SRI LANKA STANDARD 757: 2011

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SPECIFICATION FOR
STAPLE SPUN POLYESTER SEWING THREAD
(Second Revision)

SRI LANKA STANDARDS INSTITUTION

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Gr. 9

SRI LANKA STANDARDS INSTITUTION
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SRI LANKA.

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This standard does not purport to include all the necessary provisions of a contract.

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SPECIFICATION FOR STAPLE SPUN POLYESTER SEWING THREAD
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FOREWORD

This standard was approved by the Sectoral Committee on Textiles, Clothing and Leather and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 2011-04-28.

This standard was first published in 1986. First Revision was in 1993. In this Second Revision, existing method of test for lubricant content has been replaced by a new method and also the requirements for linear density and breaking force of sewing threads have been revised.

Sewing thread is designated by a ticket number which is an indication of the amount of raw fibre in the thread. It is based on grey thread rather than finished thread because finishing processes such as bleaching, dyeing, stretching, mercerizing, or finishing applications significantly change the apparent thread size, so that it may become an inadequate indicator of raw fibre present. However, ticket number is widely used by thread manufacturers and industrial thread consumers to describe approximately the thickness of the finished product. Different ticket numbering systems are used in the industry. The ticket numbers given in this standard reflect the trade practice in this country at present.

Guidelines for the determination of the compliance of a lot with the requirements of this specification based on statistical sampling and inspection are given in Appendix **A** and Information of ticket number calculations are given in Appendix **E**.

For the purpose of deciding whether a particular requirement of this specification is complied with, the final value, observed or calculated, expressing the result of a test or an analysis shall be rounded off in accordance with **SLS 102**. The number of significant places retained in the rounded off value shall be the same as that of the specified value in this specification.

In the preparation of this standard the assistance derived from the following publications is gratefully acknowledged:

ASTM 123: 2007	Standard terminology relating to textiles
BS 4134 : 1990	British standard specification for designation of ticket numbers of industrial sewing threads
EN 12590 : 1999	Textiles – Industrial sewing threads made wholly or partly from synthetic fibres
IS 9543 : 1980	Indian standard specification for spun polyester sewing threads

1 SCOPE

This specification prescribes the requirements, and methods of sampling and test for staple spun sewing thread of polyester. This standard does not cover grey threads.

2 REFERENCES

SLS	16	Textiles - Standard atmospheres for conditioning and testing
SLS	20	Determination of linear density (mass per unit length) of yarn from packages by the skein method
SLS	22	Determination of single-end breaking load and elongation at break of yarns from packages
SLS	62	Determination of colour fastness of textile materials Part 2: Colour fastness to artificial light xenon-arc fading lamp test
SLS	63	Determination of colour fastness of textile materials to rubbing
SLS	67	Determination of colour fastness of textile materials to perspiration
SLS	102	Presentation of numerical values
SLS	416	Determination of colour fastness of textile materials to dry cleaning
SLS	428	Random sampling methods
SLS	1357	Determination of colour fastness of textile materials to washing with soap or soap and soda

3 DEFINITIONS

For the purpose of this specification, the following definitions shall apply:

3.1 sewing thread : A structure of staple fibre and/or filaments produced by any of the varieties of techniques such that the cohesive whole can withstand the mechanical operation of sewing, usually treated with a surface coating , lubricant or both intended to be used to stitch one or more pieces of material or an object to a material.

3.2 ticket size; ticket number : A measure of the linear density of a sewing thread expressed as the approximate three-ply equivalent of the metric count of the input single yarn (see Appendix **E**).

3.3 spun polyester sewing thread : A thread that consists of polyester staple fibres of regular length, usually bound together by twist.

3.4 grey thread (greige thread)**:** Undyed or unfinished sewing thread in the state following final plying or equivalent step in processing sequence, such as extruding, texturizing or braiding.

4 REQUIREMENTS

4.1 Thread shall be made only from staple fibres of polyester.

4.2 Thread shall be virtually free from knots, snarls, and other defects and shall have a uniform thickness.

4.3 The direction of the final twist of common thread shall be '**Z**'. In case of **'S'** twist it shall be clearly marked.

NOTE: For special applications final twist direction of sewing thread can be 'S'

4.4 Thread shall be heat set.

4.5 The linear density (resultant tex.) of thread shall lie with in the value specified in Column **3** of Table **1** and coefficient of variation shall be not more than 3 per cent when tested by the method prescribed in **SLS 20 : 1996**

NOTES :
1. At least five test pieces should be tested from one package. Accordingly, a minimum length of about 500 m *is needed to carry out this test. In cases where this length cannot be obtained from one package, a sufficient number of packages should be used for the test*

.

2. Tolerance for linear density values of Tkt No. 80 and above is 10% and tolerance for linear density values below 80 is 5%

3. Any ticket number specified as per **BS 4134** *is allowed*

4.6 The breaking force and Elongation of thread shall conform to the requirements specified in Columns **4** and **5** of Table **1** respectively when tested by the method prescribed in **SLS 22**.

TABLE 1 – Requirements for linear density and breaking force of sewing threads

SI No. (1)	Ticket No. (2)	Approximate resultant tex Method of test SLS 20 :1996 (3)	Minimum average breaking force(N) Method of test SLS 22 :1995 (4)	Elongation at break, Per cent (5)
i)	220	15.5	3.7	12 to 18
ii)	180	21.0	5.0	12 to 18
ii)	150/140	22.0	5.5	12 to 18
iv)	120	29.0	8.2	12 to 18
v)	110	31	9.0	12 to 18
vi)	100	33.0	9.5	12 to 18
vii)	80/75/70	42.0	12.8	12 to 18
viii)	60	56.0	14.5	12 to 18
ix)	50	62.0	18.5	14 to 20
x)	30	93	29.0	14 to 20
xi)	24/25	125	35	14 to 20
xii)	20	155	44.0	14 to 20
xiii)	15/16	200	75	14 to 20
xiv)	11	280	85.0	14 to 20
xv)	9	330	96.0	14 to 20
xvi)	8/7	400	120	14 to 20
xvii)	6	500	144	14 to 20
xviii)	5	580	168	14 to 20
xix)	4	665	192	14 to 20
xx)	3	830	240	14 to 20

4.7 The lubricant content of thread shall be not less than 3 per cent (by mass) when tested by the method prescribed in Appendix **B**.

4.8 The dry shrinkage and wet shrinkage of thread shall be less than 2 per cent and 1 per cent respectively when tested by the method prescribed in Appendix **C.**

4.9 The length of thread in a package shall equal or exceed 95% of the labelled length when tested by the method prescribed in Appendix **D**

4.10 The colour fastness ratings of thread shall conform to the requirements specified in Table **2** when tested by the methods given in Coloumn **4** of the table.

TABLE 2 – Requirements for colour fastness of sewing thread

Sl No. **(1)**	**Charactoristic** **(2)**	**Numerical rating** **(3)**	**Method of test** **(4)**
(i)	Colour fastness to washing	4 or better	SLS 1357 (Test B)
(ii)	Colour fastness to light	5 or better (see note)	SLS 62 : Part 2
(iii)	Colour fastness to rubbing	4 or better	SLS 63
(iv)	Colour fastness to perspiration	4 or better	SLS 67
(v)	Colour fastness to dry cleaning	4 or better	SLS 416

NOTE: *For luminous/fluorescent colours, the rating for colour fastness to light shall be not less than 4.*

5 PACKAGING AND MARKING

5.1 The appropriate length of thread shall be wound suitably on a material strong enough to withstand thread without collapsing. It shall be wrapped suitably.

5.2 The free end of the thread shall be securely fastened to prevent unravelling.

5.3 Each package of thread shall be legibly and indelibly marked with the following :

a) Name of the product giving raw material as “100 % SPUN POLYESTER” ;
b) Ticket number ;
c) Number of plies ;
d) Shade number ;
e) Length, in meters ;
f) Registered trade mark, if any ;
g) Brand name, if any ; and
h) Batch identification mark. (only applicable for saleable units)

5.4 A number of such packages may also be packed in a suitable carton. Each such carton shall be legibly and indelibly marked or labelled with the information given in **(a)** to **(h)** of **5.3.** (See Note). In addition, the actual colour of thread and name and address of the manufacturer/supplier shall be indicated on the carton and the number of packages in the carton shall be marked.

NOTE: *When marking on carton, length (e of 5.3) refers to that of one package.*

6 METHODS OF TEST

6.1 Tests for the requirements given in **4** shall be carried out as prescribed in **SLS 20**, **SLS 22**, **SLS 62 Part 2**, **SLS 63**, **SLS 67**, **SLS 416** and **SLS 1357** Standards given therein and Appendices **B** to **D** of this specification.

6.2 The conditioning and testing atmosphere shall be the standard atmosphere for conditioning and testing textiles as defined in **SLS 16**. i.e., a relative humidity of 65 ± 4 per cent and temperature of 20 ± 2 ^{o}C.

NOTE : *Attention is drawn to the certification marking facilities offered by the Sri Lanka Standards Institution . See inside back cover of this standard.*

APPENDIX A
COMPLIANCE OF A LOT

The sampling scheme given in this appendix shall be applied where compliance of a lot to the requirements of this standard is to be assessed based on statistical sampling and inspection.

Where compliance with the standard is to be assessed based on manufacturer's control systems coupled with type testing and check tests or any other procedure, an appropriate scheme of sampling and inspection should be adopted.

A.1 LOT

In any consignment all packages of polyester sewing thread of the same linear density and number of plies and belonging to one batch of manufacture or supply should constitute a lot.

A.2 SCALE OF SAMPLING

A.2.1 Samples should be tested from each lot for ascertaining its conformity to the requirements of this specification.

A.2.2 The number of packages to be selected from a lot should be in accordance with Table **3**.

TABLE 3 – Scale of sampling

Sl. No.	**Number of packages/cartons in the lot** **(1)**	**Number of packages/cartons to be selected** **(2)**
i)	Up to 500	5
ii)	501 to 1200	7
iii)	1201 to 3000	10
iv)	3001 and above	15

A.2.3 If the packages are packed in cartons, the number of cartons to be selected should be in accordance with Table **3**. One package should be selected from each carton so selected to form a sample.

A.2.4 The cartons and packages shall be selected at random. In order to ensure randomness of selection, random numbers tables as given in **SLS 428** shall be used.

A.3 NUMBER OF TESTS

A.3.1 Each carton and/or package selected as in **A.2.2** or **A.2.3** shall be inspected for packaging and marking requirements.

A.3.2 Each package selected as in **A.2.2.** or **A.2.3** shall be examined and tested for the requirements given in **4.2** and **4.3**

A.3.3 Each package selected as in **A.2.2.** or **A.2.3** shall be tested for the requirements given in **4.5** to **4.10**.

A.4 CRITERIA FOR CONFORMITY

A lot shall be declared as conforming to the requirements of this specification if the following conditions are satisfied.

A.4.1 Each carton and/or package inspected as in **A.3.1** satisfies the packaging and marking requirements.

A.4.2 Each package examined and tested as in **A.3.2** satisfies the relevant requirements.

A.4.3 The average linear density and coefficient of variation for the linear density calculated using the test results obtained when tested as in **A.3.3** satisfy the relevant requirements.

A.4.4 The values of the expression $\bar{x}$-1. 6 s (See notes) calculated using the test results on breaking strength is not less than the value specified.

NOTE :

1 *Mean ($\bar{x}$)* = *The sum of values of the observations divided by the number of observations.*

2 *Standard deviation (s)* = *The positive square root of the quotient obtained by dividing the sum of squares of the deviation of the observations from their mean by one less than the number of observations in the sample.*

A.4.5 The values of the expression $\bar{x}$ + 1.6 s calculated using the test results on shrinkage is not greater than the value specified.

NOTE: *The values should be calculated separately for wet shrinkage and dry shrinkage.*

A.4.6 Each test specimen when tested as in **A.3.3** satisfies the relevant requirements given in **4.5** to **4.10**.

APPENDIX B
DETERMINATION OF LUBRICANT CONTENT

B.1 PRINCIPLE

A sample of yarn contained within a glass extraction tube is extracted in a soxlet apparatus with methanol / petroleum ether. After the extraction, solvent is evaporated and the residue is weighed and expressed as a per cent of weight of the clean dried extracted yarn sample.

B.2 APPARATUS AND REAGENTS

B.2.1 Soxhlet apparatus assembled with ground glass joints. The extractor (barrel) of the soxlet shall have a capacity of 200 ml and the flask not less than 300 ml (500 ml is preferred)

B.2.2 Analytical balance with an accuracy of 0.1 mg

B.2.3 Desiccator

B.2.4 Drying oven capable at maintaining $105 \pm 5\ ^{0}C$

B.2.5 Glass extraction thimbles, porosity 1, approximate dimensions 30 x 100 mm. (filter paper or cellulose thimbles may also be used)

B.2.6 Methanol /petroleum ether, analytical grade and (sampling as per ISO 5089)

B.3 TEST SPECIMENS

B.3.1 Two specimens of each sample shall be tested.

B.3.2 yarn sample shall be cut into small pieces to permit easy introduction into extraction thimble or filter paper.

B.4 PROCEDURE

B.4.1 Take two specimens of approximately 10 g each of the sample.

B.4.2 Clean and dry the extraction thimbles in the oven at $105 \pm 5\ ^{0}C$, cool in a desiccator and weigh until constant weight is obtained. Record the weight of each thimble.

B.4.3 Take two clean 500 ml soxhlet flasks, dry in an oven of $105 \pm 5\ ^{0}C$, cool in a desiccator and weigh until constant weight is obtained. Record the weight of each flask (F_1).

B.4.4 Place each specimen in the barrel of the soxhlet apparatus in such a way as to prevent fibre loss during extraction. (i.e. sample contained in a tared, glass extraction thimble)

NOTE: *It is essential to put a piece of filter paper into the top of the thimble to prevent loss of fibre.*

B.4.5 Ensure that the specimen is below the level of the top of the siphon tube.

B.4.6 Assemble the extraction apparatus in the water bath heated previously or on electric mantles, and pour into the soxhlet barrel sufficient amount of methanol or petroleum ether to cause a first siphoning.

B.4.7 Add sufficient solvent to half fill the soxhlet barrel.

B.4.8 Adjust the heating to give six siphoning per hour and extract for 4 hours. If necessary add more solvent during the operation.

NOTE: *Reject any test in which the siphoning does not function correctly.*

B.4.9 After 4 hours remove the test specimens from the soxhlet in the glass extraction thimble.

B.4.10 Siphon any methanol/petroleum ether remaining in the barrel into the flask, and then distil it off.

Heat the flask in an oven of 105 ± 5 ^{0}C for a minimum 30 minutes, then introduce, for a few seconds, a tube connected to a pump to suck out vapour from the flask. Heat the flask for a further 5 minutes in the oven, cool in a desiccator and weigh. Record the weight of each flask containing fatty matter (F_2)

If electric mantles have been used then continue the distillation process until approximately 25 ml of methanol/ petroleum ether is left in the flask. Transfer the flask to an oven at 105 ± 5 ^{0}C (dry off completely for a minimum of 4 hours). Cool in a desiccator and weigh. Record the weight of each flask containing fatty matter (F_2)

B.4.11 Place the extracted test specimen still in the extraction thimble in the oven to dry at 105 ± 5 ^{0}C for 4 hours. Cool in a desiccator and weigh the specimen in the glass extraction thimble (Discard filter paper if used before weighing).

According to this procedure, the bone dry weight (W_1) of each extracted specimen is obtained.

NOTE: *Cellulose thimbles may be used as an alternative to the glass extraction thimbles. The accuracy of results may be affected.*

B.5 CALCULATION AND EXPRESSION OF RESULTS

Express the weight of methanol / petroleum ether soluble matter remaining in each flask as a percentage of the clean dry weight of the extracted sample.

$$\textit{Lubricant content}\ (\%) = \frac{F_2 - F_1}{W_1} \times 100$$

where,

F_1 = Dry weight of flask

F_2 = Dry weight of flask plus extract

W_1 = Bone dry weight of clean sample

Calculate the lubricant content (%) from the individual values determined for sample (a) and (b).

APPENDIX C
DETERMINATION OF SHRINKAGE OF SEWING THREADS

C.1 APPARATUS

C.1.1 *Testing frame*, comprising a vertical support on which are mounted a metric scale and a horizontal pin, as illustrated in the Figure **1.**

C.1.2 *Tensioning weight*, which when freely suspended from a loop of thread, applies a downward force of 0.45±0.09 g per tex

C.1.3 *Oven, capable of maintaining temperature up to 150 ± 2^0 C*

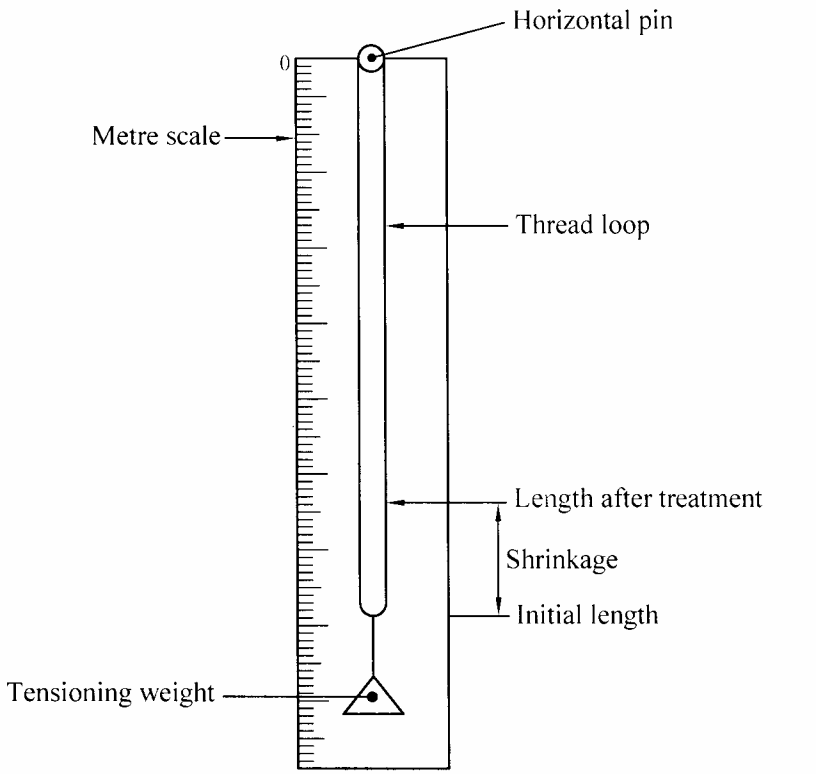

FIGURE 1 - Apparatus for determination of shrinkage

C.2 REAGENT

Soap solution, containing 1 g of soap per litre of distilled water, the soap being as specified in **SLS 1357**

C.3 PROCEDURE

C.3.1 Determine the linear density (in tex) of the thread by the method given in **SLS 20.**

C.3.2 From the skeins used to determine the linear density, cut ten specimens of thread, each 1 m long, and knot the ends of each length together to form ten loops of thread. Take care during this process to retain the initial twist of thread. Place the looped test specimens in the standard atmosphere for testing (See 6.2) until moisture equilibrium is reached (usually a minimum of 1 hour).

C.3.3 Suspend each looped test specimen in turn from the horizontal pin of the testing frame (**C.1.1**) and gently attach the tensioning weight (**C.1.2**) to the bottom of the loop, taking care that the knot does not touch either the pin or the weight. Measure the loop length. i.e.the distance between the centre of the horizontal pin and the point of attachment of weight.

C.3.4 In case of wet shrinkage test

C.3.4.1 Remove the tensioning weight and immerse the un-tensioned specimens in the soap solution (**C.2**) at boil for 15 minutes. (Use five test specimens for this test).

C.3.4.2 Rinse the specimen in running tap water and allow to dry.

NOTE : *Drying may be considered complete after 1 hour in a ventilated drying oven at 60 ^{o}C, in which the specimen should not be exposed to direct radiation from the heating elements, or after 12 hours exposure to the standard atmosphere for testing.*

C.3.4.3 Suspend each looped specimen in turn from the horizontal pin of the testing frame as described in **C.3.3** and leave in the standard atmosphere for a minimum of 1 hour.

C.3.4.4 Re-measure the loop length

C.3. 5 In case of dry shrinkage test

C.3.5.1 Remove the tensioning weight and suspend the un-tensioned specimens in an oven at 150 ± 2 ^{o} C for 15 minutes. (Use five test specimens for this test).

C.3.5.2 Re-measure the loop length.

C.4 CALCULATION

Calculate the percentage shrinkage (S) of each specimen using the following equation :

$$S = \frac{l_1 - l_2}{l_1} X 100$$

where,

1_1 is the loop length, in mm, before treatment; and

1_2 is the loop length, in mm, after treatment

Calculate the arithmetic mean of the five individual values and express this as the shrinkage (dry or wet).

APPENDIX D
DETERMINATION OF LENGTH

D.1 PROCEDURE

Weigh, to the nearest milligram, the mass of thread in the package. With the use of linear density of thread determined by the method given in **SLS 20**, calculate the length of thread in the package.

D.2 CALCULATION

$$\textit{Length, in m, of thread in the package} = \frac{1000\ m}{t}$$

where,

m is the mass, in g, of thread in the package ; and
t is the linear density of thread, in tex.

APPENDIX E
INFORMATION ON TICKET NUMBER CALCULATIONS

E. 1 Ticket Numbers

Commercially, ticket numbers have been in use for many years to represent approximate liner density of threads. These were established by using three-ply equivalents of metric numbers (Nm), an indirect numbering system (see **SLS 20:Annex E**) of input yarn, i.e 3 ply Nm 100 is Ticket number 100.

In modern thread industry all the threads are not of three-ply structure. Therefore for the calculation of ticket number the resultant metric number of the input threads is used as shown in the following examples:

EXAMPLE 1 3 ply Nm 75 =Ticket number 75 = Resultant Nm 25 = 2 ply Nm 50
= 4 ply Nm 100

EXAMPLE 2 3 ply Nm 50 =Ticket number 50= Resultant Nm 16.6 = 2 ply Nm 33.2
= 4 ply Nm 66.4

In the modern thread industry the liner density of yarns/thread is expressed in tex units (tex), a direct numbering system (See **SLS 20:Annex E**). Ticket number calculation is therefore converted to tex measurements, by dividing into a factor (See **SLS 20:Annex E**). the above principles are retained as shown in the following examples:

EXAMPLE 3 Ticket number = 3000/Total nominal input liner density(in tex)

EXAMPLE 4 Ticket number 100 = 3000/(10 tex x 3) = 3000/(15 tex x 2)

NOTE : *The above calculations are based on input linear densities. Threads are subjected to dyeing and various types of finishes are applied. Therefore only approximate resultant tex values are quoted in the tables.*

E.2 Designation of ticket number:

E.2.1 Designation:
The ticket number shall be designated from the total nominal input decitex value regardless of thread construction .(1- ply,2- ply, 3- ply, etc.) converted to the 3- ply relevant equivalent as described in **E.3** . It shall be rounded as specified in **E 2.2.**

E.2.2 Man –made fibre threads
Man-made fibre threads shall be rounded as follows:

a) for ticket numbers finer than 160 , round down to the nearest multiple of 20;
b) for ticket numbers 80 to 160 , round down to the nearest multiple of 10;
c) for ticket numbers 30 to 75 , round down to the nearest multiple of 05;
d) for ticket numbers 18 to 28 , round down to the nearest even number;
e) for ticket numbers 17 and coarser, round down to the nearest even number.

E.3 Formula for deriving 3-ply metric count equivalents

E.3.1 For man-made sewing threads calculate an approximation of 3-ply metric equivalent from the followings.

3-ply metric equivalent = metric count (in Nm × 3)

Therefore,

3-ply metric equivalent = 30000/ total nominal input linear density (in dtex)

The following is an example of how to calculate the BS ticket number for a 3-ply thread:

Total input in (dtex) = 235 dtex × 3 (ply)

3-ply metric equivalent = 30000/ 235
= 40 (42.55 rounded down to nearest 5)

SRI LANKA STANDARDS INSTITUTION

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