DRAFT TANZANIA STANDARD

Textiles – Assessing Fineness for Clean Flax Fibre

TANZANIA BUREAU OF STANDARDS

0. FOREWORD

The fineness of the fibre is an important property which influences its spinnability and qualities of the end products such as yarns, fabrics and composites.

In reporting the results of a test made in accordance with this Draft Tanzania Standard; if the final values observed or calculated is to be rounded off; it shall be done in accordance with TZS 4: (see sub clause 2.2).

In the preparation of this Draft Tanzania Standard, assistance was derived from:

ASTM D7025 – 2015 Standard Test Method for Assessing Clean Flax Fiber Fineness

1. Scope

1.1 This method provides two options for the determination of the fineness of clean loose flax fibres.

1.1.1 The first option is to measure the specific surface area by the resistance of fibres to air flow under prescribed conditions. The second option is by estimating the mass per unit length. The predetermined mass of clean loose flax fibres are generated by using a mechanical blender by placing in the specimen holder and compressed to a fixed volume. The resistance to airflow is measured using a cotton fibre instrument that provides a reading. This reading is converted to a specific surface index which is derived from the linear density of flax.

1.1.2 In option 2, the average linear density of single fibers in a bundle is calculated from mass and length measurements on the bundle and the number of single fibers in the bundle.

NOTE 1—there may be no overall correlation between the results obtained with Options 1 and 2. Consequently, these two options cannot be used interchangeably. In case of controversy, Option 1 shall prevail.

NOTE 2—a modification of this test method can be used in commercial trading to select bales that will conform to contract guarantees for specific surface index. For this purpose, the usual practice to test only one specimen per sample shall be applied.

2. Normative Reference

a) TZS 534: 2017 Textile –Standard atmospheres for condition and testing
b) TZS 325: 2016-Textile fibres-Some methods of sampling for Testing.

3. Terminology

3.1 For the terminology related to Flax, see Flax and Hemp Fibre- Glossary of Terms TZS (TDC1263)

4. Principle

4.1 The total surface area of finer fibres has a larger per unit mass and increased resistance to airflow than do coarser fibres. The Instruments for indicating the resistance to air flow using either compressed air or a vacuum are constructed;

1) to measure airflow under constant pressure drop across the plug,
2) to measure pressure drop when a constant flow of air is maintained and,
3) to indicate resistance to air flow from both a balanced and unbalanced Wheatstone bridge.

4.2 The reliability of the test results depends primarily on how well the tested specimens represent the original material. Flax and hemp fibers are different from many textile fibers, such as cotton or synthetic fibres, in that they are not individual filaments but bundles of fibrous material that may or may not be completely separated into individual filaments and therefore have a high degree of variability. While cleaning and processing can produce separation and changes in length, there is no certainty of fibrillation of the fibrous material.

4.3 The specific surface index outlined in note 2 is related to the average linear density of single fibers in a bundle calculated from mass and length measurements of the bundle and the number of single fibres in the bundle. The fibre index is influenced by fineness, degree of retting, cleanliness, variety, bundle separation, and plant maturity harvest date.

4.4 The fineness of fibres affects their mill processing and spinning performance as well as contributing significantly to the appearance and strength of the yarns produced.

4.5 The accuracy of weighing is controlled by the number of fibres composing the bundle. However, with short fibre of low linear density the number of fibres to be counted becomes prohibitive unless the bundle mass is kept low.

5. Apparatus and Materials

5.1 ***Air-Flow Instrument***, a device calibrated in micronaire readings or yielding numerical readings from which specific surface index readings can be computed.

5.2 ***Balances,*** with one having a capacity suitable for mass of the specific surface index specimen to be used and sensitivity of at least 0.2 % of the mass and another for linear density having a capacity of 15 mg and sensitivity of at least 0.005 mg.

5.3 ***Air Supply,*** to furnish the required pressure or vacuum to operate the instrument in accordance with the manufacturer's instructions.

5.4 ***Fineness Calibration Standards***, viscose rayon fibres reduced to 5 cm with a nominal linear density of 1.1, 1.5 and 3.0 denier and a nominal specific surface fineness index value of 2.55, 2.9 and 4.0.

5.5 ***Mechanical Cutting Device***, ***Template, Stelometer Clamps, or Die***, having a precision of 0.1 % designed to permit cutting fibres of a specified length.

5.6 ***Stationary Coarse Comb***, approximately 63 mm in width and having needles approximately 12.5 mm in length and spaced 19 needles to the centimeter.

5.7 ***Mechanical Blender***, to open and blend the hemp or flax fibres.

6. Sampling and Selection of Specimens

6.1 Take the test specimen by random sampling from the laboratory sample prepared as recommended in **TZS 325**

7. Conditioning

A-1 Conditioning of Test specimens and Atmospheric Conditioning for Testing

A-1.1 Prior to test, a conditioning of test specimens shall be conditioned to moisture equilibrium in a standard atmosphere at (65±2) % relative humidity and (27±2) % °C temperature as explained in **TZS 534**.

8. Procedure for Option 1: Specific Surface Index Fineness

Option one which covers the fineness measurement by resistance to airflow is converted to the specific surface index to help characterize fibres by approximating the fineness (see Note 1)

8.1 Test the conditioned calibration specimens in the atmosphere for testing textiles as **TZS 534**

8.1.1 Set up and adjust the instrument as directed in the manufacturer's instructions.

8.1.2 Adjust the instrument if necessary to secure values, which correspond to the values assigned to the Calibration Reference Standards at the beginning of each testing period.

8.2 Use a mechanical blender twice to open and blend each standard viscose rayon fibre.

8.3 Using 5 g specimens, make two tests with each standard viscose rayon fibre.

8.3.1 When the average of the two results is not within 0.1 unit of the established specific surface index reading, recheck the instrument and the technique used by the operator.

8.3.2 Check the instrument against the standards again at the end of each testing period.

8.3.3 When incorrect readings on the standards are obtained at the end of a testing period, discard the results, recheck the instrument, and repeat the Tests

8.4 Test the conditioned laboratory specimens in the atmosphere for testing textiles.

8.5 Use a mechanical blender twice to open and blend flax fibres. Using forceps, remove obvious, large pieces of shive and other foreign materials.

8.5.1 Weigh a 5g test specimen for the instrument.

8.5.2 Place the weighed specimen in the fibre compression cylinder, fluffing it with the fingers as it is packed into the cylinder to eliminate knotty balls and being careful to place all the fibres inside the cylinder. Insert or activate the fibre compression plunger. Turn on or activate the air and read the value to the nearest 0.1 unit reading.

8.6 Test three specimens for each laboratory sampling unit.

9. Calculations

9.1 If the instrument readings are not in resistance to airflow readings, compute resistance to airflow readings from instrument readings in accordance with manufacturer's instructions.

9.2 Convert resistance to airflow readings into specific surface index fineness values, using the formula below:

$$SSI = (J_1 \times R) - J_2$$

Where:

SSI = specific surface index,

R = resistance to airflow reading,

J_1 = 0.899, and

J_2 = 2.023.

Factors determined by linear regression between resistance to airflow readings and linear density values using 9 International flax grades.

9.3 Calculate the average for the three specimens test to the nearest 0.1 specific surface index reading for each laboratory sampling unit and for the lot.

10. Procedure for Option 2: Linear Density Fineness

This option measures the fineness by determining the linear density of flax fibre which is cut and weighed. Average linear density of single fibre in a bundle is calculated from mass and length measurements on the bundle and the number of single fibre in the bundle. (See Note 1.)

10.1 Test Specimens

10.1 From each laboratory-sampling unit in a container, take three specimens at random.

10.1.1 Select tufts or bundles of fibre containing a sufficient number of fibre to weigh between 0.5 and 7.5 mg when cut to a specified length.

10.2 Preparation of Specimens

10.2.1 The specimens chosen from staple fibre may require combing to align the fibres and remove short ends and obvious large pieces of non-fibrous materials.

10.2.2 Grip the specimen at one end in suitable clamp or tweezers. Ease the specimen onto the stationary coarse comb needles 3 to 5 mm on the clamp side of the centre of the tuft. Draw the specimen gently toward the centre.

10.2.3 Lift the specimen off the comb. Replace the specimen on the needles 3 to 5 mm closer to the clamp than the last position. Draw the specimen gently to the centre as before.

10.2.4 Continue to comb the specimen until the clamp is with fibres in parallel alignment and cut to known length.

10.2.4 Reverse the specimen. Clamp in the combed segment approximately 3 to 5 mm from the uncombed segment near the center. Comb the other end of the specimen, progressing from tip to center in 3 to 5 mm increments. Discard the combings.

10.2.5 Arrange fibres in parallel alignment.

10.3 Procedure

Test the specimens in the standard atmosphere for testing textiles

10.3.1 Place the combed bundle of fibres in a cutting device with fibres in parallel alignment and cut to known length.

10.3.2 Count 500 fibres in the combed bundle of fibres.

NOTE 3—Counting of fibres is facilitated by using some magnification and shuffling the specimen on a short pile surface of contrasting color to separate fibres. Small fibre bundles still attached are counted as a single fibre.

10.3.3 Weigh the 500 fibers from the specimen to the nearest 0.005 mg.

10.3.4 Test three specimens for each laboratory sampling unit.

11. Calculations

11.1 Calculate the average fibre linear density for each specimen to the nearest 0.1 mg/m.

11.2 Calculate the average for the three specimens test to the nearest 0.1 mg/m fiber linear density reading, using the formula below:

$$LD = W/(L \times N)$$

where:

LD = average fibre linear density (mg/m),

W = mass of bundle specimen (mg),

L = length of bundle specimen (m), and

N = number of fibres and attached fibres in the bundle specimen (500 fibres).

11.3 Calculate the mean of the average linear density for each laboratory sampling unit and for the lot sample.

11.4 If requested, calculate the standard deviation, coefficient of variation or both.

12. TEST REPORT

The test report shall include the following particulars:

a) Details of any operations not specified in this Draft Tanzania Standard or incidents likely to have had an influence on the results.

b) A reference to this Draft Tanzania Standard and State that the test was carried out as directed using either Option 1 (Specific Surface Index Fineness by air flow) or Option 2 (Linear Density Fineness by fiber bundle weighing)

c) Type, variety, and extent of retting for flax or hemp material according to Terminology related to Flax fibre-Glossary of Terms TZS (TDC1263)

d) Identification of flax processing and/or cottonizing system.

TABLE 1-Precision and Bias analysis for Fibre Fineness from Option 1

Sample	Average X	Repeatability Standard Deviation Sr	Reproducibility Standard Deviation S_R	Repeatability Limit r	Reproducibility Limit R
Grade B	1.28	0.0675	0.1429	0.1890	0.4002
Grade C	1.34	0.0599	0.1918	0.1678	0.5370
Grade D	1.76	0.0475	0.1691	0.1329	0.4735
Grade E	2.02	0.0951	0.1412	0.2663	0.3953
Grade F	2.03	0.0777	0.2323	0.2175	0.6503
Grade G	2.63	0.1956	0.2813	0.5476	0.7877
Grade H	3.04	0.2012	0.3885	0.5632	1.0878
Grade I	3.27	0.1856	0.2835	0.5196	0.7937
Grade J	4.20	0.1548	0.3015	0.4333	0.8443

TABLE 2-Precision and Bias analysis for Fibre Fineness from Option 2

Sample	Average X	Repeatability Standard Deviation Sr	Reproducibility Standard Deviation S_R	Repeatability Limit r	Reproducibility Limit R
Grade B	1.26	0.1402	0.8580	0.3927	0.6255
Grade C	1.52	0.1884	0.8552	0.5276	2.3946
Grade D	1.76	0.1661	0.8574	0.4650	0.5657
Grade E	2.00	0.1740	0.9056	0.4873	0.9825
Grade F	2.37	0.1443	0.9143	0.4041	1.0787
Grade G	2.65	0.2619	0.9368	0.7334	1.0563
Grade H	3.31	0.4133	0.0107	1.1574	1.2012
Grade I	3.36	0.5039	0.1668	1.4109	1.8592
Grade J	4.39	0.4480	1.2349	1.2543	2.2706