

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

**ISO RECOMMENDATION
R 1973**

TEXTILE FIBRES
DETERMINATION OF LINEAR DENSITY
GRAVIMETRIC METHOD

1st EDITION

November 1971

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BRIEF HISTORY

The ISO Recommendation R 1973, *Textile fibres – Determination of linear density – Gravimetric method*, was drawn up by Technical Committee ISO/TC 38, *Textiles*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question led to the adoption of Draft ISO Recommendation No. 1973, which was circulated to all the ISO Member Bodies for enquiry in May 1970.

The Draft was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Israel	Spain
Brazil	Italy	Sweden
Canada	Japan	Switzerland
Czechoslovakia	Netherlands	Thailand
Denmark	New Zealand	Turkey
Finland	Norway	U.A.R.
France	Poland	United Kingdom
Germany	Portugal	U.S.A.
Greece	Romania	
Iran	South Africa, Rep. of	

The following Member Bodies opposed the approval of the Draft :

Belgium
India
U.S.S.R.

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

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ISO Recommendation

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TEXTILE FIBRES
DETERMINATION OF LINEAR DENSITY
GRAVIMETRIC METHOD

1. SCOPE

This ISO Recommendation specifies the procedure to be followed for the gravimetric determination of the linear density of textile fibres cut from a length in the straightened state. Two methods are described, applicable respectively

- (a) to bundles of fibres;
- (b) to individual fibres.

The method for bundles of fibres can be applied only to those fibres which can be kept rectilinear and parallel during preparation of the bundles. It is not applicable to wool or textured fibres.

2. PRINCIPLE

The mass and length of

- (a) bundles of fibres or
- (b) of individual fibres,

in standard condition, are measured and thence a mean value of the linear density is deduced and expressed in appropriate units. For most purposes the appropriate units in the Tex System are the millitex and the decitex. (See ISO Recommendation R 1144, *Textiles – Universal system for designating linear density (Tex System)*.)

3. APPARATUS

- 3.1 *Balance*, suitable for weighing the bundles of fibres or individual fibres to an accuracy of 1 %.
- 3.2 *Device for cutting the fibres*, or bundles of fibres, to a length known with an accuracy of 1 %* and allowing of adjustment of the tension of the bundles to be cut.
- 3.3 *Textile support fabric*, of a colour contrasting with that of the fibres to be tested.
- 3.4 *Glass plate*, approximately 10 cm × 20 cm in size, with one polished edge.
- 3.5 *Forceps*.

4. CONDITIONING AND TESTING ATMOSPHERE

The atmosphere for conditioning and testing should be one of the standard atmospheres for testing specified in ISO Recommendation R 139**, *Standard atmospheres for conditioning and testing textiles*.

* It is convenient to use two razor blades set parallel in a holder.

** 2nd edition, 1967.

5. SAMPLING

Carry out sampling in accordance with ISO Recommendation R 1130, *Methods of fibre sampling for testing*.

6. PROCEDURE

6.1 General

After preconditioning, bring the sample to constant mass in the standard atmosphere. Carry out the test without removal from the standard atmosphere, following either the procedure described in clause 6.2 or that in clause 6.3.

6.2 On bundles of fibres

- 6.2.1 From the final laboratory sample take ten tufts of several milligrammes and parallelize the fibres of each tuft by carefully combing them several times.
- 6.2.2 Cut the middle part of each combed tuft to a given length (as great as possible)*, under the minimum tension necessary to remove crimp, by means of the cutting device (3.2). Take the necessary precautions so that there are no free fibre ends anywhere except at the two ends of the cut bundle.
- 6.2.3 Place the ten bundles so obtained on the textile support fabric (3.3) and cover them with the glass plate (3.4), from the edge of which they should protrude slightly.
- 6.2.4 From each of the ten bundles in turn, take out five fibres, so as to form a bundle of fifty fibres, in each case drawing the fibres from one cut end. Make at least ten of these bundles and condition them in the atmosphere specified in section 4. Then weigh these bundles individually, using the balance (3.1), to an accuracy of 1 %.

6.3 On individual fibres

- 6.3.1 From the final laboratory sample take ten tufts of several milligrammes, and with these form a bundle by repeated halving and doubling**. From this bundle then take a tuft of about fifty fibres and condition them in the atmosphere specified in section 4.
- 6.3.2 Weigh all the fibres of this tuft individually, using the balance (3.1), to an accuracy of 1 %***. Determine the length of each fibre by measuring in exactly the same way as shown in ISO Recommendation R 270, *Determination of fibre length by measuring the length of individual fibres*; for wavy fibres of high rigidity, it is necessary to use a procedure which does not produce stretching in the fibre; this is not ensured by drawing synthetic fibres across an oiled plate.

7. EXPRESSION OF RESULTS

7.1 On bundles of fibres

- 7.1.1 Calculate the mean linear density of the fibres in each bundle, and calculate the mean linear density for all the bundles from these values.
- 7.1.2 Calculate the coefficient of variation (V) of the linear densities from the ten results obtained.
- 7.1.3 From the coefficient of variation calculate the 95 % confidence limits.

If the confidence limits are less than 2 %, the number of bundles tested is adequate and the mean of the linear densities for the bundles is taken as the mean linear density of the sample.

If the confidence limits are above 2 %, the number of bundles tested should be increased until the confidence limits are less than 2 %, the mean for all the bundles then being taken as the mean linear density of the sample.

* It is common practice to use a length of 1 cm.

** It is essential to divide the tuft in the width direction and not draw out the fibres by their extremities.

*** The length of the individual fibre (especially if the linear density is low) should be such that the required accuracy is attained.

7.2 On individual fibres

7.2.1 Calculate the linear density of each fibre by dividing the mass of the fibre by its length. Calculate the mean linear density of these fibres.

7.2.2 Calculate the coefficient of variation of the individual values for linear density of each fibre.

7.2.3 The mean of the values obtained should be taken as the mean linear density of the fibres in the sample, provided that the 95 % confidence limits are less than 2 %.

If the confidence limits are too high, the number of fibres tested should be increased until the confidence limits are equal to or less than 2 %.

8. TEST REPORT

The test report should include the following information :

- (a) the method of determination (bundles of fibres or individual fibres);
 - (b) the length of the cut bundle;
 - (c) the mean linear density of the fibres in the sample;
 - (d) the 95 % confidence limits.
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