

Abrasion Resistance by the Martindale Method

ASTM D4966-98

Standard Test Method for Abrasion Resistance of Textile Fabrics (Martindale Abrasion Tester Method)

What This Test is Used For:

This test method covers the determination of the abrasion resistance of textile fabrics. Fabrics of all types may be tested by this method, including woven, non-woven, and knit apparel fabrics, household fabrics, industrial fabrics, and floor coverings, but difficulties may arise with fabrics with a pile depth greater than 2mm. Agreement between laboratories conducting this test is poor, but it is used widely, especially outside the United States.

The resistance of textile materials to abrasion as measured on a testing machine in the laboratory is generally only one of several factors contributing to wear performance or durability as experienced in the actual use of the material. While "abrasion resistance" and "durability" frequently are related, the relationship varies with different end uses, and different factors may be necessary in any calculation when trying to predict durability based on findings from specific abrasion tests.

There are three options for testing abrasion resistance included in this method. For the purposes of the Quality Assurance Class, you will be using Option 1.

Option 1:

The end point is reached for a woven fabric when two or more yarns have broken, or for a knitted fabric when a hole appears.

How the Test Works:

Abrasion resistance is measured by subjecting the specimen to rubbing motion in the form of a geometric figure. Resistance to abrasion is evaluated by various means, including comparison to visual aids in the form of photographs or actual samples.

Scientific Testing Requirements:

When using this equipment for scientific purposes, the fabric must be prepared according to ASTM D1776.

Equipment Needed:

Martindale abrasion tester
Standard abradant fabric
Standard felt
Polyurethane foam backing
Fabric press cutters
AATCC Gray Scale for Color Change

Procedure:

Sample Preparation

1. When cutting specimens, avoid wrinkles, folds or creases.
2. Avoid getting oil, water, grease, etc. on the specimens when handling.
3. Using the smallest cutting die, cut six circular specimens from the fabric to be tested with each specimen being 1.5 inches (38mm) in diameter. Take care not to apply too much pressure on the cutting die as it will break the razor blades.
4. Weigh one specimen to determine pre-test mass.
5. Also use this measurement to determine mass/unit area.

Preparation of Test Apparatus (see manual)

1. Make all tests in the standard atmosphere for testing.
2. Remove the specimen holders from the Martindale tester by
 - a. Loosening and lifting off the black knobs on top of the tester.
 - b. Removing the silver covers held on by the black knobs.
 - c. Lifting the specimen holders out
3. Note that all three parts of the specimen holders (handle, face, and ring) are numbered 1-6 and correspond to numbers on top of the Martindale tester.
4. Assemble the holder by:
 - a. Placing the cut specimen with the technical face down into the gold ring.
 - b. For specimens having a mass/unit area of less than 500 grams per square meter, place a disk of polyurethane foam between the specimen and the metal face.
 - c. The face must sit flush and square inside the ring.
 - d. Screw the handle back on.
5. Place the assembled holders into the machine, replacing silver caps and black knobs.
6. Add the required weight (9kPa for apparel, 12kPa for upholstery) by resting the weights on the ends of the handles. (kPa = 1 kilo Pascal = # pounds) Note that the weights are also numbered 1-6.
7. Set the counter system to record the desired movements using the third black button from the right.

Starting the abrasion tester

1. Turn the power on.
2. The machine should already be programmed to run a batch of 500 movements.
3. Push the green button to start the batch
3. After the first batch is complete take specimen holders off of the machine and observe. And record the results and changes in specimens.
5. Put specimens back on the machine and continue with the test.
6. Observe and record the results after each batch of 500 movements until you have Reached the desired number of movements (total of 3500). The end point is reached for a woven when two or more yarns have broken, or for a knitted fabric when a hole appears.

Report:

1. State that the specimens were tested as directed in Test Method D4966.
2. Describe the material or product sampled and the method of sampling used.
3. Report the type of abradant and the mass of the weights used.
4. State the average number of movements required to rupture two or more yarns in a woven fabric or develop a hole in a knitted fabric.