DEAS 1362: 2026

ICS 71.100.80

DRAFT EAST AFRICAN STANDARD

Sodium hypochlorite solution for water treatment — Specification

EAST AFRICAN COMMUNITY

First Edition 2026

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Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

The Community has established an East African Standards Committee (EASC) mandated to develop and issue East African Standards (EAS). The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the public and private sector organizations in the community.

East African Standards are developed through Technical Committees that are representative of key stakeholders including government, academia, consumer groups, private sector and other interested parties. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the Principles and procedures for development of East African Standards.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

The committee responsible for this document is Technical Committee EASC/TC 069, *Organic and Inorganic chemicals.*

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

Sodium hypochlorite solution for water treatment — Specification

1 Scope

This Draft East African Standard specifies requirements, sampling and test methods for sodium hypochlorite solution used for water treatment intended for human consumption.

This standard does not apply to sodium hypochlorite solutions used for general disinfecting and bleaching.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3696, *Water for analytical laboratory use — Specification and test method*

ISO 5961, *Water quality — Determination of cadmium by atomic absorption spectrometry*

ISO 6333, *Water quality — Determination of manganese — Formaldoxime spectrometric method*

ISO 8288, *Water quality — Determination of cobalt, nickel, copper, zinc, cadmium and lead — Flame atomic absorption spectrometric methods*

ISO 9174, *Water quality — Determination of chromium — Atomic absorption spectrometric methods*

ISO 11969, *Water quality — Determination of arsenic — Atomic absorption spectrometric method (hydride technique)*

ISO 12846, *Water quality — Determination of mercury — Method using atomic absorption spectrometry (AAS) with and without enrichment*

ISO/TS 17379, *Water quality — Determination of selenium — Part 2: Method using hydride generation atomic absorption spectrometry (HG-AAS)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

water intended for human consumption
all water either in its original state or after treatment, intended for drinking, cooking, food preparation or other domestic purposes, regardless of its source and whether it is supplied from a distribution network, or any other suitable containers

4 Requirements

4.1 General requirements

4.1.1 Sodium hypochlorite solution for water treatment shall be:

a) slightly yellow or slightly cloudy liquid;

b) free from visible particles; and

c) miscible in all proportions with water

4.1.2 Sodium hypochlorite solution for water treatment shall contain no soluble mineral or organic substances in a quantity that would be deleterious or injurious to anyone consuming water disinfected with acceptable quantities of the hypochlorite.

4.2 Specific requirements

Sodium hypochlorite solution for water treatment shall comply with the requirements specified in Table 1 when tested in accordance with the test methods therein.

Table 1 — Specific requirements for sodium hypochlorite solution for water treatment

S/N	Characteristic	Requirement	Test method
i.	Available chlorine content, %m /v, min.	10	Annex A
ii.	Total free alkali (as NaOH),% w/v, max.	1.2	Annex B
iii.	Insoluble matter, % m/m, max.	0.15	Annex C
iv.	pH neat	9 – 12	Annex D
v.	Manganese, (as Mn)	10	ISO 6333

4.3 Heavy metal contaminants

Sodium hypochlorite solution for water treatment shall comply with the limits specified in Table 2 when tested in accordance with the test methods therein.

Table 2 — Heavy metal contaminants for sodium hypochlorite solution for water treatment

S/N	Heavy metal	Maximum limit[a] mg/kg	Test method
i.	Iron (as Fe)	0.4	ISO 6332
ii.	Lead (as Pb)	10	ISO 8288
iii.	Arsenic (as As)	10	ISO 11969
iv.	Mercury (as Hg)	1	ISO 12846
v.	Cadmium, (as Cd)	3	ISO 5961
vi.	Chromium Total, (as Cr)	10	ISO 9174
vii.	Manganese, (as Mn)	10	ISO 6333
viii.	Selenium, (as Se)	10	ISO/TS 17379

a conversion from mg/l to mg/kg = $\frac{mg/L}{Density\ in\ kg/L}$

5 Packaging

Sodium hypochlorite solution for water treatment shall be packaged in suitable well-sealed containers that shall protect the contents and shall not cause any contamination or react with the product

6. Labelling

6.1 Each package shall be legibly and indelibly labelled in English and/or any other official language (French, Kiswahili, etc) used in the importing East African Partner State with the following information:

a) product name as “Sodium hypochlorite solution;

b) name and physical address of manufacturer;

c) net volume of the contents;

d) batch or code number;

e) nominal available chlorine content;

f) date of manufacture;

g) expiry date;

h) instruction for use and handling;

i) first aid instructions;

j) words “STORE IN A COOL DRY PLACE AWAY FROM DIRECT SUNLIGHT”

k) purpose of the product as “for water treatment” and

l) disposal instructions

6.2 The product shall also be labelled with appropriate safety symbols as specified in Globally Harmonized System of Classification and Labelling of Chemicals.

7. Sampling

Sampling shall be done in accordance with Annex E

Annex A
(normative)

Determination of available chlorine content

A.1 Summary of method

The sample is added to an acidified solution of potassium iodide and the released iodine is titrated with standard sodium thiosulphate solution to the usual starch end point.

A.2 Reagents

A.2.1 **Acetic aci**d, glacial.

A.2.2 **Potassium iodide** (KI), crystals, iodate free.

A.2.3 Sodium thiosulphate ($Na_2S_2O_35H_20$), Standard solution (0.1N).

A.2.3.1 Dissolve 25 g of Na_2SO_3 crystals in freshly boiled and cooled water and dilute to 1 L. The solution is more stable if the glass ware is cleaned with sulphuric-chromic acid and thoroughly rinsed with water. Standardize against potassium iodate (KIO_3) as follows: Weigh out accurately 3.567 g of dry KIO_3 and transfer to a 1 L volumetric flask.

A.2.3.2 Dissolve with water, make up to the mark and mix thoroughly. This solution will be exactly 0.1000 N. To standardize the Na_2SO_3 solution, carefully pipette a 50 mL aliquot of the KIO3 solution into a 250 mL Erlenmeyer flask and dilute to 100 mL with water. Add 1 g of KI crystals. When it is dissolved, add 15 mL of 1.0 N hydrochloric acid and titrate immediately with the $Na_2S_2O_3$ solution. When the solution becomes light yellow, add 1 mL of starch indicator solution and complete the titration to the disappearance of the blue colour. Standardize at least monthly. Calculate the normality of the $Na_2S_2O_3$ solution as follows.

$$\text{Normality, } N_1 = \frac{50 \times 0.1}{A}$$

where

A is the value of $Na_2S_2O_3$ solution required for titration of KIO_3 solution, mL

N_1 is normality of the $Na_2S_2O_3$

A.2.4 Mix 0.5 g of soluble starch with 5 mL of cold water and add to 95 mL of boiling water. Mix, cool and store in a sterilized bottle. Replace frequently or add 0.1% salicylic acid to minimize deterioration.

A.3 Procedure

Dissolve 2 g to 3 g of KI crystals to 50 mL of water in a 250 mL Erlenmeyer flask. Add 10 ml of acetic acid. Then pipette the aliquot of sample into the solution keeping the tip of the pipette beneath the surface of the solution until drained. Titrate at once with 0.1 *N* $Na_2S_2O_3$ solution until the iodine colour is nearly gone then add 1 mL of starch indicator solution and complete the titration to the disappearance of the blue colour. Record the titration as A.

A.4 Calculations

A.4.1 The available chlorine, expressed as percent mass by volume, shall be calculated using the formula below:

$$= \frac{(AN_1 \, X \, 35.46)\text{x } 100}{V}$$

where

A is the volume of $Na_2S_2O_3$ solution required for titration of the sample, mL;

N_1 is the normality of the $Na_2S_2O_3$ solution; and

V is the volume of original sample in aliquot used, mL

A.4.2 The sodium hypochlorite content, expressed as percent mass by volume, shall be calculated using the formula below:

$$= \frac{(AN_1 \text{ x } 37.22)\text{x } 100}{V}$$

where

A is the volume of $Na_2S_2O_3$ solution required for titration of the sample, mL;

N_1 is the normality of the $Na_2S_2O_3$ solution; and

V is the volume of original sample in aliquot used, mL

Annex B
(normative)

Determination of sodium hydroxide content

B.1 Summary of method

A sample is added to a neutralized, mixed solution of barium chloride and hydrogen peroxide, which precipitates any carbonate and reduces the hypochlorite to chloride. The free alkali is then titrated with standard hydrochloric acid using phenolphthalein indicator.

B.2 Reagents

B.2.1 Barium chloride solution (100 g/L)

Dissolve 100 g of chemically pure barium chloride ($BaCI_2.2H_2O$) in distilled water and dilute to 1 L with distilled water. Filter the solution if turbid.

B.2.2 Hydrochloric acid, standard (0.1 N)

Prepare a 0.1 N solution of hydrochloric acid (HCI) and standardize against primary standard solution carbonate and methyl red mixed indicator.

B.2.3 Hydrogen peroxide, approximately 3%.

B.2.4 Phenolphthalein indicator solution (0.5 g/100 mL)

Dissolve 0.5 g of phenolphthalein in 60 ml of 95% ethyl alcohol and dilute to 100 L; with water.

B.2.5 Sodium hydroxide solution

Dissolve 4.0 g of chemically pure sodium hydroxide in distilled water and dilute to 1 L with distilled water.

B.3 Procedure

Place 50 mL of barium chloride solution and 30 mL of hydrogen peroxide in a 250 mL Erlenmayer flask (or 6.in porcelain dish), add 10 drops of phenolphthalein indicator solution and neutralize with sodium hydroxide solution. Introduce into this neutral mixture 10 mL of the liquid sample, shake or stir vigorously for 1 min and titrate the sodium hydroxide solution with 0.1 N hydrochloric acid until the pink colour disappears.

B.4 Calculation

The free alkali as NaOH, expressed as percent weight by volume, shall be calculated using the formula below:

$$= \frac{LN_2 \text{ x } 40}{V}$$

where

L is the volume of hydrochloric acid solution used in the titration, mL;

N_2 is the normality of the hydrochloric acid solution; and

V is the volume of original sample used, mL

Annex C
(normative)

Determination of insoluble matter

C.1 Apparatus

C.1.1 Sintered crucible

C.1.2 Analytical Balance

C.1.3 Oven

C.2 Procedure

Pour approximately 100 mL of the sodium hypochlorite solution into a tared 400 mL beaker placed on a laboratory platform balance and weigh to the nearest 0.1 g. Add 100 mL of distilled water and mix thoroughly. Filter through a tared dry Sintered crucible. Wash the beaker and crucible with distilled water. Dry the crucible to a constant weight at 100°C – 105°C.

C.3 Calculation

The insoluble matter, expressed as percent mass by mass, shall be calculated using the formula below:

$$\frac{Grams\ of\ residue}{Grams\ of\ sample} \times 100$$

Annex D
(normative)

Determination of pH

D.1 Principle

pH is measured using a pH-meter, which is sensitive to the hydrogen ions that define the pH value and a sensor that supplies the reference signal or potential for the pH sensor. These sensors can be separate or in combination. The difference in potential of both these electrodes is used to determine the pH value of the measured solution.

D.2 Materials and apparatus

D.2.1 pH meter, preferably equipped with a combined pH glass electrode

D.2.1 Beaker, 250-mL

D.2.1 Glass rod

D.3 Reagents

D.3.1 Buffer solutions, buffer 4, buffer 7 and buffer 10

D.3.2 Distilled water

D.4 pH meter electrode calibration

A pH electrode shall be calibrated regularly with a recommended frequency of at least once daily before use.

D.5 Procedure

Measure about 50 mL of the sample in a 100-mL beaker. Stir well using a glass rod to make the sample homogenous. Determine the pH of the neat sample using a pH meter at 25 °C ± 2 °C.

Annex E
(normative)

Sampling

E.1 General

The following sampling procedure shall be applied in determining whether a lot, submitted for inspection and test, complies with the relevant requirements of the specification.

E.2 Sampling from tankers

Take from four levels in the tanker or at four stages during filling of the tanker a composite sample of 500 mL. Divide this sample into two equal portions and place each portion in a sample bottle. Use one portion for the determination of the insoluble matter the available chlorine and the free sodium hydroxide contents.

E.3 Sampling from other containers

E.3.1 Containers with a capacity of more than 1 L.

From the lot, take at random the number of containers relative to the lot size as given in table 1. From each container so drawn take a sample 500 mL. Divide each sample into two equal portions and place each portion in a sample bottle. Use one portion of each sample for the determination of the available chlorine and the free sodium hydroxide contents and reserve the other portion for the determination of the sodium chlorate content.

E.3.2 Containers with a capacity of 1 L or less

From the lot, take at random the number of containers relative to the lot size as given in table 1. If the containers are packed in cartons, take at random the number of cartons relative to the lot size and from each carton so drawn take at random one container. Use half of the samples for the determination of the insoluble matter, available chlorine and the free sodium hydroxide contents.

E.3.3 The containers and the samples so taken shall be deemed to represent the lot.

E.4 Compliance with the specification

The lot shall be deemed to comply with requirements of the specification, if after sampling of the containers and testing of the samples taken in accordance with E.2, no defective is found.

Table 2 — Number of containers to be taken for sampling various lot sizes

S.N	Lot size number of containers	Sample size number of containers
i.	1 – 4	All
ii.	5 – 50	4
iii.	51 – 100	5
iv.	101 – 500	8
v.	501 – 1500	10
vi.	1501 and above	12

Bibliography

[1] TZS 784: 2023,*Chemicals used for treatment of water intended for human consumption — Sodium hypochlorite*

[2] KS 1290- 2:1998**,** *Specification for bleaching agents — Part 2: Sodium hypochlorite solutions for water treatment*

[3] IS 11673-2: 2019, *Sodium Hypochlorite Solution — Specification — Part 2: Water Treatment Use second revision*