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Second edition
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Wool — Determination of fibre diameter — Projection microscope method

Laine — Détermination du diamètre des fibres — Méthode du microscope à projection

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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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 38, *Textiles*, Subcommittee SC 23, *Fibres and yarns*.

This second edition cancels and replaces the first edition (ISO 137:1975), which has been technically revised.

This second edition to ISO 137 is based on the test method IWTO-8:2011, drawn up by the International Wool Textile Organization (IWTO).

Wool — Determination of fibre diameter — Projection microscope method

1 Scope

This International Standard specifies the procedure and the measurement conditions for the determination of the wool fibre diameter using a projection microscope.

The method is suitable for wool fibres in any form and also for other fibres of reasonably circular cross-section. (In the case of dyed, bleached or finished fibres, the diameter might be different from that of fibres not subjected to such treatments. The estimates of fibre diameter obtained at the various stages of processing one lot of wool will not necessarily be the same.)

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

ISO 1130:1975, *Textile fibres — Some methods of sampling for testing*

3 Terms and definitions

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

3.1
mean diameter
average value of the projected width of either the wool fibre or another fibre of reasonably circular cross-section

3.2
total sample
sample intended to be representative of a large bulk of material, in the state in which it is sent to the laboratory

Note 1 to entry: The total sample is prepared according to the procedure specified in ISO 1130.

3.3
subsample
sample randomly drawn from and representative of the total sample, which has been suitably cleaned, dried and conditioned where appropriate

3.4
test specimen
part of a subsample which is tested at one time

4 Principle

Projection on a screen of the magnified images of the profiles of wool fibre snippets, and measurement of their width by means of a graduated scale. The operating technique ensures a random sampling of the fibres to be measured.

5 Apparatus

5.1 Projection microscope, comprising a light source, a light condenser, a stage which supports the slide carrying the fibres, an objective, an ocular and a circular screen.

5.1.1 Stage, movable in two directions at right angles by means of a sliding mechanism capable of successive displacements in 1,0 mm steps.

5.1.2 Objective and ocular, capable of providing 500X magnification.

5.1.3 Circular screen, equipped with a graduated scale capable of measuring the projected image of the fibre snippet on the screen in any orientation and position within the measuring area.

It is acceptable to mark a central circle having a diameter equal to one-quarter of the optical distance between the ocular and the centre of the screen. To ensure that any lens aberrations at the objective perimeter are avoided, all measurements must be made within this circle. However, some modern instruments contain much improved optics which ensure uniformity of magnification over the whole of the projected image. In the case of these instruments, no marked circle is needed and measurements can be made over the whole image area. In all cases where there is no marked circle on the screen, to ensure the integrity of the instrument's optics, the magnification should be checked over the whole projected image by using a certified graduated scale as described in 5.2.

NOTE A movable graduated scale made from transparent material and graduated on its underside in millimetres, as shown in Figure 1, is suitable.

Figure 1 — Centre transparent graduated scale which slides between guides

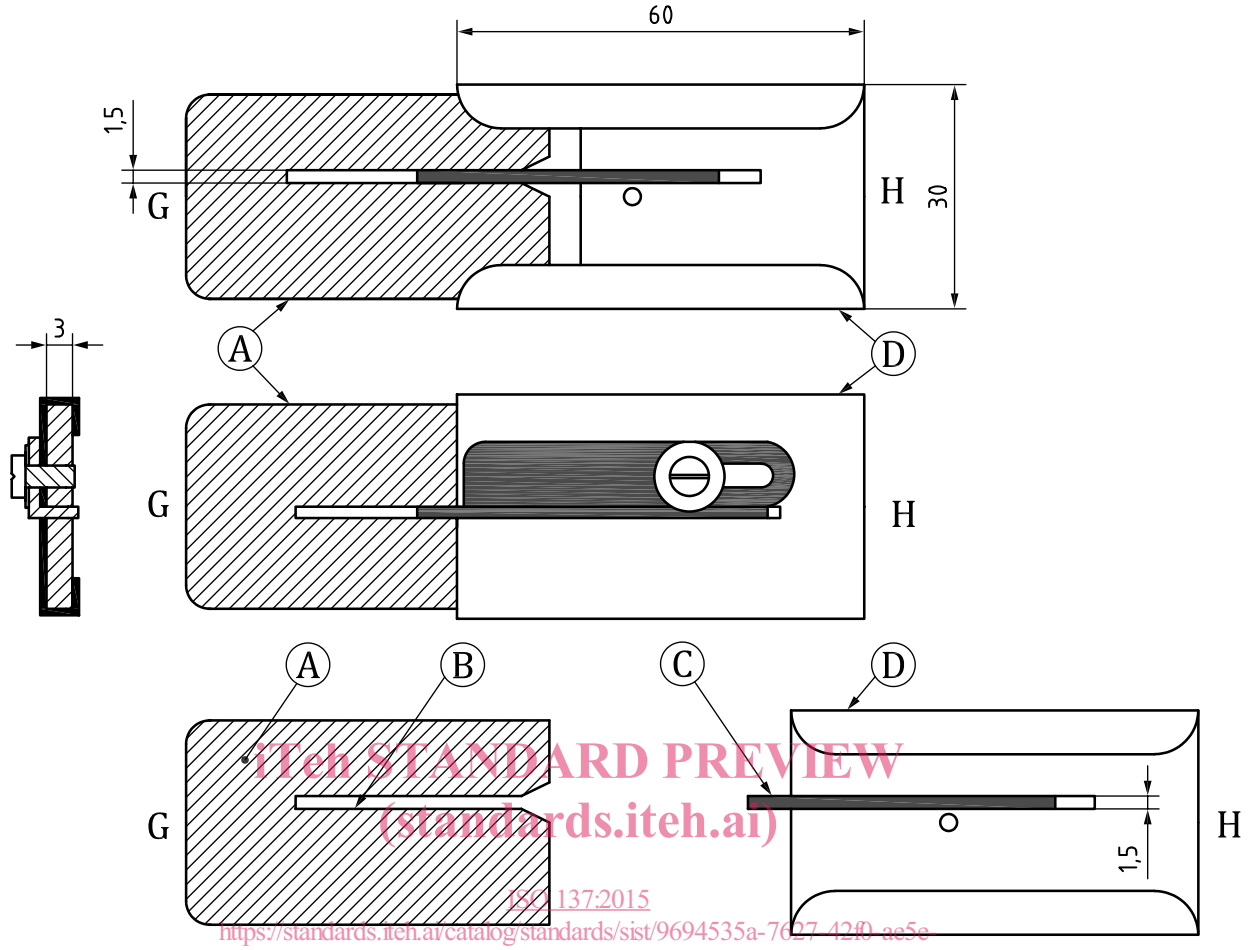
5.2 Micrometer graduated scale.

The projection microscope shall be calibrated periodically by means of a micrometer graduated scale (certified accurate), divided in hundredths of a millimetre and placed on the stage. One division of the micrometer (i.e. 0,01 mm), projected on the screen, shall cover exactly 5 mm of the graduated scale. The magnification is then equal to 500X.

5.3 Snippet cutters, suitable for cutting the fibres to a predetermined maximum length, capable of fulfilling the requirements of 6.3 regarding the cutting of the fibre pieces. The following apparatus (5.3.1) has been found suitable.

5.3.1 Fibre holder and pusher. These are shown in Figures 2 and 3. The holder is a short piece of smooth steel (G) about 3 mm thick with a 1,5 mm slot into which slides the tongue of part H. The tongue of part H is fixed by a screw and may thus be adjusted to project different distances into the slot of G. The pusher consists of a steel stem with a short stop plate near its end; the stem has the same width as the slot, namely 1,5 mm. The stem of the pusher extends 0,8 mm beyond the stop plate.

Dimensions in millimetres



Key

A steel plate
B slot
C steel tongue
D guides

Figure 2 — Fibre microtome in which the wool sample is cut into pieces of predetermined length

Dimensions in millimetres

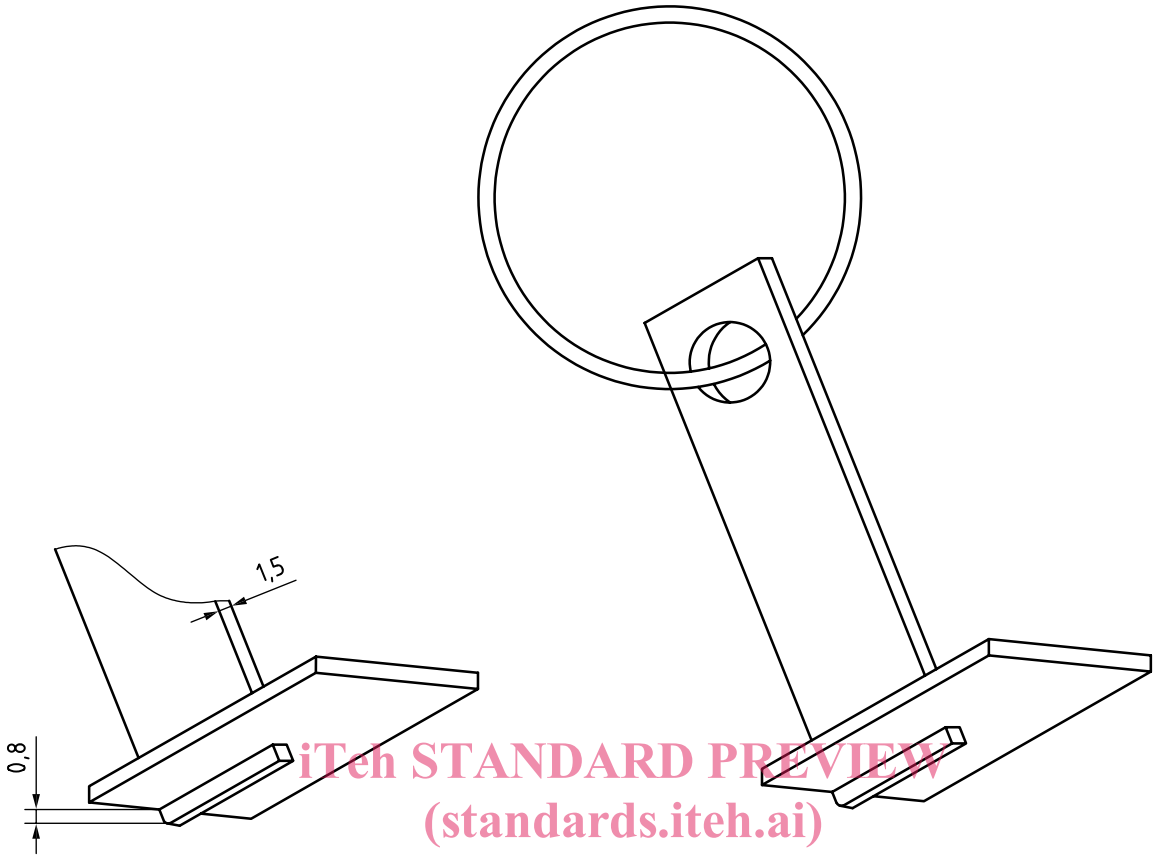


Figure 3 — A pusher by which a length of 0,8 mm of fibre can be pressed out

5.3.2 Conventional microtome.

Alternatively, a conventional microtome may be used if it is capable of fulfilling the requirements of 6.3 regarding the cutting of the fibre pieces.

5.4 Mounting medium, having the following properties:

a) a refractive index between 1,43 and 1,53, at 20 °C;

b) a suitable viscosity;

c) zero water absorption;

d) no effect on the diameter of the fibre.

Cedar wood oil and liquid paraffin are examples of suitable media. Anhydrous glycerine is not suitable.

5.5 Glass microscope slides, approximately 75 mm × 40 mm.

5.6 Cover glasses. Square or rectangular cover glass No. 1 (i.e. 0,13 mm to 0,17 mm thick) have been found suitable, as well as dimensions for the cover glass of 50 mm × 35 mm.

6 Sampling and preparation of the test specimens

6.1 Raw wool

6.1.1 Proceed in the following manner in accordance with ISO 1130:1975, 6.2.

Divide the mass of the total sample into roughly 40 zones and take a handful of fibres from each zone. Divide each handful into two (taking care to avoid breaking the fibres) and reject one-half, choosing the half to be rejected at random. If the fibres are parallel, make the division into two longitudinally, i.e. in a direction which avoids selection of fibres by their ends. Divide the retained half into two and again reject half at random. Continue in this way until 50 g of fibre remains.

6.1.2 Submit the reduced sample to a washing treatment consisting of two extractions in petroleum ether. Dry the sample and condition it in the standard atmosphere for conditioning given in ISO 139.

6.2 Slivers, rovings and yarns

6.2.1 From the total sample, which shall be as representative as possible of the bulk, take a sufficient quantity of material to fill the slot of the microtome to a sufficient depth. Long fibres are generally thick fibres, and consequently any manipulation resulting in selection of long fibres will lead to a greater diameter than mean diameter.

6.2.2 Condition the test specimen thus obtained in the standard atmosphere for conditioning given in ISO 139.

6.3 Cutting of snippets

6.3.1 Using a fibre holder and pusher

With the fibres in the slot G (as specified in 5.3), insert the part H so that the tongue compresses the fibres firmly in the slot. To ensure satisfactory retention of the fibres, the length of the tongue should be suitably adjusted, then locked by means of the screw.

Then, using a sharp razor blade or scalpel, cut off the projecting tuft of fibres flush on both sides of the holder.

Insert the 0,8 mm pusher in the slot and slide it backwards and forwards so as to cause a fringe of fibres to project from the opposite side of the holder. With a razor blade, cut off this fringe of fibres flush with the surface of the holder, and mount as described in 6.4.

6.3.2 Using a microtome

With the fibres in the slot of the microtome, insert the tongued slide to retain them firmly. Using a sharp razor blade, cut off the surplus fibre from each side of the microtome plate.

Place the prepared plate on the ejector, having first ensured that the latter is returned to its lowest position, and lock it in place.

Eject fibres from the microtome plate of the required snippet cutting length (0,8 mm) by turning the micrometer wheel the required number of divisions. Using a sharp razor blade, cut off this protruding fringe of fibres flush with the surface of the plate.

6.4 Mounting of test specimen

The cut fibres are placed in a few drops of mounting medium (5.4) on a glass slide (5.5). The fibre pieces are then stirred well into the mounting medium, using a dissecting needle and employing a circular