Designation: D4963 – 04

Standard Test Method for Ignition Loss of Glass Strands and Fabrics[1]

This standard is issued under the fixed designation D4963; 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 primarily the determination of ignition loss of glass textiles. This method applies to glass fiber strands, twisted or untwisted, coated or uncoated; and fabrics, woven, nonwoven, knitted, coated, and uncoated, and chopped strand. This procedure may be applied to other glass textiles where the amount of organic content obtained by ignition loss is required.

NOTE 1—This test method may be used with other glass fiber classifications, such as C or D, but a different ignition temperature and exposure time may be required. In these cases the manufacturer should be consulted for the appropriate ignition conditions.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D123 Terminology Relating to Textiles

D578 Specification for Glass Fiber Strands

D7018 Terminology Relating to Glass Fiber and Its Products

3. Terminology

3.1 *Definitions*—For all terminology related to Subcommittee D13.18 on Glass Fibers, see Terminology D7018.

3.2 For definitions of other textile terms used in this test method, refer to Terminology D123. For information on the designation of construction of glass strands, refer to Specification D578.

4. Summary of Test Method

4.1 The organic content on glass textiles is determined by weighing the specimen before and after ignition. The amount of ignition loss on a sample is reported as a percentage of the mass before ignition.

5. Significance and Use

5.1 This test method is considered satisfactory for acceptance testing of commercial shipments because current estimates of between-laboratory precision are acceptable.

5.1.1 In cases 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 laboratories should be compared using Student's *t*-test for unpaired data and an acceptable probability level chosen by the two parties before the testing begins. 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 the view of the known bias.

5.2 Glass textiles are provided with various sizings or coatings. These provide a protection for the individual fibers, yarns, or fabric that may compose the glass textile as well as compatibility with further finishing requirements. The amount of sizing or coating on glass textiles as determined by this procedure is used for process control.

[1] This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.18 on Glass Fiber and its Products.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

6. Apparatus and Materials

6.1 *Reel*—A hand- or motor-driven reel having at least a 1-m (1-yd) perimeter. The reel shall be fitted with a traversing mechanism that will avoid bunching the successive wraps, and with an indicator of the length wound. A warning bell that will ring at a specified length is recommended. It is advisable that one arm will be collapsible to allow for easy removal of skeins.

6.2 *Muffle Furnace*, capable of maintaining 625 ± 25°C (1157 ± 45°F).

6.3 *Air Circulating Drying Oven*, capable of maintaining a temperature of 105 ± 2°C (220 ± 4°F).

6.4 *Thermometer, or thermcouple*, for muffle furnace capable of registering 625°C with 25°C maximum increments (1157°F with 45°F maximum increments).

6.5 *Analytical Balance*, 200-g capacity, readable to 0.001 g.

6.6 *Weighing Containers.*[3]

6.7 *Hood*, suitable for removing combustion products.

6.8 *Desiccator*, of sufficient size to hold the weighing containers and an efficient desiccant.

6.9 *Tongs*, long handle, heat-resistant.

6.10 *Gloves*, heat-resistant.

7. Safety Hazards

7.1 *Precautions*—Avoid contact with the hot muffle furnace. Use tongs to remove samples. Prescribed safety gloves should be worn when performing high-temperature (over 45°C or 100°F) testing. Place hazard warning safety signs in a conspicuous place. The muffle furnace must be located under a hood suitable for removing combustion products.

8. Sampling and Number of Specimens

8.1 *Lot Size*—A lot is defined as a single shipment of a single type of glass textile. A lot may constitute all or part of a single customer order.

8.2 *Lot Sample*—As a lot sample for acceptance testing, take the number of sampling units of glass textiles directed in an applicable material specification or other agreement between the purchaser and the supplier.

8.3 *Laboratory Sample*—Consider strand packages or fabric rolls or chopped strand quantities of at least 50 g to be a laboratory sample unless otherwise agreed upon between the purchaser and the supplier.

8.4 *Test Specimens*—As test specimens for acceptance testing, proceed as follows:

8.4.1 For strands, take two lengths of strand, each weighing at least 1 g from each package in the laboratory sample.

8.4.2 For fabrics, cut two test specimens at least 103 cm^2 (16 $in.^2$) from the laboratory sample in such a way that no specimen is closer than one tenth the width of the swatch from the selvage with no two specimens cut perpendicular to the warp containing the same set of warp ends or if cut parallel to the filling, containing the same set of filling picks, and the specimens from different swatches are each taken from a different part of the width of the swatches, with no specimen being taken within 1 m (1 yd) of the very outside of the roll.

8.4.3 For bulk glass textiles, such as chopped strand, take two quantities randomly as test specimens, each weighing at least 6 g from each laboratory sampling unit.

9. Procedure

9.1 Precondition each test specimen by drying for 1 h at 105 ± 2°C (220 ± 4°F), unless otherwise specified. Remove the test specimens from the drying oven and cool in the desiccator for a minimum of 10 min in the standard atmosphere for testing glass textiles.

NOTE 2—Conditioning is often omitted in current lab practices, but must be used to resolve finish level conflicts between purchaser and supplier.

9.2 Precondition the weighing containers by placing the empty containers in the muffle furnace at 625 ± 25°C (1157 ± 45°F). After 30 min, remove and cool in the standard atmosphere for testing glass textiles for 30 min.

9.3 Weigh the empty container to the nearest 0.001 g. Record this as the tare mass, *T*.

9.4 Identify each container with respect to each test specimen.

NOTE 3—When it is known that no ash residue separates from the specimen during the weighing and igniting process, the specimen is allowed to be weighed separately without the container. When this occurs, *T* equals zero.

9.5 Place the test specimen in the container and weigh to the nearest 0.001 g. Record this as the initial mass, *A*.

9.6 With the test specimen in the container, place in the muffle furnace. Ignite at 625 ± 25°C (1157 ± 45°F) for at least 30 min.

NOTE 4—For fabrics with less than 3 % loss on ignition, some manufacturers have found that ignition time of 10 min is sufficient. In case of dispute, the conditions in 9.6 shall be used.

9.7 Remove the container with specimen residue from the muffle furnace and cool in the desiccator for at least 30 min in the standard atmosphere for testing glass textiles.

9.8 Remove each container and test specimen separately from the desiccator, and immediately weigh to the nearest 0.001 g. Record this as the ignited mass, *B*.

10. Calculation

10.1 Calculate the ignition loss of the glass textile in percent to three significant digits for each specimen using Eq 1:

10.2 Calculate the average ignition loss for each sampling unit and for the lot as directed in an applicable material specification or contract order.

$$\text{Ignition loss, \%} = 100 \times (A - B)/(A - T) \quad (1)$$

where:

A = initial mass of container and specimen before ignition, g,

B = mass of container and glass residue after ignition, g, and

T = mass of container (Note 3).

[3] Porcelain Crucible, Coors No. E-7, or other containers or holders, suitable for exposure to 625 ± 25°C (1157 ± 45°F), have been found satisfactory for this purpose.