Designation: D 1282 – 96

Standard Test Method for Resistance to Airflow as an Indication of Average Fiber Diameter of Wool Top, Card Sliver, and Scoured Wool[1]

This standard is issued under the fixed designation D 1282; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the estimation of the average fiber diameter of wool fibers by use of the Port-Ar and the WIRA Fiber Fineness Meter instrument, which operate on the air-flow principle. Other air-flow instruments have not been tested with this method. The method is directly applicable to non-medullated, carded wool and wool top.

1.2 This test method is applicable to grease wool and scoured wool after the samples of such materials have been prepared as directed in Test Method D 2130.

NOTE 1—The use of the Micronaire instrument for measuring the fineness of cotton fibers is covered in Test Method D 1448.

The assignment of grade for wool and mohair is covered in Specifications D 3991 and D 3992.

2. Referenced Documents

2.1 *ASTM Standards:*

D 123 Terminology Relating to Textiles[2]

D 584 Test Method for Wool Content of Raw Wool—Laboratory Scale[2]

D 1060 Practice for Core Sampling of Raw Wool in Packages for Determination of Percentage of Clean Wool Fiber Present[2]

D 1448 Test Method for Micronaire Reading of Cotton Fibers[2]

D 2130 Test Method for Diameter of Wool and Other Animal Fibers by Microprojection[2]

D 3991 Specification for Fineness of Wool or Mohair and Assignment of Grade[3]

D 3992 Specification for Fineness of Wool Top or Mohair Top and Assignment of Grade[3]

2.2 *Other Standard:*

IWTO-6-92(E) Method of Test for the Determination of The Mean Diameter of Wool Fibers in Combed Sliver Using the Air-Flow Apparatus

IWTO-28-82(E) Determination By The Airflow Method of the Mean Fibre Diameter of Core Samples of Raw Wool

3. Terminology

3.1 *Definitions:*

3.1.1 *sliver, n*—a continuous strand of loosely assembled fibers that is approximately uniform in cross-sectional area and without twist.

3.1.2 *specific area, n—of wool*, the ratio of the fiber surface to fiber volume.

3.1.3 *top, n—in wool*, a continuous untwisted strand of wool fibers from which the shorter fibers or noils have been removed by combing.

3.1.4 *wool, n*—the fibrous covering of the sheep, *ovis* species.

3.1.5 For definition of other textile terms used in the method, refer to Terminology D 123.

4. Summary of Test Method

4.1 The resistance to air flow of predetermined mass of wool compressed to a fixed volume is measured. The instruments approved for use have been calibrated to read average diameter in micrometres. Specimens of wool top are rated with a Wool Top Scale and specimens of carded, scoured wool and scoured ½-in. (13.0-mm) cores are rated with a Scoured Wool Scale. If instruments are properly calibrated, results are interchangeable.

5. Significance and Use

5.1 This test method is not recommended for the acceptance testing of commercial shipments of wool top, card sliver, or scoured wool since the referee method, Test Method D 2130, is recommended for that purpose. Although this test method is not recommended for acceptance testing, it is useful for fast quality control checks.

5.1.1 In case of a dispute arising from differences in reported test results when using this test method for acceptance testing of commercial shipments, the purchaser and the supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take a group of test specimens which are as homogeneous as possible and which are from a lot of material of the type in question. The test specimens should then be randomly assigned in equal numbers to each laboratory for testing. The average results from the two

[1] This test method is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.13 on Wool and Wool Felt.

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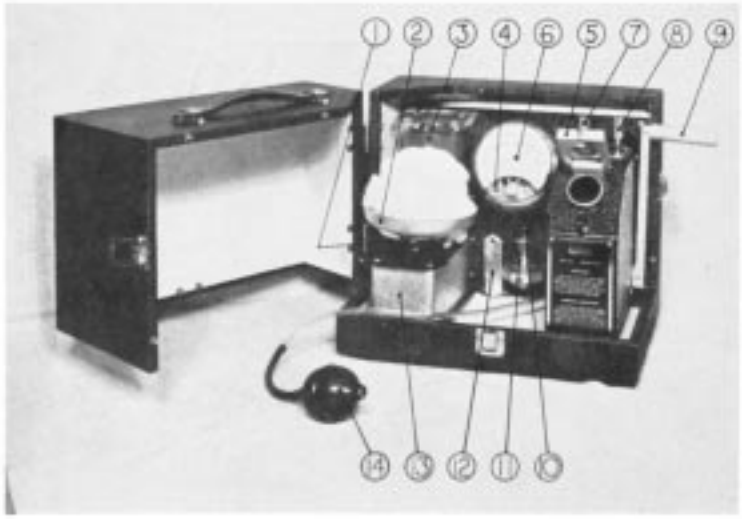
[2] *Annual Book of ASTM Standards*, Vol 07.01.

[3] *Annual Book of ASTM Standards*, Vol 07.02.



1) Balance Adjustment Knob
2) Balance Pan
3) Air Reservoir
4) Meter Zero Adjustment Screw
5) Porosity Test Chamber Lid
6) Differential Pressure Gage
7) Porosity Zero Control
8) Porosity Calibration Control
9) Compression Lever
10) Calibrator Plug Plunger
11) Porosity Calibrator Plug
12) Calibration Weight
13) Weighing Balance Mechanism
14) Atomizer Bulb

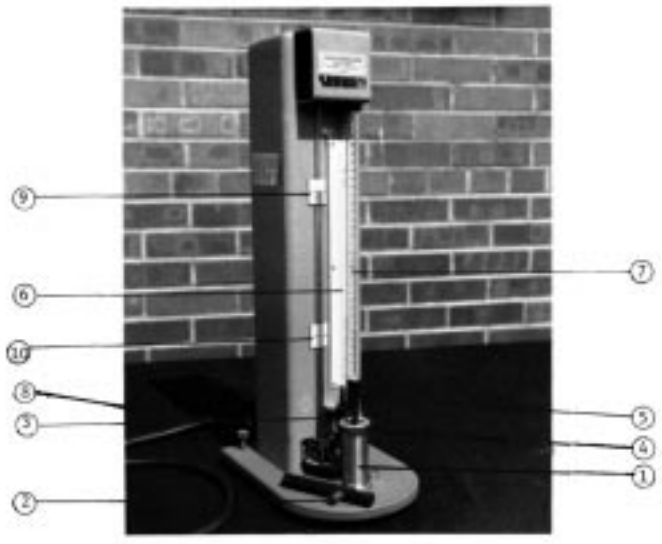
FIG. 1 Port-Ar Apparatus

laboratories should be compared using Student's *t*-test for unpaired data and an acceptable probability level chosen by the two parties before testing is begun. If a bias is found, either its cause must be found and corrected or the purchaser and the supplier must agree to interpret future test results in view of the known bias.

5.2 The specific area of the wool fibers is measured by the resistance in air flow. The resistance to air flow has been related to average fiber diameter measured by the microprojection method. The instruments have been calibrated to read average diameter in micrometres. Although the reading is affected by the average fiber diameter distribution of the specimen, the results secured by the instruments give no indication of this distribution. However, in converting the micrometres reading to millitex units (Annex A1), low, medium, and high standard deviations were used in the calculations to arrive at the range of millitex units which accordingly reflect the distribution of fiber diameters.

6. Apparatus, Materials, and Reagent

6.1 *Port-Ar*[4], described in this method and shown in Fig. 1.



1) Metal specimen container
2) Packing rod
3) Plunger
4) Retaining collar
5) Control knob
6) Gage tube
7) Millimetre scale
8) Vacuum supply
9) Upper gage tube mark
10) Lower gage tube mark

FIG. 2 WIRA Fiber Fineness Meter

[4] The Port-Ar instrument, trademark for a product manufactured by Zellweger Uster, 456 Troy Circle, P.O. Box 51720, Knoxville, TN 37950, has been found satisfactory for this purpose.

6.2 *WIRA Fiber Fineness Meter*[5], described in this method and shown in Fig. 2.

6.2.1 Scale graduated in millimetres.

6.2.2 Calibration chart converting float height in millimetres to diameter in micrometres.

6.2.3 Air pump capable of furnishing a constant vacuum of 609.6 mm (24 in.) of mercury.

6.2.4 Tables of correction values to correct observed results in micrometres to deviations from standard conditions, 20°C (68°F) and 65 % relative humidity, as shown in Annex A2.

6.3 *Trichloroethane* or equivalent solvent.

6.4 *Working Reference Samples*, three, prepared by each laboratory for use in checking the instruments. One working reference sample should be selected from each of the following ranges of grade: (*1*) up to and including 48's, (*2*) 50's to 60's inclusive, and (*3*) 62's or finer. These samples of uniform fineness with a low standard deviation, as explained in Appendix A1.1, must be thoroughly tested both by the air-flow instrument being used and by the microprojection method.

6.5 *Standard Reference Samples*[6]—Three samples are available with the following average fiber diameters: 20.7 µm, 27.3 µm and 37.4 µm.

7. Hazards

7.1 Refer to the manufacturer's material safety data sheet for information on handling, use, storage, and disposal of trichloroethane or equivalent solvent.

7.2 Use trichloroethane or equivalent solvent in well-ventilated hood due to the associated health hazards.

8. Calibration of Apparatus

8.1 Calibrate the instrument on arrival in accordance with instructions in Annex A2.

8.2 Recalibrate the instrument each day. Verify calibration after each 4 h of use or whenever an operational problem is noted.

9. Sampling

9.1 *Lot Sample*—For acceptance testing, take at random the number of shipping containers directed in an applicable material specification or other agreement between the purchaser and the supplier, such as an agreement to use Practice D 1060. Consider shipping containers to be the primary sampling units.

NOTE 2—A realistic specification or other agreement between the purchaser and the supplier requires taking into account the variability between shipping containers, between laboratory samples within a shipping container, and between specimens within a laboratory sample so as to provide a sampling plan which at the specified level of the property of interest has a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

9.2 *Laboratory Sample*—As a laboratory sample for acceptance testing, take the number of subsamples from each package in the lot sample as directed in an applicable material specification or other agreement between the purchaser and the supplier, such as an agreement to use Practice D 1060 if baled or bagged wool is to be tested.

9.3 *Test Specimens:*

9.3.1 *Port-Ar Procedure*—Take one specimen per laboratory sampling unit.

9.3.2 *Wira Procedure*—Take one specimen per laboratory sampling unit.

10. Specimen Preparation

10.1 Prepare test specimens of wool top, card sliver, scoured, or grease wool as directed in Test Method D 2130.

10.2 If no mechanical card is available, take two subsamples of scoured wool, each weighing approximately 4 g more than the mass of wool required for measurement in the air-flow instrument being used; hand card these subsamples at least 30 strokes each and prepare a test specimen from each of them.

10.3 Rinse all test specimens in the recommended solvent to reduce the extractable matter to less than 1 % of the specimen mass. Condition the test specimens as prescribed in 11.1 or 11.2. From the conditioned test specimen, weigh the amount of wool required for measurement in the air-flow instrument being used.

10.3.1 *Port-Ar*—Place approximately 12.5 g of the conditioned wool specimen in the balance basket. One pump of the atomizer bulb will indicate whether the specimen is too light or too heavy: If the meter reads above the red triangle, the specimen is too heavy; if below, the specimen is too light. Adjust the specimen to 12.5 g by adding or removing small amounts of wool. The meter indicates the mass of the specimen to within ± 0.5 % if the pointer is on scale, so the mass needs to be adjusted only until the pointer reads within the red triangle.

NOTE 3—The accuracy of the balance should be thoroughly checked before and while using the Port-Ar. The specimen may be weighed on a separate balance.

10.3.2 *WIRA Fiber Fineness Meter*—Weigh a 2.500 ± 0.005 g test specimen. Remove pieces of vegetable matter and other impurities before weighing.

11. Conditioning

11.1 For tests made on the Port-Ar as directed in 11.2, reasonable results may be obtained even if the standard atmosphere for testing is not available since the instrument uses low-pressure ambient air. Keep the instrument in a draft-free room, away from radiators, sunlight, and other elements which disturb temperature or air. Allow the instrument and the well-opened wool to be tested to remain in the same atmospheric conditions for approximately 4 h before the specimens are tested.

11.2 For tests made on the WIRA Fiber Fineness meter as directed in 12.2, bring the test specimen to moisture equilibrium with the standard atmosphere. A 4 h conditioning period is usually sufficient.

12. Procedure

12.1 *Procedure with the Port-Ar*:

[5] The WIRA Fiber Fineness Meter, trademark for a product manufactured by Reynolds and Branson Ltd., for Thorn Bendix Ltd., Beech Ave., New Barford, Nottingham NG7 7JJ England. This instrument is available from Lawson-Hemphill Sales, Inc., P.O. Drawer 6388, Spartanburg, SC 29304.

[6] May be obtained from Agricultural Marketing Service, Livestock and Seed Division, 711 "O" Street, Greeley, CO 80631.

TABLE 1 Components Of Variance As Standard Deviations, µm

Names Of The Properties	Single-Operator Component	Within-Laboratory Component	Between-Laboratory Component
Fiber diameter,			
Port-Ar procedure			
Single-material comparisons	0.21	0.20	0.72
Multi-material comparisons	0.00	0.20	0.74
Fiber diameter,			
WIRA procedure			
Single-material comparisons	0.23	0.11	0.37
Multi-material comparisons	0.13	0.11	0.38

TABLE 2 Critical Differences,[A] µm, For The Conditions Noted

Names Of The Properties	Number Of Observations In Each Average	Single-Operator Precision	Within-Laboratory Precision	Between-Laboratory Precision
Fiber diameter,				
Port-Ar procedure				
Single-material comparisons	1	0.57	0.79	2.14
	2	0.41	0.68	2.10
	4	0.29	0.61	2.08
	8	0.20	0.58	2.07
Multi-material comparisons	1	0.57	0.79	2.20
	2	0.41	0.68	2.17
	4	0.29	0.61	2.15
	8	0.20	0.58	2.14
Fiber diameter,				
WIRA procedure				
Single-material comparisons	1	0.64	0.71	1.25
	2	0.46	0.55	1.16
	4	0.32	0.44	1.11
	8	0.23	0.38	1.09
Multi-material comparisons	1	0.73	0.79	1.32
	2	0.57	0.65	1.24
	4	0.48	0.56	1.20
	8	0.42	0.52	1.18

[A] The critical differences were calculated using $t = 1.96$, which is based on infinite degrees of freedom.

12.1.1 *Wool Top, Card Sliver, Scoured Wool, Grease Wool*—Using the weighed test specimen, (see 10.3.1) place one end of the sliver in the chamber and tamp in the remainder. Do not fold the wool top before placing in the chamber. When all of the specimen has been forced into the chamber, close the compression chamber lid, 5, in place. Pull forward on the compression lever, *9*, until it locks in place. Apply air pressure either by the atomizer bulb or by the electric pump to fill the pressure tank (Note 3). Read the diameter in micrometres on the scale as the piston settles. Record the reading and remove the specimen, carefully reopen it by hand to eliminate compact areas, replace the specimen in the chamber and make a second reading.

NOTE 4—In using the electric pump, some operators find continuous operation advantageous. Satisfactory results will be obtained in this case if calibration adjustments are also made with the pump running continuously. A small reservoir tank or "bladder" mounted in the air line between the pump and the instrument will reduce needle vibration.

NOTE 5—Port-Ar instrument described in Fig. 1 is calibrated for wool grade (Top and wool). Port-Ar instrument is also available for measuring mohair fibers.

12.2 *Procedure with the WIRA Fiber Fineness Meter*:

12.2.1 Feed the weighed specimen into the metal container, meanwhile pushing the wool down evenly into the container with the *short* end of the rod provided. It is important to use this rod and nothing else for packing since it prevents tight packing of the fibers. Then push in the metal plunger (avoiding trapping any fibers) until it rests on the lip of the container and screw down the retaining collar to the furthest extent, meanwhile holding the plate attached to the metal plunger to prevent it rotating.

12.2.2 With the control knob in the OFF position switch on the pump then turn the knob slowly until the liquid level in the gage tube falls to the lower mark reading at eye level.

12.2.3 Reading at eye level across the top of the spinner record the scale reading to the nearest millimetre.

12.2.4 Take out the specimen, reverse its direction, repack in the container using the rod and take another reading. Repeat this until 4 readings have been recorded and take the average. Do not repack the specimen with the fingers.

12.2.5 Turn the control knob back to zero.

12.2.6 For wool above 30 micrometres make four readings on each of four weighings and for wool of 30 micrometres or less make four readings on each of three weighings.

13. Calculation

13.1 Calculate the average fiber diameter of the lot from all the readings, to the nearest 0.05 µm.

14. Report

14.1 State that the specimens were tested as directed in Test Method D 1282. Describe the material or product sampled and the method of sampling used.

14.2 Report the following information:

14.2.1 The average fiber diameter to the nearest 0.05 µm.

14.2.2 The number of test specimens used and the number of readings made on each specimen.

14.2.3 The solvent used if not trichloroethane.

14.2.4 For the Port-Ar, the conditions under which the testing was carried out, if the standard atmosphere for testing was not used, and if the instrument was calibrated using the standard calibration switch plunger, 10, or well-measured wool samples.

15. Precision and Bias

15.1 *Summary*—In comparing two averages, the differences should not exceed the following critical differences in 95 cases out of 100 when all of the observations are taken by the same well-trained operator using the same piece of test equipment and specimens randomly drawn from the same sample of material.

Fiber Diameter, Port-Ar Procedure	0.40
Fiber Diameter, WIRA Procedure	0.45
Micrometres For Averages Of	2
Micrometres For Averages Of	2

The size of an observed difference is likely to be affected adversely by different circumstances. The true values of the properties tested by Test Method D 1282 can be defined only in terms of specific test methods. Within this limitation, the procedures in Test Method D 1282 for determining these properties have no known bias. Sections 14.2.1-14.2.4 explain the basis for this summary and for evaluations made under other conditions.

15.2 *Interlaboratory Test Data*[7]—An interlaboratory test was run in 1976 in which randomly drawn samples of five materials were tested in each of five laboratories using the Micronaire and Port-Ar procedures and in each of three laboratories using the WIRA procedure. Each laboratory used two operators, each of whom tested two specimens of each material. The components of variance expressed as standard deviations were calculated to be the values listed in Table 1.

NOTE 6—Where separate components of variance are shown for multimaterial comparisons, (*1*) the multi-material, single-operator component is due to an operator times material (within-laboratories) interaction and is combined with the single-material, single-operator component in calculating critical differences, and (*2*) any increase in the multimaterial, between-laboratory component over the single-material, between-operator component is due to a material times laboratory interaction.

NOTE 7—Since the Interlaboratory tests using the WIRA procedure included only three laboratories, between-laboratory precision data for that procedure should be used with special caution.

NOTE 8—The tabulated values of the critical differences should be considered to be a general statement, particularly with respect to between-laboratory precision. Before a meaningful statement can be made about two specific laboratories, the amount of statistical bias, if any, between them must be established, with each comparison being based on recent data obtained on randomized specimens from one sample of the material to be tested.

15.3 *Bias*—The microprojector procedure in Test Method D 2130 is the accepted referee method for determining the diameter of wool and other animal fibers.

15.3.1 The values obtained using the procedures in Test Method D 1282 for measuring average fiber diameter have the following estimated biases as compared to the values obtained using Test Method D 2130.

Instrument	Average Bias, µm
Port-Ar	+ 0.68
WIRA	− 0.41

NOTE 9— *Example*—A wool reported as having a diameter of 26.000 µm when using Method D 2130 would tend to be reported as having a diameter of 26.68 µm when using the Port-Ar procedure of Method D 1282.

16. Keywords

16.1 air-flow; diameter; wool

[7] ASTM Research Report No. RR D-13-1051. A copy is available from ASTM Headquarters.

ANNEXES

(Mandatory Information)

A1. LINEAR DENSITY ESTIMATES OF WOOL FIBER IN MILLITEX UNITS FOR USE WITH AIR-FLOW INSTRUMENTS

A1.1 Fourth degree polynomial equations were fitted to data presented in Appendix A2 of Test Method D 2130. Average fiber diameter at midpoint of grades 80's to 36's, in micrometres, and fiber linear density in tex units corresponding to low, medium, and high standard deviations were used in the fitting of the equations[8] which are:

$$\text{Low} \quad Y = 875.50424 + 60.925705\,(X-28.885715) + 0.981545\,(X-28.885715)^2 - 0.001111\,(X-28.885715)^3 + 0.000211\,(X-28.885715)^4$$

$$\text{Medium} \quad Y = 891.15382 + 62.324926\,(X-28.885715) + 0.980233\,(X-28.885715)^2 - 0.001826\,(X-28.885715)^3 + 0.000342\,(X-28.885715)^4$$

$$\text{High} \quad Y = 909.29206 + 63.857949\,(X-28.885715) + 1.002864\,(X-28.885715)^2 - 0.001343\,(X-28.885715)^3 + 0.000287\,(X-28.885715)^4$$

where:
Y = fiber linear density, tex units, and
X = fiber diameter, μm

A1.2 Since the porous-plug instruments do not indicate distribution of fiber diameters, Table A1.1 was simplified to

[8] Biometrical Services, Agriculture Research Service, Beltsville, MD, calculated the equations.

TABLE A1.1 Millitex Units Equivalent to Micrometre Readings (Based on Low, Medium, and High Standard Deviations.)

Micrometres	Millitex	Micrometres	Millitex	Micrometres	Millitex
18.00	333 to 339	25.50	681 to 706	33.00	1143 to 1189
18.25	343 to 349	25.75	694 to 719	33.25	1160 to 1207
18.50	352 to 359	26.00	708 to 733	33.50	1178 to 1225
18.75	362 to 369	26.26	722 to 748	33.75	1195 to 1244
19.00	372 to 380	26.50	736 to 763	34.00	1213 to 1262
19.25	382 to 391	26.75	750 to 778	34.25	1231 to 1281
19.50	393 to 402	27.00	764 to 792	34.50	1249 to 1299
19.75	403 to 413	27.25	778 to 808	34.75	1267 to 1318
20.00	414 to 424	27.50	793 to 823	35.00	1285 to 1337
20.25	424 to 435	27.75	808 to 838	35.25	1303 to 1356
20.50	435 to 447	28.00	822 to 854	35.50	1322 to 1376
20.75	446 to 458	28.25	837 to 869	35.75	1340 to 1395
21.00	457 to 470	28.50	852 to 885	36.00	1359 to 1415
21.25	469 to 482	28.75	867 to 901	36.25	1378 to 1434
21.50	480 to 494	29.00	888 to 917	36.50	1397 to 1454
21.75	492 to 506	29.25	898 to 933	36.75	1416 to 1474
22.00	503 to 518	29.50	913 to 949	37.00	1435 to 1494
22.25	515 to 531	29.75	929 to 965	37.25	1454 to 1514
22.50	527 to 543	30.00	945 to 982	37.50	1474 to 1535
22.75	539 to 556	30.25	960 to 998	37.75	1493 to 1555
23.00	551 to 569	30.50	976 to 1015	38.00	1513 to 1576
23.25	564 to 582	30.75	992 to 1032	38.25	1533 to 1596
23.50	576 to 595	31.00	1009 to 1049	38.50	1553 to 1617
23.75	589 to 608	31.25	1025 to 1066	38.75	1573 to 1638
24.00	602 to 622	31.50	1041 to 1083	39.00	1593 to 1659
24.25	614 to 635	31.75	1058 to 1100	39.25	1614 to 1681
24.50	627 to 649	32.00	1075 to 1118	39.50	1634 to 1702
24.75	640 to 663	32.25	1092 to 1135	39.75	1655 to 1724
25.00	654 to 676	32.50	1109 to 1153	40.00	1676 to 1745
25.25	667 to 690	32.75	1126 to 1171	40.25	1697 to 1767

present the range of millitex units for low to high standard deviations at a particular micrometer reading. This accounts for the overlapping of millitex units in the table. For instance, fibers measuring an average of 21.00 µm range from 457 to 470 millitex units, while fibers, averaging 21.25 µm range from 469 to 482. Therefore, a wool which reads 470 millitex can be a 21.00 µm wool with high standard deviation or a 21.25-µm wool with low standard deviation.

A2. CALIBRATION OF INSTRUMENTS

A2.1 Port-Ar Calibration

A2.1.1 *Balance Calibration*—Check the calibration of the balance by pushing back the compression lever, *9*, shown in Fig. 1, thus operating an air switch and connecting the balance to the differential pressure gage. Next place the 12.5-g weight, *12*, in the balance pan. Apply air pressure either by the atomizer bulb or by the electric pump until the piston reaches the top of the air reservoir, *3*. As the piston descends, the meter pointer should indicate the center of the triangle located at 26 on the micrometer scale. If the pointer deviates, center it by turning the flat, balance adjustment knob, *1*, located on top of the balance assembly at the rear of the balance pan.

A2.1.2 *Fineness Calibration*—Place the porosity calibrator plug, *11*, in the test chamber and pull the compression lever forward until it locks in position. Rotation of the porosity calibrator plug, *11*, as it is inserted will reduce the force required. Pull the calibrator plug plunger located in the center of the porosity calibrator plug to the“ out” position and apply air pressure either by the atomizer bulb or electric pump to raise the piston to the top of the air reservoir, *3*. As the piston settles, the meter should read zero. If it does not, perform the necessary adjustment by the pointer up-scale. Push the plunger “in’’ and again apply air pressure. The meter reading as the piston settles should correspond to the largest number stamped on the porosity calibrator plug. Again make the necessary corrections, turning the porosity calibration control, *8*. It may then be necessary to adjust the porosity zero control slightly as some interaction between the two controls may occur. If this is necessary, also recheck the“ calibrate’’ reading and repeat the adjustments in the same manner until the proper readings are obtained. Calibration of the Port-Ar may be accomplished by using well-measured, short fiber method, samples of wool or wool top in place of the porosity calibrator plug, *11*.

NOTE A2.1—The two methods of calibration of the instrument may not give the same results.

A2.2 WIRA Calibration

A2.2.1 Mount the instrument on a firm table and adjust the leveling screws until the plumb line swings freely in the center of the hole. The level of the liquid in the gage tube will coincide with the upper mark reading at eye level. Distilled water may be added to the gage tube if, due to evaporation, the liquid level falls below the upper mark.

A2.2.2 Each instrument is calibrated before delivery and furnished with a non-hygroscopic fiber-filled correction plug. The standard reading at 65% relative humidity and 21°C (70°F) is given for each instrument.

A2.2.3 The correction plug should be kept at the same temperature and humidity as the instrument.

A2.2.4 Correction plugs are not inter-changeable between instruments.

A2.2.5 *Use of Correction Plug*:

A2.2.5.1 Adjust the liquid level to coincide accurately with the upper mark at eye level.

A2.2.5.2 Place the plug in the container with the stamped number at the front nearest the operator so that the plug is always tested in the same position, then screw down the collar *lightly.*

A2.2.5.3 Switch on the pump, open the valve and adjust the liquid level to the lower mark and allow air to pass through the plug for about 30 s.

A2.2.5.4 Take the reading of the fineness meter at eye level to the nearest millimetre. Unscrew and rescrew the collar down *lightly.*

A2.2.5.5 Repeat procedure 4 for a second and then a third time.

A2.2.5.6 Take the mean of the 3 readings.

A2.2.6 *Correction*—Find the difference in millimetres between the average reading and the standard reading. *This is the correction.* For any test *add* the correction if average plug reading is below standard, *subtract* the correction if average plug reading is above standard. Disregard corrections less than 1 mm.

A2.2.7 *Working Reference Sample Check*:

A2.2.7.1 Check the instruments in use and the technique of the operators by testing portions of working reference samples

TABLE A2.1 WIRA Fiber Fineness Meter Correction Table for Effect of Temperature and Relative Humidity on Fiber Diameter Measurements of Wool

NOTE 1—The figures given in the table are the amounts in micrometres to be added to or subtracted from the result obtained on fineness meter to give the result at a standard air temperature and relative humidity of 65%.

NOTE 2—It is assumed that the sample of wool has been in the room for sufficient time to come into equilibrium with the standard atmosphere for testing textiles.

Observed result, µm	Air Temperature, °F (°C)						
	56 (13)	60 (16)	64 (18)	68 (20)	72 (22)	76 (24)	80 (27)
	Subtract	Subtract	Subtract	Add	Add	Add	Add
18 to 22.9	0.2	0.1	0.1	0.0	0.1	0.1	0.2
23 to 27.9	0.3	0.2	0.1	0.0	0.1	0.2	0.3
28 to 32.9	0.3	0.2	0.1	0.0	0.1	0.2	0.3
33 to 37.9	0.4	0.3	0.1	0.0	0.1	0.3	0.4

TABLE A2.2 WIRA Fiber Fineness Meter Correction Table for Effect of Relative Humidity on Fiber Diameter Measurements of Wool

Observed result, μm	Relative Humidity, %									
	38 to 42 Add	43 to 47 Add	48 to 52 Add	53 to 57 Add	58 to 62 Add	63 to 67 Add	68 to 72 Subtract	73 to 77 Subtract	78 to 82 Subtract	83 to 87 Subtract
18 to 19.9	0.4	0.4	0.3	0.2	0.1	0.0	0.1	0.2	0.4	0.6
20 to 21.9	0.5	0.4	0.3	0.2	0.1	0.0	0.1	0.2	0.4	0.7
22 to 23.9	0.5	0.4	0.3	0.2	0.1	0.0	0.1	0.3	0.5	0.7
24 to 25.9	0.6	0.5	0.4	0.3	0.1	0.0	0.1	0.3	0.5	0.8
26 to 27.9	0.6	0.5	0.4	0.3	0.1	0.0	0.1	0.3	0.5	0.8
28 to 29.9	0.6	0.5	0.4	0.3	0.2	0.0	0.2	0.4	0.6	0.9
30 to 31.9	0.7	0.6	0.5	0.3	0.2	0.0	0.2	0.4	0.6	1.0
32 to 33.9	0.7	0.6	0.5	0.3	0.2	0.0	0.2	0.4	0.7	1.0
34 to 35.9	0.8	0.7	0.5	0.4	0.2	0.0	0.2	0.4	0.7	1.1
36 to 37.9	0.8	0.7	0.6	0.4	0.2	0.0	0.2	0.4	0.7	1.1

(see 6.4) in the appropriate range of grade at suitable intervals, for example, once each day when tests are made every day, or with the first specimens when testing is resumed after an interval of one or more days without testing.

A2.2.8 *Standard Reference Sample Check*:

A2.2.8.1 Check the instruments in use and the technique of the operators by testing portions of standard reference samples in the appropriate range of grade at the time the instruments are first calibrated and at least once a week thereafter.

NOTE A2.2—This plug is also useful in drawing attention to any major change in the instrument. An air bubble in the manometer will cause a large change in the plug reading.

NOTE A2.3—Dust from the atmosphere is drawn through the plug and the plug should not thus be left with the air switched on for longer than necessary. The plug may need to be restandardized about every 2 years, and a new standard reading obtained. WIRA should be consulted about this restandardization.