Textiles – Woven fabrics – Determination of the number of threads per unit length.
FOREWORD

This Draft Tanzania Standard prescribes three methods for the determination of the number of threads per centimetre. Basically there are five methods in use at international level; dissection, traversing thread counter, counting glass, parallel-line gratings and taper-line gratings. The first three methods are prescribed in this Draft Tanzania Standard.

This Draft Tanzania Standard is the second edition. This edition cancels and replaces the first edition which was developed in 1981.

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

- IS 1963: 2004 *Methods for determination of threads per unit length in woven fabrics.*

In reporting the results of a test 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 4:2009 – *Rounding off numerical values.*
1. **SCOPE**
This Draft Tanzania Standard specifies three methods for the determination of the number of warp threads (ends) per centimetre and the number of weft threads (picks) per centimetre in woven fabrics as follows:

- **Method A** – Determination by dissection.
- **Method B** – Determination by traversing thread counter.
- **Method C** – Determination by counting glass.

2. **PRINCIPLE**
Three methods of determining the number of threads per centimetre are specified, any of which may be used, the choice depending on the character of the fabric. The principles are as follows:

- **Method A** – A section of a fabric of dimensions in accordance with those given in clause 3 is dissected and the number of threads counted. The threads that are to be counted are preferably short, one or two centimetres' being suitable.
- **Method B** – The number of threads per centimetre of the fabric is determined with the aid of a traversing thread counter.
- **Method C** – The number of threads visible within the aperture of a standard counting glass is determined.

3. **MINIMUM MEASURING DISTANCE**

3.1 Where visual counting is carried out, as for Methods A, B and C, the minimum distance should conform with that given in Table 1.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Number of threads per centimetre</th>
<th>Minimum measuring distance (cm)</th>
<th>Accuracy of an individual measurement in threads per centimetre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Less than 10</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>2.</td>
<td>10 to 50</td>
<td>5</td>
<td>0.2</td>
</tr>
<tr>
<td>3.</td>
<td>More than 50</td>
<td>2</td>
<td>0.5</td>
</tr>
</tbody>
</table>

3.2 The dissection measurement is the most laborious but fewer limitation than any of the others; in particular, it is the only one that is really suitable for the examination of certain folded structures and other complicated weaves.
4. ATMOSPHERE FOR CONDITIONING AND TESTING.

The atmosphere for conditioning and testing shall be the standard atmosphere of 65 ± 2% relative humidity and 27 ± 2°C temperatures, see also TZS 3: *Atmospheric condition for testing*.

5. TEST SPECIMENS

5.1 No specially prepared specimens are required, but count the threads at not less than five different points each for ends and picks. The five points where the determinations are made shall be selected to represent the fabrics as fully as possible.

   NOTE: Avoid specimens from selvedges unless it is specified.

5.2 Expose the fabrics or specimens to the standard atmosphere for testing (See Clause 4) for at least 16 hours before making the test.

6. METHOD A - DETERMINATION BY DISSECTION

6.1 Apparatus

The following are required:

   a) *Gauge* – comprising a clamp holding two short pins parallel and with their points being ± 0.02 cm of the integral number of centimetre chosen as appropriate for particular fabric bearing in mind the minimum measuring distance as laid down in Clause 3;

   b) *Two dissecting needles and heavy steel rule*, if a clamp is not available;

   c) *Means of cutting test pieces*;

   d) *Means for producing the standard atmosphere for testing* (See Clause 4).

6.2 Test procedures

   6.2.1 Conduct the test in the standard atmosphere for testing (See Clause 4) and count in not less than five different places each for ends and picks (See Clause 5).

   6.2.2 A test piece shall be cut from the test specimen for each determination such that its length over the direction to be tested is 0.6 cm greater than the distance between the pins of the gauge selected.

   6.2.3 The pins of the selected gauge shall pass through the test piece – whilst laid out or held flat and free from applied tensions and creases, so that the line joining the points of the pins is at right angles to the direction of the threads being counted and there are 0.3 cm of fabrics outside the gauge points on either side (See Figure 1).

   6.2.4 The threads outside the two pins shall be removed in the direction of the threads to be counted.

   6.2.5 The remaining threads which are between the two pins shall be separated and counted, counting any thread impaled on a pin as half a thread.
6.2.6 An approved alternative method where a clamp is not available is to insert two dissecting needles the required distance apart by sliding their points down the appropriate graduation marks of heavy steel rule placed on edge.

6.3 Calculation and expression of results
Calculate the number of threads per centimetre where the test does not give it directly. Quote the mean of individual results for each direction, that for the warp threads as ends per centimetre and that for the weft threads as picks per centimetre. The number of threads per square centimetre is given by the sum of the mean ends and picks per centimetre.

6.3.1 When fabrics patterned by areas of greater or lower density of thread spacing than that of the ground are under examination, the results may be expressed as a mean of threads per centimetre in the fabric. If this procedure is followed, report the fact with the results. With such an example, measure the distance covered by one or more complete units of the pattern to an accuracy of 0.025 cm over a distance of at least 10 cm using a steel rule. Count the number of threads in one complete repeat and calculate the mean threads per centimetre.

6.3.2 Where relatively broad areas of pattern occur, it may also be desirable to record the number of threads per centimetre in each different portion of the pattern.

7. METHOD B – DETERMINATION BY TRAVERSING THREAD COUNTER
7.1 Apparatus
The following are required:
   a) Low – power microscope, of magnification 4× to 20×, mounted so that it can be traversed by means of a screw over a graduated base. Types with an index line in the eyepiece or a pointer traversing with and visible through the microscope are equally suitable.
7.2 Test procedures

7.2.1 Conduct the test in the standard atmosphere for testing (See Clause 4) and count in not less than five different places each for ends and picks (See Clause 5).

7.2.2 Use the measuring distance in accordance with that shown in columns 1, 2 or 3, of Table 1.

7.2.3 Lay the fabric on horizontal surface and place the thread counter upon it in such a way that when the screw is turned the microscope moves across the fabric in a direction that is either parallel to the warp or parallel to the weft, depending on which set of thread is being counted. Count the number of threads as specified in columns 1, 2 or 3 of the Table 1.

7.2.3.1 In some fabric it is possible to see and count every thread passed by the pointer or index line as it moves across the fabric. If this is not possible, weave repeats may be counted. Begin counting from a thread in a weave repeat which can be readily identified. Count the number of whole repeats in measuring distance, plus the remaining individual threads. The number of threads in a repeat is found by analysis of the weave.

7.2.3.2 If the fabric has a face composed mainly of one set of threads, as with certain twills, sateen, etc., it may be found easier to count on the back of fabric, where the weave design is more readily recognizable.

7.3 Calculation and expression of results

7.3.1 Calculate the number of threads per centimetre. Quote the mean of individual results for each direction, expressing that for the warp threads as ends per centimetre and that for the weft as picks per centimetre. The number of threads per square centimetre is given by the sum of the mean ends and picks per centimetre.

7.3.2 When fabrics patterned by areas of greater or lower density of thread spacing than that of the ground are under examination, the results may be expressed as a mean of the threads per centimetre in the fabric.

8. METHOD C – DETERMINATION BY TWO CENTIMETRE COUNTING GLASS

8.1 Apparatus

The following apparatus are required:

- Counting glass, the aperture width of which shall be 2 ± 0.005 cm at all places. The thickness of the base plate at the edge of the aperture shall not exceed 0.1 cm;
- Means of producing the standard atmosphere for testing (See Clause 4).

8.2 Test procedures

8.2.1 Conduct the test in the standard atmosphere for testing (See Clause 4).

8.2.2 Use a measuring distance in accordance with that shown in Table 1.

8.2.3 Lay the fabric flat on a horizontal surface and place the glass on the fabric so that one of the edge of its aperture is parallel to the warp threads. Count the number of the warp threads, or weave repeats or number of warp thread units and fractions of a unit bonded by the appropriate pair of opposite sides of the aperture. Repeat with one of the edges of the aperture parallel to weft threads, and count the number of the weft threads or weave repeats or number of weft thread units in a similar manner.
8.2.4 If the face of the fabric is composed of mainly one set of threads, as with certain twills, sateen, etc., it may be found easier to count on the back of the fabric where the weave design is more readily recognizable.

8.3 Calculation and expression of results

8.3.1 Quote the individual results and calculate the mean number of threads per centimetre for each direction, expressing that for warp threads as ends per centimetre, and that for the weft as picks per centimetre. The number of threads per square centimetre is given by sum of the mean ends and picks per centimetre.

8.3.2 When fabrics are patterned by areas of greater than two centimetres, of greater and lower density of thread spacing the results may be expressed as two or more means of constituent fabric. If this procedure is followed, report the fact with the results.

9 REPORT

The reports shall state:

9.1 The test method used;
9.2 The measuring distance used;
9.3 The number of ends and picks per centimetre;
9.4 The mean value for warps and weft threads per centimetre;
9.5 When a pattern is formed by varying the number of ends or picks per centimetre, the means of the repeats of pattern of warp and weft and also, for preference, two or more values of high and low ends and picks per centimetre;
9.6 The accuracy of measurement, i.e. the standard deviation of the individual measurement and the number of those measurements.