RWANDA STANDARD

DRS 127-1

Second edition

2018-mm-dd

Bleaching agents — Specification —

Part 1:

Sodium hypochlorite solutions for water treatment

Reference number

DRS 127-1: 2018

In order to match with technological development and to keep continuous progress in industries, standards are subject to periodic review. Users shall ascertain that they are in possession of the latest edition

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS 127-1 was prepared by Technical Committee RSB/TC 013, *Water and sanitation*.

This second edition cancels and replaces the first edition (RS 127-1: 2011), which has been technically revised.

DRS 127 consists of the following parts, under the general title *Bleaching agents — Specification*:

— *Part 1: Sodium hypochlorite solutions for water treatment*

— *Part 2: Sodium hypochlorite solutions for industrial and domestic use*

Committee membership

The following organizations were represented on the Technical Committee on Water and sanitation (RSB/TC 013) in the preparation of this standard.

Integrated Polytechnic Regional Centre/Kigali (IPRC-Kigali)

Rwanda Utility Regulatory Authority (RURA)

TAI Consult Ltd

University of Rwanda/College of Sciences and Technology (UR/CST)

Water and Sanitation Corporation Ltd (WASAC)Rwanda Standards Board (RSB) – Secretariat

Bleaching agents — Specification — Part 1: Sodium hypochlorite solutions for water treatment

1 Scope

This Draft Rwanda Standard specifies the requirements and methods of test for sodium hypochlorite solutions used to produce potable water.

2 Application

This standard applies only to sodium hypochlorite solutions used to produce potable water. It does not apply to sodium hypochlorite solutions used for general disinfecting and bleaching.

3 Description

3.1 Identification

3.1.1 Chemical name

Sodium hypochlorite.

3.1.2 Synonym or common names

Liquid bleach, soda bleach, bleach lye.

3.1.3 Relative molecular mass

74,44.

3.1.4 Empirical formula

NaClO.

3.1.5 Chemical formula

NaClO.

3.2 Commercial form

The product is supplied as an aqueous solution with an available (active) chlorine concentration up to a mass fraction of 18 %.

3.3 Physical properties

3.3.1 Appearance and odour

Sodium hypochlorite solution (NaClO) is a clear light-yellow liquid with a faint chlorinous odour.

3.3.2 Density

The density of the product varies between 1,13 g/ml and 1,30 g/ml at 20 °C

4 Normative references

There are no normative references in this document.

5 Requirements

4.1 Sodium hypochlorite solution shall be a clear liquid containing not more than 0.15 % insoluble matter, by weight.

4.2 Sodium hypochlorite solution shall be miscible in water in all proportions.

4.3 Sodium hypochlorite solution shall also, in addition to 4.1, comply with the requirements specified in Table 1, when tested in accordance with the tests specified therein.

Table 1 — Requirements for sodium hypochlorite solutions

S/N	Characteristic	Requirement	Method of test
(i)	Insoluble matter, % by mass, max	0.15	Annex A
(ii)	Available chlorine, % m/v, min.	10	Annex B
(iii)	Total free alkali (as NaOH), % m/v, max.	1.5	Annex C
(iv)	Iron (as Fe), ppm, max.	0.4	Annex D
(v)	pH, min.	9	Annex E

6 Packaging and labelling

6.1 Packaging

The sodium hypochlorite solutions shall be packaged in suitable containers made of polyethylene or stainless steel which shall be properly sealed, appropriately vented and able to withstand normal usage and transportation.

6.2 Labelling

The containers shall be labelled legibly and indelibly with the following information:

a) chemical name of the product indicating its intended use;

b) name and address of manufacturer and/or trademark;

c) instructions for use and safety precautions;

d) batch or code number of the solution

e) net volume of the solution;

f) per cent mass by volume of available chlorine;

g) storage conditions;

h) manufacture and expiry date; and

i) country of origin

Annex A
(normative)

Testing for insoluble matter in sodium hypochlorite solution

A.1 Procedure

Pour approximately 100 mL of the sodium hypochlorite solution into a tared 400 mL beaker, place 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 gooch crucible. Wash the beaker and crucible with distilled water. Dry the crucible to a constant weight from 100°C to 105°C.

A.2 Calculation

$$\text{Per cent insoluble matter} = \frac{Mass of residue}{Mass of sample} \times 100$$

Annex B
(normative)

Determination of available chlorine

B.1 Principle of test methods

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

B.2 Reagents

B.2.1 Glacial acetic acid

B.2.2 Standard potassium iodate solution — 0.1 N

B.2.3 Starch indicator solution — 0.5. Mix 0.5 % of solution starch with 5 mL of cold water and add 95 mL of boiling water. Mix, cool and store in a glass bottle. Replace frequently or add 0.1 % m/v salicylic acid to the starch solution to minimize deterioration.

B.2.4 Potassium iodine crystals — Iodate Free.

B.2.5 Standard Sodium Thiosulphate Solution — 0.1 N.

Dissolve 25 g of sodium thiosulphate (Na2S2O3.5H2O) crystals in freshly boiled and cooled water, and dilute to 1 000 mL.

NOTE The solution is more stable if the glassware is cleaned with sulphuric or chromic acids and thoroughly rinsed with water before use.

B.3 Procedure

Dissolve 2 g to 3 g of potassium iodide crystals in 50 mL of water in a 250 mL conical flask.

Add 10 mL of glacial acetic acid, then pipette out a 3 mL 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 standard sodium thiosulphate 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.

B.4 Calculation

$$\text{Available chlorine (as Cl)percent mass by volume} = \frac{0.03546 \times 100 \times \text{AN}}{V}$$

where,

A = Volume in mL of standard sodium thiosulphate solution required for titration of the sample,

N = Normality of the standard sodium thiosulphate solution, and

V = Volume in mL of original sample in aliquot used.

Annex C
(normative)

Determination of free alkali

C.1 Principle of test method

The sample solution 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.

C.2 Reagents

C.2.1 Barium chloride solution — 100 g/L. Dissolve 100 g of barium chloride (BaCl2.2H2O) in water and dilute to one litre. Filter if turbid.

C.2.2 Hydrochloric acid, standard — 0.1 N.

C.2.3 Hydrogen peroxide solution — 3 %.

C.2.4 Phonolphthalein indicator solution — 0.5 %. Dissolve 0.5 g of phenolphthalein in 60 mL of 95 % ethyl alcohol and dilute to 100 mL with water.

C.2.5 Sodium hydroxide solution — 4 g/L.

C.3 Procedure

Place 50 mL of barium chloride solution and 30 mL of hydrogen peroxide solution in a 250 mL conical flask, add 10 drops of phenolphthalein indicator solution, and neutrolize with Na0H solution. Introduce into this neutral mixture 10 mL of the sample solution, shake or stir vigorously for one minute, and titrate the sodium hydroxide solution with 0.1 N HCl until the pink colour disappears.

C.4 Calculation

$$\text{Free alkali (as NaOH)g/L} = \frac{V_1 \times \text{N} \times 40}{V}$$

where,

V_1= Volume, in mL of standard HCL required,

N = Normality of the hydrochloric acid, and

V = Volume, in mL of sample solution

Annex D
(normative)

Determination of heavy metals (as Fe)

D.1 Apparatus

C.1.1 Nessler Cylinders — 50 mL capacity.

D.2 Reagents

D.2.1 Ammonium per Sulphate

D.2.2 Butanoic potassium thiocyanate solution — Dissolve 10 g of potassium thiocynate in 10 mL of water. Add suffiecient n-butonal to make up to 100 mL and shake vigorously till the solution is clear.

D.2.3 Standard iron solution A — Dissolve 0.7202 g of ferrous ammonium sulphate in 100 mL of water, and 5 mL of 1.5 (v/v) sulphuric acid and run in cautiously a dilute solution of potassium permangenate (0.2 % m/v) until a slight pink coloration remains after stirring well. Dilute with water to 1 000 mL and mix thoroughly. One millilitre of this solution contains 0.1 mg of iron as Fe.

D.2.4 Standard iron solution B — Taken 100 mL of standard iron solution A and dilute to 1 000 mL with water. One millilitre of this solution contains 0.01 mg of iron as Fe. This dilute solution shall be prepared fresh.

D.3 Procedure

D.3.1 Weigh 50.0 g of the sodium hypochlorite solution and evaporate it to dryness. Dilute it to 30 mL in a Nessler cylinder, add about 30 mg of ammonium persulphate and 15 mL of butanoic potassium thiocyanate solution. Make up to 50 mL, shake vigorously for about 30 seconds and allow the layers to separate. Carry out a control test in another Nessler cylinder using 2 mL of standard iron and solution B. Compare the intensity of the colour produced in the butanol layers in the two cylinders.

D.3.2 The limit prescribed in Table 1 shall be taken as not having been exceeded if the intensity of colour produced with the sample is not greater than that produced in the control test.

Annex E
(normative)

Measurement of pH value

E.1 Measure the pH, at room temperature, using a pH meter equipped with a glass electrode capable of measuring pH values to an accuracy of 0.1 or better.

A= Reaction vessel

B= 250 mL separating funnel

C= Test tube

D= Rubber tube

E= Rubber stoppers

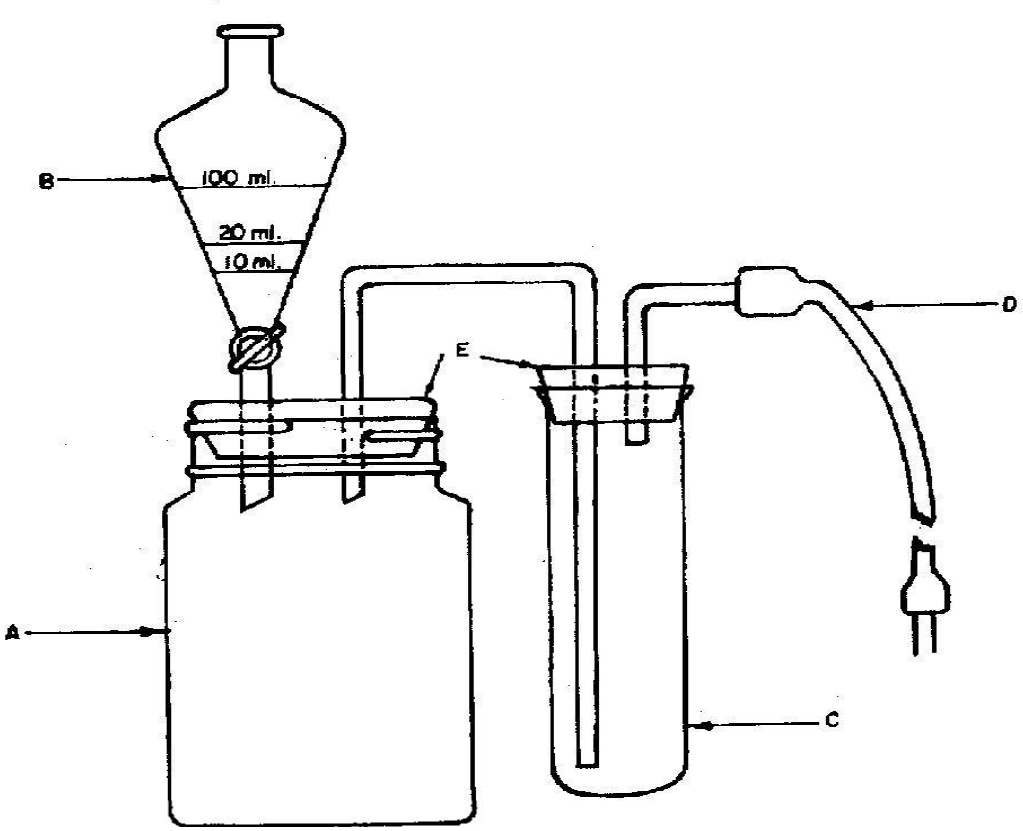

Figure 1 — Apparatus for determination of sodium chlorate

Annex F
(normative)

Determination of sodium chlorite

F.1 Principle of method

Sodium chlorate is reduced by sodium bromide in 8 N hydrochloric acid. After dilution and addition of potassium iodide, the released iodine (equivalent to hypochlorite plus chlorate) is titrated with standard sodium thiosulphate solution and starch indicator.

F.2 Apparatus

The apparatus (*see* Figure 1) consists of a 1 000 mL of wide mouth reaction bottle (A), fitted with a double hole rubber stopper carrying a separating funnel B, conveniently graduated or marked at 10, 20 and 100 mL levels, and a delivery tube leading to a 50 mL test tube gas trap C. The test tube trap is fitted with rubber tubing and a glass mouthpiece, D.

F.3 Reagents

F.3.1 Concentrated hydrochloric acid.

F.3.2 Sodium bromide solution — 10 % w/v.

F.3.3 Potassium iodine solution — 10 w/v.

F.3.4 Standard sodium thiosulphate solution — 0.05 N.

F.3.5 Starch indicator solution — 0.5 % m/v.

F.3.6 Sodium bicarbonate.

F.3.7 Procedure

Pipettee out a 3 mL aliquot of the sample into the reaction bottle (A), add one millilitre of concentrated hydrochloric acid and 0.3 g of pure sodium bicarbonate to expel all the air from the vessel through the long test tube C, containing a saturated solution of sodium bicarbonate. Then add 20 mL of sodium bromide solution followed by 80 mL of concentrated HCL.

Stopper the bottle and shake well. Allow to stand for 10 minutes. Add 20 mL of 10 % m/v potassium iodide solution through the separating funnel carefully and titrate the liberated iodide against 0.05 N sodium thiosulphte solution using a few drops of a starch indictor solution. Turn a blank with all the reagents except the sample by proceeding in the same manner as that of the test.

F.4 Calculate

$$\text{Sodium chlorate } \frac{(\text{as NaClO})\text{g}}{\text{Lx}} = \frac{(V_2 - V_1) \times \text{N} \times 17.75}{V}$$

where,

V2= Volume in mL of sodium thiosulphate used for the test;

V1= Volume in mL of sodium thiosulphate used for the blank;

N = Normality of sodium thiosulphate solution;

***V* = Voume in mL of sample solution used**

F.5 Principle of method

Sodium chlorate is reduced by sodium bromide in 8 N hydrochloric acid. After dilution and addition of potassium iodide, the released iodine (equivalent to hypochlorite plus chlorate) is titrated with standard sodium thiosulphate solution and starch indicator.

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