DEAS 257:2021

ICS 59.080.01

DRAFT EAST AFRICAN STANDARD

Textiles — Determination of moisture, total size, ash, fatty and water-soluble matter

EAST AFRICAN COMMUNITY

Second Edition 2021

Copyright notice

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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 061, Textiles, textile products and accessories.

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.

This second edition cancels and replaces the first edition (EAS 257:2001), which has been technically revised. The main changes compared to the previous edition are as follows:

— A clause on normative references has been added;

Introduction

In the textile industry, yarns and fabrics undergo treatments during manufacture in the course of which extraneous matter of various types is gathered by or added to the original textile material. The standard, therefore, lays down standard methods for estimating the quantity of each and for determining the water-soluble matter, which if present beyond certain limits in the textile materials adversely affect their quality.

Textiles — Determination of moisture, total size, ash, fatty and water-soluble matter

1 Scope

This Draft East African Standard prescribes methods for determining moisture, total size, ash, fatty and water-soluble matter in cellulosic textile materials and their blends.

The method for determination of water-soluble matter is applicable to other textile fibres

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 139, *Textiles — Standard atmospheres for conditioning and testing*

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

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 Quality of reagents

Analytical grade reagents shall be utilised in the tests and grade 3 of water, as specified in ISO 3696 shall be used where the use of water as a reagent is intended.

5 Determination of moisture

5.1 Apparatus

5.1.1 Drying oven — Capable of maintaining a temperature of 105 ^{0}C ± 3 ^{0}C.

5.1.2 Weighing balance — Capable of weighing to an accuracy of 0.001 g.

5.1.3 Desiccator.

5.2 Procedure

From the sample under test draw at least two test specimens each weighing approximately 3 g.

5.2.1 Take a test specimen drawn as in 5.2 and weigh it accurately in a clean and dry tared weighing bottle. Place the weighing bottle containing the test specimen in the drying oven and dry the specimen at 105 °C to 110 °C to constant mass (see Note), the in a desiccator and determine the oven -dry mass of the test specimen.

NOTE The mass usually be regarded as constant if the loss between two successive weighing, taken at an interval of 30 min does not exceed by 0.1 per cent of the first of the two values.

5.2.2 Similarly test the other test specimen(s).

5.3 Calculation

Calculate the percentage of moisture content in the test specimen by the following formula:

$$Moisture\ content, percent\ = \frac{a-b}{a} \times 100$$

where;

a original mass in g of the test specimen; and

b oven-dry mass in g of the test specimen.

5.3.1 Determine the mean of all values obtained in 5.8 and express it as moisture content of the material.

5.3.2 Corrected invoice mass of cotton textile material shall be calculate by the following formula:

$$L_1 = \frac{L(b \times 1.085)}{a}$$

where;

L_1 corrected invoice mass in g of the material

L original mass in g of the material;

b oven-dry mass in g of the test specimen; and

a original mass in g of the test specimen.

6 Determination of total size

6.1 Apparatus

6.1.1 Soxhlet extractor

6.1.2 Drying oven — See 5.1.1

6.1.3 Desiccator

6.2 Reagents

6.2.1 Trichloroethane of dichloromethane

6.2.2 Diastase or other suitable desizing enzyme

6.2.3 Sodium chloride

6.2.4 Soap-soda solution — Containing 20 g soap and 10 g of anhydrous sodium carbonate per litre. The soap shall contain not more than 5 per cent moisture and shall comply with the following composition in Table 1, on dry basis.

Table 1 — Composition of soap soda solution

Free alkali (as Na_2CO_3), max.	0.3 %
Free alkali (as NaOH), max.	0.1 %
Combined fatty acids (as sodium salt), min.	85 %
Titre of mixed fatty acids prepared from the soap, max.	30 ^{0}C
Iodine value of fatty acids, max.	50

6.3 Procedure

From the sample under test, draw at least two test specimens each weighing approximately 5g.

6.3.1 If the sample under test is yarn, cut each test specimen into pieces 15 cm long, form into separate bundles and tie each bundle loosely round the middle.

6.3.2 If the sampled under test is fabric, trim each test specimen parallel to the directions of warp and weft and pull out five threads all round to form a fringe.

6.3.3 Using test specimens other than those drawn in 6.3, determine the moisture content of the sample by the method prescribed in 3 and calculate its oven-dry mass.

6.3.4 Take a test specimen as drawn in 6.3 and extract it in a Soxhlet extractor for one hour with trichloroethane or eichloromethane, adjusting the rate of boiling to at least six hot extractions per hour.

6.3.5 Treat the extracted specimen in the manner prescribed in 6.3.5.1, 6.3.5.2 or 6.3.5.3 depending on the type of the ingredients used in the size.

6.3.5.1 In case it is known that the material is sized with a mixing containing starch but not tarmarind kernel powder, dip the specimen in a solution (weighing 20 times the mass of the specimen) containing 5 g of diastase and 10 g sodium chloride per litre at 50 ^{0}c and at a pH of 6.5 to 7.7 (see Note). Allow the specimen to remain in the solution for one and a half hours. During this period, take it out from the solution and wring it by hand atleast three times. At the end of the period remove the specimen, wash it thoroughly four times in hot and cold water successively using 50 ml of water for each wash.

NOTE The temperature and pH given for the desizing solution are the optimum for bacterial diastase. If any other type of desizing enzyme is used, then the temperature and pH shall be modified to that recommended by the supplier. As many enzymatic desizing agents slowly deteriorate in storage, care shall be taken to see that the sample of desizing agent at the time of test has still satisfactory desizing efficiency.

If any doubt exists as to whether the size has been completely removed, the treatment with the enzymatic desizing solution shall be repeated, the specimen being again weighed after drying to constant mass at 105 °C to 110 °C and the percentage loss in mass has increased by not more than 0.25, then it may be considered that complete desizing has been effected, and the second value be accepted as the final value. If the value for the percentage loss in mass has increased by more than 0.25, then the desizing treatment shall be repeated until the value of percentage loss in mass does not differ from the previous figure by more than 0.25.

6.3.5.2 In case it is known that the material is sized a mixture containing tarmarind kernel powder but not starch, boil the specimen in the soap-soda solution (weighing 20 times the mass of the specimen) for 45 min, Wash it thoroughly first in hot water and then in cold water.

6.3.5.3 In case it is known that the material is sized with a mixture containing both starch and tarmarind kernel powder or in case the ingredients used in the size are not known, desize the specimen as prescribed in 6.3.5.1 and treat it further as prescribed in 6.3.5.2.

6.3.6 Dry the specimen treated as above (see 6.3.3, 6.3.4 and 6.3.5) in the drying oven at 105 °C to 110 °C to constant mass (see Note under 5.2.1), and weigh accurately.

6.3.7 Similarly repeat the test with other test specimen(s).

6.4 Calculations

Calculate the percentage of total size expressed on the oven-dry mass of the unsized material by the following formula:

$$X = \frac{a - kb}{kb} \times 100$$

where,

X = total size, percent by mass;

a = oven-dry mass (calculated) in g of the test specimen containing the size;

$$k = \frac{c}{d}$$

experimentally (on unsized) for adjusting the value of b, due to loss of natural constituents sustained by the test specimen during treatment as prescribed in 6.3.3, 6.3.4 and 6.3.5;

b = oven-dry mass in g of the test specimen determined as in 6.3.6; and

c = oven-dry mass in g of blank after treatment as prescribed in 6.3.3, 6.3.4, 6.3.5 and 6.3.6.

NOTE Normally k cannot be determined experimentally as a comparable unsized control blank is usually not available, particularly so in the case of fabric. In the absence of a control blank, k shall be taken as equal to 1.03 for grey cotton, 1.02 for unbleached viscose and 1.00 for all other fibers.

6.4.1 Determine the mean of all values as obtained in 6.4

6.4.2 Total size of cotton textile material expressed as a percentage of:

i) the original mass of the material;

ii) the conditioned mass of the material; and

iii) the corrected invoice mass of the material, may be calculated by the following formulas:

$$X_1 = \frac{a - kb}{a_1} \times 100$$

$$X_2 = \frac{a - kb}{a_2} \times 100$$

$$X_3 = \frac{a - kb}{kb \times 1.085} \times 100$$

where,

X_1 total size as a percentage by mass of the original mass of the material;

X_2 total size as a percentage by mass of the conditioned mass of the material;

X_3 total size as a percentage by mass of the corrected invoice mass of the material;

a oven-dry mass (calculated) of the test specimen containing the size.

k correction factor b (see 6.4);

a_1 original mass in g of the test specimen; and

a_2 conditioned mass in g of the test specimen.

7 Determination of ash

7.1 Apparatus

7.1.1 Silica or porcelain crucible with lid.

7.1.2 Muffle furnace — Capable of being heated to 700 °C.

7.2 Procedure

From the sample under test, draw at least two test specimens each weighing approximately 5 g.

7.2.1 Determine the moisture content of the sample by the method prescribed in Clause 5, not using the test specimens drawn as in 7.2. Cut one test specimen drawn as in 7.2 into small pieces, place all the pieces of the test specimen in a silica or porcelain crucible and weigh accurately. Slowly ignite the test specimen in the crucible over a Bunsen flame, taking care to avoid flaming. Transfer the crucible to the muffle furnace and ash at 700 °C for one hour or more until it attains constant mass (see Note under 5.2.1) and note the mass accurately.

7.2.3 Similarly repeat the test with the remaining test specimen(s).

7.3 Calculation

7.3.1 Calculate the percentage of ash by the following formula:

$$Ash\ content, percent = \frac{a}{b} \times 100$$

where;

a mass in g of the residue (ash); and

b oven-dry mass (calculated) in g of the test specimen.

7.3.2 Determine the mean of all values as obtained in 7.3.

8 Determination of fatty matter

8.1 Apparatus — same as in 6.1.

8.2 Reagent — Trichloroethane or dichloromethane.

8.3 Procedure

From the sample under test draw at least two test specimens each weighing approximately 5 g.

8.3.1 Take one test specimen drawn as in 8.3 and weigh it accurately in a clean, dry, tared weighing bottle. Place the weighing bottle containing the test specimen in the drying oven maintained at 105 °C to 110 °C and dry the specimen to constant mass (see Note under 5.2.1) and note the mass.

8.3.2 Transfer the specimen to a thoroughly dry and clean thimble (previously extracted in a Soxhlet extractor with trichloroethane or dichloromethane). Place the thimble with the test specimen in the Soxhlet extractor. Take adequate quantity of trichlororoethane in tared Soxhlet extraction flask and assemble the Soxhlet extraction apparatus. Heat it on a water bath or electric hot-plate at such a rate that at least six hot extractions occur per hour. Keep the volume of the solvent fairly constant by adding enough of trichloroethane to make up for any loss due to evaporation. Continue extraction 4 h. Cool and disconnect the extraction flask.

8.3.3 Recover the bulk of the solvent by distillation and evaporate the extract to dryness on a steam bath. Further dry the contents in the drying oven at 105 °C to 110 °C to constant mass (see Note under 5.2.1) and determine its mass.

8.3.4 Similarly repeat the test with the remaining test specimen(s)

8.4 Calculation

8.4.1 Calculate the percentage of fatty matter by the following formula:

$$Fatty\ matter, percent = \frac{b}{a} \times 100$$

where;

b mass in g of the extract (see 8.3.3); and

a oven-dry mass in g of the test specimen (see 8.3.1)

8.4.2 Determine the mean of all values as obtained in 8.4.

9 Determination of water soluble matter

9.1 Test specimens

From the test sample, cut out at least two test specimens each weighing about 10g. Cut the test specimens into small pieces.

NOTE If the sample under analysis is loose fiber, take about 5 g of the test specimen.

9.2 Conditioning of test specimens

Prior to test, the test specimens shall be conditioned for 24 h in accordance with ISO 139. However, in case of fabrics which weigh more than 270 g/m^2, the test specimens shall be conditioned for 48 h.

9.3 Apparatus

9.3.1 Flat-bottomed flasks of suitable capacity with a glass stopper incorporating a stop-cock.

NOTE The flasks that are used for the preparation of the extract shall not be used for any other purposes.

9.3.2 Water-cooled Reflux Condenser

9.4 Reagent

9.4.1 **Distilled water** — Conforming to ISO 3696.

9.5 Procedure

9.5.1 Condition the test specimens to moisture equilibrium in the standard atmosphere (see 9.2.1) and weigh and weigh accurately each test specimen.

9.5.2 Put a test specimen in the flask and add sufficient amount of water to it to make a liquor to material ratio of 20:1 (see Note below). Connect the flask to the condenser and bring rapidly to the boil and continue to boil the liquor gently for 60 min. Disconnect and remove the flask while the liquor is still boiling and close it immediately with the glass stopper fitted with a top-cock.

Rapidly cool the flask to room temperature (20 ± 20 °C). Do not remove or open the tap until ready for filtration. Reject any extract where the flask is not under vacuum at the time of opening. Filter the extract through a suitable filter paper (Whatman No. 42 is suitable) and evaporate a measured portion of the extract to dryness in a tared vessel. Dry the residue to constant mass at 105 °C to 110 °C.

NOTE If the test specimen is wool, the liquor to material ratio shall be 50:1.

9.5.3 Calculate the water-soluble matter as a percentage of the conditioned mass of the specimen by the following formula:

$$p = \frac{W_2}{W_1} \times 100$$

where,

p percentage of water-soluble matter;

W_2 mass, in g, of the residue (see 9.5.2); and

W_1 mass, in g, of the conditioned test specimen (see 9.5.1)

9.5.4 Repeat the test as given in 9.5.2 with the remaining test specimen(s) and calculate the percentage of water-soluble matter in each test specimen.

10 Test report

The test report shall include the following information:

a) moisture content, percent;

b) size, percent;

c) ash content, percent, and

d) the average of the values obtained as in 9.5.3 and 9.5.4 as the percentage of water-soluble matter of the textile.

Bibliography

EAS 257:2001, Methods for estimation of moisture total size for finish, ash, fatty matter and determination of water-soluble matter in textiles