Revision & Correction Required in Draft

1) Page 5. Table 2 Requirements for Polyamide (Nylon) Fully Drawn Yarn

Should mention .. Requirement for Polyamide (Nylon) fully drawn yarns (FDY, HOY, DW, DT)

2) Page 1 - ….It is suitable for uses like hosiery, swimwear, upholstery, parachute cloth, sportswear, umbrella cloth, etc….

And also for Textile usage like Saree, Dupatta, Dress material, Ethnic Wear, Laces through weaving, knitting etc.

(This should be mentioned.)

3) Page 3 - 3.8 Mono Yarn — It is continuous strand of twist less single or two filament yarn.

Only Single filament should be there in Mono.

(There can't be two filaments in mono yarn)

4) Page-5 Table 2 Point iii- Number of filaments (+/-) in number of filaments.

Tolerance should be "ZERO".

5) Page 5 - Tenacity, gpd, (As declared) 3.0– <7.2 ± 0.3

(Tolerance should be ± 10 Percent)

6) Page 4 - melting point of 219 °C, Min

Nylon 6 Melting point range should be of 215 to 220 C

7) Page 5 - Elongation at break, Percent 40 - 65

Multifilament yarn rage should be 40 to 70

8) Page 4 - Notation i) Mother Yarn MNFY. It should be writes as MY
ii) Mono Yarn MY . It should be written as MONO

9) Page 10 Partially Oriented yarn i) Spin Finish Oil pick-up, Percent 0.50 - 1.50 -

(Tolerance should be ± 0.2)

10) Page 4, Point 4.1 Identification and Notation of Polyamide (Nylon) Yarns – The Polyamide (Nylon) filament yarns shall be identified by ~~microscopic and~~ dissolution test given in IS 667 and melting point..

(Nylon Identification has to be by Melting point only)

11) Page 5..point ii.. Linear Density - Mono - tolerance +/- 2.5%

It should be ± 7 percent for Mono yarns made from Mother Yarn -Split route & +/-5 percent for HOY route

12) Page 5. Point ii. Multi filaments tolerance +/- 2.5 percent.

Should be, if Denier < 100 ± 4.0 percent & > 100 - ± 2.5 percent

13) Page 5 & page7, page 10.. Table 2,3 & 4.

. Point v. Elongation at break - Tolerance value will be ± 5
not ± 5 ~~Percent~~

14) Page 5 & page7.. Table 2 &3.
Point vi. Boiling Water Shrinkage -Tolerance value will be ± 2
not ± 1 ~~Percent~~

15) Page 10.. Table 4.
Point vi. Hot Air Shrinkage -Tolerance value will be ± 2
not ± 1 ~~Percent~~

16) 5.2.5 Broken Filaments - ~~None shall be allowed~~. Shall be allowed 1 BF per kg
(refer – Polyester Standard/should be same for Nylon)

17) 5.2.9 Slubs/Loops/Kinks - ~~None shall be allowed~~ Shall be allowed 1.5 loops per kg
(refer – Polyester Standard/should be same for Nylon)

18) Page 6..xvii Colour Fastness to Light (for Dope Dyed Yarns only), Mono & Multifilament - 5
It should be > 4 in case of Nylon.
(Only in Polyester it is possible to get 5 & not in other polymers)

भारतीय मानक ब्यूरो

भारतीय मानक मसौदा

वस्त्रादि — सतत तंतु पॉलिएमाइड (नॉइलान) के धागे — विशिष्टि

(आई एस 7867 का *दूसरा पुनरीक्षण*)

BUREAU OF INDIAN STANDARDS
Draft *Indian Standard*

Textiles — Continuous Filament Polyamide (Nylon) Yarn — Specification

(*Second revision of* IS 7867)

ICS 59.080.20

Last date for receipt of comment is 23 March 2024

FOREWORD
(*Formal foreword to be added later*)

This Indian Standard was originally published in 1975 and was first revised in 2022. This Indian Standard is again being revised to incorporate the following changes:

a) The requirements for Partially oriented yarn and high tenacity yarn have been incorporated in the standard.
b) The packing, marking and sampling clause has been modified to cover latest industry's practices.
c) The requirements for identification of yarn, interlace per meter, water soluble matter, moisture regain, colour fastness properties, colour strength, colour difference, lustre/brightness, etc. have been incorporated to make the standard more realistic and end use oriented;
d) The clause for Terms and Definitions' have been incorporated in the standard.
e) References to Indian Standards have been updated.

Nylon is a generic term used for the long chain synthetic polyamides. Nylon Filament Yarn is produced as multi-filament yarn or mono filaments in a wide range of deniers. It has excellent orientation and crystalline characteristics which imparts it with good mechanical properties. It is suitable for uses like hosiery, swimwear, upholstery, parachute cloth, sportswear, umbrella cloth, etc. It is also used for many industrial applications like tyre cords, fish-nets, ropes, seat belts etc. due to its high flexural strength and tenacity.

Nylon is used extensively in Saree, Dupatta, Dress material, Ethnic Wear, Laces, Sewing thread through weaving, knitting etc.

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.

1. SCOPE

1.1 This standard specifies requirements for all types of nylon continuous single multifilament or monofilament flat yarn for various end usages. This standard covers the requirements for both dyed and undyed nylon continuous filament yarn.

1.2 This standard does not specify requirements for parallel, tow and top, doubled or plied nylon yarns.

1.3 This standard is not applicable to bio-degradable nylon yarns. and Nylon 66

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 editions of the standards indicated in Annex A.

3. TERMS AND DEFINITIONS

3.1 Commercial Allowance — A defined percentage to be added to the oven-dry mass of the material for the calculation of commercial mass and certain other properties. This allowance includes the moisture content and the content of the substances which can be removed during analysis, for example, spin finish, oligomers etc.

NOTE — The commercial allowance for nylon continuous filament yarn shall be 6.50 percent.

3.2 Commercial Mass — The mass obtained by adding to the oven-dry mass, the mass corresponding to the commercial allowance.

3.3 Cross Section — The shape of a fibre when viewed perpendicular to its axis.

NOTE — The shape of man-made fibres can be influenced by the spinning process and subsequent processing and treatments, such as texturizing.

3.4 Flat Yarn — Man-made continuous filaments that have not been twisted or textured.

3.5 High Tenacity Yarn — A yarn with a significantly higher breaking tenacity than others of the same generic category, generally used because of that main characteristic.

NOTE — Currently the minimum limit used for high tenacity Nylon filament yarns is 7.20 gpd (64cN/Tex). High Tenacity 6.5 GPD, 58 CN/Tex

3.6 Industrial Filament Yarn — Yarn intended for use in products other than non-protective clothing, household, furnishing, and floor coverings selected principally but not exclusively for their performance and properties as opposed to their aesthetic or decorative characteristics.

3.7 Intermingled Yarn — A multifilament yarn in which cohesion is imparted to the constituent filaments usually by passing the yarn through a turbulent air without causing entwining of the filaments and the formation of randomly distributed interlacing points (knots).

NOTE — The knots are not actually the knots tied when two threads are broken but they are the tangle knots created by opening up of filaments and mingling under the influence of air pressure. This creates compact sections in the yarn imparting cohesiveness.

3.8 Mono Yarn — It is continuous strand of twist less single or two filament yarn. Strand of Single filament yarn

3.9 Mother Yarn — It is a continuous drawn multifilament yarn without entanglement, where its individual filament can be separated continuously at subsequent downstream process.

3.10 Shrinkage — The decrease in length of a test specimen caused by a specified treatment, expressed as a percentage of the length of the untreated test specimen. The lengths are measured before and during or after treatment under specified tensions.

3.10.1 Boiling Water Shrinkage — The decrease in length of a test specimen caused by a treatment in boiling water for specified time, expressed as a percentage of the length of the untreated test specimen. The lengths are measured before and after treatment under a specified pretension.

3.10.2 Hot Water Shrinkage — The decrease in length of a test specimen caused by a treatment in hot water under as specified conditions of temperature and time, expressed as a percentage of the length of the untreated test specimen. The lengths are measured before and after treatment under a specified pretension. The water temperature to be applied is specified between buyer and seller.

3.10.3 Hot Air Shrinkage, After Treatment - The decrease in length of a test specimen caused by a treatment in hot air under specified conditions of temperature and time, expressed as a percentage of the length of the untreated test specimen. The lengths are measured before and after treatment under a specified pretension.

3.10.4 Hot Air Shrinkage, During Treatment - The decrease in length of a test specimen caused by a treatment in hot air under specified temperature and time, expressed as a percentage of the length of the untreated test specimen. The lengths are measured before (under a specified pretension) and during treatment (under a specified measuring tension).

3.11 Oven-dry Mass - The mass obtained by drying the filament yarn usually after removal of added products such as finish oil, moisture & extractable matters.

4. IDENTIFICATION AND NOTATION OF POLYAMIDE (NYLON) FILAMENT YARNS

4.1 Identification and Notation of Polyamide (Nylon) Yarns – The Polyamide (Nylon) filament yarns shall be identified by microscopic and dissolution test given in IS 667 and melting point of 219 °C, *Min* when tested as per method specified in Annex B. The yarn may be denoted by the notations given in Table 1. Melting point range 214- 220 oC

TABLE 1 Examples of Notation of Polyamide (Nylon) Filament Yarns
(*Clause* 4.1)

Sl No.	Factors to Identify	Examples
(1)	(2)	(3)
i)	Mono or multifilament, Denier / Filament	20/1, 30/24, 240/12, 360/12
ii)	Fibre Cross Section	Circular, Trilobal, Triangular, Slit, Octa lobal etc.
iii)	Filament Count	30/24 – Filament count is 24
iv)	Denier per filament	30/24 DPF – 1.25
v)	Overall, Denier	30/24 - 30
vi)	Lustre	Full dull (FD), Semi dull (SD)/ Semi dull optically bright (SDOB), Optically bright (OBRT)/Bright (BRT)
vii)	Surface Characteristics	Flat
viii)	UV Resistant	UV
ix)	Fire Retardant	FR
x)	Anti-microbial	AM
xi)	Dope Dyed	DD (Optical, Black, Navy, Brown etc.)
xii)	Mother Yarn	MNFY should write "MY" ONLY
xiii)	Mono Yarn	MY Should be "Mono" only
xiv)	High Tenacity Yarn	HT
xv)	Highly Oriented Yarn	HOY
xvi)	Draw Winder Yarn	DW
		xvii) Partially Oriented Yarn POY xviii) Fully Drawn Yarn FDY

5. REQUIREMENTS

5.1 The Nylon filament yarn (NFY) shall conform to the requirements specified in **Table 2, Table 3** and **Table 4** in addition to requirements specified in **4.1**, **5.2, 5.3 and 5.4** (optional).

Table 2 Requirements for Polyamide (Nylon) Fully Drawn Yarn Should mention- "Nylon Flat Yarn (FDY, HOY, DW, DT, MOTHER YARN & MONO)

(*Clause* 5.1)

	Characteristic	Requirements	Method of Test

Sl No.		Mono Filament			Multifilament			
		Range	Tolerance	CV Percent, *Max*	Range	Tolerance	CV Percent, *Max*	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Cross section, Circular, Triangular, Trilobal, Slit, Hollow, Hexagonal etc. (*see* Fig 1)	As Declared	-	-	As Declared	-	-	Microscope with magnification of minimum 100 X
ii)	Linear Density (Denier) (*see* Note 1)	As Declared	± 2 Percent 3 %	1.50 3 %	As Declared	± 2 Percent	1.50 2%	IS 7703 (Part 1)
iii)	No. of Filaments (As Declared) (*see* Note 2)	Single	-	-	≤ 60 > 60	± 1 ± 2	-	Visual inspection under microscope
iv)	Tenacity, gpd, (As declared)	3.0– <7.2 3.0 - 6.5	± 0.3	5.0	3.5 – <7.2 3.0-6.5	± 0.3	5.0	7703 (Part 2)- Dry Method
v)	Elongation at break, Percent, (As Declared)	45 - 65 35-65	± 5 Percent 6 +/- 5 (not percent)	5.0	40 - 65 30-70	± 5 Percent +/- 5 (Not percent)	5.0 6.0	IS 7703 (Part 2) – Dry Method
vi)	Boiling Water Shrinkage, Percent (As Declared)	9.0 - 13.0 8 -14	± 1 Percent +/-1 (not percent)	-	8.0 - 13.0 6-14	± 1 Percent +/- 1(not percent)		Annex G of IS 17261
vii)	Spin Finish Oil pick-up, Percent, (As declared)	0.60 – 2.0 0.4-1.5%	± 0.2	-	0.60 – 2.0 0.6-2.5	± 0.2	-	Annex C of IS 17261
viii)	Unevenness of Linear Density (Normal), Percent, *Max* (*see* Note 3)	2.0 max 3	-	-	2.0	-	-	IS 7703 (Part 5)
ix)	Lustre, Titanium Dioxide Content, Percent, (as Declared)							Annex F of IS 17261
	Full dull (FD)	Above 1.5 above 1.2	-	-	Above 1.5	- Above 1.2	-	
	Semi dull (SD)/ SDOB	Above 0.16 and up to 1.5 above 01.6 upto 1.2	-	-	Above 0.16 and up to 1.5	- Upto 1.2	-	

	Bright (BRT)/OBRT	Up to 0.16	-	-	Up to 0.16	-	-	
x)	Moisture Regain, Percent, *Max*	4.50	-	-	4.50	-	-	Annex B of IS 17261
xi)	Water Soluble Matter, Percent, *Max*	2.5	-	-	2.5	-	-	IS 3456
xii)	Limiting Oxygen Index, *Min* (For fire retardant yarns only)	30	-	-	30	-	-	IS 13501
xiii)	Ultraviolet resistance, UV-B Lamp, 144 h, Percent retained strength, *Min* (For UV resistant yarn only)	70	-	-	70	-	-	Annex F IS 16481
xiv)	Anti-microbial activity value, *Min* (For anti-microbial yarn only)	2.0	-	-	2.0	-	-	IS/ISO 20743
xv)	Colour strength with reference to standard yarn, percent (For dope dyed yarns only) (*see* NOTE 4)	100	-	±5	100	-	±5	Annex E of IS 17261
xvi)	Colour difference with reference to standard yarn, measured as ΔE, *Max* (for dope dyed yarns only) (*see* NOTE 4)	1.5	-	-	1.5	-	-	Annex E of IS 17261
xvii)	Colour Fastness to Light (for Dope Dyed Yarns only), *Min*	5	-	-	5	-	-	IS/ISO 105-B01 Or IS/ISO 105-B02

NOTES

1 For mono yarns made from mother yarn, the tolerance on linear density shall be ± 3 Percent. shall be +/- 5

2 For mother yarn, the tolerance for the requirement of number of filaments shall be 0.

3 For mono yarns made from mother yarn, the unevenness shall be 4.0 percent, *max*. The requirement of unevenness shall not be applicable for the mono yarn less than 20 Denier.

4 Either of the requirements indicated at xv) and xvi) needs to be complied with.

5 Interlace in nips per meter shall be 10-30 with a tolerance of ± 5 on the declared value when tested by the method prescribed in Annex B of IS 17262, except for mother yarn where interlace can be up to zero. The requirement for Interlace in nips per meter shall not be applicable for mono yarn.

Table 3 Requirements for Polyamide (Nylon) High Tenacity Yarn

(*Clause* 5.1)

Sl No.	**Characteristic**	**Requirements**						**Method of Test**
		Mono Filament			**Multifilament**			
		Range	**Tolerance**	**CV Percent, *Max***	**Range**	**Tolerance**	**CV Percent, *Max***	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Cross section, Circular, Triangular, Trilobal, Slit, Hollow, Hexagonal etc. (*see* Fig 1)	As Declared	-	-	As Declared	-	-	Microscope with magnification of minimum 100 X
ii)	Linear Density (Denier) (*see* Note 1)	As Declared	± 2 Percent	1.50	As Declared	± 2 Percent	1.50	IS 7703 (Part 1)
iii)	No. of Filaments (as Declared) (*see* Note 2)	Single	-	-	≤ 60 > 60	± 1 ± 2	-	Visual inspection under microscope
iv)	Tenacity, gpd, *Min*, (As declared)	≥7.2	± 0.3	5.0	≥7.2	± 0.3	5.0	7703 (Part 2)-Dry Method
v)	Elongation at break, Percent, (as Declared)	25 - 35	± 5 Percent	5.0	25 - 35	± 5 Percent	5.0	IS 7703 (Part 2) – Dry Method
vi)	Hot Air Shrinkage, Percent (as Declared)	6.0 - 9.0	± 2 Percent	-	6.0 - 9.0	± 2 Percent		Annex F of IS 17264
vii)	Spin Finish Oil pick-up, Percent, (As declared)	0.60 – 1.5	± 0.2	-	0.60 – 1.5	± 0.2	-	Annex C of IS 17261

viii)	Unevenness of Linear Density (Normal), Percent, *Max* (*see* Note 3)	2.0	-	-	2.0	-	-	IS 7703 (Part 5)
ix)	Lustre, Titanium Dioxide Content, Percent, (as Declared)							Annex F of IS 17261
	Full dull (FD)	Above 1.5 above 1.2			Above 1.5 above 1.2			
	Semi dull (SD)/ SDOB	Above 0.16 and up to 1.5 0.16 -1.2			Above 0.16 and up to 1.5 0.16-1.2			
	Bright (BRT)/OBRT	Up to 0.16			Up to 0.16			
x)	Moisture Regain, Percent, *Max*	4.50	-	-	4.50	-	-	Annex B of IS 17261
xi)	Water Soluble Matter, Percent, *Max*	2.5	-	-	2.5	-	-	IS 3456
xii)	Limiting Oxygen Index, *Min* (For fire retardant yarns only)	30	-	-	30	-	-	IS 13501
xiii)	Ultraviolet resistance, UV-B Lamp, 144 h, Percent retained strength, *Min* (For UV resistant yarn only)	70	-	-	70	-	-	Annex F IS 16481
xiv)	Anti-microbial activity value, *Min* (For anti-	2.0	-	-	2.0	-	-	IS/ISO 20743

	microbial yarn only)							
xv)	Colour strength with reference to standard yarn, percent (For dope dyed yarns only) (*see* NOTE 4)	100	-	±5	100	-	±5	Annex E of IS 17261
xvi)	Colour difference with reference to standard yarn, measured as ΔE, *Max* (for dope dyed yarns only) (*see* NOTE 4)	1.5	-	-	1.5	-	-	Annex E of IS 17261
xvii)	Colour Fastness to Light (for Dope Dyed Yarns only), *Min*	6 Min 5	-	-	6 Min 5	-	-	IS/ISO 105-B01 Or IS/ISO 105-B02

NOTES

0 For mono yarns made from mother yarn, the tolerance on linear density shall be ± 3 Percent.

1 For mother yarn, the tolerance for the requirement of number of filaments shall be 0.

2 For mono yarns made from mother yarn, the unevenness shall be 4.0 percent, *max*. The requirement of unevenness shall not be applicable for the mono yarn less than 20 Denier.

3 Either of the requirements indicated at xv) and xvi) needs to be complied with.

Table 4 Requirements for Polyamide (Nylon) Partially Oriented Yarn

(*Clause* 5.1)

Sl No.	**Characteristic**	**Requirements**						**Method of Test, Ref to**
		Mono Filament			**Multifilament**			
		Range	**Tolerance**	**CV Percent, *Max***	**Range**	**Tolerance**	**CV Percent, *Max***	
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**

i)	Cross section, Circular, Triangular, Trilobal, Slit, Hollow, Hexagonal etc. (*see* Fig 1)	As Declared	-	-	As Declared	-	-	Microscope with magnification of minimum 100 X
ii)	Linear Density, (Denier)	As Declared	± 2 Percent +/- 3%	1.50 3.0%	As Declared	± 2 Percent	1.50 2.0%	IS 7703 (Part 1)
iii)	No. of Filaments as Declared	Single	-	-	≤ 60 > 60	± 1 ± 2	-	Visual inspection under microscope
iv)	Tenacity, gpd, (As declared)	3.5 – 6 3.0-6.5	± 0.3	5.0	3.5 – 6 2.5-6.0	± 0.3	5.0	7703 (Part 2)- Dry Method
v)	Elongation at break, Percent, (as Declared) (*see* Note 1)	45 - 65 35-65	± 5 Percent +/- 5 (not percent)	6.0	50 - 70 45-70	± 5 Percent +/- 5 not percent	6.0	IS 7703 (Part 2) – Dry Method
vi)	Boiling Water Shrinkage, Percent, (as Declared)	8 - 12.0	± 1 percent +/- 1 (not precent)	-	8.0 - 12.0 7-12	± 1 percent +/-1 not percent		Annex G of IS 17261
vii)	Spin Finish Oil pick-up, Percent	0.50 - 1.50	- +/-0.2%	-	0.60 – 1.5 0.4-1.5	- +/-0.2%	-	Annex C of IS 17261
viii)	Unevenness of Linear Density (Normal), Percent, *Max*	4.0 max 3%	-	-	2.0 max 2.5%	-	-	IS 7703 (Part 5)
ix)	Lustre, Titanium Dioxide Content, Percent, (as Declared)							Annex F of IS 17261
	Full dull (FD)	Above 1.5 1.2%	-	-	Above 1.5 1.2%	-	-	
	Semi dull (SD)/ SDOB	Above 0.16 and up to 1.5 0.16-1.2	-	-	Above 0.16 and up to 1.5 0.16-1.2	-	-	

	Bright (BRT)/OBRT	Up to 0.16	-	-	Up to 0.16	-	-	
x)	Moisture Regain, Percent, *Max*	4.50	-	-	4.50	-	-	Annex B of IS 17261
xi)	Water Soluble Matter, Percent, *Max*	2.5	-	-	2.5	-	-	IS 3456
xii)	Limiting Oxygen Index, *Min* (For fire retardant yarns only)	30	-	-	30	-	-	IS 13501
xiii)	Ultraviolet resistance, UV-B Lamp, 144 h, Percent retained strength, *Min* (For UV resistant yarn only)	70	-	-	70	-	-	Annex F IS 16481
xiv)	Anti-microbial activity value, *Min* (For anti-microbial yarn only)	2.0	-	-	2.0	-	-	IS/ISO 20743
xv)	Colour strength with reference to standard yarn, percent (For dope dyed yarns only) (*see* NOTE 2)	100	-	±5	100	-	±5	Annex E of IS 17261
xvi)	Colour difference with reference to standard yarn, measured as ΔE, *Max* (for dope dyed yarns only) (*see* NOTE 2)	1.5	-	-	1.5	-	-	Annex E of IS 17261
xvii)	Colour Fastness to Light (for Dope Dyed	6 Min 5	-	-	6 Min 5	-	-	IS/ISO 105-B01 Or

	Yarns only), *Min*							IS/ISO 105-B02

NOTES

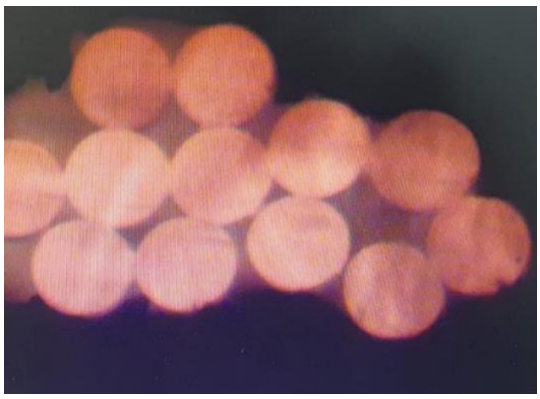
will be +/-5 (not percent)

1 For draw winder POY, elongation shall be 35 – 50 percent with a tolerance of ± 5 percent on the declared value when tested by the method prescribed in IS 7703 (Part 2) – Dry Method.

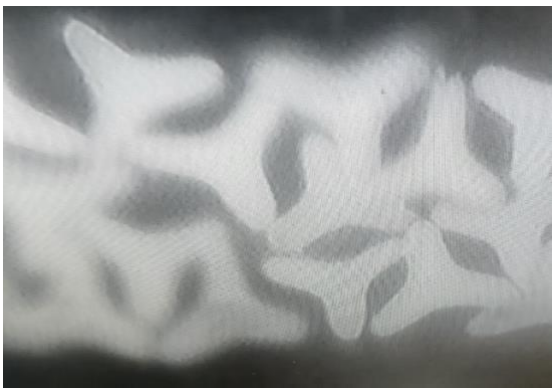
2 Either of the requirements indicated at xv) and xvi) needs to be complied with.

3 Interlace in nips per meter shall be 5-30 with a tolerance of ± 5 on the declared value when tested by the method prescribed in Annex B of IS 17262, except for mother yarn where interlace can be up to zero. The requirement for Interlace in nips per meter shall not be applicable for mono yarn. For Draw winder yarn, interlace in nips per meter shall be 5-70 with a tolerance of ± 5 on the declared value when tested by the method prescribed in Annex B of IS 17262.

4

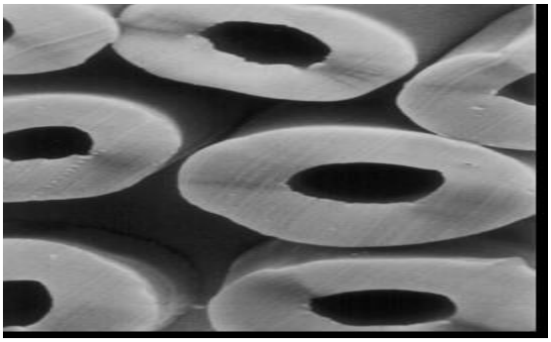


Circular

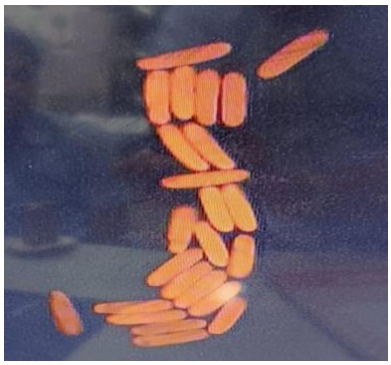


Trilobal

Triangle



Hollow



Slit cross section

FIG 1: CROSSECTIONAL VIEW OF NYLON FILAMENT YARN

5.2 Freedom from Yarn Defects — The NFY shall be free from the following major defects:

5.2.1 Dirt/Grease — No soiling or grease spots shall be allowed. It is acceptable, if the spots can be cleaned off. Air strip yarn to remove dirt on the outside surface, for dirt on the ends, clean with sprayer. If dirt does not come off, reject to off grade.

5.2.2 Wound in Waste — None shall be allowed. Strip to correct or reject to rewind.

5.2.3 Damaged/Bumped — None shall be allowed. Strip to correct or reject to rewind.

5.2.4 Finish Oil Contamination — Dry or regular oil yarn shall not be contaminated with finish oil when viewed under a packing table UV light, unless very slight (not immediately visible). Strip to clean if possible. Otherwise reject to off-grade.

5.2.5 Broken Filaments — None shall be allowed. For commodity 1 bf/kg & in Micro (< 1 dpf) 2 bf/kg

5.2.6 Texture Colour/Appearance — No overly shiny or dull yarn shall be allowed.

5.2.7 Fluorescent Oil — If applicable, the package shall have even coverage under UV light.

5.2.8 Crossed Ends — Nose end crosses can be allowed unless they appear matted or too numerous to count. Up to 25 mm crosses on the tail end shall be allowed or crosses <6 mm 10 mm from the tube shall be allowed.

5.2.9 Slubs/Loops/Kinks — None shall be allowed. For commodity 2 loops/kg & in Micro (< 1 dpf) 3 loops/kg

5.2.10 - Proper Wind — No patterns or bands, no high or falling off edges and no excessive hard/soft packages shall be allowed.

5.2.11 Ridges/Grooves — No ridges or grooves greater than3 mm high or deep shall be allowed. 5 mm

5.2.12 Twist — For single ply yarns only, Z twist shall rotate clockwise when allowed to relax and S twist Will rotate counter- clockwise.

5.2.13 Proper Ply — Count the number of ends if the yarn is three ply or more. Air strip the yarn to correct if possible. Also check the tail.

5.2.14 Latching — Plies that separate when winding off package shall not be allowed.

5.2.15 Tail — Only one tail package per layer shall be permitted. The minimum tail length shall be one wrap around the tube.

5.3 Commercial Mass

The commercial mass shall be obtained by adding mass corresponding to commercial allowance of 6.50 percent to the oven dry mass of the consignment when tested by the methods prescribed in IS 7703 (Part 3) and it shall not be less than the declared commercial mass of the consignment.

5.4 Additional Requirements for Ecomark (Optional)

For Ecomark, the product shall also comply with the additional requirements as given in Table 5.

Table 5 Additional Requirements for ECO-Mark (Optional)
(*Clause* 5.4)

Sl. No.	Characteristic	Requirement	Method of Test
(1)	(2)	(3)	(4)
i)	Total Free and releasable formaldehyde, mg/kg (ppm), *Max*	20	IS 14563 (Parts 1 and 2)
ii)	Extractable heavy metals by artificial Acidic sweat/saliva, ppm, *Max* i) Mercury ii) Chromium III iii) Chromium VI iv) Lead v) Cadmium vi) Copper vii) Antimony	 0.1 0.1 Not Detected 0.2 0.1 25 30	Annex A of IS 15651
iii)	Pentachlorophenol, ppm, *Max*	0.5	Annex B of IS 15651
iv)	Pesticides, (sum parameter), ppm, *Max*	1.0	Annex D of IS 15651
v)	Banned Pesticides, ppm, *Max*	Not Detected	Annex D of IS 15651
vi)	Banned Azo Colourants (arylamines), ppm, *Max* (For	20	IS 15570

	dyed yarns only) (sum parameters)		

6 PACKING

6.1 The continuous filament nylonyarn (NFY) shall be wound over bobbins in any mass up to 15 kg of yarn per bobbin. All such packages shall be packed in pallets or cartons, properly strapped using polypropylene/ PET straps. Packing materials should be roadworthy/airworthy/sea worthy as agreed to between the buyer and the seller.

6.2 All wooden pallets used for packing are to be heat treated. All wooden/paper packing should be free from infestation/fungal growth.

NOTE — Container fumigation for domestic supply shall be optional.

6.3 Each carton/ Pallet shall be marked with the grade of the package. The grade of the package is based on the tolerance on the weight of the package and length of the yarn on the package. The manufacturer shall declare the grade of the package. The different grades of the packages for different types of Nylon filament yarn is specified in the table below:

Sl. No.	Nomenclature of grade	POY	Mother Yarn	FDY	Draw Winder	Mono FDY
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	AA-Equal Length	± 2%	± 2%	± 2%	± 2%	± 2%
	A1	± 1 kg	± 1 kg	± 0.5 kg	± 0.5 kg	± 0.5 kg
ii)	A2	± 2 kg	± 2 kg	± 2 kg	± 1 kg	± 1 kg
iii)	A3	> 3 kg	> 3 kg	> 3 kg	>1.5 kg	>1.5 kg
iv)	A4	>1 kg	>1 kg	>1 kg	> 0.5 kg	> 0.5 kg’

7 MARKING

7.1 Each carton/pallet of NFY shall be marked with indelible ink, the following information:

a) Name and description of the material (*see* **4.1**);
b) Commercial mass of each carton/Pallet;
c) Manufacturer’s name, address and trade-mark (if available);
d) Lot/batch/merge number;
e) Month and year of manufacture; and
f) Any other information required by the law in force.

NOTES

1 Alternatively, the above information may be captured in a QR code that shall be printed on the carton/pallet. The QR code shall lead to a webpage offering all information as specified in **7.1** above.

2 Thermocol shall not be used in packaging of yarn.

7.2 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 thereunder, and the product(s) may be marked with the Standard Mark.

7.3 The declared parameters as per Table 2, Table 3 and Table 4 shall be provided in the form of a technical data sheet by either pasting on the package or provided separately linking it with lot/batch/merge no. on request for domestic supplies. Box/ pallet

7.4 Instructions for transportation and handling of the material shall also be provided by the manufacturer for proper care of the product.

8 SAMPLING AND CRITERIA FOR CONFORMITY

8.1 Lot — The number of packages in all cartons/pellets of NFY and of the same description delivered to a buyer against one dispatch note shall constitute a lot.

8.2 The number of packages to be selected at random from a lot shall be according to column 3 of Table 6. The packages shall be selected at random from different cartons/pallets to constitute the sample size. To ensure the randomness of selection, IS 4905 may be followed.

8.3 Number of Tests and Criteria for Conformity

8.3.1 The number of packages to be selected for manufacturing defects shall be in accordance with column 5 of Table 6. These packages may be selected from the packages selected for non-destructive tests.

8.3.2 All the packages selected from the lot shall be visually examined for yarn defects as specified in **5.2**. Four such defects will be considered as one major defect. A package shall be considered defective if it contains any major defect. All the packages selected for destructive tests shall be tested for the requirements as specified in **5.1**, **5.2, 5.3** and **5.4** as applicable.

8.3.3 The lot shall be declared conforming to the requirements of this standard if the total number of defective packages does not exceed the value given in column 4 of Table 6 for yarn defects or column 6 of Table 6 for other requirements.

Table 6 Number of Packages of Yarn to be selected

(*Clauses* 8.2, 8.3.1 *and 8*.3.3)

S. No	Lot Size	Non Destructive Testing		Destructive Testing	
		No. of Packages	Acceptance Number	No. of Packages	Acceptance Number

		to be Selected		to be Selected	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Up to 280	13[1] 7	1	NA 8	0
ii)	281-500	20 10	2	NA 8	0
iii)	501-1200	32 16	3	NA 13	0
iv)	1201-3200	50 25	5	NA 13	0
v)	3201-10000	80 40	7	NA 20	1
[1] or lot size when less than 13					

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
667 : 1981	Methods for identification of textile fibres (*first revision*) (with supplement)
3456 : 1966	Method for determination of water soluble matter of textile materials
4905 : 2015	Random sampling and randomization procedures (*first revision*)
6359 : 1971	Method for conditioning of textiles
7703	Methods of test for continuous filament polyester and polyamide flat yarn
(Part 1) : 1990	Linear density (*first revision*)
(Part 2) : 1990	Dry and wet tenacity and elongation (*first revision*)
(Part 3) : 1991	Commercial mass (*first revision*)
(Part 5) : 1990	Unevenness percentage
14563	Textiles — Determination of formaldehyde
(Part 1) : 2021	Free and hydrolysed formaldehyde water extraction method (*first revision*)
(Part 2) : 2021	Released formaldehyde vapour absorption method (*first revision*)
13501 : 1992	Textiles - Determination of flammability by oxygen index
15570 : 2005	Textiles — Method of test — Detection of banned azo colourants in coloured textiles
15651 : 2006	Textiles — Requirements for environmental labelling — Specification
16481 : 2016	Textiles — Synthetic micro-fibres for use in cement based matrix — Specification
17261 : 2022	Textiles – Polyester Continuous Filament Fully Drawn Flat Yarn *(First Revision*)
17262 : 2022	Textiles — Polyester partially oriented yarn (POY) — Specification (*first revision*)
17264:2022	Textiles — Polyester Industrial Yarns — Specification *(First Revision)*
IS/ISO 105-B01 : 2014	Textiles — Tests for colour fastness: Part B01 Colour fastness to light: Daylight

IS/ISO 105-B02 : 2014	Textiles — Tests for colour fastness: Part B02 Colour fastness to artificial light: Xenon arc fading lamp test
IS/ISO 20743 : 2013	Textiles — Determination of antibacterial activity of textile product

ANNEX B

(*Clause* 4.1**)**

DETERMINATION OF MELTING AND GLASS TRANSITION TEMPERATURES

B-1 GENERAL

This test method covers determination of melting temperatures of nylon polymers by Differential Scanning Calorimetric (DSC). It is applicable to polymers in granular form or to any fabricated shape from which it is possible to cut appropriate specimens. The normal operating temperature range is from the cryogenic region to 600°C. Certain equipment allows the temperature range to be extended.

NOTE –This method does not purport to address all the safety concerns, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

B-2 PRINCIPLE

The test material is heated or cooled at a controlled rate under a specified purge gas at a controlled flow rate and continuously monitoring with a suitable sensing device the difference in heat input between a reference material and a test material due to energy changes in the material. A transition is marked by absorption or release of energy by the specimen resulting in a corresponding endothermic or exothermic peak or baseline shift in the heating or cooling curve.

NOTES

1 Differences in heating or cooling rate as well as the final heating and cooling temperature have an effect on the measured results. Therefore, departure from conditions specified for a given polymer is not permitted.

2 The presence of impurities is known to affect the transition temperature, particularly if an impurity tends to form solid solutions or to be miscible in the melt phase.

3 Uncertain radiation losses at temperatures higher than 400 °C have been known to affect the accuracy of results at time.

4 Since particle size has an effect upon detected transition temperatures, the specimens to be compared shall be approximately the same particle size.

5 In cases that specimens react with air during the temperature cycle, provision shall be made for running the test under an inert gas blanket to avoid any incorrect measurement. Since some materials degrade near the melting region. care must be used to distinguish between degradation and transition.

6 Since very small quantities of specimen are used. it is essential to ensure that specimen are homogeneous and representative.

7 It is possible that toxic or corrosive effluents are released when heating the material which may be harmful to the personnel or to the apparatus.

B-3 APPARATUS

B-3.1 Differential Scanning Colorimeter (DSC)

B-3.1.1 DSC Test Chamber - composed of the following:

B-3.1.1.1 Furnaces to provide uniform controlled heating (cooling) of a specimen and reference to a constant temperature or at a constant rate within the applicable cryogenic to 600^{o}C temperature.

B-3.1.1.2 Temperature Sensor to provide specimen temperature to an accuracy of ± 0.01°C.

B-3.1.1.3 Differential Sensor to detect heat flow difference between the specimen and reference equivalent to I mW

B-3.1.1.4 Means of sustaining a Test Chamber Environment - of purge gas; at a purge flow rate of 10 to 50 ± 5 ml/min

NOTE – Typically, 99+ percent pure nitrogen, argon or helium arc employed when oxidation in air is a concern. Unless effects of moisture are to be studied, use of dry purge gas is recommended and is essential for operation at sub-ambient temperatures.

B-3.1.2 Temperature Controller, capable of executing a specific temperature program by operating the furnace between selected temperature limits at a rate of temperature change of 0.5°C to 20°C/min constant to ± 0.1°C/ min or at an isothermal temperature constant to ± 0.1°C.

B-3.1.3 Recording Device, capable of recording and displaying any fraction of the heat flow signal (DSC curve) including the signal noise as a function of temperature.

B-3.1.4 Software, for integrating areas under endothermic valleys or exothermic peaks, or both.

B-3.1.5 Containers (pans, crucibles and so forth) that are inert to the specimen and reference materials, and which are of suitable structural shape and integrity to contain the specimen and reference in accordance with the specific requirements of this method.

B-3.1.6 Cooling capability to hasten cool down from elevated temperatures, to provide constant cooling rates of 0.5°C – 20°C/min to obtain repeatable crystallization temperature to achieve sub-ambient operation or to sustain an isothermal sub-ambient temperature or combination thereof.

B-3.2 Balance capable of weighing to ± 10 µg.

B-4 TEST SPECIMENS

B-4.1 Powdered or Granular Specimens-Avoid grinding if the preliminary thermal cycle as outlined in **J-6.1.3** is not performed. Grinding or similar techniques for size reduction often introduce thermal effects because of friction or orientation or both, and thereby change the thermal history of the specimen.

B-4.2 Molded or Pelleted Specimens - Cut the specimens with a microtome, razor blade, hypodermic punch, paper punch, or cork borer (size No.2 or 3) or other appropriate means to appropriate size, in thickness or diameter and length that will best fit the specimen container, as in **B-3.1.5** and will approximately meet the desired weight in the subsequent procedure.

B-4.3 Film or Sheet Specimens – For films thicker than 40 µm see **B-4.2**. Fur thinner films, cut slivers to fit in the specimen capsules or punch disks, if the circular specimen capsules are used.

B-4.4 Use any shape or form listed in **B-4.1** to **B-4.3** except when conducting referee tests that shall be performed on films as specified in **B-4.3**.

B-5 CALIBRATION

B-5.1 The purge gas sha11 be used during calibration.

B-5.2 Calibrate the DSC temperature signal using a heating rate of 10°C/min.

B-5.3 Calibrate the DSC heat flow signal using heating rate of 10°C/min.

B-5.4 Some instruments allow for the temperature and heat flow calibration to be performed simultaneously. In such cases, use the same heating rate for this method (10°C/min) and follow the manufacturer's instruction.

B-6 PROCEDURE

B-6.1 Melting Temperature

B-6.1.1 The purge gas shall be used during testing. The flow rate of the gas shall be the same as used in the calibration (10°C/min).

B-6.1.2 Use a specimen mass appropriate for the material to be tested, In most cases, a 5 mg specimen mass is satisfactory. Avoid overloading. Weigh the specimen to an accuracy of

± 10µg.

B-6.1.2.1 Intimate thermal contact between the pan and specimen is essential for reproducible results. Crimp a metal Cover against the pan with the sample sandwiched in between to ensure good heat transfer. Take care to ensure flat pan bottoms.

B-6.1.3 Perform and record a preliminary thermal cycle by heating the sample at a rate of 10°C/min. from at least 50°C below to 30°C above the melting temperature to erase previous thermal history.

NOTE – In some cases it is possible that the preliminary thermal cycle will interfere with the transition of interest, causing an incorrect transition or eliminating a transition. Where it has been shown that this effect is present, omit the preliminary thermal cycle.

B-6.1.4 Hold the temperature for 5 min **(B-6.1.3)**

B-6.1.5 Cool to at least 50°C below the peak crystallization temperature at a rate of 10°C/min and record the cooling curve.

B-6.1.6 Hold the temperature for 5 min.

B-6.1.7 Repeat the heating at a rate of 10°C/min and record the heating curve.

B-6.1.8 Measure the melting temperatures on the curve (that is melting extrapolated onset temperature, melting extrapolated end temperature and melting peak temperature.

B-6.2 Glass Transition Temperature

B-6.2.1 The purge gas shall be used during testing. The flow rate of the gas shall be the same as used in the calibration.

B-6.2.2 Use a specimen mass appropriate for the material to be tested. In most cases, a 10 to 20 mg specimen mass is satisfactory. Weigh the specimen to an accuracy of ± 10 µg.

B-6.2.3 Perform and record a preliminary thermal cycle by heating the sample at a rate of 20°C/min from at least 50°C below to 30°C above the melting temperature to erase previous thermal history.

B-6.2.4 Hold the temperature for 5 min.

B-6.2.5 Quench cool to at least 50°C below the transition temperature of interest.

B-6.2.6 Hold the temperature for 5 min.

B-6.2.7 Repeat heating at a rate of 20°C/min and record the heating curve until all desired transitions have been completed.

B-6.2.8 The glass transition is more pronounced at faster heating rates. A heating rate of 20°C/min is used for Tg measurements. The instrument shall be calibrated at this heating rate. If both first and second-order transition (Tm and Tg respectively) arc to be determined in the same run, use procedure **B-6.1** and determine results from the second heating step (**B-6.1.7**).

B-6.2.9 Measure Tg (extrapolated onset temperature, midpoint temperature and extrapolated end temperature)