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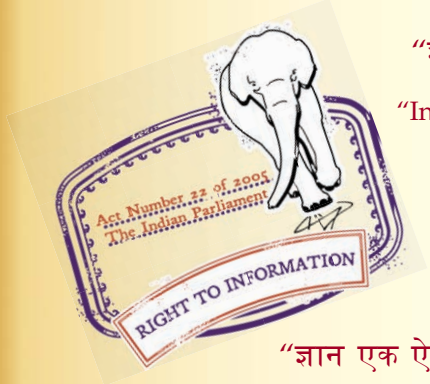

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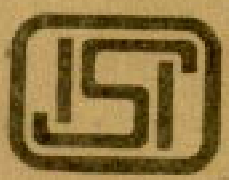
Indian Standard

METHODS FOR DETERMINATION OF THREADS PER UNIT LENGTH IN WOVEN FABRICS

(Second Revision)

UDC 677·017·352



INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

March 1981

Indian Standard

METHODS FOR DETERMINATION OF THREADS PER UNIT LENGTH IN WOVEN FABRICS

(Second Revision)

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Indian Standard

METHODS FOR DETERMINATION OF THREADS PER UNIT LENGTH IN WOVEN FABRICS

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 31 January 1981, after the draft finalized by the Physical Methods of Test Sectional Committee had been approved by the Textile Division Council.

0.2 This standard was first published in 1961 and revised in 1969. The standard has now been revised again to make provision of determining the number of threads per centimetre in addition to per decimetre. This has become necessary with the adoption of SI units and also adoption of practice of expressing threads per centimetre in India and abroad.

0.3 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 consumers 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 **5.3**).

0.4 Apart from the two methods given in this standard, method based on use of different types of line gratings is also followed.

0.5 To familiarize the industry with International System of Units (SI Units), the basic SI Units as well as the recommended SI Units for use in the textile industry are given in Appendix A.

0.5.1 Standards of Weights and Measures Act, 1976 also stipulates use of SI Units.

0.6 In reporting the results or analysis of a test 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 : 2-1960*.

*Rules for rounding off numerical values (*revised*).

1. SCOPE

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

1.2 The methods are applicable to all textile 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. TERMINOLOGY

2.0 For the purpose of this standard the following terms, in addition to those given in IS : 232-1967* shall apply.

2.1 Warp Threads — The threads which lie along the length of a fabric as woven.

2.2 Weft Threads — The weft or filling threads which lie across the length of the fabric.

2.3 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.

2.4 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.

3. ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

3.1 Prior to test, the fabric shall be conditioned to moisture equilibrium from dry side, in the standard atmosphere of 65 ± 2 percent relative humidity and 27 ± 2°C temperature as prescribed in IS : 6359-1971†.

3.2 The test shall be carried out in a standard atmosphere (*see* **3.1**).

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

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*Glossary of textile terms — natural fibres (*first revision*).
†Method for conditioning of textiles.

4. GENERAL INFORMATION

4.1 Choice of Method

Method A (*see* **5**) — This method is suitable for fabrics, the individual threads of which can be easily identified with a thread counting glass.

Method B (*see* **6**) — This method is suitable for fabrics, the individual threads of which cannot be easily identified with a thread counting glass.

NOTE — It may be noted that none of these methods may be applicable to certain special type of fabrics, such as Moleskin, Lappet, Butta, Leno weaves, etc.

4.2 Determination shall not be made (a) within 50 mm from the selvedges, or (b) within two metres from either end of a piece, roll or bolt. In case of fabrics having width from 10 cm to 20 cm the selvedge ends shall be excluded while counting.

NOTE — This is not applicable to narrow fabrics.

4.3 Narrow Fabrics — In case of narrow fabrics having width of 10 cm or less, all warp threads including selvedge ends shall be counted and expressed as threads per full width.

4.4 Design Fabrics — For design fabrics, it is convenient (a) to determine the number of units in a weave repeat from a point paper diagram, and (b) to count (i) the number of whole repeats, and (ii) remaining units, in the distance across which the threads are to be counted; and calculate from the data so obtained, the number of threads per centimetre or decimetre, warpway or weftway as required.

4.5 For the purpose of determining the distance across which the number of threads is to be counted, assume the fabric to have the number of warp and weft threads per centimetre or decimetre as in the material specification, as specified in an agreement between the buyer and the seller, or by actual determination of thread count in one or two places.

5. METHOD A — BY TRAVERSING THREAD COUNTER

5.1 Apparatus — A thread counter, equipped with a low power microscope of suitable magnification and a pointer which traverses along a graduated base, shall be used. However, in the absence of such a thread counter, an ordinary counting glass with an aperture satisfying the requirements of **5.2** 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.

5.2 Warp and Weft Threads per Centimetre or Decimetre

5.2.1 Lay on a flat table a portion of one of the pieces constituting the test sample and smoothen it out. Place the counting glass with the pointer at zero on the piece in such a way that (a) 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 (b) 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 L (*see* **4.5**), which shall be:

i) 50 mm, if the number of threads are 20 per centimetre (200 per decimetre) or less;

ii) 20 mm, if the number of threads are more than 20 per centimetre (200 per decimetre), but less than or equal to 100 per centimetre (1 000 per decimetre); and

iii) 10 mm, if the number of threads are more than 100 per centimetre (1 000 per decimetre).

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.

5.2.2 Following the procedure prescribed in **5.2.1** determine the number of warp and weft threads per centimetre or decimetre as required, in at least four more places evenly distributed along the width and length of the piece. Avoid counting same set of warp or weft threads more than once. Average all the observed values and note the value so obtained as the number of warp and weft threads per centimetre or decimetre in the piece as the case may be.

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

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

$$n = \frac{N}{L} \times 10 \text{ (or } 100 \text{)}^*$$

where

n = number of threads per cm (or dm)*;

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

L = distance, expressed in mm, across which the threads are counted; 50 or 20 or 10 mm, as the case may be.

5.3 Determine in a similar manner (*see* **5.2**) warp threads and weft threads per centimetre or decimetre as required of the remaining pieces in the sample and find the mean of the value for warp threads per centimetre or decimetre as required and the mean of the value for weft threads per centimetre or decimetre, 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:

		Multiply	
i) Porter:		Threads/cm by	Threads/dm by
a) For hessian (plain weave) cloth	=	2·349	0·234 9
b) For double warp plain weave cloth	=	1·175	0·117 5
c) For single warp 2/1 twill cloth	=	1·566	0·156 6
d) For double warp 2/1 twill cloth	=	0·783	0·078 3
ii) Shots/inch	=	2·54	0·254 0

6. METHOD B — BY DISSECTION OF FABRIC

6.1 Apparatus

6.1.1 *Clamps* — Use any of the following clamps (*see also* Table 1):

a) *Type 'A' Clamp* — A clamp with two parallel pins with their points 50 mm apart,

b) *Type 'B' Clamp* — A clamp with two parallel pins with their points 20 mm apart, and

c) *Type 'C' Clamp* — A clamp with two parallel pins with their points 10 mm apart.

NOTE — An outline of the clamp is shown in Fig. 1.

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

6.2 Warp and Weft Threads per Centimetre or Decimetre

6.2.1 Take one of the pieces constituting the sample and cut out from it a specimen of the width and length 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 and along the warp threads for determining number of weft threads per centimetre or decimetre. Lay the specimen on table with the length running from left to right.

Take an appropriate type of clamp (*see* Table 1) and position it centrally over the specimen. Then pass the pins on the clamp through the specimen. Remove using forceps, the threads remaining outside of cloth pins, leaving only the gauge length of specimen between them, and such threads through which the pins pass. From this gauge length of the specimen remove the threads one by one and count the number of threads within the gauge length.

TABLE 1 NUMBER OF THREADS, LENGTH OF SPECIMEN, WIDTH OF SPECIMEN, GAUGE LENGTH AND TYPE OF CLAMP

(*Clauses* 6.1 *and* 6.2.1)

All dimensions in millimetres.

No. of Threads (*see* **4.5**)	Length of Specimen	Width of Specimen	Gauge Length	Type of Clamp
(1)	(2)	(3)	(4)	(5)
20 per cm (200 per dm) or less	80	15	50	A
More than 20 but less than or equal to 100 per cm (or more than 200 but less than or equal to 1 000 per dm)	50	15	20	B
More than 100 per cm (or more than 1 000 per dm)	40	15	10	C

6.2.2 Following the procedure prescribed in **6.2.1**, determine the number of warp and weft threads per centimetre or decimetre as required, in at least four more places equally distributed along the width and length respectively of the piece. Average all the observed values and note the value so obtained as the number of warp and weft threads per centimetre or decimetre in the pieces as the case may be.

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 by the following formula:

$$n = \frac{N}{L} \times 10 \text{ (or } 100 \text{)}^*$$

where

n = the number of threads per cm (or dm)*;

N = observed number of threads in the gauge length L; and

L = gauge length, that is, the distance expressed in mm, between the pins on the clamp; 50 or 20 or 10 mm, as the case may be.

6.3 Determine in a similar manner (*see* **6.2**) warp threads and weft threads per centimetre or decimetre as required of the remaining pieces 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 **5.3**).

7. REPORT

7.1 The report shall include the following information:

a) Description of the material tested;

b) Method used;

c) Atmospheric conditions:

1) Standard atmosphere, or

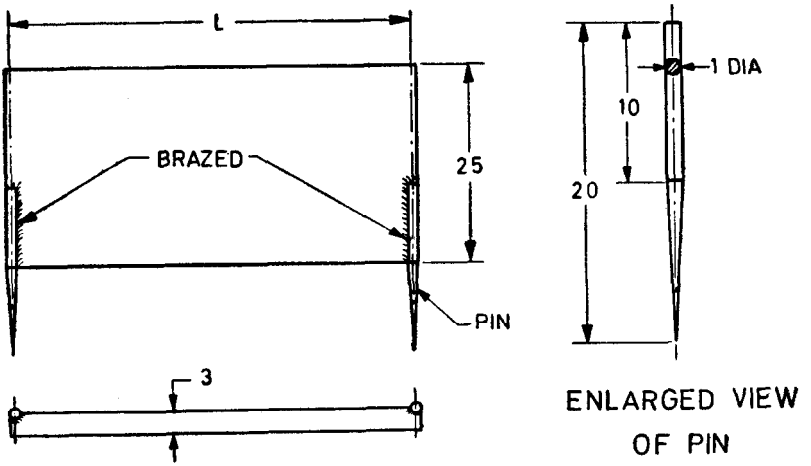
2) Prevailing atmosphere (give relative humidity and temperature); and

d) Results:

1) Number of warp threads per cm or dm, and

2) Number of weft threads per cm or dm.

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



L = Gauge length = 50 mm (Type 'A' Clamp)

OR

20 mm (Type 'B' Clamp)

OR

10 mm (Type 'C' Clamp)

All dimensions in millimetres.

FIG. 1 CLAMP

APPENDIX A

(*Clause* 0.5)

RECOMMENDED SI UNITS FOR TEXTILES

Sl No.	Characteristic	SI Units		Application
		Unit	Abbreviation	
(1)	(2)	(3)	(4)	(5)
1)	Length	Millimetre	mm	Fibres
		Millimetre, centimetre	mm, cm	Samples, test specimens (as appropriate)
		Metre	m	Yarns, ropes, cordages, fabrics
2)	Width	Millimetre	mm	Narrow fabrics
		Centimetre	cm	Other fabrics
		Millimetre, centimetre	mm, cm	Samples, test specimens (as appropriate)
		Centimetre, metre	cm, m	Carpets, druggets, *DURRIES* (as appropriate)
3)	Thickness	Micrometre (micron)	µm	Delicate fabrics
		Millimetre	mm	Other fabrics, carpets, felts
4)	Linear density	Tex	tex	Yarns
		Millitex	mtex	Fibres
		Decitex	dtex	Filaments, filament yarns
		Kilotex	ktex	Slivers, ropes, cordage
5)	Diameter	Micrometre (micron)	µm	Fibres
		Millimetre	mm	Yarns, ropes, cordages
6)	Circumference	Millimetre	mm	Ropes, cordages
7)	Threads in fabric:			Woven fabrics (as appropriate)
	a) Lengthwise	Number per centimetre	ends/cm	
		Number per decimetre	ends/dm	
	b) Widthwise	Number per centimetre	picks/cm	
		Number per decimetre	picks/dm	
8)	Warp threads in loom	Number per centimetre	ends/cm	Reeds
9)	Stitches in knitted fabric:			Knitted fabrics (as appropriate)
	a) Lengthwise	Courses per centimetre	courses/cm	
		Courses per decimetre	courses/dm	
	b) Widthwise	Wales per centimetre	wales/cm	
		Wales per decimetre	wales/dm	

Sl No.	Characteristic	SI Units		Application
		Unit	Abbreviation	
(1)	(2)	(3)	(4)	(5)
10)	Stitch length	Millimetre	mm	Knitted fabrics, made-up fabrics
11)	Mass per unit area	Grams per square metre	g/m^2	Fabrics
12)	Mass per unit length	Grams per metre	g/m	Fabrics
13)	Twist	Turns per centimetre	turns/cm	Yarns, ropes (as appropriate)
		Turns per metre	turns/m	
14)	Test or gauge length	Millimetre, centimetre	mm, cm	Fibres, yarns and fabric specimens (as appropriate)
15)	Breaking load	Millinewton	mN	Fibres, delicate yarns (individual or skeins)
		Newton	N	Strong yarns (individual or skeins), ropes, cordages, fabrics
16)	Breaking length	Kilometre	km	Yarns
17)	Tenacity	Millinewton per tex	mN/tex	Fibres, yarns (individual or skeins)
18)	Twist factor or twist multiplier	Turns per centimetre × square root of tex	turns/cm $\times \sqrt{\text{tex}}$	Yarns (as appropriate)
		Turns per metre × square root of tex	turns/m $\times \sqrt{\text{tex}}$	
19)	Bursting strength	Newton per square centimetre	N/cm^2	Fabrics
20)	Tear strength	Millinewton, newton	mN, N	Fabrics (as appropriate)
21)	Pile height	Millimetre	mm	Carpets
22)	Pile density	Mass of pile yarn in grams per square metre per millimetre pile height	$g/m^2/mm$ pile height	Pile carpets
23)	Elastic modulus	Millinewton per tex per unit deformation	mN/tex/unit deformation	Fibres, yarns, strands