Preliminary Draft

भारतीय मानक ब्यूरो
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भारतीय मानक मसौदा

वस्त्रादि — कृत्रिम तन्तु फ्लैट धागे — परीक्षण पद्धतियाँ

भाग **1** रैखिक घनत्व

[आई एस 7703 (भाग 1) *का दूसरा पुनरीक्षण*]

Draft *Indian Standard*

TEXTILES — SYNTHETIC FILAMENT FLAT YARNS — METHODS OF TEST

PART 1 LINEAR DENSITY

[*Second Revision of* IS 7703 (Part 1)]

ICS 59.080.20

Physical Methods of Test Sectional Committee	Last date for receipt of comments
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FOREWORD

(*Formal clauses will be added later***)**

This standard was first published in 1975 and revised in 1990. The first revision to this standard was made to enlarge the scope to cover continuous filament flat yarns of all man-made fibres including rayon and acetate instead of polyester and polyamide only and also to supersede IS 1256 : 1957 ‘Method for determination of linear density (mass per unit length) in denier units (or tex units) of continuous filament rayon yarn and acetate yarn’.

This revision has been made in the light of experience gained since its publication and to incorporate the following major changes:

a) The Scope of the standard has been modified;
b) The provision of measuring linear density of synthetic filament yarns in ‘dtex’ system in place of ‘tex’ system has been incorporated;
c) The clause ‘Terminology’ has been modified;
d) The tolerance of relative humidity for atmospheric conditioning has been modified;
e) The clause ‘Calculation’ has been modified;

f) The clause ‘Test report’ has been modified; and
g) References to standards have been updated.

In the preparation of this standard due weightage has been given to the testing practices followed in the country in this field.

This standard forms a part of the series of standards on methods of test for synthetic filament flat yarn. The other parts in the series are:

Part 2 Dry and wet Tenacity and elongation
Part 3 Commercial mass
Part 4 Sampling
Part 5 Unevenness percentage

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’.

Draft *Indian Standard*

TEXTILES — SYNTHETIC FILAMENT FLAT YARNS — METHODS OF TEST

PART 1 LINEAR DENSITY

[*Second Revision of* IS 7703 (Part 1)]

1 SCOPE

1.1 This standard (Part 1) prescribes the method for the determination of linear density of man-made fibres continuous filament flat yarn.

1.2 The test method is prescribed in this standard is not applicable, except by agreement, to yarns which stretch more than 0.5 percent when the tension, in centinewtons, per unit linear density of yarn, in tex, increases from 0.5 to 1.0. Such yarns may be tested under special conditions if they are accepted by all the parties interested in the test results.

1.3 The method is also not applicable to yarns having a linear density greater than 2 000 tex or for reinforcement yarns. For such yarns, other skein lengths and special conditions of reeling may be adopted by agreement of the interested parties.

2 REFERENCES

The Indian Standards given below 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 below:

IS No.	***Title***
1324 : 2021	Textiles — Man-made fibres, yarns and fabrics — Glossary (*second revision*)
196 : 2024	Atmospheric conditions for testing (*first revision*)
6239 : 2021	Textiles — Man-made fibres — Generic names (*third revision*)
6359 : 2023	Method for conditioning of textiles (*first revision*)
IS 13157 : 1991	Textile fibres - Commercial moisture regains - Specification

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 1324 and IS 6239, and the following shall apply:

3.1.1 *Commercial Moisture Regain* — Arbitrary value formally adopted as the moisture regain to be used with oven-dry mass when calculating the linear density and/or the commercial mass of any specific textile material (*see* IS 13157).

3.1.2 *Linear Density* — It is expressed as the mass per unit length of a yarn. The linear density of synthetic filament flat yarns is measured majorly in dtex or denier.

3.1.2.1 *Denier* — A yarn count system equivalent to mass in grams of 9 kilometres length of yarn.

3.1.2.2 *dtex* — A yarn count system equivalent to mass in grams of 10 kilometres length of yarn.

3.1.3 *Moisture equilibrium* — Condition reached by a sample at a closely defined temperature and relative humidity when the net difference between the amount of moisture absorbed and the amount desorbed, as indicated by a change in mass, shows no trend and becomes insignificant.

NOTE — A textile material is in moisture equilibrium with the ambient atmosphere when it does not exchange water with this atmosphere; its mass then remains constant as long as the experiment is carried out in an unchanged atmosphere. For test purposes, moisture equilibrium is reached by absorption starting from a relatively low moisture content. Moisture equilibrium for testing is considered as having been reached when the rate of increase in mass of a Sample or specimen due to moisture uptake does not exceed that prescribed for the material being tested (see IS 6359).

3.1.4 *Oven-dry mass* — Constant mass of a specimen obtained by drying in an oven under prescribed conditions for temperature and humidity.

NOTE — Conditions most frequently used are a temperature of (105 ± 3) ℃ and an air supply having a relative humidity of (65 ± 2) percent at a temperature of (27 ± 2) ℃, under which conditions the specimens will not be moisture-free.

3.1.5 *Skein* — A continuous length of yarn in the form of a coil made on a reel of known girth.

4 PRINCIPLE

4.1 The linear density is determined from the mass of a specified length of yarn and expressed in denier or dtex ($1/10^{th}$ of Tex). The specimen is first conditioned free from tension and thereafter length is measured under standard pretension. The specimen is then oven-dried to constant mass and weighed. The commercial moisture regain is then added to the oven-dry mass and the resultant mass is used to calculate the specimen's linear density.

5 SAMPLING

5.1 Sample to test the conformity of a lot to a specification shall be selected to represent the lot.

5.2 Sample shall be drawn as per the procedure laid down in the relevant material specification or as agreed to between the buyer and the seller.

6 ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

6.1 Unless otherwise agreed to between the buyer and the seller, the test sample shall be conditioned to a state of moisture equilibrium from the dry side in a standard atmosphere at (65 ± 4) percent relative humidity and (27 ± 2) °C temperature (*see* IS 6359)

NOTE — When a test sample under zero tension has been left in such a way as to expose, as far as possible, all portions of it to the standard atmosphere for 24 h, the test sample shall be deemed to have reached a state of moisture equilibrium.

6.2 The test shall be carried out in the standard atmosphere as laid down in 6.1 (*see also* IS 196).

7 APPARATUS

7.1 Pan Balance and Weights — Capable of weighing test specimens to an accuracy of 0.1 mg.

7.2 Drying Oven — Provided with forced ventilation and positive valve control and capable of maintaining a temperature of (105 ± 3) ºC and an air supply having a relative humidity of 65 percent at 20 °C, preferably provided with a weighing balance. In case the weighing balance is not provided, a desiccator with a suitable desiccant and sealed containers of known mass shall be made available.

7.3 Wrap Reel — A hand or motor driven reel with 1 meter circumference capable of winding specific length under required tension. The wrap reel should stop at the same position as it started without any backlash to an accuracy of ± 2.5 mm to avoid extra/less length of yarn in the skein.

8 PREPARATION OF TEST SPECIMENS

8.1 From each conditioned sample, draw suitable lengths of yarn preferably in multiples of 10 m for dtex and 9 m for denier measurement by the wrap reel without alteration of twist under a constant yarn tension of 0.5 ± 0.1 cN/tex so that the mass of each specimen is at least 5 g. Discard a few metres of yarn while taking each specimen. Operate the reel by hand or motor (preferably the latter) at a speed of 100 rev/min to 150 rev/min when reeling out yarn present in the skein form otherwise use a speed of 200 rev/min to 300 rev/min for reeling out yarn from packages other than skeins. Tie the tail end of the skein or other packages to its starting end.

9 PROCEDURE

9.1 Take at least six test specimens, two from each package, one drawn from the inside and one drawn from the outside of the package, except when the yarn is on pirns. When the yarn is on pirns, take at least ten test specimens each reeled off the middle portion of each pirn. Place each test specimen in the ventilated drying oven maintained at (105 ± 3) °C and fed with air from the standard atmosphere. Continue drying until the constant mass is obtained.

NOTE — The mass shall be taken as constant when the difference between any two successive weighing made at intervals of 20 minutes does not exceed 0.1 percent.

9.2 Record the oven-dry mass of each test specimen correct to 1 mg.

10 CALCULATION

10.1 Calculate the linear density for each test specimen by one of the following formulae:

a) dtex = $(100 + R) \times \frac{100\,M}{L}$

b) Denier = $(100 + R) \times \frac{90\,M}{L}$

where

R = percentage commercial moisture regain of the fibre used in the yarn being tested (*see* 13157),
M = oven-dry mass of the test specimen in grams, and
L = length of specimen in metres.

10.2 Find out the mean of the linear density values, obtained in **10.1**.

11 TEST REPORT

11.1 The test report shall include the following information:

a) The nature and composition of the material to be tested;
b) Month and year of manufacture of the material,
c) Number of specimens tested;
d) Commercial moisture regain used;
e) Length of yam taken for each test specimen;
f) Mean and Individual values of Linear density in dtex or denier units; and
g) Coefficient of Variation of the linear density, if determined.