INTERNATIONAL STANDARD

ISO 2648

Second edition
2020-01

Wool — Determination of fibre length distribution parameters — Capacitance method

Laine — Détermination des paramètres de distribution de longueur des fibres — Méthode capacitive

Reference number
ISO 2648:2020(E)

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Published in Switzerland

Contents

Page

Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 38, *Textiles,* Subcommittee SC 23, *Fibres and yarns*.

This second edition cancels and replaces the first edition (ISO 2648:1974), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the title has been modified as "*Wool — Determination of fibre length distribution parameters — Capacitance method"*;

— the content structure has been updated;

— in the scope, the text for “wool/synthetic blends” has been modified;

— the mandatory Clauses 2 and 3, “Normative references” and” Terms and definitions” respectively, have been added, and the subsequent clauses have been renumbered;

— Clause 4 "Principle" has been modified;

— in Clause 5, “measuring apparatus” has been modified and additional apparatus (5.2, 5.3and 5.4) for test specimen preparation have been included;

— the “Test specimen” clause has been deleted;

— Clause 6 "Conditioning and testing atmosphere" has been modified;

— a new Clause 7, “Sampling and preparation of laboratory sample” has been added;

— the former Clause 6, “Preparation of samples for testing” has been modified as 8.1 “"Preparation of test specimen”;

— in Clause 8, the procedure for apparatus measuring has been added;

— a new subclause (9.2)on “Digital system” has been added;

— the former “Definition of the test on top sliver-notes on sampling” clause has been deleted;

— new Clauses 10 and 11, “Test report” and “Precision” respectively, have been added;

— the former Annexes A (Literature reference), Annex C (The Almeter), Annex D (Control of the machine), Annex E (Calibration check of the machine) and Annex F (Accuracy of the method) have been deleted;

— a new Annex A, “Preparation of top and sliver”, has been added;

— former Annex B has been modified, and its title has been replaced with “Test specimen preparation”;

— a new Annex C ,“The introduction of the precision of the method”, has been added;

— the former Figures 1 to 4 have been deleted;

— new Figures A.1 to A.3 have been added;

— a Bibliography has been added.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Wool — Determination of fibre length distribution parameters — Capacitance method

1 Scope

This document specifies a method for the determination of fibre length distribution parameters (principally mean length, expressed as Hauteur or Barbe, and the coefficient of variation of the measurement) on slivers and rovings made from combed wool or combed synthetic fibres.

As the fibres of different chemical structure have different di-electric values, the method is not directly applicable to slivers made up of a blend of wool/synthetic fibres.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 139, *Textiles — Standard atmospheres for conditioning and testing*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
Hauteur
H
mean cross-section biased length of the test specimen

Note 1 to entry: It is expressed in millimetres (mm).

3.2
Barbe
B
mean weight-biased length of the test specimen

Note 1 to entry: It is expressed in millimetres (mm).

Note 2 to entry: Only Hauteur is certifiable.

3.3
total sample
total of the *laboratory samples* (3.4) taken to represent the lot

[SOURCE: ISO 137:2015, 3.2, modified — The definition has been slightly modified.]

3.4
laboratory sample
sample of sliver about 1,20 m long, twisted by 30 turns per metre if the test is not carried out within 4 h after it is taken for sampling

3.5
test specimen
sample of fibres aligned at one end made up of approximate 30 000 fibres

Note 1 to entry: It is sometimes referred to as "beard".

3.6
one measurement
result of an evaluation of the length distribution on both "left" and "right" ends of the sliver, in order to avoid the influence of any possible asymmetry between the two directions of the sliver

4 Principle

The capacitive sensor-based machine tests the length of textile fibres, using a test specimen of fibres made up with the aid of the mechanical grip.

The grip, fed with slivers or rovings, prepares a numerical specimen of fibres, where the number of fibres in each length class is represented in the same numerical proportion as in the original sliver.

This test specimen is arranged in the form of a draw of fibres, with all the fibres having one of their ends (their base) situated approximately on the same line, perpendicular to the direction of the fibres. The test specimen formed in this way is then transferred from the grip to the capacitive sensor-based apparatus, where it is inserted between two thin plastic sheets.

The carriage containing the test specimen is either moved at a constant speed through a measuring condenser, or the measuring condenser moves over a stable test specimen at a constant speed. The variation in capacitance so produced is due to the partial replacement of the dielectric "air" and fibres between the dielectric plates of the condenser. Knowing the formation of the sample, it can be shown that the measured signal (proportional to this increase in capacitance) is equivalent to a cumulative Hauteur (H) diagram, which is automatically traced.

The following length distribution parameters are calculated, Hauteur (H), coefficient of variation of hauteur (CV_H), Barbe (B), coefficient of variation of barbe (CV_B), L values and K values.

5 Apparatus

5.1 Measuring apparatus.

5.1.1 Mechanical grip.

The mechanical grip works in the same way as the nip of a rectilinear comb. At each cycle, it takes from the sliver a numerical draw or sample containing all the fibres whose heads lie in a short length of the sliver, between 2 cross-sections of the sliver about 2,5 mm (automatic preparer) to 3,7 mm (manual preparer) apart. The complete test specimen is made up of a collection of about 6 to 10 of these samples.

5.1.2 Main capacitive sensor-based instrument, consists of two parts, assembled within one chassis:

1) a device, measuring the local mass of the fibre test specimen;

2) a computer, automatically evaluating the length distribution parameters during the test.

The device for measuring the local mass is made up of a special condenser in the form of a greatly elongated rectangle, 1,8 mm × 175 mm. The small dimension (1,8 mm) of the condenser in the direction

of the fibres provides for a detailed examination of the local mass from the end of the sample up to the line of the common origin of the fibres.

A carriage automatically carries the test specimen at a constant speed between the electrodes of the measuring condenser, or conversely the condenser moves over the test specimen.

5.1.3 Recorder.

In the analogue system, the record is a galvanometric recorder, which automatically traces the cumulative Hauteur diagram on squared paper during measurement.

In the digital system, the data are captured by a computer which is capable of outputting the results to either the screen or to a printer. The diagram ordinate gives the percentage of fibres (biased by cross-section) of length greater than the length indicated on the corresponding abscissa. (The percentage by cross-section is very close to the percentage by number).

5.2 Test specimen holder.

5.3 Extractor system.

5.4 Restraining strip.

6 Conditioning and testing atmosphere

6.1 Conditioning atmosphere

6.1.1 General

The sample, kept in the form of a twisted hank, is exposed to the conditioning atmosphere for a minimum period as indicated below. This period can vary according to the type of the material and the sampling conditions.

Generally, regardless of the origin of the sample of sliver, the preliminary conditioning period is 24 h in the standard atmosphere for testing as defined in ISO 139.

In order to standardize the procedure, this period of 24 h may be adopted for all cases where no urgency exists.

6.1.2 For slivers coming from a process involving soaking, drying or oiling, a conditioning period of 24 h in standard atmosphere is to be observed.

6.1.3 For tops sampled in the normal way at a passage following combing, and drawing slivers and rovings sampled from a machine where fibre lubricant is not applied, the period of conditioning in standard atmosphere can be reduced to a minimum of 4 h.

6.1.4 In some cases, this period can be reduced still further; for instance, if a rapid conditioning enclosure is available in which the sample hank can be placed for 30 min followed by a further 30 min in the standard atmosphere.

6.1.5 The conditioning period may be omitted or reduced to a precautionary 30 min when a combination of the following conditions occurs.

a) Sampling has taken place approximately within the 4 h prior to the test during processing or from balls stored in a satisfactory atmosphere.

b) The sample hank has been transported in a sufficient airtight plastic bag, avoiding any excessive heat or cold.

6.2 Testing atmosphere

The test is to be performed in the standard atmosphere for testing as defined in ISO 139.

7 Sampling and preparation of laboratory sample

7.1 Sampling

Samples shall be taken from bales distributed equally throughout a lot. Only one sample shall be taken from a bale, unless the lot is smaller than 5 bales when an equal number of samples shall be taken from each bale.

To characterize a lot, take at least one sample from each of 5 homogeneous portions of the lot to form the total sample. For masses greater than 5 000 kg, at least one sample shall be added per 5 000 kg portion.

NOTE Homogeneous portion of the lot is a ball or bump of sliver, a can of drawing sliver, a roving bobbin, a sliver or roving taken directly from a finisher.

Samples shall not be taken for measurement from the disturbed outer layer, or immediately next to the core of a package. Slivers having adventitious thickness faults (especially abnormal thick or thin places) are to be discarded. Slivers taken directly from a comb, cut or chopped slivers and those containing fibre bundles are also unsuitable. In such cases, the variation in fibre length between successive samplings is likely to be very large, potentially giving rise to significant errors.

7.2 Preparation of laboratory sample

7.2.1 General

To obtain a suitable laboratory sample, fibres shall be under semi-relaxed state. To achieve this form, pre-treat laboratory samples according to Annex A.

7.2.2 Slivers of combed wool weighing between 15 g/m and 30 g/m

For slivers of combed wool weighing between 15 g/m and 30 g/m, a length of about 1,2 m is broken off from the homogeneous portion of the lot. Immediately after sampling, the sample held under slight tension is given 36 turns of twist (30 turns/m); held taut in this condition, it is doubled at its centre and its ends are brought together and held. See Annex A for details.

In this form, the sample can be stored indefinitely and can easily be sent by post in a plastic bag, or held fast on a tube of approximate diameter 40 mm in the twisted state, to the testing laboratory.

For in-mill management, the operation of twisting may be omitted only when the ball of combed sliver or of roving is available at the moment of testing and if the test is going to be carried out within 4 h of sampling.

NOTE This twisting operation is absolutely essential in order to obtain accurate test results.

7.2.3 Rovings or slivers weighing less than 15 g/m

In the case of rovings or slivers weighing less than 15 g/m, sufficient 1,2 m lengths of sliver are successively drawn to build up, by overlaying, a sliver which weight per metre is about 22 g (30 g maximum). At the time of the overlaying, the slivers shall always be laid in the same direction (for example, the leading end as delivered by the mill machine always to the left).