38

INTERNATIONAL STANDARD 270

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Textile fibres — Determination of length by measuring individual fibres

Fibres textiles — Détermination de la longueur par mesurage des fibres individuelles

First edition — 1975-10-15

To become ISO 6989

Textile fibres — Determination of length and length distribution of staple fibres — Method by measurement of single fibres

UDC 677-1 : 531.717.14

Ref. No. ISO 270-1975 (E)

Descriptors : textiles, fibres, measurement, length.

Price based on 3 pages

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up has the right to be represented on that Committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 38 has reviewed ISO Recommendation R 270 and found it technically suitable for transformation. International Standard ISO 270 therefore replaces ISO Recommendation R 270-1962 to which it is technically identical.

ISO Recommendation R 270 was approved by the Member Bodies of the following countries :

Austria	Israel	Romania
Belgium	Italy	South Africa, Rep. of
Canada	Japan	Spain
Czechoslovakia	Netherlands	Sweden
Denmark	New Zealand	Switzerland
France	Norway	Turkey
Germany	Poland	United Kingdom
Greece	Portugal	U.S.S.R.

The Member Bodies of the following countries expressed disapproval of the Recommendation on technical grounds :

Hungary
India*
U.S.A.

* Subsequently, this Member Body approved the Recommendation.

The Member Body of the following country disapproved the transformation of ISO/R 270 into an International Standard :

Hungary

Printed in Switzerland

Textile fibres – Determination of length by measuring individual fibres

0 INTRODUCTION

The determination of fibre length by measuring the length of individual fibres has been chosen as the reference method for the following reasons :

a) the fibre length is better defined than by measurement of the fibre held in combs;

b) this is a general method, and its range of application is not limited by the length or diameter of the fibres tested;

c) the risk of accidental or systematic errors is less than with other methods, particularly with collective measurements of the length of a group of fibres.

It should be noted that measurements by this reference method are made on straightened fibres and may give different results from those obtained by other methods of measurement. In the case of fibres which have inherent crimp, straightening the fibre may also introduce errors due to stretching. Nevertheless, the other methods (for example the comb sorter) are quicker for some fibres (for example cotton and wool) and for this reason may be preferred, for routine tests, to the more exact method of measuring individual fibre lengths.

From the results of individual fibre measurements, the frequency-distribution curve may be obtained, as well as certain other characteristics, such as the modal length, the mean length and percentage frequencies of fibres by number or mass as a function of their length.

It should be stressed that, if the results of individual fibre measurements are to be applied to the bulk source from which a laboratory sample for examination has been drawn, it is essential that

a) the laboratory sample be drawn in such a manner that it is properly representative of the bulk source as a whole;

b) the number of fibres measured be statistically adequate to reproduce the range and proportions of lengths in the bulk source.

Methods of sampling are not given in this document, which relates only to the method of measurement.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method of determining fibre length by measurement of individual fibres. The method may be applied to all discontinuous textile fibres, except those in which strong inherent crimp would render the procedure inapplicable.

2 REFERENCE

ISO 139, *Textiles – Standard atmospheres for conditioning and testing.*

3 PRINCIPLE

Measurement of the *individual* length of each fibre, straightened and laid out in the measuring zone.

4 APPARATUS

4.1 Polished glass plate set on a dark background for undyed fibres and on a contrasting background for dyed fibres. Manipulation is often facilitated if a millimetre scale is engraved or reproduced on the glass plate by photography.

4.2 Bevelled rule finely graduated in millimetres on the thin edge of the bevel (unless a graduated glass plate is used).

4.3 Tweezers.

4.4 White petroleum jelly or **liquid paraffin.**

4.5 Velvet cloth stretched on a frame.

5 CONDITIONING

The laboratory sample shall be opened out and kept for at least 24 h in one of the standard atmospheres for testing textiles as specified in ISO 139. The measurements shall be made in the same atmosphere.

6 PROCEDURE

6.1 Select the fibres to be tested at random either from the laboratory sample or from a test sample representative of the random selection technique.

6.2 Smear the glass plate with a small quantity of white petroleum jelly or liquid paraffin. Using the tweezers,

arrange a fibre in a straight line on the glass plate and along the scale, if the plate is graduated. Measure the length of the fibre along the attached scale or with the graduated rule. Repeat the operation for each fibre to be tested.

6.3 Group the observed lengths in classes, the interval between these being as follows :

Nominal length of fibres mm	Class interval mm
less than or equal to 45	1
more than 45 and less than or equal to 80	2
more than 80	5

6.4 Observe the class limits given by the following deviations from the mid-points of the classes :

Class interval mm	Permissible deviations mm
1	+ 0,50 − 0,49
2	+ 1,00 − 0,99
5	+ 2,50 − 2,49

7 EXPRESSION OF RESULTS

7.1 Method of calculation

Count the number of fibres in each class, of length l_i. Calculate for each class the percentage frequency by number f_i using the formula :

$$f_i = \frac{n_i}{\Sigma n_i} \times 100$$

the percentage length-biased frequency f'_i using the formula :

$$f'_i = \frac{n_i l_i}{\Sigma n_i l_i} \times 100$$

where

n_i is the number of fibres in the i^{th} class;

l_i is the central length of the i^{th} class, in millimetres;

Σn_i is the total number of fibres in all the classes;

$\Sigma n_i l_i$ is the sum of the products $n_i \times l_i$ for all the classes.

This calculation coincides with the percentage frequency by mass, if fibres of different lengths have the same mass per unit length, which is not always the case, particularly for the natural fibres.

7.2 Characteristic distribution values

7.2.1 *Lengths*

The following characteristic distribution values are commonly calculated; other quantities may also be calculated for particular purposes :

a) the modal length (the central length of the most numerous class);

b) the mean length of the individual fibres :

$$L = \frac{\Sigma n_i l_i}{\Sigma n_i}$$

c) the length-biased mean length of fibres in a sliver, roving or yarn section :

$$L' = \frac{\Sigma n_i l_i^2}{\Sigma n_i l_i}$$

Express the lengths in millimetres.

7.2.2 *Coefficient of variation*

This is calculated from the frequency distribution using the formula :

$$V\,\% = \frac{100}{L} \times \sqrt{\frac{\Sigma (l_i - L)^2 n_i}{\Sigma n_i}}$$

8 NUMBER OF FIBRES TO BE MEASURED

Begin by taking 500 fibres from the laboratory sample and determine their length. From these individual lengths, calculate the mean length (see 7.2.1 b)) and 95 % confidence limits CL given by the formula :

$$\text{CL}\,\% = \frac{2V}{\sqrt{\Sigma n_i}}$$

where V is the coefficient of variation, defined in 7.2.2.

The number of fibres shall be sufficient to reduce this value to 5 % or less, according to practical needs.

9 TEST REPORT

9.1 State

a) the number of fibres measured;

b) the percentage by number of the fibres in each class f_i.

9.2 State also, if requested,

c) the modal class length;

d) the mean length of the individual fibres (calculated by number) or length-biased (calculated by mass);

e) the coefficient of variation;

f) the confidence limits.

9.3 Plot the frequency distribution curve from the percentage frequencies by number.

9.4 Make reference to this International Standard.

9.5 Report any operational details not specified in this International Standard and any incidents likely to have influenced the results.

9.6 Report all details needed to identify the sample.