Preliminary Draft

भारतीय मानक ब्यूरो

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भारतीय मानक मसौदा

वस्त्रादि — बुने हुए कपड़े — प्रति ईकाई लम्बाई में धागों की संख्या ज्ञात करना

(*दूसरा पुनरीक्षण*)

Draft Indian Standard

TEXTILES — WOVEN FABRICS — DETERMINATION OF NUMBER OF THREADS PER UNIT LENGTH

(Second Revision)

ICS 59.080.30

Physical Methods of Test Sectional Committee	Last date for receipt of comments
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FOREWORD

(*Formal clauses will be added later***)**

This standard was first published in 1961 and subsequently revised in 1969 and 1981. This standard was revised to made provision of determining the number of threads per centimetre in addition to per decimetre. This had become necessary with the adoption of SI units and also adoption of practice of expressing threads per centimetre in India and abroad.

This revision has been made in the light of experience gained since its publication and to incorporate the following major changes:

i) The Scope of the standard has been modified;
ii) The tolerance of relative humidity for atmospheric conditioning has been modified;
iii) A new clause ‘Sampling’ has been incorporated;
iv) The provision of determining the number of threads per centimetre has been incorporated;
v) A new method ‘Counting Glass’ for determining the number of threads per unit length has been incorporated;

vi) The requirement for minimum distance across which the number of threads is to be counted has been modified;
vii) The clause 'Test report' has been modified; and
viii) References to standards have been updated.

Jute industry is an export oriented industry and the overseas consumers use the terms 'porter' and 'shots' for expressing warp and weft threads per unit length of jute fabrics. For the convenience of the overseas consumer's conversion factors for converting values of warp threads per decimetre to 'porter' and weft threads per decimetre to 'shots per inch' have been given in the standard. (*see* Note under 6.3).

In the formulation of this standard, considerable assistance has been derived from ISO 7211-2 : 2024 Textiles — Method for analysis of woven fabrics construction — Part 2: Determination of number of threads per unit length.

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'.

Draft Indian Standard

TEXTILES — WOVEN FABRICS — DETERMINATION OF NUMBER OF THREADS PER UNIT LENGTH

(*Second Revision*)

1 SCOPE

1.1 This standard prescribes three methods for determination of warp threads and weft threads per unit length (per centimetre, per decimetre and per inches) in woven fabrics.

- Method A: Traversing thread counter, suitable for all woven fabrics
- Method B: Counting glass, suitable for woven fabrics with more than 50 threads per centimetre
- Method C: Dissection of fabric, suitable for all woven fabrics, especially, for the examination of folded structures and complicate weaves.

1.2 The methods are applicable to all woven fabrics irrespective of their composition (that is, whether they are made of cotton, wool, silk, jute, man-made fibres or blends of two or more such fibres), manufacturing processes and finishing treatments.

2 REFERENCES

The Indian Standards given below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
IS 196 : 2024	Atmospheric conditions for testing (*first revision*)
IS 232 : 2020	Glossary of textile terms - Natural fibres (*third revision*)
IS 3919 : 1966	Methods for sampling cotton fabrics for determination of physical characteristics
IS 6359 : 2023	Method for conditioning of textiles (*first revision*)

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 232 and the following shall apply:

3.1 Warp Threads — The threads which lie along the length of a woven fabric. A single warp thread in woven fabric is also called as End.

3.2 Weft Threads — The weft or filling threads which lie across the length of the fabric. A single weft thread in woven fabric is also called as Pick.

3.3 Porter — The value obtained by counting in jute fabric the number of warp threads per gauge length of 47 mm (or 37/20 in) and dividing it by the number of threads per split (2 for hessian, 3 for single warp twill cloth, 4 for double warp plain fabric and 6 for double warp twill cloth).

NOTE — This definition of 'porter' based on the Indian practice refers to the finished fabric, and has to be distinguished from the Dundee practice according to which 'porter' is evaluated in terms of loom reed used in weaving the cloth.

3.4 Shot — Single thread of weft yarn in jute fabrics running from selvedge to selvedge. It is inserted in one passage of the shuttle across the loom.

4 ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

4.1 Prior to test, the fabric shall be conditioned to moisture equilibrium from dry side, in the standard atmosphere of (65 ± 4) percent relative humidity and (27 ± 2) °C temperature as prescribed in IS 6359.

4.2 The test shall be carried out in a standard atmosphere as in **4.1** (*see also IS 196*).

4.3 The conditioning and testing may also be carried out in prevailing atmosphere, if agreed between the parties.

5. SAMPLING

Follow the method of drawing the test sample from the lot as given in the relevant specification for the material or as agreed to between the buyer and the seller.

NOTE — For cotton fabrics, IS 3919 may be followed.

5.1 Preparation of Test Specimens

5.1.1 From each samples, as selected in **5**, take a full width swatch at least 2 m long as test sample. Consider each randomly designated place at which end counts and pick counts are made as a test specimen. The precautions taken while designating the places for considering test specimens are as follows:

a) For fabric widths of 100 cm or more, make no count closer than 15 cm from the selvedge edges, or within 50 cm from either ends of roll or piece or bolt.
b) For fabric width of less than 100 cm but greater than 12.5 cm, make no count closer than one tenth of the width of the fabric from the selvedge edge, or within 50 cm from the end of the roll or piece.
c) For narrow fabrics with width of 12.5 cm or less, use the full width of the fabric, but make no count with 50 cm from the end of the roll or piece.

5.1.2 In case of fancy weaves where one or more yarns do not appear at regular , short intervals, make count over at least one full pattern repeat of each design in the weave.

5.1.3 The minimum distance specified in **Table 1** shall be followed for measuring the number of threads per unit length in woven fabrics.

Table 1 Minimum Distance for Measuring Number of Threads
(*Clauses* 5.1.3, 6.1, 6.2, 8.1, *and* 8.2)

Sl. No.	Number of Threads per Unit Centimetre (per Inches)	Minimum Distance across which Number of Threads to be Counted (*L*)
(1)	(2)	(3)
i)	Less than 10 (25)	10 cm (4 inches)
ii)	10 to 25 (25 to 62)	5 cm (2 inches)
iii)	25 to 40 (62 to 100)	3 cm (1 inches)
iv)	More than 40 (100)	2 cm (1inches)

6 METHOD A — BY TRAVERSING THREAD COUNTER

6.1 Apparatus — A thread counter, equipped with a low power microscope of suitable magnification and a pointer which traverses by means of a screw over a graduated base sufficiently long to meet the minimum distance requirements, as specified in **Table 1**, shall be used. However, in the absence of such a thread counter, an ordinary counting glass with an aperture satisfying the requirements of **6.2** may be used.

NOTE — It is recommended that a table with a ground glass top illuminated from below should be used. Such a table greatly facilitates the work involved.

6.2 Procedure

6.2.1 Lay the test sample on a flat table and smoothen it out. Designate the test specimens on the test sample as specified in **5.1.1**. Place the thread counter with the pointer at zero on the test specimen in such a way that on turning the screw the pointer moves in a direction parallel or perpendicular to warp threads, depending upon which set of threads (warp or weft) is being counted, and the pointer shall coincide either with the right hand or the left-hand edge of a thread, depending on whether the counting is started from right to left or from left to right direction. Find the number of warp or weft threads by counting the number of units (normally comprising one thread and one space) and including as a fraction, any part of such unit in a distance specified in Table 1.

NOTE — Counting edge of the thread counter should be placed always either parallel to the warp threads or perpendicular to the warp threads as the case may be.

6.2.2 Following the procedure prescribed in **6.2.1,** determine the number of warp and weft threads in the minimum distance as specified in Table 1, in at least four more places evenly distributed

along the width and length of the test sample. Avoid counting same set of warp or weft threads more than once.

NOTE — In case of weft threads, it is preferable to have at least 10 readings, if the size of the sample permits.

6.2.3 Calculate the number of warp and weft threads per centimetre or decimetre or inches as the case may be by the following formula:

$$n = \frac{N}{L}$$

where

n = number of threads per cm or dm or inches;

N = observed number of threads in the minimum distance L; and

L = minimum distance, expressed in cm or dm or inches, across which the threads are counted as specified in Table 1.

6.3 Determine in a similar manner (*see* 6.2) warp threads and weft threads per centimetre or decimetre or inches as required of the remaining test specimens in the sample and find the mean of the value for warp threads per centimetre or decimetre or inches as required and the mean of the value for weft threads per centimetre or decimetre or inches, respectively.

NOTE — For converting 'warp threads per cm or dm' to 'porter' and 'weft threads per cm or dm' to 'shots per inch' in case of jute fabrics, the following conversion factors may be used:

i)	Porter:	Multiply		
		Threads/cm by	Threads/dm by	Threads/inches by
a)	For hessian (plain weave) cloth	2.349	0.2349	0.9248
b)	For double warp plain weave cloth	1.175	0.1175	0.4626
c)	For single warp 2/1 twill cloth	1.566	0.1566	0.6165
d)	For double warp 2/1 twill cloth	0.783	0.0783	0.3083
ii)	Shots/inch	2.54	0.2540	1

7 METHOD B — COUNTING GLASS

7.1 Apparatus — A counting glass with the aperture width of 20 ± 0.05 mm or 30 ± 0.05 mm or 1 ± 0.02 inches at all the places. The thickness of the base plate at the edges of the aperture shall not exceed 1 mm.

7.2 Procedure

7.2.1 Lay the test sample on a flat table and smoothen it out. Designate the test specimens on the test sample as specified in **5.1.1**.

7.2.2 Place the counting glass on the test specimen so that one of the edges of its aperture is parallel to the warp threads. Count the number of warp threads in the aperture width of counting glass.

7.2.3 Similarly, count the number of weft threads in the in the aperture width of counting glass by placing it on the test specimen in such a way that one of the edges of its aperture is parallel to the weft threads.

7.2.4 Determine the number of warp and weft threads of at least four more test specimens by following the procedure as laid down in **7.2.2** to **7.2.3.**

7.2.5 Calculate the number of warp and weft threads per centimetre or inches as the case may be by the formula given in **6.2.3**.

7.3 Determine in a similar manner (*see* **7.2**) warp threads and weft threads per centimetre or inches as required of the remaining test specimens in the sample and find the mean of the value for warp threads per centimetre or inches as required and the mean of the value for weft threads per centimetre or inches, respectively.

8. METHOD B — BY DISSECTION OF FABRIC

8.1 Apparatus

8.1.1 *Clamps* — comprises of two short pins parallel to each other and with their points being within $\pm$ 0.2 mm of the minimum measuring distance specified in Table1.

8.1.2 *Forceps* — One pair of pointed forceps for removing threads.

8.2 Procedure

8.2.1 Take the test sample and cut at least five test specimen randomly of the width and length longer than 4mm to 6mm than the minimum measuring distance as specified in Table 1. The length of the specimen shall be along the weft threads for determining number of warp threads per centimetre or decimetre or inches and along the warp threads for determining number of weft threads per centimetre or decimetre or inches. Lay the specimen on table with the length running from left to right. Take the clamp and position it centrally over the specimen. Then pass the pins on the clamp through the specimen. Remove the threads remaining outside of cloth pins using forceps, leaving only the length of specimen (equal to minimum distance specified in Table 1) between them, and such threads through which the pins pass. From this length of the specimen, remove the threads one by one and count the number of threads within the length.

8.2.2 Following the procedure prescribed in **8.2.1**, determine the number of warp and weft threads in the minimum distance for all the remaining four test specimens.

NOTE — In case of weft threads, it is preferable to have at least 10 readings, if the size of the sample permits.

8.2.3 Calculate the number of warp and weft threads per centimetre or decimetre or inches by the formula as given in **6.2.3**.

8.3 Determine in a similar manner (*see* **8.2**) warp threads and weft threads per centimetre or decimetre or inches as required of the remaining test specimens in the sample and find the mean of the values for warp threads per centimetre or decimetre and the mean of the values for weft threads per centimetre or decimetre respectively (*see also* Note under 6.3).

9 REPORT

9.1 The report shall include the following information:

a) Description of the material tested;
b) Method used (A, B or C);
c) Minimum distance used for counting threads;
d) The atmosphere used for conditioning and testing;
e) Number of specimens tested;
f) Mean and individual values of Number of warp threads per cm or dm or inches; and
g) Mean and individual values of Number of weft threads per cm or dm or inches.

NOTE — The value should be rounded off to first decimal place in the case when the results are reported for threads per centimetre or inches.