

वस्त्रादि — उपभोक्ता सामानों के लिए बंधक  
संश्लिष्ट हुक और फंदा टेप — विशिष्टि  
( चौथा पुनरीक्षण )

**Textiles — Synthetic Hook and Loop  
Tape Fasteners for Consumer  
Goods — Specification**  
( *Fourth Revision* )

ICS 81.040

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## FOREWORD

This Indian Standard (Fourth Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Technical Textiles for Clothtech Applications including Narrow Fabrics and Braids Sectional Committee had been approved by the Textile Division Council.

With the advancement of technology, the synthetic hook and loop tapes are being used in more diversified fields. These revolutionary fasteners are gentle enough to be used in baby's diapers replacing safety pins and yet sturdy and reliable enough to be used even in aircrafts and space-ships and now household fasteners.

This standard was first published in 1976 and subsequently revised in 1981, 1994 and 2014. This revision is based on the prevalent practice followed by the Indian industry. In this revision the following major changes have been made:

- a) Five classes of tapes manufactured from 100 percent nylon, 100 percent polyester, and combinations of polyester/nylon and polyester/polypropylene as material of manufacturing for portions of loop and hook tape have been included;
- b) Requirements for hook and loop density and their test method have been included;
- c) Requirements for shrinkage of hook and loop tape have been revised;
- d) Requirements for flame resistant of hook and loop tapes and its test method have been incorporated;
- e) Requirement for fraying test of hook and loop tapes and its test method has been incorporated;
- f) BIS certification marking clause has been modified; and
- g) References in this standard have been updated.

The composition of the Committee responsible for the formulation of this standard is given in [Annex P](#).

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard***TEXTILES — SYNTHETIC HOOK AND LOOP TAPE  
FASTENERS FOR CONSUMER GOODS — SPECIFICATION***( Fourth Revision )***1 SCOPE**

**1.1** This standard covers the dimensions, materials and other requirements pertaining to construction and performance of synthetic hook tape and loop tape fastener.

**1.2** This standard also covers the hook tape and loop tape fastener manufactured from 100 percent nylon, 100 percent polyester, and combinations of polyester/nylon and polyester/polypropylene as material of manufacture.

**2 REFERENCES**

The standards listed in [Annex A](#) 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 subjected to revision, and parties to agreements based on this standard are encourage to investigate the possibility of applying the most recent edition of these standards.

**3 TERMS AND DEFINITIONS**

For the purpose of this standard, the following definitions shall apply.

**3.1 Hook Tapes** — Hook tapes are one side of a fastener system, featuring small, stiff hooks. When pressed against a corresponding loop tape, the hooks catch and bind to the loops, creating a secure closure. Commonly used in fasteners, hook tapes provide a durable and adjustable fastening solution.

**3.2 Loop Tapes** — Loop tapes are the counterpart to hook tapes in a fastener system, consisting of soft,

pliable loops. When combined with hook tapes, the loops catch onto the hooks, forming a strong bond. Loop tapes are essential in fasteners, offering a flexible and reusable closure mechanism.

**4 CLASSES**

**4.1** Based on the type of material used for manufacturing, the hook and loop tape fasteners shall be divided into the following classes as given in [Table 1](#).

**5 MATERIALS**

**5.1** Hook and loop tape fasteners shall be manufactured from the materials specified in [Table 1](#).

**5.2** The materials used in manufacturing of Hook and loop tapes shall be identified when tested in accordance with the test method specified in [Annex B](#).

**5.3** The diameter of monofilament yarn used in hook yarns shall be tested by suitable dial gauge. The average of 10 reading shall be reported and the average value of the diameter of monofilament yarn shall conform to the requirements specified in [Table 1](#).

**6 DIMENSIONS**

**6.1** The sizes of hook tapes and loop tapes and their tolerances shall be as given in [Table 2](#).

**6.2** The density of hook and loop shall be as given in [Table 3](#) when tested as per the method given in [Annex E](#).

**Table 1 Classification of Hook Tapes and Loop Tapes**(Clause [4.1](#), [5.1](#) and [5.3](#))

Sl No.	Classes	Hook Tapes		Loop Tapes	
		Binder Ground Nylon	Hook Yarn	Binder Ground Yarn	Pile Yarn
(1)	(2)	(3)	(4)	(5)	(6)
i)	Class 1	Multifilament Nylon 6	Mono filament Nylon 6,6 of diameter 0.20 mm to 0.23 mm	Multifilament Nylon 6	Multifilament Nylon 6
ii)	Class 2	Multifilament Polyester	Mono filament Nylon 6,6 of diameter 0.20 mm to 0.23 mm	Multifilament Polyester	Multifilament Nylon 6
iii)	Class 3	Multifilament Polyester	Mono filament polyester of diameter 0.21 mm to 0.23 mm	Multifilament Polyester	Multifilament Polyester
iv)	Class 4	Multifilament Polyester	Mono filament polypropylene of diameter 0.17 mm to 0.18 mm	Multifilament Polyester	Multifilament Nylon 6 / Polyester
v)	Class 5	Multifilament Nylon 6	Mono filament Nylon 6,6 of diameter 0.15 mm to 0.16 mm	Multifilament Nylon 6	Multifilament Nylon 6

NOTE — For manufacturing hook and loop tapes with softer hooks, class 5 shall be used.

**Table 2 Sizes for Hook Tapes and Loop Tapes**

(Annex C, Annex D, Clause 6.1)

Sl No.	Characteristic	Classes					Tolerances	Method of Test, Ref to
		(3)	(4)	(5)	(6)	(7)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Classes	Class 1	Class 2	Class 3	Class 4	Class 5		
ii)	Nominal width, mm (see NOTE)	12 mm to 25 mm					$\pm 1.5$ mm	Annex C
		30 mm to 38 mm					$\pm 1.5$ mm	
		50 mm to 75 mm					$\pm 2$ mm	
		80 mm to 175 mm					$\pm 3$ mm	
iii)	Length, m (see NOTE)	25, 50, 100					+ 1 m - 0 m	Annex D

NOTE — If required for a particular application, the nominal width and length other than those given above may be used as per the agreement between the buyer and the seller.

**7 MANUFACTURE**

**7.1 Hooks**

The hook fastener tape shall be a narrow woven fabric construction with hooks in warp direction and ground ends and picks made up of multifilament yarn. Monofilament auxiliary warp ends shall be woven in the form of raised loops which can be heat set to retain their shape and cut near the top of the loop in order to form a free hook engaging section. The hook shall be a leno weave, woven in a staggered order. Minimum two ends of ground yarns on either side of monofilament yarn shall be provided. The weave pattern of the hook tape shall be as given in [Fig. 1](#) where ‘A’ is ground yarn and ‘B’ is monofilament yarn for hook formation.

**7.2 Loops**

The loop fastener tape shall be a woven, warp loop, narrow fabric construction, with multifilament ground ends and picks, with leno woven multifilament loop warp ends. The loops shall be

suitably napped to form a uniformly disoriented surface of uncut loops capable of being engaged by the hooks of the hook fastener tape component. As an alternate, the loop shall be woven of specially treated yarns that provide a uniformly disoriented surface without being napped. Minimum two ends of ground yarns on either side of multifilament yarn shall be provided. The weave pattern of the loop tape shall be as given in [Fig. 2](#) where ‘A’ is ground yarn and ‘B’ is multifilament yarn for loop formation.

**7.3** The hook and loop tapes shall be manufactured with or without selvedge as per the agreement between the buyer and the seller. If manufactured with selvedge, a selvedge of 1 mm to 3 mm shall be provided in hook and loop tapes along with both the edges to facilitate stitching.

**8 PERFORMANCE REQUIREMENT**

**8.1** The hook and loop tape fasteners shall conform to the requirements given in [Table 4](#).

**Table 3 Hook and Loop Density**

(Clause [6.2](#))

SI No.	Characteristic(s)	Classes					Method of Test, Ref to
		Class 1	Class 2	Class 3	Class 4	Class 5	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Hook density, No. of Hooks/inch <sup>2</sup> , <i>Min</i>	280	240	230	460	280	} <a href="#">Annex E</a>
ii)	Loop density, No. of loops/inch <sup>2</sup> , <i>Min</i>	535	520	500	500	535	



A: Ground Yarn  
 B: Monofilament Hook Yarn

FIG. 1 WEAVE PATTERN OF HOOK TAPE YARNS



A: Ground Yarn  
 B: Multifilament Loop Yarn

FIG. 2 WEAVE PATTERN OF LOOP TAPE YARNS

**Table 4 Requirement for Hooks and Loops Tape Fasteners**(Clause [8.1](#))

SI No.	Characteristic	Requirement					Method of Test, Ref to
		Class 1	Class 2	Class 3	Class 4	Class 5	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Initial shear strength, g/cm <sup>2</sup> , <i>Min</i>						<a href="#">Annex F</a>
	a) Lengthwise b) Widthwise ( <i>see Note</i> )	960 960	860 860	760 760	2 000 2 000	300 300	
ii)	Initial peel strength, g/cm, <i>Min</i>	255	225	180	700	50	
iii)	Endurance strength, <i>Min</i>	675 g/cm <sup>2</sup> after being subjected to 5 000 cycles	610 g/cm <sup>2</sup> after being subjected to 3 000 cycles	305 g/cm <sup>2</sup> after being subjected to 500 cycles	—	150 g/cm <sup>2</sup> after being subjected to 5 000 cycles	<a href="#">Annex G</a>
iv)	Dot tear test, N, <i>Min</i>	15	25	25	25	15	<a href="#">Annex H</a>
v)	Shrinkage (longitudinal), Percent, <i>Max</i>						<a href="#">Annex J</a>
	a) For hooks b) For loops	3 4					
vi)	Colour fastness a) Colour fastness to light (grey scale)	3-4 or Better					IS/ISO 105- B01 or IS/ISO 105-B02
	b) Colour fastness to crocking (grey scale) 1) Dry crocking 2) Wet crocking	3-4 or Better					<a href="#">Annex K</a>
	c) Colour fastness to washing C(3) (grey scale)	3-4 or Better					IS/ISO 105-C10 Temperature: 70 °C ± 2 °C
	d) Colour fastness to sea water (grey scale)	3-4 or Better					IS/ISO 105-E02
NOTE — For hook and loop tapes of width less than 50 mm, widthwise initial shear strength test shall not be applicable.							

**Table 5 Requirement for Flame Resistance of Hooks and Loops Tapes**(Clause [8.2](#))

SI No.	Characteristic	Requirement		Method of Test, Ref to
(1)	(2)	(3)		(4)
		Ignition Time ( <i>see Note</i> )		
i)	Vertical flammability test (optional)	12 s	60 s	<a href="#">Annex L</a>
	a) Flame time, s, <i>Max</i>	15	15	
	b) Drip flame time, s, <i>Max</i>	5	3	
	c) Burn length vertical, mm, <i>Max</i>	200	150	
ii)	Horizontal flammability test (optional)		100	Annex A of IS 15061
	a) Burn rate, mm/min, <i>Max</i>			

NOTE — As agreed to between the buyer and the seller, the ignition time for flammability test shall be either 12 s or 60 s.

### 8.2 Flammability Test (Optional Requirement)

If agreed to between the buyer and the seller, the hook and loop tapes shall conform to the requirements of flammability test as given in [Table 5](#).

NOTE — Depending upon the use of the hook and loop tapes, vertical flammability test and/or horizontal flammability test may be carried out.

### 8.3 Fray Resistance

The hook and loop fasteners shall conform to the requirement that the tapes shall not fray more than 0.8 mm when tested in accordance with the test method specified in [Annex M](#).

### 9 DYEING

**9.1** The hook and loop tapes shall be dyed suitably. The dyes that are used for the dyeing of the hook and loop tapes shall be azo free dyes and free from formaldehyde.

**9.2** The tapes shall conform to the requirements of this standard prior to the application of the adhesive backings.

**9.3** The hook and loop tape fasteners may be supplied in any colour as desired by the purchaser.

The shade shall be uniform throughout on both the hook and loop tapes.

### 10 COATING

**10.1** Coating shall be Polyurethane based for all classes. The precoats may be activated with water or solvents like Ethyl Acetate, methyl ethyl ketone, as agreed to between the purchaser and the supplier.

**10.2** The hook and loop tapes shall be stabilized as necessary and pre-shrunk to ensure maximum flatness, evenness and dimensional stability. The back of the tape shall be coated with a polyurethane based elastomeric coating. The coating shall be properly cured.

**10.3** If agreed to between the buyer and the seller, the back of the tapes may be coated with a flame-retardant coating instead of Polyurethane based elastomeric coating.

### 11 TOXICITY

The hook and loop fasteners shall meet the requirements for the toxic chemicals as given in [Table 6](#).

NOTE — The requirements for toxicity shall be optional for flame resistant hook and loop tape fasteners.

**12 SAMPLING**

**12.1** All the hook and loop tape rolls of same construction and type dispatched to a buyer against one dispatch note shall constitute a lot.

**12.2** Unless otherwise agreed to between the buyer and the seller, the number of hook and loop rolls to be selected at random from a lot shall be as given in

col (3) of [Table 7](#).

**12.3 Criteria for Conformity**

The lot shall be declared conforming to the requirements of this standard if the total number of defective samples does not exceed the permissible numbers given in col (4) of [Table 8](#) as applicable.

**Table 6 Toxic Chemicals**(Clause [11](#))

SI No.	Chemical Substance	Requirements	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Allergenic and carcinogenic disperse dye	< 1 mg/l	IS 16914 (Part 2) and IS 16914 (Part 3)
ii)	Aromatic amines released from Azo dyes	< 20 mg/kg	IS 15570 and IS 582 (Part 5/Sec 1) and IS 582 (Part 5/Sec 2)
iii)	Dimethyl fumarate (DMFU)	< 0.1 mg/kg	IS 16991
iv)	Formaldehyde	Adults: < 100 mg/kg ( <i>see</i> Note 1) < 75 mg/kg ( <i>see</i> Note 2) Children: < 20 mg/kg	IS 14563 (Part 1)
v)	Organotin compounds	<i>see</i> <a href="#">Annex N</a>	IS 16981
vi)	pH	Not less than 3.5 and in case it is less than 3.5, the difference of pH on dilution by a factor of 10 (differential number), shall not be more than 0.6.	IS 1390
vii)	Phthalates (each individual phthalate)	< 500 mg/kg(for each)	IS 16915

NOTES

**1** Not in direct contact with skin.

**2** Direct contact with skin.



**Table 7 Scale of Sampling**(Clause [12.2](#))

Sl No.	No. of Rolls in Lot	Sample Size for Length, Width and Manufacturing Parameters	Sample Size for Performance Requirements, Hook and Loop Density, Fray Resistance	Sample Size for Flame Resistance and Toxicity
(1)	(2)	(3)	(4)	(5)
i)	Up to 150	8	3	3
ii)	151 to 500	13	5	3
iii)	501 to 1 200	20	5	5
iv)	1 201 to 10 000	32	8	5
v)	10 001 to 35 000	50	8	5
vi)	35 001 and above	80	13	8

**Table 8 Criteria for Conformity**(Clause [12.3](#))

Sl No.	Characteristic	Sample Size	Criteria for Conformity
(1)	(2)	(3)	(4)
i)	Length, width and manufacturing parameters	According to col (3) of Table 7	Each roll to satisfy the specified requirement
ii)	Performance requirements, hook and loop density, fray resistance	According to col (4) of Table 7	Each roll to satisfy the specified requirement
iii)	Flame resistance and toxicity	According to col (5) of Table 7	Each roll to satisfy the specified requirement

**13 MARKING**

**13.1** Each roll of tape shall be legibly and indelibly marked with the following:

- a) Name or trade-mark indicating source of manufacture;
- b) Class of the tapes;
- c) Batch number; and
- d) Any other information as required by the law in force.

**13.2** Each package of roll(s) of the tapes shall be legibly and indelibly marked with the following:

- a) Name or trade-mark indicating source of manufacture;

- b) Width and length of the tapes;
- c) Class of the tapes;
- d) Batch number;
- e) Flame resistance of tapes if applicable;
- f) Month and year of manufacture; and
- g) Any other information as required by the law in force.

**13.3 BIS Certification Marking**

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

**14 PACKING**

**14.1** The packing of hook and loop tape rolls shall be as per agreement between the buyer and the seller.

**14.2** The hook and loop tape fasteners shall be packed in rolls of 25 m, 50 m or 100 m or any other

desired length as agreed to between the buyer and the seller.

**14.3** The end of the hook or loop tape shall be ultrasonically sealed.

## ANNEX A

(Clause 2)

## LIST OF REFERRED STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
IS/ISO 105-B01: 2014	Textiles — Tests for colour fastness: Part B01 Colour fastness to light: Daylight	IS 15061 : 2002	Automotive vehicles — Flammability requirements
IS/ISO 105-B02: 2014	Textiles — Tests for colour fastness: Part B02 Colour fastness to artificial light: Xenon arc fading lamp test	IS 15570 : 2005	Textiles — Method of test — Detection of banned azo colorants in coloured textiles
IS/ISO 105-C10 : 2006	Textiles — Tests for colour fastness: Part C10 Colour fastness to washing with soap or soap and soda	IS 16914 (Part 2) : 2018/ ISO 16373-2 : 2014	Textiles — Dyestuffs: General method for the determination of extractable dyestuffs including allergenic and carcinogenic dyestuffs (method using pyridine-water)
IS/ISO 105-E02 : 2013	Textiles — Tests for colour fastness: Part E02 Colour fastness to sea water ( <i>first revision</i> )	(Part 3) : 2018/ ISO 16373-3 : 2014	Textiles — Dyestuffs: Part 3 Method for determination of certain carcinogenic dyestuffs (method using triethylamine/methanol)
IS 582 (Part 5/ Sec 1): 2024/ ISO 17234-1 : 2020	Methods of chemical testing of leather: Part 5 Determination of certain azo colorants in dyed leathers, Section 1 Determination of certain aromatic amines derived from azo colorants ( <i>first revision</i> )	IS 16915 : 2018/ ISO/TS 16181 : 2011	Footwear — Critical substances potentially present in footwear and footwear components — Determination of phthalates in footwear materials
IS 582 (Part 5/ Sec 2) : 2018/ ISO 17234-2: 2011	Methods of chemical testing of leather Part 5 Determination of certain azo colorants in dyed leathers, Section 2 Determination of 4-aminoazobenzene	IS 16981 : 2018/ ISO/TS 16179 : 2012	Footwear — Critical substances potentially present in footwear and footwear components — Determination of organotin compounds in footwear materials
IS 1390 : 2022/ ISO 3071 : 2020	Textiles — Determination of pH of aqueous extract ( <i>third revision</i> )	IS 16991 : 2018/ ISO/TS 16186 : 2012	Footwear — Critical substances potentially present in footwear and footwear components — Test method to quantitatively determine dimethyl fumarate (DMFU) in footwear materials
IS 14563 (Part 1) : 2021/ISO 14184 -1 : 2011	Textiles — Determination of formaldehyde: Part 1 Free and hydrolysed formaldehyde (water extraction method) ( <i>first revision</i> )		

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**ANNEX B**

(Clause [5.2](#))

**METHOD FOR DETERMINATION OF NYLON 6, NYLON 6.6, POLYESTER AND  
POLYPROPYLENE YARNS**

**B-1 IDENTIFICATION OF NYLON 6.6**

The material used for manufacturing is dipped in any one of the following reagents:

- a) Concentrated formic acid (98 percent) at room temperatures; and
- b) Trifluoroacetic acid (TFA) at temperatures of 70 °C; and
- c) m-Cresol at temperatures of 80 °C.

If the material used for manufacture is nylon 6,6, it shall dissolve in any one of the above mentioned reagents.

**B-2 IDENTIFICATION OF NYLON 6**

The material used for manufacturing is dipped in any one of the following reagents:

- a) Concentrated formic acid (90 percent) at temperatures of 70 °C.
- b) Concentrated 'sulfuric acid at temperatures of 100 °C.

If the material used for manufacture is nylon 6, it shall dissolve in any one of the above mentioned reagents.

**B-3 IDENTIFICATION OF POLYESTER**

The material used for manufacturing is dipped in any one of the following reagents:

- a) Solution of crystallized trichloroacetic acid/chloroform reagent, prepared at a mass ratio 1 : 1.
- b) Benzyl alcohol at temperatures of 150 °C.
- c) m-Cresol at boil.

If the material used for manufacture is polyester, it shall dissolve in any one of the above mentioned reagents.

**B-4 IDENTIFICATION OF POLYPROPYLENE**

The material used for manufacturing is dipped in the following reagents:

- a) Boiling xylene at temperatures of 145 °C.

If the material used for manufacture is polypropylene, it shall dissolve in the above mentioned reagents.

**ANNEX C**

([Table 2](#))

**DETERMINATION OF WIDTH**

**C-1** Select at least 5 sample tape rolls. From each tape roll, draw 1 m length of tape specimen and render the tape flat on a table and free from any twist or wrinkles. Take steel scale with graduation up to 0.5 mm which shall be used to measure the width of the tape. The steel scale shall be placed on the table and the sample tape shall be laid flat perpendicular

to the scale. Width reading shall be taken up to the accuracy of 0.5 mm. 3 readings shall be taken from each sample and average of the readings shall be determined. Repeat this for all the 5 samples and the average shall be taken to calculate the width of the sample. A tolerance of  $\pm 0.5$  mm on average values of tapes shall be permissible.

## ANNEX D

(Table 2)

## DETERMINATION OF LENGTH

**D-1** Select 3 sample tape rolls. Unroll the tape from one of the sample rolls and lay it flat on the table marked with 5 m of length on it. Measure the tape by placing between marks of 5 m length on the table (measurement shall be made in the multiples of 5 m). Repeat this process on the complete length of the roll until a length less than 5 m is left at the end of

the tape. Measure the remaining length with a steel scale of graduation up to 1 cm. Measure other tape rolls with the same process. Average of all the 3 values of length shall be taken. A tolerance of  $\frac{+1\text{ m}}{-0\text{ m}}$  on average length of tapes shall be permissible. The length shall conform as per [6.1](#).

## ANNEX E

(Clause [6.2](#) and [Table 3](#))

## DETERMINATION OF HOOK AND LOOP DENSITY

**E-1** Select 5 samples of hook and loop tape roll, discard the initial one meter of tape from the sample packages.

**E-2** From hook and loop tape roll, draw 150 mm length of tape specimen and cut the specimen into 3 sub-specimen of one square inch area each.

**E-3** Place each of the specimen under pick glass and count pick per inch of the sample

**E-4** The density of hook and loops shall be calculated as follows:

Hook density = (No. of picks/2) × No. of hooks per row of the marked area.

Loop density = (No. of picks/2) × No. of loops per row of the marked area.

**E-5** Calculate the hook and loop densities for the 3 sub-specimens from each roll and average them to get a density value for each roll. The final hook and loop density for the tape shall be the average of the values from all 5 sample rolls.

**E-6** For 25 mm and below width hook and loop tapes (where specimen area is less than one square inch) hook and loop density can be measure as follows:

Hook density = Density of hook in  $\frac{1}{4}$  square inch area × 4

Loop density = Density of loop in  $\frac{1}{4}$  square inch area × 4.

NOTE – If the width of the hook and loops is less than half inch, full width shall be taken.

## ANNEX F

(Table 4)

## TEST FOR SHEAR, PEEL AND TENSILE STRENGTH

**F-1** The apparatus shall be as follows:

**F-1.1** A pendulum type tester with cam drive shall be used for the tests to minimize the possibility of slipping as well as for the ease of putting the samples in the jaws.

**F-1.2** A constant power-driven tensile testing machine having a constant rate of traverse type shall be used.

**F-1.2.1** The rate of traverse shall be constant. The jaw separation speed should be 300 mm/min ± 5 mm/min.

**F-1.3** A steel roller having a diameter of 121 mm and 57 mm wide weighing 5 kg for mating the tape components.

**F-2 REQUIREMENTS OF TEST SPECIMEN**

The test specimen shall be as follows:

Sl No.	Type of Test	Size of Hook and Loop Tape mm	
		Length	Width
(1)	(2)	(3)	(4)
i)	Peel strength	175	Full width
ii)	Shear strength (length-wise)	125	Full width
iii)	Shear strength (width-wise)	100	50 (see NOTE)

NOTE — The shear strength (width-wise) shall be only tested on hook and loop tapes of width greater than or equal to 50 mm.

**F-3 PREPARATION OF THE TEST SPECIMEN FOR PEEL AND SHEAR STRENGTH TEST****F-3.1 Mating of the Components**

Select the width and length of hook and loop tape as specified in [F-2](#). Place the hook tape (hook side down) evenly and without pressure on tape of a corresponding equal width of loop tape (loop side up). Mesh the two tapes by traversing the steel roller back and forth across the overlap for 5 times in each direction. The pressure shall be applied evenly across the full width of the combined tapes in a smooth and continuous way. The hand pressure shall not be applied. The roller alone shall exert the required pressure.

**F-3.2** If the width of the hook and loop tape is greater than the width of the steel roller, the hook shall be laid out evenly with hook side down on tape of a corresponding equal width of loop tape with loop side up and parallel vertical lines shall be marked on full length of the tape at a distance of 57 mm from one edge of the tape until a length less than

57 mm is remaining. The hook and loops tapes shall then be meshed by traversing the steel roller back and forth across the overlap for 5 times in each direction. The pressure shall be applied evenly across those sectors marked with length of 57 mm each.

**F-4 PROCEDURE FOR PEEL AND SHEAR STRENGTH TEST**

**F-4.1** Grip one end of the free hook or loop tape in the upper jaw and the other end in the lower jaw of the machine. Apply a continuous increase in load to the specimen longitudinally until the specimen is loosened and separated. Note down the reading.

**F-4.2** The peel strength (longitudinal) shall be conducted in the same way as mentioned in [F-4.1](#).

**F-4.3** The shear strength (longitudinal) shall be conducted in the same way as mentioned in [F-4.1](#).

**F-4.4** The shear strength (width-wise) may be conducted if specifically required by the buyer.

**ANNEX G**

(Table 4)

**METHOD FOR ENDURANCE TEST**

**G-1** This machine consists of two drums mounted one on top of the other (schematic arrangement is shown in Fig. 3) the bottom drum is driven at 60 rev/min with the direction of rotation reversed every 30 s. The machine is fitted with a counter which counts the number of cycles regardless of

direction of rotation. The drive from the bottom drum is imparted to the top drum through the physical contact of the hook and loop tape fastener under test.

**G-2** The bottom drum is 160 mm in diameter and 180 mm wide with a slot 175 mm long cut into the

rim for mounting the sample. The loop tape sample is mounted onto this drum free from any wrinkles and creases with the stitching of the loop being used to clamp the specimen in place.

NOTE — If the of loop tape is greater than the width of bottom drum as given in [F-2](#), a suitable bottom drum of appropriate width shall be used.

**G-3** The top drum is 162.5 mm in diameter and 180 mm wide with a slot 175 mm long cut into the rim and can rotate freely. The hook tape is mounted onto this drum free from any wrinkles or creases and clamped in place through the slot using the stitching of the loop. The drive from the bottom drum is imparted to the top drum contact between the hook tape and the loop tape. This drum has a means of loading the drum with 1 kg/cm width of fastener.

NOTE — If the width of hook tape is greater than the width of top drum as given in [F-3](#), a suitable top drum of appropriate width and weight shall be used.

**G-4** If necessary, it is allowable to mount two narrow tapes, side by side on the drums provided the top drum is still loaded with 1 kg of total width of tapes in cm.

**G-5** If due to stretching of the tape during cycling it becomes difficult to adjust the fastener to the correct tension and position, it is permissible to stick the tapes to the drum using double sided adhesive tape.

**G-6** When removing the samples from the machine it is important to mark where the fastener passes through the slot to ensure that only those areas worn by cycling are subsequently tested for shear strength and peel strength.

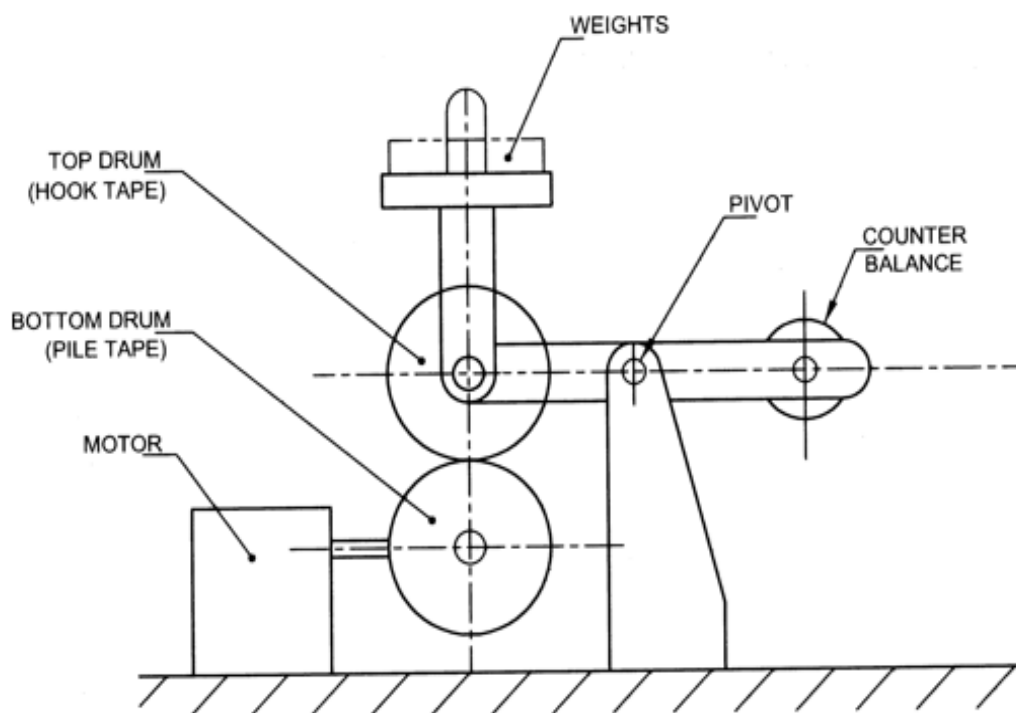


FIG 3. SCHEMATIC ARRANGEMENT OF ENDURANCE TESTER

## ANNEX H

*(Table 4)*

## METHOD FOR DOT TEAR TEST

**H-1 PROCEDURE**

**H-1.1** Take a sample of hook-and-loop tape with a length of 120 mm to 150 mm and full width.

**H-1.2** Mark a horizontal line at a distance of 50 mm from one end of the sample.

**H-1.3** Cut the sample lengthwise in the middle, from one end up to the 50 mm mark.

**H-1.4** Fix one end of the sample in the upper jaw

and other end in the lower jaw of the tensile strength testing machine.

**H-1.5** Set the rate of extension of the tensile-testing machine to  $(300 \pm 15)$  mm/min.

**H-1.6** Set the machine to zero and start machine.

**H-1.7** Perform the extension until the specimen is separated completely. Record the maximum reading of dot tear force in newtons.

## ANNEX J

*(Table 4)*

## METHOD FOR DETERMINATION OF SHRINKAGE

**J-1 OUTLINE OF THE METHOD**

Shrinkage is determined by finding the difference in longitudinal measurement before and after washing the specimen. The shrinkage shall be expressed in percentage.

**J-1.1 Apparatus**

A suitable washing machine with a cylinder 535 mm in diameter rotating at 60 rev/min shall be used. The water temperature of washing machine shall be maintained at  $70 \text{ }^\circ\text{C} \pm 2 \text{ }^\circ\text{C}$  by means of an electric pad. The machine shall be able to run continuously in the wash cycle for this test.

**J-2 TEST SPECIMEN**

**J-2.1** Cut about 560 mm long, full width hook and loop tapes of the same size and thickness. Make two marks 500 mm apart on the back of the tapes using the laundry mark.

**J-2.2 Procedure**

**J-2.2.1** Put the sample into the washing machine with enough household detergent to form a thin layer of suds and wash for 4 h. Rinse and dry the specimen.

**J-2.2.2** Recondition the specimen at  $27 \text{ }^\circ\text{C} \pm 2 \text{ }^\circ\text{C}$  temperature, and  $65 \text{ percent} \pm 4 \text{ percent}$  relative humidity until it reaches a constant mass (a constant mass is considered to be achieved when measurements made at 1 h intervals do not show a change in mass greater than 0.25 percent).

**J-2.2.3** Measure the distance between the marks on the back of the tapes in the length-wise direction. This shall be the laundered length.

**J-2.2.4** Calculate the percentage shrinkage as follows:

Percent shrinkage =

$$\frac{(\text{Original Length}) - (\text{Laundered length})}{\text{Original length}} \times 100$$



## ANNEX K

*(Table 4)*

## TEST FOR COLOUR FASTNESS

**K-1 FASTNESS TO LIGHT**

The colour of the hook and loop tapes shall be fast to light and when tested in accordance with the method prescribed in IS/ISO 105-B02. The test specimen shall be of full width and 100 mm ± 2 mm in length.

**K-2 FASTNESS TO SEA WATER**

The tapes shall be fast to sea water and when tested in accordance with the method prescribed in IS/ISO 105-E02. The test specimen shall be of full width and 100 mm ± 2 mm in length.

**K-3 FASTNESS TO WASHING**

The tapes shall be fast to washing and when tested in accordance with the method prescribed in IS/ISO 105-C10. The test specimen shall be of full width and 100 mm ± 2 mm in length.

**K-4 CROCKING TEST****K-4.1 Dry and Wet Crocking**

A crockmeter shall be used in this test along with a

50 mm × 50 mm square of bleached, unsized cotton fabric piece. Cut a piece of hook or loop tape 180 mm long. Place the tape face up on the abrasive area of the crockmeter, fasten ends with suitable adhesive tape and/or rubber band. Fasten 50 mm × 50 mm square cotton fabric piece on the fingertip with a rubber band. Turn the crank so that the cloth on the finger is rubbed over the tape a total of 10 times in each direction. Turn the tape over and attach new 50 mm × 50 mm square cotton fabric piece. Again, turn the crank so that the cloth is rubbed over the tape a total 10 times in each direction. Soak two square cloth pieces in distilled water, lay them between blotters and squeeze by finger. Repeat the test as above on face and back using moistened cloth pieces. Evaluate the amount of staining on the 50 mm × 50 mm square by grey scale.

## ANNEX L

*(Table 5)*

## METHOD FOR DETERMINATION OF VERTICAL FLAMMABILITY OF HOOK AND LOOP TAPES

**L-1 OUTLINE OF THE METHOD**

This method is intended for use in determining the resistance of hook and loop tapes to flame when tested according to the ignition time of 12 s or 60 s for vertical flammability test.

**L-2 DEFINITIONS****L-2.1 Ignition Time**

Ignition time is the duration of time the burner flame is applied to the specimen. It can be either 12 s or 60 s for this test.

**L-2.2 Flame Time**

Flame time is the time in seconds that the specimen continues to flame after the burner flame is removed

from beneath the specimen. Surface burning that results in a glow but not in a flame is not included.

**L-2.3 Drip Flame Time**

Drip flame time is the time in seconds that any flaming material continues to flame after falling from the specimen to the floor of the chamber.

**L-2.4 Burn Length**

Burn length is the distance from the original specimen edge to the farthest evidence of damage to the test specimen due to that area's combustion including areas of partial consumption, charring, or embrittlement but not including areas sooted, stained, warped, or discolored nor areas where material has shrunk or melted away from the heat.

### L-3 TEST APPARATUS

#### L-3.1 Test Cabinet

An incombustible box 305 mm × 305 mm × 760 mm open at the top, and provided with a vertical transparent front. An opening, 25 mm deep and 125 mm long is left at the bottom of the front, to allow manipulation of the gas burner.

#### L-3.2 Clip

A suitable clip for suspending the test specimen above the flame.

#### L-3.3 Gas Burner

A Bunsen burner about 150 mm high with an internal diameter of 9 mm.

#### L-3.4 Specimen Holder

Consisting of two U-shaped metal plates between which the specimen can be held in such a way that the tape specimen is free at the bottom and is held at the top and sides so that the total exposed area is 50 mm × 305 mm. The specimen holder will be positioned in the draught-free box vertically so that the igniting flame strikes the specimen centrally and 19 mm above the bottom edge of the specimen.

#### L-3.5 Clamps

These may be plain or serrated spring clips or small clamps. When made of smooth material, it may be necessary to insert emery paper to increase friction.

#### L-3.6 Stenter Pin Plates

Two stenter pin plates, each consisting of a flat plate carrying pointed pins attached to one side of its broad surface, to prevent movement of the lower end of the test specimen during the application of the test flame. Each plate is secured at one end to the side of the shield in the horizontal position.

#### L-3.7 Stopwatch

A stopwatch calibrated to the nearest 0.1 s, will be used to measure the time of application of the burner flame, the flame time, and the drip flame time.

#### L-3.8 Ruler

A ruler or scale graduated to the nearest 0.1 cm will be provided to measure the burn length.

### L-4 TEST SAMPLE

**L-4.1** The test specimen of hook or loop shall be of full width and 120 mm to 180 mm in length.

**L-4.2** Each separate set of specimens prepared for testing shall consist of minimum three specimens.

**L-4.3** If the shape and dimensions of a product do not permit taking a sample of the given size, the material is tested in the product's width.

### L-5 PROCEDURE

**L-5.1** Keep the apparatus in a substantially draught-free room or enclosure having  $27\text{ °C} \pm 2\text{ °C}$  of temperature, and 65 percent  $\pm$  4 percent relative humidity. Suspend the test specimen from the clip so that it hangs vertically, with its lower end held by the horizontal stenter pin plates in such a way that the bottom 6 mm of the specimen is attached to the horizontal stenter pins thereon. The plates shall be so fixed that not more than 9 mm of the specimen on either side is covered by them.

NOTE — The test specimen should not have loose threads or any form of fringe along its edges, that might affect the ease of ignition, cause initial flaring or flashing and thus prejudice the test.

**L-5.2** Shut off the air supply to the gas burner completely and adjust to give a luminous flame 38 mm in length. Place the gas burner such that the base of the flame is 19 mm below the middle of the lower edge of the specimen. Apply the flame for a period of 12 s or 60 s to the mid-point of the lower edge of the specimen and then withdraw the flame.

**L-5.3** If flaming material falls from the test specimen, determine the drip flame time for the specimen.

**L-5.4** Determine the flame time for the specimen.

**L-5.5** After all flaming ceases, open the cabinet door slowly, Remove the specimen and determine the burn length. To aid in determining the burn length,

a dry soft cloth or tissue, or a soft cloth or tissue dampened with a moderate solvent, such as methyl, ethyl, or isopropyl alcohol (which does not dissolve or attack the specimen material), may be used to remove soot and stain particles from tested specimens.

## L-6 TEST RESULTS

### L-6.1 Ignition Time

Report whether the ignition time was 12 s or 60 s.

### L-6.2 Flame Time

Report the flame time for each specimen tested. Determine and record the average value for flame time.

### L-6.3 Drip Flame Time

Report the drip flame time for each specimen tested. Determine and record the average value for the drip flame time. If no material falls from the specimen, the drip flame time is reported to be 0 s, and the notation "No Drip" is also reported. If there is more than one drip, the drip flame time reported is that of the longest flaming drip. If succeeding flaming drips reignite earlier drips that flamed, the drip flame time reported is the total of all flaming drips.

### L-6.4 Burn Length

Report the burn length to the nearest 1 mm for each specimen tested. Determine and record the average value for burn length.

## ANNEX M

(Clause [8.3](#))

### DETERMINATION OF FRAY RESISTANCE

**M-1** Select one sample roll of hook and loop tape each from the respective lot, discard the initial one meter of tape from the sample rolls.

**M-2** From the hook and loop tape roll, draw one test specimen each of 250 mm length with full width.

**M-3** Cut the hook and loop tape specimen each by slitting lengthwise in the middle up to a distance of 200 mm from one end.

**M-4** For performing fraying resistance test, the test specimen shall be washed for 3 cycles in a front-loading type, horizontal axis automatic washing

machine (Type A of IS 15370) with  $20 \text{ g} \pm 1 \text{ g}$  of reference detergent 2 in water and shall be washed as per washing procedure 7N at  $70 \text{ }^\circ\text{C} \pm 3 \text{ }^\circ\text{C}$  (Annex B of IS 15370). Drying shall be carried out by Type A1 tumble dryer (Annex F of IS 15370).

**M-5** A total of 3 washing cycles shall be carried out. After completion of the washing cycles, the center slit edges and outside edges of the hook and loop tape specimen shall be examined for fraying.

**M-6** The fraying width of the hook and loop tape specimen shall be reported. each shall not exhibit fraying of more than 0.8 mm after completion of 3 washing cycles.

## ANNEX N

[\(Table 6\)](#)

## LIST OF ORGANOTINS AND PRESCRIBED LIMITS

<i>Sl No.</i>	<i>Substance(s)</i>	<i>CAS No.</i>	<i>Limit</i>
(1)	(2)	(3)	(4)
i)	Dibutyltin	14488-53-0	< 5.0 mg/kg
ii)	Dibutyltin dichloride	683-18-1	< 5.0 mg/kg
iii)	Diocetyl tin	250252-87-0	< 5.0 mg/kg
iv)	Monobutyltin	78763-54-9	< 5.0 mg/kg
v)	Tributyltin	36643-28-4	< 1.0 mg/kg
vi)	Triphenyltin	668-34-8	< 1.0 mg/kg
vii)	Monooctyltin	94410-07-8	< 5.0 mg/kg
viii)	Bis(tributyltin)oxide	56-35-9	< 1.0 mg/kg

## ANNEX P

*(Foreword)*

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Technical Textiles for Clothtech Applications including Narrow Fabrics and Braids Sectional Committee, TXD 39

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