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**Distilled water — Specification**



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## Distilled water — Specification

### 1 Scope

This African Standard prescribes the requirements, methods of sampling and test for distilled water.

### 2 Normative references

The following referenced documents are indispensable for the application 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.

ARS 53, *General principles of food hygiene — Code of practice*

ARS 56, *Pre-packaged Foods — Labelling*

ISO 3696, *Water for analytical laboratory use*

### 3 Terms and definitions

No terms and definitions are listed in this document. 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>

### 4 Requirements

#### 4.1 General requirements

The distilled water shall be the water purified by thermal distillation or any other suitable means, such as ion exchange. It shall be clear, colourless, odourless and tasteless.

#### 4.2 Specific requirements

The distilled water shall comply with specific requirements given in Table 1 when tested according to the methods prescribed.

**Table 1: Specific requirements for distilled water.**

S/No.	Characteristic	Requirements	Test method
(i)	Non-volatile residue at 105 °C, mg/kg max.	10	B.2
(ii)	pH	6.5 – 7.5	B.3
(iii)	Chlorides, mg/kg, max	1	B.4
(iv)	Sulfate, mg/kg, max.	2	B.5
(v)	Calcium, mg/kg, max	5	B.6
(vi)	Magnesium, mg/kg, max	1	B.7
(vii)	Heavy metals, mg/kg, max.	1	B.8
(viii)	Ammonia, mg/kg, max	1	B.9
(ix)	Carbon dioxide	To pass test	B.10
(x)	Oxidizable matter	To pass test	B.11
(xi)	Iron, mg/kg, max.	1	B.7
(xii)	Specific conductivity $\mu\text{S}/\text{cm}$ at 27 °C, max.	0.2	ISO 3696

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## 5 Packaging

The distilled water shall be packed in securely closed suitable containers that will ensure the integrity of the product.

## 6 Labelling

Each package shall be legibly and indelibly labelled with the following information:

- a) name of the product as “distilled water”;
- b) manufacturer’s name and physical address;
- c) net content in litres
- d) country of origin;
- e) batch number or lot number.
- f) date of manufacture and best before date

## 7 Sampling

Sampling shall be done in accordance with Annex A.

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## Annex A (normative)

### Sampling of bulk supplies of water, distilled quality

#### A.1 General requirements of sampling

**A.1.1** In drawing, preparing, storing and handling samples, the following precautions and directions shall be observed.

**A.1.2** Samples shall not be taken in an exposed place.

**A.1.3** The sampling instrument shall be clean. Before use, these shall be washed several times with the material to be sampled.

**A.1.4** Precautions shall be taken to protect the samples, the material being sampled, the sampling instruments and the containers for samples from adventitious contamination.

**A.1.5** To draw a representative sample, the contents of each container selected for sampling shall be mixed thoroughly as possible by suitable means.

**A.1.6** The samples shall be placed in clean airtight glass bottles or other suitable containers on which the material has no action and which have previously been washed several times with the material to be sampled.

**A.1.7** The sample containers shall be of such a size that they are filled by the sample leaving an ullage of 10 %.

**A.1.8** Each sample container shall be sealed airtight after filling, and marked with full details of sampling, the date of sampling and the year of manufacture of the distilled water.

#### A.2 Scale of sampling

**A.2.1** All containers in a single consignment of the distilled water drawn from a single batch of manufacture shall constitute a lot. If a consignment is declared or known to consist of different batches of manufacture, the batches shall be marked separately and the groups of containers in each batch constitute a separate lot.

**A.2.2** For ascertaining conformity of distilled water in a lot to the requirement of this standard, samples shall be tested for each lot separately. The number of containers to be selected at random from lots of different sizes shall be in accordance with Table 2.

**Table 2 — Number of containers to be selected for sampling (See A.2.2)**

Lot size <i>N</i>	Number of containers to be selected <i>n</i>
3 to 15	3
16 to 40	4
41 to 65	5
66 to 110	7
111 and above	9

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## A.3 Preparation of test samples

**A.3.1** From each of the containers select according to A.2.2 equal portions of the distilled water shall be taken out so that the total quantity collected from all the containers is about 18 L. This shall be the composite sample.

**A.3.2** The composite sample shall be divided into three test samples not less than 2 L each. These test samples shall be transferred immediately to thoroughly washed bottles which are sealed airtight with glass stoppers and marked with the particulars of sampling as given in A.1.8. One test sample shall be sent to the purchaser and one to the vendor. The third test sample bearing the seals of the purchaser and the vendor shall constitute the referee sample, to be used in case of dispute.

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**Annex B**  
(normative)**Analysis of distilled water****B.1 Quality of reagents**

Unless specified otherwise, analytical grade chemicals and distilled water complying to ISO 3696 shall be used in tests.

**B.2 Determination of non-volatile residue at 105 °C ± 2 °C****B.2.1 Procedure**

Evaporate to dryness 500 ml of the sample in a weighed container, adding the sample in instalments, if necessary.

**B.2.2 Calculation**

Non-volatile residue at 105 °C, mg/kg =  $2m$

where

$m$  mass in mg of the dried residue.

**B.3 Determination of pH****B.3.1 Methods**

The determination shall be carried out either by the electrometric method or by the indicator method. In case of dispute the electrometric method shall be adopted.

**B.3.2 Test temperature**

The determination shall be made at room temperature and the sample shall be collected and tested in an atmosphere reasonably free from carbon dioxide.

**B.3.3 Electrometric method**

The determination shall be made by using a pH meter with glass electrode.

**B.3.3 Indicator method****B.3.3.1 Reagents**

**B.3.3.1.1 Bromocresol purple**, pH ranges 5.2 to 6.8 and colour change yellow to blue violet.

**B.3.3.1.2 Bromothymol blue**, pH ranges 6.0 to 7.6 and colour change yellow to blue.

**B.3.3.2 Procedure**

Take 10 ml of the sample in two hard glass test tubes and add 0.5 ml of the two indicators, one to each tube. Compare the colour produced with a series of buffer tubes of known pH in the range 6.0 to 7.0. Report as pH, the pH of the buffer solution, which gives the closest match with the colour, produced by the sample.

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## B.3.4 Apparatus

Standard calibrated glass discs may also be used for determination of pH.

## B.4 Test for chloride

### B.4.1 Apparatus

**Nessler tubes**, 100 ml capacity.

### B.4.2 Reagents

**B.4.2.1 Dilute nitric acid**, approximately 5 M.

**B.4.2.2 Silver nitrate**, approximately 0.5 M.

**B.4.2.3 Standard chloride solution.** Dissolve 0.164 9 g of sodium chloride in water and make up to 1 000 ml. One millilitre of this solution is equivalent to 0.1 mg of chloride (as Cl).

### B.4.3 Procedure

Transfer 100 ml of the sample into a Nessler tube. Add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Carry out a control test in another Nessler tube using 100 ml of water (which does not give any opalescence with dilute nitric acid and silver nitrate), 0.1 ml of standard chloride solution, one ml of dilute nitric acid and 1 ml of silver nitrate solution. Mix both the solutions and observe after 3 min. The sample shall be taken to have passed the test if any opalescence produced in the test with the sample is not greater than that produced in the control test.

## B.5 Test for sulfate

### B.5.1 Apparatus

**Nessler tube**, 100 ml capacity.

### B.5.2 Reagents

**B.5.2.1 Dilute hydrochloric acid**, approximately 1 M.

**B.5.2.2 Barium chloride**, approximately 0.5 M.

### B.5.3 Procedure

Transfer by means of a pipette 100 ml of the sample into the Nessler tube. Add 1 ml of dilute hydrochloric acid and then 1 ml of barium chloride solution to it and mix well. The sample shall be taken to have passed the test if no turbidity is produced within 12 min.

## B.6 Test for calcium

### B.6.1 Apparatus

**Nessler tube**, 100 ml capacity

### B.6.2 Reagent

Ammonia oxalate solution, dissolve 3.5 g of ammonium oxalate in 100 ml of water.

### B.6.3 Procedure

Transfer by means of a pipette 100 ml of the sample into the Nessler tube. Add 2 ml of ammonium

oxalate solution and mix well. The sample shall be taken to have passed the test if no turbidity is produced within 5 min.

## **B.7 Test for magnesium**

### **B.7.1 Reagents**

**B.7.1.1 Titan yellow solution**, dissolve 0.1 g of titan yellow (also known as clayton yellow or thiazole yellow) in 100 ml of water.

**B.7.1.2 Sodium hydroxide solution**, approximately 5 M.

Transfer 10 ml of the sample into it test tube and add 0.2 ml of titan yellow solution and 4 ml of sodium hydroxide solution.

The distilled water shall be taken to have passed the test if no red colour or precipitate is produced.

## **B.8 Test for heavy metals**

### **B.8.1 Apparatus**

**Nessler tubes**, 100 ml capacity.

### **B.8.2 Reagents**

**B.8.2.1 Dilute acetic acid**, approximately 1 M

**B.8.2.2 Hydrogen sulfide solution**, freshly made and saturated.

### **B.8.3 Procedure**

Transfer 40 ml of the sample into one of the Nessler tubes. Add 1 ml of dilute acetic acid and 10 ml of hydrogen sulfide solution. Carry out a control test in another Nessler tube by taking 40 ml of sample and 1 ml of dilute acetic acid. Compare the colour of the solution in both the tubes after 10 min. The sample shall be taken to have passed the test if the intensity of colour, if produced, in the Nessler tube containing hydrogen sulfide solution is not deeper than that produced in the control test.

## **B.9 Test for ammonia**

### **B.9.1 Apparatus**

**Nessler tubes**, 100 ml capacity.

### **B.9.2 Reagents**

#### **B.9.2.1 Nessler reagent**

Dissolve 10 g of potassium iodide in 10 ml of ammonia free water and add to it slowly, with stirring, saturated mercury (II) chloride solution until a slight permanent precipitate forms. Add 30 g of potassium hydroxide and when it has dissolved, add 1 ml more of mercury (II) chloride solution. Dilute to 200 ml with water (ammonia-free). Allow to settle overnight, decant the clear solution and keep the solution in the bottle closed with a well-fitting rubber stopper.

#### **B.9.2.2 Standard ammonia chloride solution**

Dissolve 3.15 g of ammonium chloride in sufficient water to produce 1000 ml. Dilute 10 ml of this solution with water to 1 000 ml.

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### B.9.3 Procedure

**B.9.3.1** Transfer 10 ml of the sample into a Nessler tube and add five drops of Nessler reagent. Carry out a control test in the other Nessler tube using 2 ml of standard ammonium chloride solution, dilute to 100 ml and add 5 drops of Nessler reagent. Shake and compare the colour after 3 min. The sample shall be taken to have passed the test if the intensity of colour produced with the sample is not greater than that produced in the control test.

**B.9.3.2** Alternatively, permanent standard glass colour disc may be used for the determination.

### B.10 Test for carbon dioxide

#### B.10.1 Apparatus

**Nessler tube**, 50 ml capacity.

#### B.10.2 Reagents

**Calcium hydroxide solution**, saturated

#### B.10.3 Procedure

Transfer 25 ml of the sample into the Nessler tube. Add 25 ml of calcium hydroxide solution and mix well.

The sample shall be considered to have passed the test if no turbidity or precipitate is produced within 5 min.

### B.11 Test for oxidizable matter

#### B.11.1 Reagents

**B.11.1.1 Dilute sulfuric acid**, 1 M.

**B.11.1.2 Potassium permanganate solution**, 0.002 M.

#### B.11.2 Procedure

Transfer 100 ml of the sample into a beaker. Add 10 ml of dilute sulfuric acid and 1 ml of potassium permanganate solution. Boil for 10 min.

## Bibliography

EAS 123:2023, *Distilled water — Specification*, Fourth edition 2023

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