Draft

Tanzania Standard

Textiles – Cotton fibres – Determination of micronaire value

TANZANIA BUREAU OF STANDARDS

DRAFT TANZANIA STANDARD **TDC5 (5028)P_3**

Textiles – Cotton fibres – Determination of micronaire value

0 Foreword

Fineness is one of the important characteristics of cotton fibre. The airflow instruments, generally prescribed for this method, operate on the principle that the rate of airflow, through a plug of cotton fibre of fixed weight contained in a container of definite dimensions and subjected to a constant pressure head is related to the fineness of the cotton fibre.

Much work on an international basis has been done to develop and make available a range of cottons for the calibration of airflow instruments. By use of these calibration cottons and application of the procedures prescribed in this test, it is possible to achieve agreement between two laboratories within ± 0.2 micronaire units in the fineness measurement of the usual commercial sample of cotton.

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

ISO: 2403: 1972(E), Textiles – Cotton fibres – Determination of micronaire value, published by the International Organization for Standardization.

In reporting the result of a test made in accordance with this Draft Tanzania Standard, if the final value observed or calculated is to be rounded off, it shall be done in accordance with TZS 4: 2009 (see clause 2).

1 Scope and field of application

This Draft Tanzania Standard specifies a method of determining the micronaire value of loose disorientated cotton fibres taken from bales, laps, and slivers, or other sources of lint cotton.

2 References

For the purpose of this Draft Tanzania Standard the following references shall apply:

TZS 3: 1979 *Atmospheric conditions for testing*

TZS 4: 2009 *Rounding off numerical values*

TZS 325:1987 *Textiles – Textiles fibres – Some methods of sampling for testing*

3 Definitions

Micronaire value
measure of the air permeability of a mass of cotton under specified conditions, expressed in terms of an arbitrary scale, the so-called micronaire scale. The micronaire scale is based on a range of cottons to which micronaire values have been assigned by international agreement.

4 Principle

Air is passed through a test specimen consisting of a plug of fibres. The permeability is indicated on a scale for recording variations in either the rate of flow through, or the pressure difference across, the plug. The mass and volume of the test specimen are either a constant for a given type of instrument, or varied appropriately in relation to each other. The scale indicating variations in permeability may be calibrated in arbitrary units or micronaire value or marked in the appropriate absolute units of rate of flow or of pressure difference, and a table or graph provided for conversions of the observed readings into micronaire values.

5 Apparatus and materials

5.1 Balance of sufficient capacity to weigh the test specimen required for the flow instrument used, with an accuracy of + 0.2%.

5.2 Airflow instrument whose principal parts are:

5.2.1 Compression cylinder with perforated ends of such dimensions that with the prescribed mass of specimen each cubic centimeter shall contain between 0.16g and 0.30g of cotton when compressed.

5.2.2 Means for measuring the air permeability of the specimen, comprising, for example:

a) a suitable air pump;

b) one or more valves or other means controlling the flow of air through, or the pressure difference across the specimen in the compression cylinder;

c) a manometer for measuring the required air pressure difference across the specimen and a flowmeter for indicating the rate of airflow through it.

NOTE 1 – Details of certain commercially available instruments which comply with this specification are given in the annexes to this standard. The method of calibration of airflow instruments is described in annex A.

5.3 International calibration cotton standards (See A.1 of annex A).

6 Atmosphere for conditioning and testing

6.1 Condition test samples in the standard atmosphere for 4 h in moving air (or alternatively for 12hours in still air) or for a shorter time if the change in mass in a 2hours period does not exceed 0.25% before weighing and testing the specimen. Preconditioning is not required.

6.2 Weigh and test the specimen in the standard atmosphere for conditioning according to TZS 3: 1979 (see clause 2).

7 Test specimens

7.1 Take test specimens in accordance with the instructions given in TZS 325: 1987 (see clause 2) or specimens and samples may be drawn in other ways with prior agreement between the parties concerned.

7.2 Remove from the sample foreign bodies such as seed, sand, pieces of stalk and other impurities. Use a test specimen of the size prescribed for the instrument being used. In instruments having a compression cylinder of fixed volume, weigh the specimen to within + 0.2% of the specimen size appropriate for the instrument (see annexes). In instruments having compression cylinder with adjustably varied volume, determine the mass of the specimen with an accuracy of + 0.2%.

7.3 Test the number of specimens per sample or per lot or shipment, and specify the scheme for the selection of samples, as agreed between the parties concerned.

8 Procedures

8.1 Before each series of measurements, make the necessary preliminary adjustments appropriate to the instrument in use (see annexes). From time to time test a minimum of two check specimens from each of three calibration cottons (see annex A) covering the range of micronaire values of samples to be tested to determine whether or not the instrument is correctly adjusted and is giving results on the correct level.

8.1.1 Consider the performance of any instrument to be within the requirements of this Tanzania Standard if the average results for each such calibration cotton do not differ from its corresponding established values by more than + 0.10 micronaire scale unit.

8.1.2 Re-test, the above procedure, cottons giving differences greater than + 0.10 micronaire scale unit between the average of the two tests and the established value. Accept the result if the difference between the two new micronaire values for such a cotton does not exceed + 0.10 micronaire scale unit. If the difference continues to be greater than + 0.10 micronaire scale unit, either re-adjust the instrument and repeat the above check procedure or apply, on the basis of the established differences referred to above, an appropriate correction or adjustment to test values for subsequent samples submitted for testing.

8.2 Pack the test specimen evenly into the compression cylinder, a small portion at a time, fluffing the fibres with the fingers in order to break up any lumps and taking care that all the fibres are inserted in the cylinder. Put the compression plunger in position and lock it.

8.3 Cause air to flow through the specimen at the appropriate flow (or pressure) and note the reading on the airflow (or pressure difference) scale of the instrument to an accuracy of about + 1%.

8.4 If a second measurement is required for the same specimen, remove the cotton from the instrument, taking care not to lose fibre, and repeat the procedure given in 8.2 and 8.3.

9 Calculations and expression of results

9.1 For instruments in which the scale is graduated in micronaire values, average the readings of the specimens tested from a sample. If necessary, apply any correction based on 8.1.2 and report the average to the nearest 0.1 micronaire value.

9.2 For instruments in which the scale is graduated in units other than micronaire values, convert the direct readings to micronaire values from a previously established conversion curve or statistical relation as described in annex A. Calculate the converted values as described in 9.1.

10 Test report

The test report shall include the following information:
a) reference to this Draft Tanzania Standard;

b) the material source (lint cotton, picker lap, processing waste) and if possible type and/or botanical species (desi, Upland, *G. barbadense*);

c) the number of specimens tested, the number of readings per specimen, the number of samples used, and the scheme for drawing them;

d) the average values calculated;

e) the type, make and model of instrument used.

Annex A

Method of calibration of instruments

A.1 Calibration of airflow instruments is based on samples of a series of International Calibration Cottons which are available from the Standards Preparation and Distribution, Cotton Division, Consumer and Marketing Service, US Department of Agriculture, P O Box 17723, Memphis, Tennessee, 38112 U.S.A. These are furnished with micronaire values established by the International Calibration Cotton Standards Committee.

A.2 For calibration purposes use the full range of calibration cottons available. They approximately cover the range of the micronaire values of the world's commercial cottons.

NOTE 2 – The routine checking and adjustment of the instruments in relation to a section of the instrument's scale is to be distinguished from the more elaborate determination of the locations of numerous points along the full-scale range of the instrument when it is being calibrated. Routine checking for daily use is described in 8.1 to 8.1.2, B.2 and B.3 of annex B and in C.3 of annex C. Calibration of an instrument, such as at the factory, or upon receiving it at the laboratory, or occasionally under other special circumstances at the laboratory is described in the following clauses of this annex.

A.3 For each calibration cotton, make a minimum of two test determinations on each of three test specimens. The difference between the test values for the first and second determinations shall not exceed 0.10 units. If a greater difference is obtained, discard the result and make two determinations on a fresh test specimen. Take the average of the first readings on each of the thre test specimens for each calibration cotton.

NOTE 3 – The scale from which the readings are noted may already be graduated in micronaire values (as with most commercially available instruments). For a new instrument it may be a uniformly graduated scale.

A.4 For instruments already fitted with a scale graduated in micronaire values, determine the difference between the average scale reading and the corresponding established value for each cotton. If none of these differences exceeds 0.10unit, regard the previous calibration of the instrument a satisfactory. If greater differences occur, make appropriate instrument checks and adjustments to bring the instrument performance into compliance with the above requirements. Alternatively a series of appropriate scale corrections may be calculated.

A.5 For instruments fitted with a scale graduated in other than micronaire values.
either
– plot a graph showing the average instrument readings as abscissae and the corresponding established values as ordinates and draw a smooth curve to pass evenly through the points.
or
– determine statistically the relation between average instrument readings and corresponding established values in the form of an equation.
The deviations between average scale readings and established micronaire value shall not be greater than the equivalent of 0.10 units, as indicated by the graph or by the statistically established relation, as in A.4.

A.6 Use the calibration curve, or the corresponding statistical relation, to convert final test values yielded by cotton samples into micronaire values. Alternatively fit the

instrument with a scale graduated in micronaire values, the markings of which are obtained from the calibration curve or from the statistical relation.

Annex B

Operation of the Micronaire[1)] airflow instrument

B.1 There are several models of the micronaire instrument. They vary only in details of construction and operation. Any tails of the operation of a particular model which differ from the instructions given in this annex are described in the manufacturer's instructions included with the instrument.

B.2 Micronaire 60600

Mechanically adjust and check the instrument as follows:
a) Adjust the primary air regulator to give a pressure of 172kN/m^2 (172kPa, 1.76kgf/cm^2) and open the valve that admits air to the instrument. Check the reading after the air flows through the instrument, and make a re-adjustment if necessary.

b) Insert the manometer plug in the compression chamber. Allow the air to enter the chamber and adjust the secondary valve to obtain a pressure 41.4kN/m^2 (41.4kPa, 0.42kgf/cm^2) in the compression chamber. Again, if necessary, after the air flows through the instrument, re-adjust the regulation valve.

c) Insert one of the master orifice plugs, allow the air to enter, and if necessary, turn calibration screw to bring the float to the position on the curvilinear scale corresponding to the designation of the orifice plug. Repeat these operations, using the other orifice plug or disk.

NOTES 1 - Instead of two calibration disks, each with its bore, one disk with two different bores may be used. If the latter is used, close one of the bores with a finger at the lower scale value (2.8), the bore to be closed being especially marked.
2 The scale readings 2.8 and 6.2 respectively correspond to flow rates of 21.1 + 0.81l/min and 49.3 + 1.4 l/min.

1.3 Micronaire 80400

Mechanically adjust and check the instrument in accordance with 8.1 to 8.1.2 as follows:
a) Operate the foot valve and see if the air pressure behind the filter is between 413kN/m^2 (413kPa, 4.22kgf/cm^2) and 862kN/m^2 (862kPa, 8.79kgf/cm^2).

b) Open the pressure regulator and the upper and lower adjusting valves as far as possible.

c) Insert the control disk in the test chamber and open the foot valve. Operate the pressure regulator so that the mercury column rises to 30.3kN/m^2 (30.3kPa, 0.31kgf/cm^2). The air must pass through both bores of the control disk without hindrance. Operate the foot valve several consecutive times. The mercury must always rise to the same height.

d) Adjust the lower adjusting valve so that the upper edge of the float comes to rest at micronaire value 4.6.

e) Adjust the upper adjusting valve so that the upper edge of the float comes to rest at the upper check mark at about micronaire value 6.0.
f) With one finger, tightly close the upper opening of the control disk. The float will then fall to about the level of the lower check mark.

g) In order to make an exact adjustment, while alternately opening and shutting the upper opening of the control disk, alternately change the lower and upper adjusting valves. Do this until the upper edge of the float corresponds with the two check marks located at about micronaire values of 2.9 and 6.0.

h) Turn the pressure regulator until the mercury column stands at 32.4 kN/m2 (32.4 kPa, 0.33kgf/cm^2).

i) By opening and closing the upper opening of the control disk, check whether the upper and lower positions of the float still correspond with the two adjustment marks even after the change of the mercury column from 30.3 kN/m2 (30.3 kPa, 0.31 kgf/cm2) to 32.4 kN/m2 (32.4 kPa, 0.33 kgf/cm2). If this does not occur, repeat the procedure in g).

j) Open and close the upper opening of the control disk several times. If the adjustments were correctly made, the float position must correspond to both marks without further changes of the adjusting valves.

NOTE – If the manufacturer's instructions are different from those given above, adhere to the principles of these (standard) instructions as closely as possible.

B.4 After a micronaire instrument has been mechanically adjusted (see B.2 and B.3), check the instrument with at least three International Calibration Cottons in accordance with 8.1 to 8.1.2. Repeat the check with the Calibration Cottons at frequent intervals.
If it is necessary to calibrate the instrument, consult annex A.

B.5 Follow the instructions given in sections 6 and 7 of this Tanzania Standard for drawing, preparing and conditioning samples and specimens to be tested by airflow methods.

B.6 The test specimen for the various models of the micronaire instrument shall have a mass of 3.24 g + 0.2%.

NOTE – Weighing is a critical operation. The tolerances given are those which must be allowed for the balance. No additional tolerance is permitted for operator error.

B.7 Follow the instructions given in 8.2 to 8.4 of this Draft Tanzania Standard for fluffing the specimen, loading and closing the compression cylinder, and reading the scale.

B.8 Follow the instructions given in sections 9 and 10 of this Draft Tanzania Standard for calculating and reporting results.

B.9 Current models of the Micronaire1) instrument may be purchased from M.P.J. Gauge and Tool Co., Limited, Hanson's Bridge Road, Erdington, Birmingham 24, England. Models of the Fibronaire1) instrument may be obtained from Motion Control Inc., 7128 Envoy Court, Dallas, Texas 75247, USA and of the Port-ar1) instrument from Spinlab Inc., 312W, Vine Avenue, Knoxville, Tennessee 37902, U.S.A.

Annex C

Operation of the Wira Fineness meter (cotton model)[1)]

C.1 There are two models of the Wira Fineness Meter (Cotton Model) described as the "old model" and "new model" respectively. They differ primarily in the scale units and size of test specimen used. The old model is graduated in litres per minute and measures a specimen having a mass of 6.0 g. The new model is equipped with a scale graduated in micronaire values and measures a specimen having a mass of 5.0 g.

C.2 For preliminary calibration, adjust the instrument until the level of the liquid in the manometer tube coincides with the upper "zero" mark.

NOTE – The lower edge of the meniscus is observed when noting the length of the liquid column.
For the details in preparing the instruments of use, consult the manufacturer's instructions which accompany the instrument.

C.3 After the instrument has been mechanically adjusted check the instrument with at least three of the International Calibration Cotton Standard, in accordance with 8.1 to 8.1.2. Repeat the check with calibration cottons at frequent intervals. If it is necessary to calibrate the instrument consult annex A.

C.4 Follow the instructions given in sections 6 and 7 of this Tanzania Standard for drawing, preparing and conditioning samples and specimens to be tested by airflow methods.

C.5 The test specimen for the old model Wira shall have a mass of 6.0 g + 0.2%; and for the new model, it shall have a mass of 5.0 g + 0.2%.

C.6 Follow the instructions given in 8.2 to 8.4 of this Tanzania Standard for fluffing the specimen, loading and closing the compression cylinder, and reading the scale.

C.7 Follow the instructions given in section 9 and 10 of this Tanzania Standard for calculating and reporting results.