: class 8, packing group III.

## 6.4 Marking

The marking shall include the following:

- name "sodium hydrogen sulfite", trade name and grade;
- net mass;
- name and the address of supplier and/or manufacturer;
- statement "this product conforms to EN 12120".

## 6.5 Storage

### 6.5.1 Long term stability

The product is stable when stored in containers in a cool and dry place.

### 6.5.2 Storage incompatibilities

The product shall be kept away from acids, such as hydrochloric acid and sulfuric acid, to avoid the risk of sulfur dioxide evolution.

The product shall be kept away from oxidising substances, such as sodium hypochlorite, hydrogen peroxide.

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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.

8) International Maritime Transport of Dangerous Goods.

9) International Air Transport Association.

## **Annex A** (informative)

### **General information on sodium hydrogen sulfite**

#### **A.1 Origin**

##### **A.1.1 Raw materials**

The sodium hydrogen sulfite is manufactured from sulfur dioxide and sodium hydroxide.

##### **A.1.2 Manufacturing process**

Aqueous sodium hydroxide is treated with sulfur dioxide to produce sodium hydrogen sulfite solution.

#### **A.2 Use**

##### **A.2.1 Function**

Sodium hydrogen sulfite is used as a reducing agent to remove excess chlorine, chlorine dioxide or ozone in the drinking water.

##### **A.2.2 Form in which it is used**

Sodium hydrogen sulfite is used as the commercial product (aqueous solution with contents of mass fraction of 40 %).

##### **A.2.3 Treatment dose**

The treatment dose depends on the content of oxidants in the water, e.g. for chlorine in water the stoichiometric dose is 1,5 mg of  $\text{NaHSO}_3$  (= 3,74 g of commercial product with a mass fraction of 40 % for 1 mg of  $\text{Cl}_2$ ), but in practice an excess over the stoichiometric dose can be required.

##### **A.2.4 Means of application**

It is usually applied using a metering pump.

##### **A.2.5 Secondary effects**

The use of sodium hydrogen sulfite increases the content of sodium and sulfate.

##### **A.2.6 Removal of excess product**

The excess product is removed by oxidation.

### **A.3 Rules for safe handling and use**

The supplier should provide current safety instructions.

### **A.4 Emergency procedures**

#### **A.4.1 First aid**

In case of contact with the skin, it is recommended to wash immediately with plenty of water.

In case of contact with the eyes, it is recommended to treat by irrigation with plenty of water, with the eyelids held open.

In case of ingestion, it is recommended to seek immediately medical advice.

#### **A.4.2 Spillage**

It is recommended to remove any spillage by means of inert absorbent material.

Any remaining product can be flushed away with plenty of water to which an oxidising agent is added.

#### **A.4.3 Fire**

The product is not combustible.

Decomposition can be caused by fire with release of sulfur dioxide. It is recommended to wear suitable respiratory equipment.

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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