TDC 5(3708) DTZS

TANZANIA STANDARD

Textiles – Methods for testing the strength of yarns from packages Part 1: Determination of breaking strength and extension

TANZANIA BUREAU OF STANDARDS

Foreword

This Draft Tanzania Standard is being developed by the Sampling and Test Methods Textiles Technical Committee under supervision of the Textile and Leather Divisional Standards Committee and it is in accordance with the procedures of the Bureau.

In the preparation of this Draft Tanzania Standard, assistance has been obtained from the following standard:

BS 1932: Part1: 1965 *Methods of Testing the strength of yarns form packages. Part 1: determination of skein breaking strength and extension;* published by the British Standards Institution.

IS 1671: 1977 *Method for determination of skein breaking strength and yarn strength index of cotton yarn (by constant-rate-of-traverse machine);* published by the Indian Standards Institution

In reporting the result of a test or analysis made in accordance with this standard if the final value, calculated or observed is to be rounded off, it shall be done in accordance with TZS 4 *Rounding off numerical values.*

1. Scope

1.1 This Draft Tanzania Standard specifies method for determination of breaking strength and breaking extension of yarns from packages by means of constant-rate-of-loading machines, constant-rate-of-extension machines, and machines with constant-rate-of-traverse of driven clamp.

1.2 This Draft Tanzania Standard covers both specimens that have been conditioned in the standard atmosphere for testing, and specimens in the wet state.

1.3 It is emphasized that, in most cases, the results obtained on one type of machine will differ from those obtained on another type.

2. Normative reference

2.1 For the purpose of this standard the following references shall apply:

a) TZS 3 *Atmospheric conditions for testing*

b) TZS 4 *Rounding off numerical values.*

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 https://www.iso.org/obp
— IEC Electropedia: available at https://www.electropedia.org/

3.1 breaking strength
maximum force applied to a specimen in a tensile test carried to rupture. It is expressed in Newtons (N).

3.2 breaking extension
extension caused by increasing the force on a specimen from the preliminary tension to the breaking strength.

3.3 yarn strength index
quantity obtained by dividing the skein breaking strength of the yarn in grams by its universal count in tex.

4. Principle

A length of yarn is extended until it breaks by a suitable apparatus that records or indicates the breaking strength and the breaking extension or provides a record of the load-extension curve.

5. Apparatus

5.1 Testing machines

a) All tensile testing machines shall be provided with means of indicating, and/ or recording, the maximum force applied to the specimen in stretching it to rapture and the corresponding extension of the specimen. Means of magnifying or diminishing the actual extension of the specimen may be usefully incorporated. Under the conditions of use, the error of the indicated or recorded force at any point in the range in which the machine is used shall not exceed ± 1 per cent of the force and the indicated or

recorded jaw separation shall not exceed 1 mm. The machine shall provide means for gripping the yarn securely. The gripping device shall not cause an undue number of jaw or grip breaks.

b) The machine shall include facilities for producing different constant rates of loading, traverse, or extension in order to break specimens in the specified average time-to-break of 20 ± 3 seconds. Different rates can be obtained most readily by means of a continuously variable drive, but satisfactory results can be obtained by means of a series of steps, provided that they are small enough.

5.1.1 *Constant-rate-of-loading machines*

After the first four seconds of the test, the average rate of increase of load in any tow second interval shall not differ by more than 25 percent from the average rate of increase of load over the whole period of the test.

5.1.2 *Constant-rate-of-traverse machine (e.g . pendulum-type)*
After the first two seconds of the test, the average rate of traverse of the pulling jaw in any two second interval shall not differ by more than 5 per cent from the average rate of traverse over the whole period of the test.

5.1.3 *Constant-rate-of-extension machines*

After the first two seconds of the test, the rate of increase in the distance between the clamps shall not differ by more than 5 per cent from the average rate of increase over the whole period of the test.

5.2 Conditioning apparatus

Means shall be provided for producing the atmospheres for conditioning and testing *as specified in TZS 3.*

6. Number of tests

If the number of specimens to be tested is not otherwise stipulated, the minimum shall be as follows:

a) Single yarns

1) Continuous-filament yarns: 10
2) Spun yarns: 20

b) Plied and cabled yarns: 10

7. Procedure

7.1 Preparation of sample skeins
From each package in the test sample (see Annex), reel at the lowest possible tension a sample skein of sufficient length to provide as many test specimens as may be required. Draw the yarn form the package in the manner in which it would normally be drawn in processing.

7.2 Conditioning of sample skeins

Expose the sample skeins in the atmosphere for conditioning and testing as defined in clause 5.2 until they have reached equilibrium. Equilibrium with atmosphere for testing shall be deemed to have been reached when successive weighing, carried out at intervals of not less than two hours, of the textile material freely exposed to the moving air do not increase by more than 0.25 per cent.

7.3 Wet tests

7.3.1 Where wet tests are required, before removing the sample skein from the reel wrap, two or three turns of strong thread (e.g. sewing thread) tightly round the skein at two places about an inch apart and securely tie the ends of the thread. Cut the skein midway between these two places, lay the cut skein on the surface of air-free distilled or dematerialized water, and leave it until it sinks under its own eight. Yarns made from fibers of specific gravity less than a unit shall be held under the surface of the water until they thoroughly saturated. One those occasions when the complete wetting out of yarns normally resistant to wetting is essential, an aqueous solution of non-ionic wetting agent of a concentration not exceeding 0. 1 per cent may be used. If any wetting agent is used, it shall be completely rinsed out with distilled or demineralised water before the yarn is tested.

7.3.2 A wet test should be complete within two minutes of removal of the specimen of the specimen form the water.

7.4 Method of test – set the grips of the testing machine to give a specimen test length for 500 mm. Adjust the machine so that the specified minimum breaking strength (or the average breaking strength as determined by preliminary experiments) is reached in 20 ± 3 seconds.

7.4.1 Mount the tread from the sample to be tested in the testing machine, taking precautions to avoid any displacement of twist. Apply a preliminary tension to the thread before it is finally secured in the grips. The value of the tensions shall be:

a) for conditioned specimens: 0.5 ± 0.1 centinewton per tex (cN/tex)
b) for wet specimens: 0.25 ±0.05 centinewton per tex (cN/tex)

7.4.2 Set the machine in operation and stretch the yarn until it breaks. For each specimen record the breaking strength in newtons, the breaking extension in millimeters and the time-to-break in seconds. If the average time-to-break of the first five tests does not fall within the specified limit of 20 ± 3 seconds discard the results and make the necessary adjustments to secure an average time-to-break within the specified limits. Make five more tests under the adjusted conditions, note the average time-to-break, and make further adjustments if necessary.

7.4.3 After obtaining five tests with an average time-to-break of 20 ± 3 seconds make the required number of observations (see clause 6) under essentially the same conditions.

7.4.4 Discard all observations secured on specimens which slip between the jaws, or which break in the jaws or within 5 mm of the edge of the clamp. Note the number of results rejected and if the total is greater than 10% of the number of specimens tested, overhaul the jaws.

7.4.5 In the case of automatic single thread strength testers, it may not be possible to record such observations, but adequate maintenance of the jaw mechanism and faces should reduce such occurrences to negligible proportions.

8. Calculations and expression of results

In making the following calculations, do not use the results of any tests in which the specimens broke within 5 mm of the point of contact of the yarn with the gripping device.

a) **8.1 Breaking strength**

Calculate the mean of the breaking strength results, expressing to three significant figures. Calculate the breaking strength.

b) 8.2 Breaking extension

Calculate the mean breaking extension as percentage of the initial length of the test specimen between the gripping points expressing it to two significant figures. Calculate the coefficient of variation of the breaking extension

9. Test report

9.1 The test report shall state that the test procedures were conducted in accordance with this Draft Tanzania Standard.

9.2 The test report shall give the following information:

a) The arithmetic mean breaking strength in newtons
b) The arithmetic mean breaking extension per cent
c) The coefficient of variation of the breaking strength
d) The coefficient of variation of the breaking extension
e) The type of capacity of the machine, the type of clamps used, and the force-range at which the machine was operated.
f) The condition in which the specimens were tested (conditioned or wet) and, for wet tests the technique used for wetting.

Annex

Sampling

A.1 Requirements relating to the selection of sample and the specimens to be tested are generally included in materials specifications. In the absence of any such requirements, the following procedure is recommended.

A.1.1 An inspection lot - shall consist of all the cases (skips, etc.) in a single delivery up to a maximum of 100 cases. Deliveries exceeding 100 cases shall be subdivided into inspection lots of approximately equal size each containing not more than 100 cases.

A.1.2 For inspection lots containing not more than 5 cases the bulk sample shall consist of all the cases in the inspection lot, and the test sample shall consist of 100 packages selected at random but in approximately equal numbers from each case.

A.1.3 For inspection lots containing more than 5 cases, a bulk sample of 5 cases shall be selected at random and the test sample shall consist of 2 packages selected at random from each of the 5 cases.