

BSI

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Method for the
Measurement of the length
of wool fibres processed on the
worsted system, using a
fibre diagram machine

Gr 5
British Standards Institution

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Foreword

This British Standard has been prepared under the authority of the Textile Divisional Council. It is identical with International Standard ISO 2646 'Wool - Measurement of the length of fibres processed in the worsted system, using a fibre diagram machine', published by the International Organization for Standardization.

For the purposes of this British Standard, the text of ISO 2646 given in this publication should be modified as follows.

Terminology. The words 'British Standard' should replace 'International Standard' wherever they appear.

Cross references. The references to other ISO standards should be replaced by references to British Standards as follows:

Reference to International Standard	Appropriate British Standard
ISO 139 Textiles - Standard atmospheres for conditioning and testing	BS 1051 Glossary of terms relating to the conditioning and testing of textiles

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British Standard Method for the
**Measurement of the length of wool fibres
processed on the worsted system,
using a fibre diagram machine**

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1. Scope and field of application

This International Standard specifies a method for the measurement of the length of wool fibres using a fibre diagram machine. The method is applicable to combed slivers processed on the worsted system. For slivers containing two or more fibres of different dielectric constants (for example wool and polyesters) and length distributions, the results may not be an accurate reflection of the actual fibre-length distribution of the top.

2. Reference

ISO 139 'Textiles – Standard atmospheres for conditioning and testing'.

3. Principle

A length of sliver under test is folded in two and squared off. A band of fibre ends is sealed to a plastic strip and withdrawn. The draw is then fed through the electrodes of a capacitance bridge in the apparatus and the position of a spot of light marked on recording paper, thus giving an estimate of the cumulative length distribution (hauteur).

4. Apparatus

4.1 **Sealing unit.** The unit comprises the following main parts and accessories:

- (a) trough with sliver clamp;
- (b) hand-grip for squaring sliver;
- (c) sealing film;
- (d) roll of plastic strip;
- (e) punch for making a hole 23.8 mm from aligned ends of fibres;
- (f) thermostatically controlled heating element 3 mm wide on welding arm.

4.2 **Fibre diagram machine.** The main parts and accessories are as follows:

- (a) transparent recording table of overall width 22.9 cm between edges;
- (b) input platform with velvet strip for tensioning fibre draw;
- (c) R.F. bridge electrode system working into tuned amplifier giving linear output;
- (d) optical system giving deflection or recording image proportional to mass of fibre between electrodes;
- (e) tension clip of mass between 1.5 and 3 g;
- (f) small brush (see figure 1);
- (g) recording paper graduated in millimetres horizontally and vertically from 0.20 cm.

A suitable machine is described in the annex.

5. Atmosphere for conditioning and testing

The fibres shall be conditioned and the test shall be conducted in one of the standard atmospheres defined in ISO 139.

6. Test specimens

6.1 **Number of specimens.** Unless otherwise stated, prepare and test four specimens from one sample of sliver.

6.2 **Squaring the sliver.** Take a length of sliver about 150 cm in length with pulled ends. Remove the presser and sliver clamp from the trough, insert the doubled thickness of sliver in the sliver clamp near the fold and screw up.

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Replace the sliver clamp in the slots and dispose the two layers of sliver in the trough so that the pulled ends project about 1 cm over the front edge of the slide. Smooth down the sliver with the fingers and insert the presser at the front of the trough.

Take the hand-grip and use it to remove and discard successive 2 mm bands of fibre ends. Continue squaring until a short distance beyond the squaring line marked on the slide.

6.3 Preparing the draw. Rotate the trough control until the aligned fibre ends are opposite the red arrow on the right of the slide. Cut two 19 cm lengths of plastic strip and slide one strip under the squared end of sliver until the end is at the black line (i.e. the plastic strip projects 3 mm under the fibre ends).

Take the second plastic strip, place it over the first so that its end covers the squared end of sliver and is opposite the black line, then place the sealing film over the ends of the plastic strips.

Move the welding arm down the slot so that the heating element presses on the sealing film. Keep up slight pressure for 10 to 15 s, then raise the welding arm, allow about 30 s to cool and peel back the sealing film from the plastic strip.

Free the plastic strips from the slide and pull in line with the trough, then cut away the upper plastic strip about 2 cm from the aligned fibre ends.

Place the sealed draw between the guide of the punch so that the aligned fibre ends, visible through the plastic strip, are opposite the index line, and depress the punch, thus making a hole 23.8 mm from the aligned fibre ends. Before preparing a second fibre draw from the same squared end of sliver, remove and discard about three bands of fibre ends.

6.4 Conditioning. Condition the prepared specimens before testing in the standard atmosphere specified in section 5, until they are in equilibrium with that atmosphere. If the test specimen is well opened out, conditioning for 1 h is generally sufficient to achieve a state of equilibrium.

7. Procedure

Conduct all fibre measurements in the standard atmosphere specified in clause 5.

7.1 Insert a sheet of recording paper between the curved plates of the recording table, switch on the recording light and rotate the left-hand knob until the V-point of the recording image is exactly on the line 10 mm from the zero of the percentage axis.

7.2 If necessary, move the galvo lever until the V-point of the recording image is on the length axis of the recording paper. Move the TEST/ZERO switch to ZERO and, whilst holding it in this position, rotate the SET/ZERO dial until the V-point of the recording image is on the length axis of the recording paper.

7.3 Release the TEST/ZERO switch to OFF position.

7.4 Insert the prepared specimen between the cover and velvet of the input platform so that the short plastic strip is uppermost. Move the plastic strip forward with the fingers until the leading edge of the strip enters the electrode guard and cannot be pushed further.

7.5 Rotate the right-hand knob, driving the specimen forward, and ensure that the short plastic strip does not catch as it enters the input platform.

7.6 When the end of plastic strip has nearly reached the end of the output slide, attach the tension clip. Brush the exposed fibres on the input platform lightly towards the front. Rotate the right-hand knob and look through the front of the illuminated prism for the appearance of the index hole. Stop the rotation of the right-hand knob when the index hole lies exactly across the reference line.

7.7 If the hole is inadvertently moved beyond the reference line, the specimen must be completely removed by rotating the right-hand knob, and re-inserted.

7.8 Switch the TEST/ZERO switch to TEST and rotate the SET MAX. dial until the V-point of the recording image is on the black line at 97 %. With a pencil, record the position of the V-point of the recording image.

7.9 Rotate the left-hand knob in steps of 5 mm and record the position of the V-point of the recording image until it is within 2 mm of the length axis.

7.10 Rotate the left-hand knob until the end of the longest fibre in the specimen is seen to be at the edge of the electrode guard. Record its position by making a mark through the longest-fibre hole with the pencil.

7.11 Move the ratchet lever forward and rotate the left-hand knob until the recording paper and specimen are released from the instrument. Move the TEST/ZERO switch to the OFF position ready for the next test.

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8. Calculation and expression of results

8.1 For each specimen, draw a smooth curve through the marks on the recording paper and read off and record the length ordinates corresponding to 5 %, 15 %, 25 % . . . 95 % (ten values). Calculate the mean of the values and record this as the mean length (hauteur) for each specimen.

Calculate the average hauteur for all specimens tested.

8.2 From the ten values of length recorded for each specimen, calculate the average and, using these, draw an average cumulative distribution to the same scale as that for individual specimens.

8.3 From the ten values of length X recorded in 8.2, calculate the coefficient of variation CV of hauteur using the formula

$$CV \% = 100 \sqrt{\frac{10\sum X^2}{(\sum X)^2} - 1}$$

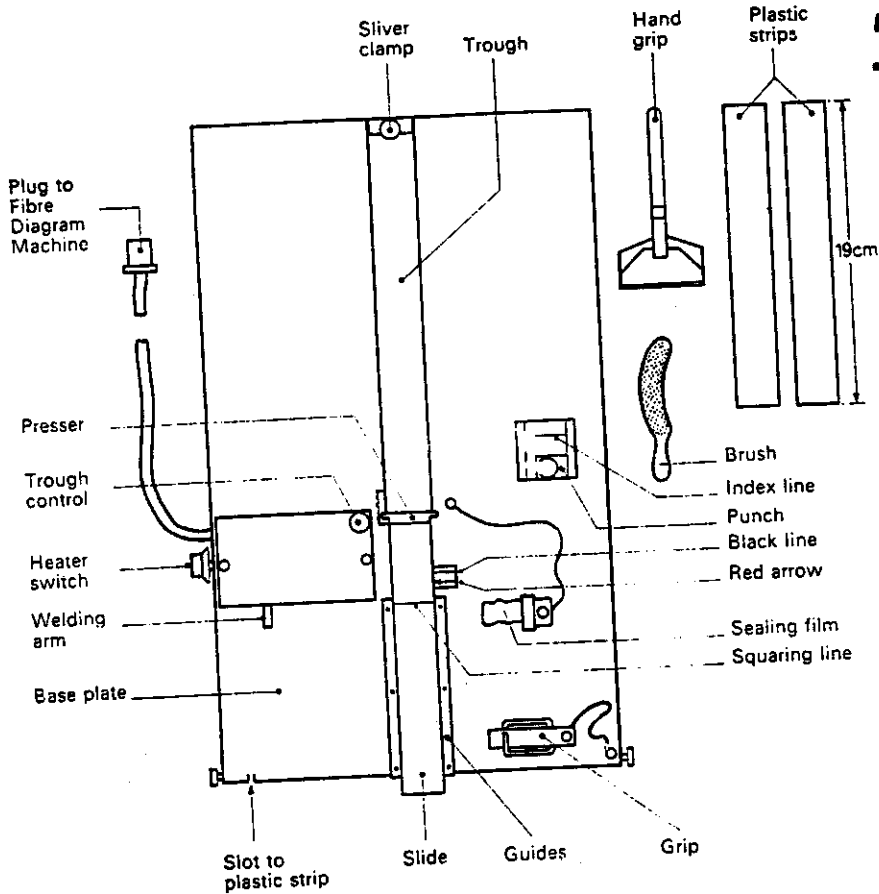
8.4 From the results of 8.1 and 8.3, calculate the average barbe as follows:

$$\text{Average barbe} = \text{average hauteur} \left[1 + \left(\frac{CV}{100} \right)^2 \right]$$

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Figure 1. Sealing unit

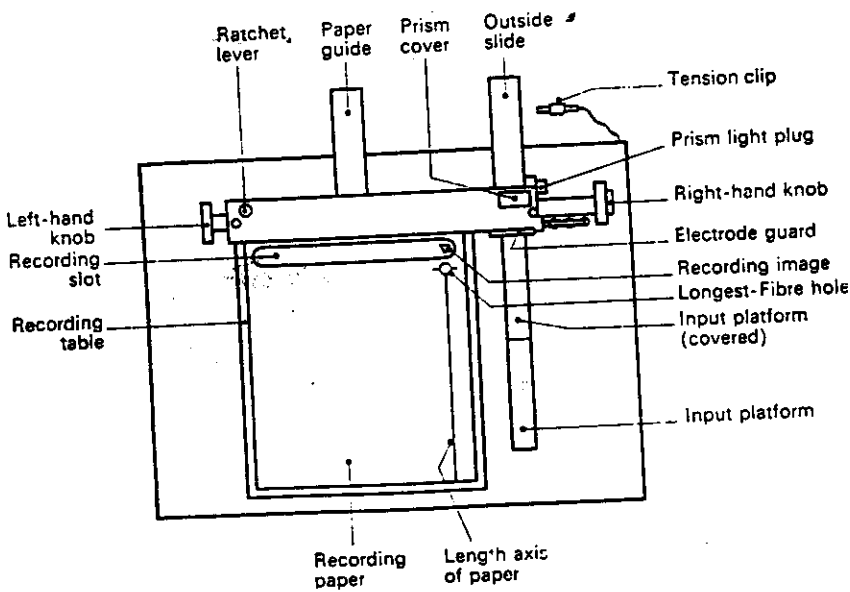


Figure 2. Plan view of diagram machine

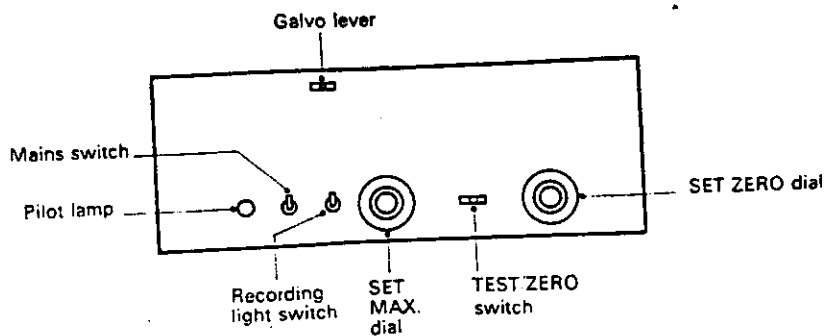


Figure 3. Front face of diagram machine

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Annex

Wira fibre diagram machine *

A.1 Characteristics. The principal features of this machine are the means for automatically giving an estimate of the cumulative length distribution (hauteur) in a draw of fibres, recorded graphically.

The main parts and accessories are described in 4.2. Figures 1, 2 and 3 illustrate the essential features.

A.2 Setting up. Switch on the mains switch of the apparatus. If the machine is to be used intermittently throughout the day, the mains switch shall be left on, but the recording light switched off between tests to prolong the life of the lamp. The stabilization of the machine is complete after 15 min, and the heating up time of the sealing unit is 5 min. Ensure that the heater of the sealing unit is set at 3.5, at which setting it shall be left throughout use.

A.3 Calibration. The following calibration checks shall be carried out from time to time.

A.3.1 Reference sliver. A well-gilled ball of sliver shall be retained for this test of mean length (hauteur) between 6 and 7 cm, the cumulative distribution of which has been verified to give a smooth curve.

The sliver is repeatedly tested, as described, by an experienced operator taking alternate test samples from the inside and outside of the ball, the average of (say) 20 draws is computed and an average distribution also drawn, as described in 7.2.

This top is then used from time to time for verifying the accuracy both of the instrument and the technique of a new operator by comparing the test result (mean of four or more specimens) with the known value.

A.3.2 Plastic test tape. This calibration checks the optical and electrical accuracy of the machine but not the preparation and presentation of the test specimen.

The plastic test tape is cut from a sheet of uniform polyester film of approximate thickness 0.05 mm to the following dimensions :

width 25 mm;

length 300 mm;

and with an isosceles triangle of height 175.0 mm cut at one end. A reference line is marked by light perforations exactly across the base of the triangle (i.e. 175.0 mm from the apex of the triangle).

The mean length of the tape has been established by feeding the test tape through the input platform, setting the perforated line to the reference line seen through the prism and setting the V of the recording image to 100 %. Record the distribution at 5 mm intervals as described in clause 7 and calculate the mean length (hauteur), this being repeated four times and the average calculated.

In use, the test tape shall give a mean value of length (four tests) within ± 1 mm of the established length.

Care shall be taken to store the test tape in a clean and flat condition.

NOTE. A test tape may be obtained from Wira, Torridon, Headingley Lane, Leeds LS6 1BW, England.

* The information given on this machine is not intended to favour its use or to give preference to this apparatus. Other apparatus giving equivalent results may be used.