Indian Standard

TEXTILES — NYLON SEWING THREADS FOR AEROSPACE PURPOSES — SPECIFICATION

(Third Revision)

1 SCOPE

This standard prescribes the constructional particulars and performance requirements for 6 varieties of nylon sewing threads used for stitching aerospace textile materials.

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 subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 YARN

Bright, high tenacity, continuous multifilament yarn of nylon 6 or nylon 6.6 shall be used in the manufacture of sewing thread. The yarn nylon 6 or nylon 6.6 shall be identified by confirmatory test of microscopic and dissolution as prescribed in IS 667. The yarn shall be even and uniform with suitable twist to produce a balanced thread.

4 FINISH

4.1 General

The threads shall be supplied heat set and in one of the following conditions according to the agreement between the buyer and the seller:

a) Undyed;

b) Undyed and bonded;

c) Dyed, or; and

d) Dyed and bonded.

4.2 A lubricating finish may be applied to the thread to facilitate its performance.

4.3 Finishing and bonding agents shall not contain substances known to promote microbiological growth.

4.4 Dyeing

If dyeing is required, the colour and depth of shade shall be as specified in contract or order. For dyeing, metallic or chrome dyes shall not be used. The dyeing should be uniform throughout and dyed threads should be free from dyeing defects.

5 REQUIREMENTS

5.1 The nylon sewing threads shall conform to the requirements specified in Table 1 and Table 2.

Table 1 Physical Requirements

(*Clauses* 5.1, 5.2 *and* 8.1)

Sl No.	Variety No.	Structure of Sewing Thread		Length per Unit Mass, *Min* (*see* Note 1)	Average Breaking Strength, *Min* (*see* Note 1 and 2)	Average Extension at Break, Percent, *Max* (*see* Note 1)
		Filament Yarn Linear Density	No. of Plies			
		tex		m/kg	N	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	L1	23.3	2	18 500	23.5	28
ii)	L2	23.3	3	12 300	35.0	28
iii)	H1	23.3	6 (2 × 3)	6 150	71.0	28
iv)	H2	23.3	9 (3 × 3)	4 100	106.0	28

Table 1 (*Concluded*)

Sl No.	Variety No.	Structure of Sewing Thread		Length per Unit Mass, *Min* (*see* Note 1)	Average Breaking Strength, *Min* (*see* Note 1 and 2)	Average Extension at Break, Percent, *Max* (*see* Note 1)
		Filament Yarn Linear Density	No. of Plies			
		tex		m/kg	N	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
v)	H3	23.3	12 (4 × 3)	3 075	141.0	28
vi)	H4	23.3	18 (6 × 3)	2 050	211.0	28
Method of Test, Ref to		IS 4910 (Part 2)	—	IS 4910 (Part 2)	IS 4910 (Part 3)	

NOTES
1 In case of dyed threads, 5 percent relaxation shall be allowed in length per unit mass, breaking strength and extension at break.
2 In case of dyed and bond threads, additional 10 percent relaxation shall be provided in length per unit mass and filament linear density of yarn.
3 No individual reading of breaking strength shall be less than the 95 percent of the specified value.

Table 2 Chemical Requirements

(*Clause* 5.1)

Sl No. (1)	Characteristic (2)	Requirement (3)	Method of Test, Ref to (4)
i)	Colour fastness to:		
	a) Light	5 or better	IS/ISO 105-B01
	b) Washing, Test B (2)	4 or better	IS/ISO 105-C10
	c) Dry-cleaning	4 or better	IS/ISO 105-D01
ii)	Conductivity of aqueous extract (*see* Notes 1 and 2), S/cm, *Max*	150	IS 4420
iii)	*p*H value of aqueous extract	6 to 8	IS 1390
iv)	Water soluble chlorides, as NaCl, *Max*, percent	0.1	IS 4202
v)	Water soluble sulphates, as Na_2SO_4, *Max*, percent	0.25	IS 4203

NOTES
1 Test for *p*H value, water soluble chlorides and sulphates to be carried out only when the conductivity exceeds the specified value.
2 The nylon sewing thread failing in respect of conductivity shall be rejected if it fails also in respect of *p*H, water soluble chlorides or water-soluble sulphates.

5.2 Twist

Threads shall be supplied with suitable twist levels as agreed to between the buyer and the seller so as to meet the requirements given in Table 1. The twist shall not vary more than ± 10 percent for any level of twist.

5.2.1 The direction of twist in single yarn and final thread shall be at the discretion of the manufacturer. However, the direction of twist starting from single yarn should be S/Z for plied and S/S/Z for cabled threads.

5.2.2 The amount of twist shall be tested in accordance with IS 832 (Part 1).

5.3 Extension Under Load

The extension of the threads, when subjected to a load equal to 25 percent of the specified strength for (60 ± 5) s, shall not exceed 15 percent.

5.4 Shrinkage in Boiling Water

The mean shrinkage of the threads in boiling water, when determined in accordance with the method prescribed in IS 4910 (Part 5), shall not exceed 2.5 percent.

5.5 Sewing Properties

5.5.1 Threads of minimum length per unit mass of

not less than 9 000 m/kg shall be tested in accordance with Annex B. The stitching pattern shall be completed without slipped or broken stitches and the number of malformed stitches shall not exceed two.

5.5.2 Threads other than those specified in 5.5.1 shall be tested in accordance with Annex C. The stitches pattern shall be completed without slipped or broken stitches and the number of malformed stitches shall not exceed two.

6 SEALED SAMPLE

6.1 If, in order to specify the shade, tone, finish, and general appearance, etc, a sample has been agreed upon between the buyer and the seller and sealed, the supply shall be in conformity with the sealed sample in such respects.

6.1.1 The custody of the sealed sample shall be a matter of prior agreement between the buyer and the seller.

7 PACKAGING

The nylon sewing threads shall be compactly wound on reels or bobbins or in any other form and supplied as detailed in the contract or order. The free end of the thread shall be securely fastened to prevent unravelling.

8 MARKING

8.1 Each package shall be marked, preferably by a label, with the following information:

a) Manufacturer's name, initials, or trade-mark;

b) Name of the material;

c) Variety No. (*see* Table 1);

d) Finish of yarn;

e) Nominal length or mass of thread in metres in a unit package;

f) Year of manufacture; and

g) Indication of the source of manufacture.

8.2 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 there under, and the products may be marked with the Standard Mark.

9 PACKING

Unless otherwise specified, the package containing the nylon sewing thread shall be packed in accordance with IS 1066.

10 SAMPLING AND CRITERIA FOR CONFORMITY

10.1 Lot

The quantity of sewing thread of same quality and variety delivered to a buyer against one dispatch note shall constitute a lot.

10.2 The conformity of the lot to the requirements of this standard shall be determined on the basis of tests carried out on the sample selected from it. Unless otherwise agreed to between the buyer and the seller, the number of packages to be selected from a lot shall be according to Table 3. To ensure randomness of selection, methods given in IS 4905 shall be followed.

Table 3 Sample Size and Permissible Number of Non-Conforming Packages

(*Clauses* 10.2 *and* 10.3)

Sl No.	Lot Size	Sample Size	Permissible Number of Non-Conforming Packages
(1)	(2)	(3)	(4)
i)	Upto 100	5	0
ii)	101 to 300	10	0
iii)	301 to 500	15	0
iv)	501 to 1 000	20	1
v)	1 001 and above	30	1

10.3 The sample size and criteria for conformity for various characteristics shall be as follows:

Sl No. (1)	*Characteristics* (2)	*Samples Size* (3)	*Criteria for Conformity* (4)
i)	Breaking strength, elongation at break, length (m/kg), twist per metre, extension under specified load and mass, and length of sewing thread	All the packages according to col (2) of Table 3	Non-conforming packages not to exceed corresponding number given in col (4) of Table 3
ii)	Colour fastness, conductivity of aqueous extract, *p*H value of aqueous extract, water soluble chlorides, water soluble sulphates, shrinkage in boiling water and sewing properties	Two packages for a lot of 300 packages and three above 300	All the packages to satisfy the relevant requirements

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS/ISO 105-B02 : 2014	Textiles — Tests for colour fastness: Part B02 Colour fastness to artificial light : Xenon arc fading lamp test
IS/ISO 105-C10: 2006	Textiles — Tests for colour fastness: Part C10 Colour fastness to washing with soap or soap and soda
IS/ISO 105-D01 : 2010	Textiles — Tests for colour fastness: Part D01 Colour fastness to drycleaning using perchloroethylene solvent
IS 667 : 1981	Methods for identification of textile fibres (*first revision*)
IS 832 (Part 1) : 2021/ ISO 2061 : 2015	Textiles — Determination of twist in yarns: Part 1 Direct counting method (*third revision*)
IS 1066 : 1980	Code for packaging of sewing threads (*first revision*)
IS 1390 : 2022/ ISO 3071 : 2020	Textiles — Determination of *p*H of aqueous extract (*third revision*)
IS 4202 : 2022	Method for determination of chloride content of textile materials (*first revision*)
IS 4203 : 2022	Method for determination of sulphate content in textile materials (*first revision*)
IS 4420 : 2022	Methods for determination of conductivity of aqueous and organic extracts of textile materials (*first revision*)
IS 4727 : 2020	Textiles — Nylon webbing for aeronautical purposes — Specification (*first revision*)
IS 4905 : 2015/ ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
IS 4910	Tyre yarns cords and tyre cord fabrics made from man-made fibres — Methods of test
(Part 2) : 2023	Linear density (*second revision*)
(Part 3) : 2023	Load and elongation characteristics (*second revision*)
(Part 5) : 2023	Heat shrinkage and heat shrinkage force (*second revision*)

ANNEX B

(*Clause* 5.5.1)

TEST FOR SEWING PROPERTIES FOR THREADS OF LINEAR DENSITY ABOVE 9 000 METRES PER KILOGRAM

B-1 GENERAL

The properties of the fabric on which this test is to be performed shall be according to the agreement between the buyer and the seller.

B-2 TEST SPECIMEN

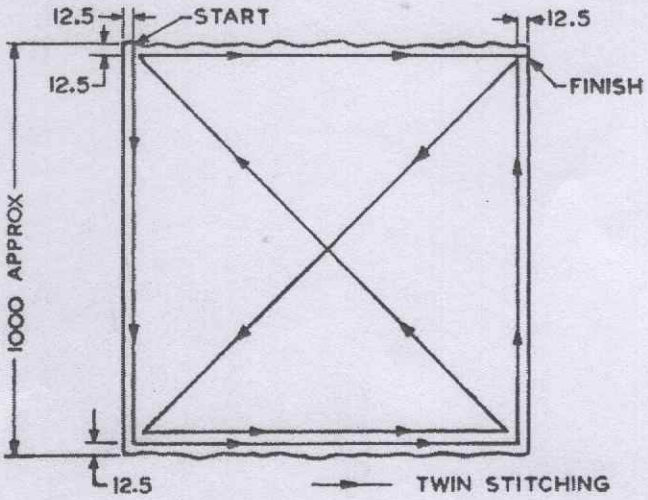
The test specimen shall consist of four full-width lengths, each approximately 1 m long, of nylon parachute fabric laid out in stack.

B-3 APPARATUS

A twin-needled lockstitch sewing machine capable of stitching at the rate of (3 250 ± 250) stitches per minute, maintaining 32 stitches/dm, properly adjusted for tension, 8 mm gauge, and fitted with an appropriate size of needle, shall be used.

B-4 PROCEDURE

Stitch the test piece at the rate given in B-2 as shown in Fig. 1 lifting the foot and needle but not cutting the thread at the end of each straight run to enable the test piece to be turned. Ignore any slight looping at each corner.



All dimensions in millimetres.

FIG. 1 TEST PIECE FOR LIGHT SEWING THREADS

ANNEX C

(*Clause* 5.5.2)

TEST FOR SEWING PROPERTIES FOR THREADS OF LINEAR DENSITY LESS THAN 9 000 METRES PER KILOGRAM

C-1 TEST SPECIMEN

Four test specimens of dyed nylon webbing conforming to IS 4727 shall be tested. Each specimen shall consist of the layers of webbing, approximately 45 mm wide and 0.5 m long as given below:

a) For threads of varieties No. H1 and H2 — 2 layers

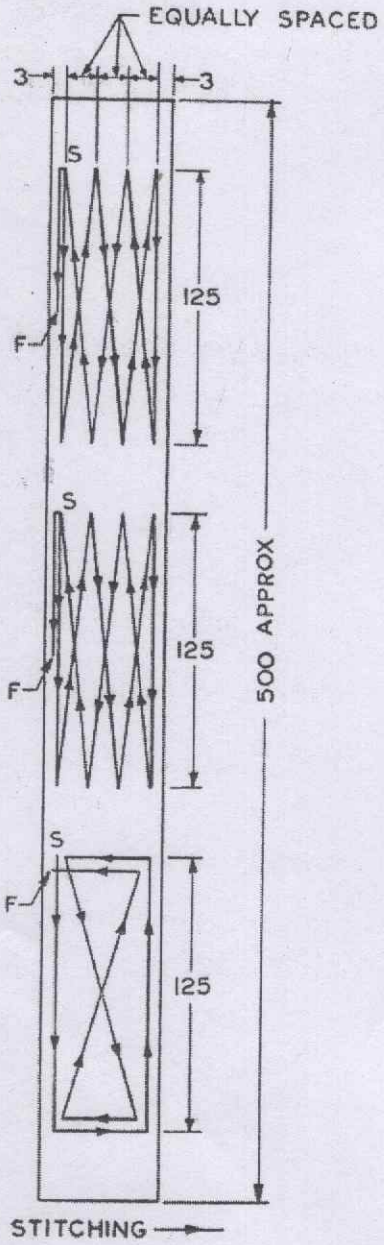
b) For threads of varieties No. H3 and H4 — 3 layers

C-2 APPARATUS

A single-needle lockstitch sewing machine, capable of stitching at the rate of (250 ± 40) stitches per minute, maintaining 20 stitches/dm, properly adjusted for tension and fitted with an appropriate size of needle shall be used. Application of lubricant to the needle is permitted.

C-3 PROCEDURE

Stitch together the webbings of each test piece with two four-point double W's and a gate pattern, as shown in Fig. 2.



All dimensions in millimetres.

FIG. 2 TEST PIECE FOR HEAVY SEWING THREADS