Other LEITZ instruments for the textile industry:

Binocular prism magnifiers, magnifications up to 30×

Stereoscopic binocular microscopes with rapid changer for magnifications up to 216×, polarizing equipment

Magnifying glasses, thread counters

Monocular and binocular microscopes with built-in illumination for all forms of microscopy in transmitted and incident light including phase contrast microscopy

ULTROPAK incident light illuminators, Polarizing equipment

Photomicrographic equipments, Monochromators

Microprojectors

Microtomes, Ultra Microtomes, Micro-Manipulator

Electro-Photometer LEIFO-E for the determination of concentration by absolute measurements

Infrared Spectrograph

ERNST LEITZ GMBH WETZLAR
Subsidiary: Ernst Leitz (Canada) Ltd., Midland, Ontario

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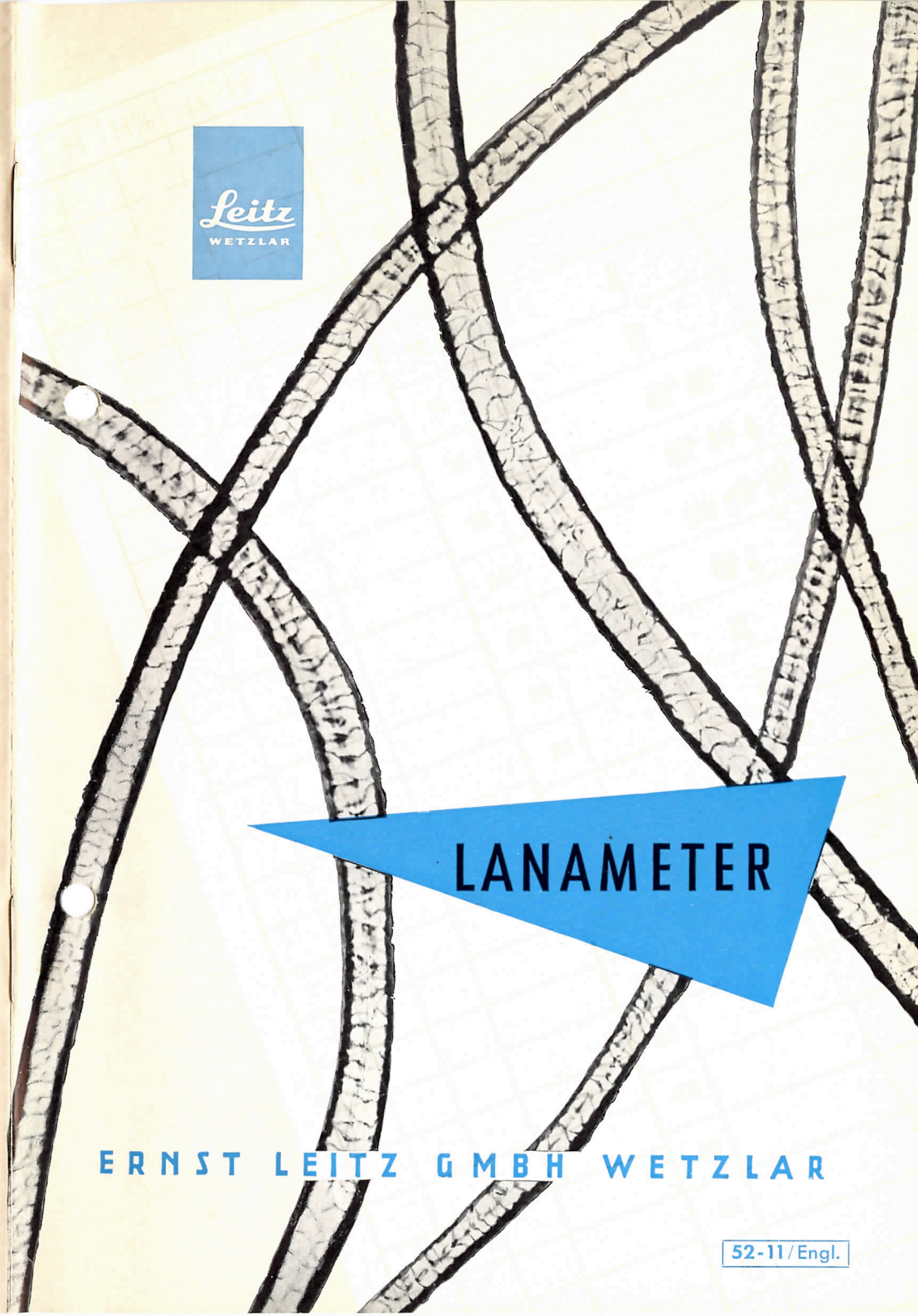


Application of the LANAMETER in textile research and the textile industry

A vital criterion in the difficult task of determining the class of a particular wool is offered by the microscopic measurement of the degree of fineness of the wool fibre. It is true that there are other measuring processes for determining the **average** fibre diameter, but such an average value gives no indication as to the **distribution** of the various fibre diameters in natural raw materials. This distribution of the varying diameter, which is of particular interest in assessing the spinning properties and characterising the type of wool, can only be ascertained by the **microscopic measuring method.** Measurements with the projection microscope give an objective picture of the true quality of the wool, and supply valuable data for making further decisions.

The LEITZ LANAMETER

has been developed as a special projection microscope for this measuring purpose. It quickly permits a large number of accurate thickness measurements. After a little practice, a laboratory assistant can carry out 300 measurements in 25 to 30 minutes. The microscopic image of the fibre is projected onto the table surface at 700× magnification, and is evaluated on a measuring sheet.

For controlling production and pre-determining the quality of finished products, this optical method is of particular importance in

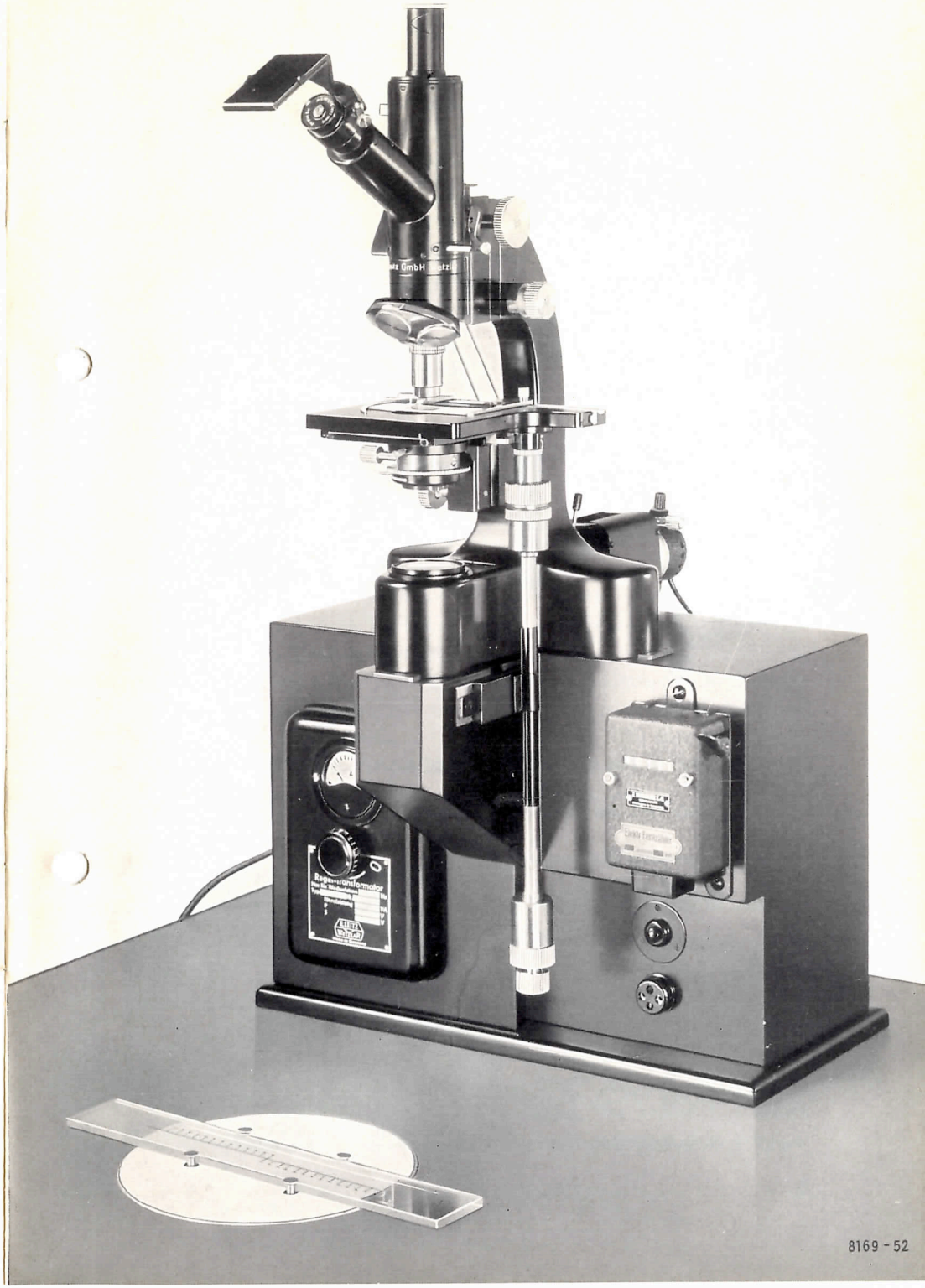
assessing the wool quality of sheep's fleece,

in helping the worsted spinner to judge the spinning properties of slubbing,

in determining the homogeneity of mixtures for carded-wool spinning,

examining the wool qualities of yarns of competitors,

and in comparing the qualities of sales samples and subsequent deliveries of wool and reprocessed wool.



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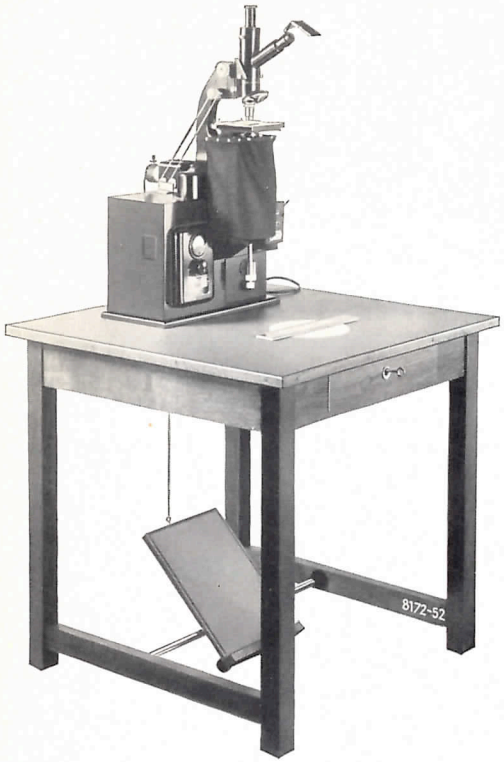


Technical Description

The LEITZ LANAMETER consists of the following components:
LABORLUX II microscope with built-in illuminating system. Projection apparatus with regulating transformer for the image brilliance and the acoustic counting mechanism.

Table with drawer and foot pedal for the fine focusing of the microscopic image.

Rotating projection surface with sliding rule recessed in the bench top.

Total height of the apparatus	60″
Height of table	30″
Total table surface	31½″×31½″
Free working area of table	20″×31½″

The equipment of the LABORLUX II microscope is as follows: –

Photo tube with inclined monocular observation tube,

Revolving nosepiece for 4 objectives,

Mechanical stage with co-axial controls and click-stops,

Substage with focusing 2-lens condenser and swing-out front lens No. 80,

Light screen to fit on microscope foot,

Swing-out projecting mirror,

Survey objective 10/0.25, measuring objective 25/0.50,

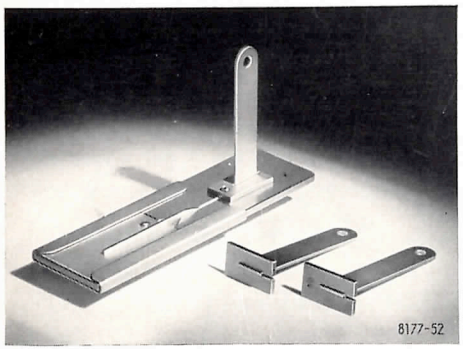
Periplanatic eyepiece 8× with circle and cross lines.

The LANAMETER, in combination with the objective 25/0.50 and the Periplanatic eyepiece 8×, gives a magnification of 700× on the table surface. The measuring sheets for determining the fineness of the wool have been calibrated for this magnification.

The operating heads of the mechanical stage are extended for a convenient operating height. The fine focusing of the microscopic image takes place by means of a foot pedal; this leaves both hands free for the actual measuring. Other objectives may be screwed into the revolving nosepiece to give different scales of magnification, e. g. for general microscopic examinations etc.

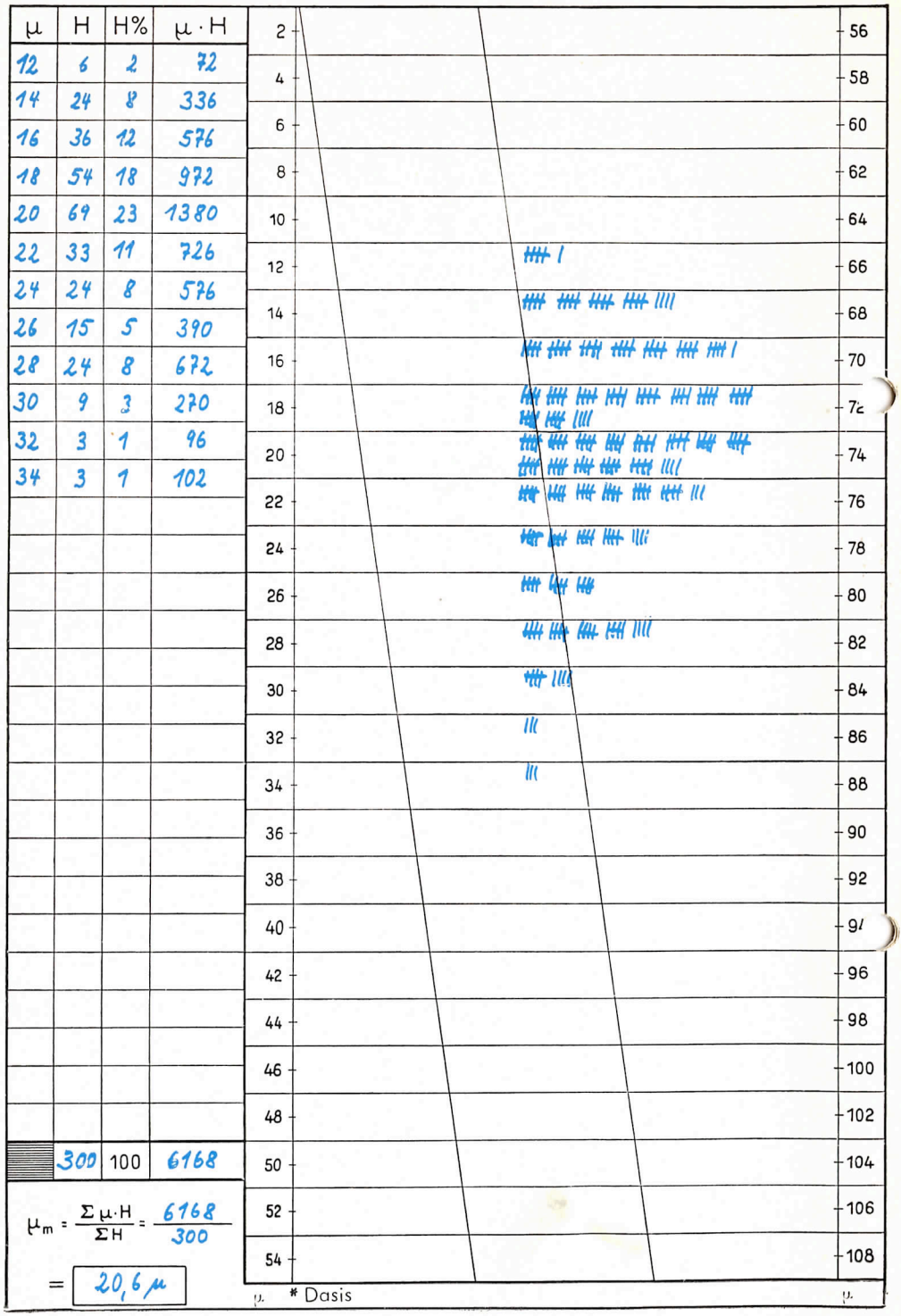
Microscope with built-in illumination

The LABORLUX II microscope itself, which is included in the apparatus, can be separated from the projection base after the clamp screws have been loosened, and may then be used for general textile microscopy or for microscopic examinations of every description. The built-in illumination ensures that the microscope is always ready for immediate use, guarantees constant centration of the beam, and gives optimum illumination in every respect. The LABORLUX II is particularly suitable for bright field, dark field and phase contrast microscopy, and also for photomicrography in combination with the "Makam" camera attachment or with the LEICA in combination with the micro attachment. In addition to these possibilities, all the usual microscope accessories for work in transmitted light can be used in conjunction with the LABORLUX II.



Cutting appliance

A useful item supplied for the LANAMETER is a cutting appliance with which any desired number of fibre cuttings measuring 0.4, 0.6 or 0.8 mm in length can be prepared with ease. This appliance is shown in the adjacent illustration.



μ	H	H%	μ · H
12	6	2	72
14	24	8	336
16	36	12	576
18	54	18	972
20	69	23	1380
22	33	11	726
24	24	8	576
26	15	5	390
28	24	8	672
30	9	3	270
32	3	1	96
34	3	1	102
	300	100	6168

$$\mu_m = \frac{\Sigma\, \mu \cdot H}{\Sigma H} = \frac{6168}{300} = 20{,}6\ \mu$$

To obtain a series of measurements

about 400 wool fibres 0.4–0.8 mm in length are evenly distributed on a slide, embedded in cedar wood oil, placed on the microscope, and focused. Then one of the following methods is applied.

1. **Measuring method by Dr. Sustmann, Aachen**

   All portions of the microscopic image are brought into the field of projection (as indicated by the eyepiece circle) one after the other with the mechanical stage, through systematic displacement of the specimen. Maximum definition for each individual fibre measurement is easily obtained through focusing by means of the foot pedal, so that both hands are free to carry out the measurement with the aid of the wedge-shaped measuring areas printed on the measuring sheets. For diameters of fibres from 2–54 μ, the measuring area used is the space between the basis vertical on the left and the first oblique line; for diameters from 56–108 μ this area is extended to the second oblique line. When the fineness of the fibre has been determined, a dash is made in the appropriate column with a special pencil combined with an electric contact automatically actuating and recording each mark on the counting device. A buzzing tone serves as an acoustic control and gives confirmation that the measurements carried out have actually been recorded by the counting mechanism.

   After the series of measurements has been made, the results are evaluated in the left-hand columns of the measuring sheet. The μ values of the fibres are entered in the μ column; the marks entered for the individual μ values are then added and the sum (frequency) is entered in the H column for each μ value. The ratio between the frequency figures for the individual μ values and the total number of measurements carried out gives the percentage of the frequency, and this figure is then entered in the column H %.

   From the frequency figures and the corresponding μ values, the average μ value can be calculated, according to which the wool is classified. In order to calculate the μ_{av}, the absolute frequency is multiplied with the corresponding μ value, the result is entered in column μ H, and the total sum of this column is then divided by the total number of measurements.

   Example: $\mu_{av} = 6168 : 300 = 20.6\ \mu$

   According to the German method of classification, the average wool fineness of 20.6 μ corresponds to the wool quality A-A/B (DIN 60 404 combing types).

The Dr. Sustmann method

The I.W.T.O. measuring method

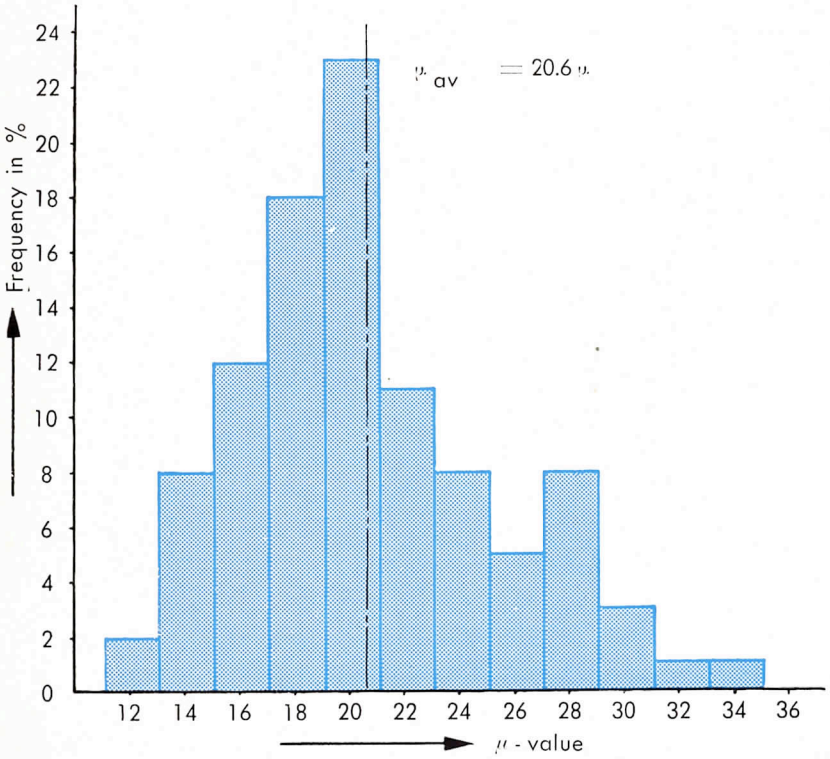
A frequency diagram drawn up from this completed measuring sheet illustrates the numerical distribution of the individual fibre diameters and therefore gives more valuable information about the true quality of the wool than can be obtained with the average μ value alone.

2. I.W.T.O.* Measuring Method

A rotating projection surface is recessed in the top of the LANAMETER bench. A 2 in. wide transparent rule, which can only be moved on the projection surface between the guide pins in the diameter direction, is used for measuring the projected fibres. If this method does not produce the required number of measurements, the specimen should be advanced

* I.W.T.O = International Wool Textile Organisation

further longitudinally and a fresh series of measurements undertaken in the transverse direction. A locking device enables the object stage and specimen to be adjusted at intervals of 0.5 mm in both directions, thus ensuring systematic measurement of all the fibres in the specimen. (Draft Specification, The Determination of Wool Fibre Thickness by the Projection Microscope, I.W.T.O. Bradford, England.) The measuring results are usually recorded in classes separated by a difference of 2 μ. There is no special form for this purpose. The results are evaluated by the method already described i. e. by calculating the average diameter of the fibre and also by means of an informative frequency diagram.



Specification of the complete LANAMETER

Codeword

LABORLUX II microscope with bilateral rack and pinion and micrometer fine focusing mounted on ball-bearings, with graduation 1 interval = 0.001 mm; interchange slide for the microscope tubes; mechanical stage No. 45 with low-set co-axial operating knobs and click-stops; detachable carrier for the revolving objective nosepiece, interchangeable photo tube with lateral monocular tube (FP); attachable reflecting mirror; substage No. 80 with rack and pinion, two-lens condenser, with swing-out front lens, iris diaphragm, and swing-out filter holder, also ground and blue glass screens; lamp attachment with low-voltage 6 volt 30 watt lamp, regulating transformer, and ammeter.

Light-screen attachment for the condenser.

Wooden table with drawer and base for LABORLUX II with rotating projection surface recessed into the table and 2 in. transparent rule.

Remote control for the micrometer fine adjustment by means of cable, guide rollers, and foot pedal.

Screw-on remote focusing mechanism with guide bar for the operating knobs of the mechanical stage.

Built-in electric remote counting device actuated by special pencil with electric contact for recording each measurement

LANAMETER basic equipment, as described, with regulating transformer for 120/220 v A.C.	LINAL
100 measuring sheets (as reproduced on page 6)	LIOBY

Optical equipment:

Achromatic objective 10/0.25 (surveying objective)	ACORA
Achromatic objective 25/0.50 (measuring objective)	ACVIR
Periplanatic eyepiece 8× with cross lines and circle	LIPOR
Stage micrometer, 2 mm = 200 intervals	OBMET
Complete LANAMETER outfit	LINEM

If the LABORLUX II microscope is required for other microscopic work, after unscrewing from the wooden base, it may be used together with all usual accessories for microscopy in transmitted light. We recommend the following additional optical equipment:

Codeword

Achromatic objective 3.5/0.10	OANEE
Achromatic objective 45/0.65	ACMAT
Achromatic oil immersion 100/1.30	OILIM
Huygens eyepiece 6×	HYZWA
Huygens eyepiece 10×	HYVIR
Huygens micrometer eyepiece 6× with scale 10 mm = 100 intervals	OCMIR-OCASY

Supplementary photomicrographic equipment:

MAKAM camera attachment 9×12 cm (3¼"×4¼") with lateral focusing telescope with swing-out prism, time and instantaneous shutter, 2 metal darkslides 9×12 cm (with ¼ plate adapters, if desired), ground glass screen, 2 wire releases, Periplanatic eyepiece 10×, and tube clamping collar, in case — MAKAM

MIKAS micro attachment for the LEICA (24×36 mm) with lateral focusing telescope with swing-out prism, time and instantaneous shutter, 2 wire releases, adapter ⅓×, Periplanatic eyepiece 10×, and tube clamping collar, in case

For LEICA with screw mount	MIKAS
For LEICA with bayonet mount	MIKAS-M
Release coupler (for prism and shutter)	CALOS

Where a LEICA camera is not already available we recommend the following outfit for photomicrography:

LEICA camera body M 1 with film cassette	KOOCT
Film cassette, Model N (additional)	IXMOO
Cable release for LEICA M 1	FONOT
Cable release for LEICA I g	FINOT