

**Test Method of Specified Requirements of
Antistatic Textiles**

FTTS-FA-009

FTTS-FA-009 Antistatic Textiles

The category, Antistatic Textiles mainly comprises products that conform to safety regulations for environments that are highly inflammable or explosive. However, the category also includes products used in operating rooms to prevent static electricity from interfering with medical equipment. In environments with low humidity (very dry), the human body can produce a significant charge of static electricity. Antistatic textiles prevent the body from suffering electric shocks due to static discharge. These products usually consist of metallic fiber blended with cotton, polyester, twisted or interwoven, as well as fiber containing “conductive carbon black“. For example, **Nega-Stat®** by **Barnet** is a fine-filament bi-component yarn. Each filament has a unique, patented, “trilobal-carbon” conducting core surrounded by a sheath of polyester.

Four main measures are used to evaluate the antistatic function of textiles

1. Surface-charge resistance
2. Friction-charge electrostatic potential
3. Half-time
4. Decay time

Taiwan technology for Antistatic Textiles maintains perfect resistance to frictional charge up to 1000 Volts (JIS L1094-B). The goal is Zero Voltage, or perfect resistance, with surface resistance below $10^{10}\Omega/\text{sq}$ (DIN 54345).

1. Scope

This criterion is applicable to textiles in all forms, including woven, knitted, coated/laminated fabric and non-woven. To consider the durability, the pretreatment, ex: repeated laundering, weathering, may be required.

2. Terminology

2.1 Insulative material: surface resistance $> 1 \times 10^{11}\Omega$ or surface resistivity $. 1 \times 10^{12}\Omega$.

2.2 Static dissipative material: $1 \times 10^{14}\Omega < \text{surface resistance} < 1 \times 10^{11}\Omega$; or $1 \times 10^5\Omega/\text{cm}^2 < \text{static resistivity} < 1 \times 10^{12}\Omega/\text{cm}^2$

3. Performance specification

3.1 Grade and Classification based on this specification

Frictional charge (V)	Grade	Classification
Knitted / Woven		
warp and weft		
V < 100	3	Excellent

$100 \leq V < 500$	2	Good
$500 \leq V < 1000$	1	Fair

Surface resistance (Ω)	Grade	Classification
$1 \times 10^4 \leq \Omega < 1 \times 10^6$	3	Excellent
$1 \times 10^6 \leq \Omega < 1 \times 10^9$	2	Good
$1 \times 10^9 \leq \Omega < 1 \times 10^{12}$	1	Fair

Decay time (Second)	Grade	Classification
$S < 0.01$	3	Excellent
$0.01 \leq S < 0.5$	2	Good
$0.5 \leq S < 2$	1	Fair

3.2 General requirement for pretreatment

Item	General Requirement	Test Method
Washing Durability	tested in original state, after 20 washes, 50 washes (refer to note 1)	(A) woven, coated/laminated fabric and non-woven fabric: washed based on AATCC 135 (1) III (A)ii; knitted: washed based on AATCC 135 (2) III (A)ii (refer to note 2) (B) washed based on JIS L0217-103 (refer to note 2)

Note 1

The treatment of washing durability may be varied upon agreement.

Note 2

The washing condition for Surface resistivity and Decay time test should be based on AATCC 135;

The washing method for Surface resistance test should be according to JIS L0217-103

4. Test Method

4.1 Friction-Charged electrostatic potential measuring method

4.1.1 Test Condition: Tests should be carried out at $20 \pm 2^\circ\text{C}$ and $40 \pm 2\%$ RH; for special requirements other relative humidity and temperature may be used.

4.1.2 Sample preparation: take 20 test specimens, each in 50 mm (2 inches) by 80 mm (3.2 inches), from the sample. 10 pieces should be taken along warp direction

and another 10 should be taken along the weft direction.

4.1.3 Pretreatment: condition the test specimens before testing for at least 24 hours under the atmosphere of $20\pm 2^{\circ}\text{C}$ and $40\pm 2\% \text{RH}$.

4.1.4 Apparatus and Material: friction-charged electrostatic potential measuring apparatus and rubbing cloth (according to JIS L1094).

4.1.5 Procedure:

- (1) take 20 rubbing cloth (Cotton, Wool), each in 150mm (6inches) by 25mm (1inch), 10 along warp and another 10 along weft.
- (2) wash the rubbing cloth according to the washing condition specified in JIS L0217-103 method before testing
- (3) Fix the test specimen to the frame (treat face side as the rubbing side), rotate the rotary drum in a speed of 400rpm to rub the test specimen. Measure the electrostatic potential given when 60 seconds elapsed after starting rubbing. Replacing the test specimen and rubbing cloths, repeat this procedure on 5 test specimens respectively along warp/wale direction and weft/course direction.
- (4) if the technician uses the Cotton rubbing cloths in the 1st test, then, the 2nd test should use Wool rubbing cloths for testing.
- (5) Before attach the specimen on the frame, adhesive tape should be put on the holding frame.

4.2 Electrical Surface Resistivity Test

4.2.1 there are two type of test, described as below:

Type I: electrical surface resistivity test (according to AATCC 76): applicable to fabric.

Type II: point to point electrical surface resistivity test (according to ESD STM2.1): applicable to garment.

4.2.2 Test Condition: Tests shall be carried out at $23\pm 2^{\circ}\text{C}$ and $20\pm 2\% \text{RH}$; for special requirements, other relative humidity and temperature may be used but it should be marked on the report

4.2.3 Test Specimen:

Type I: randomly take 5 specimens in the size which is suitable to the electrodes of the particular equipment being used.

Type II: garment

4.2.4 Pretreatment: condition the test specimens before testing for at least 24 hours under the atmosphere of $23\pm 2^{\circ}\text{C}$ and $20\pm 2\% \text{RH}$.

4.2.5 Apparatus:

Type I: concentric electrodes electrical resistance meter (refer to AATCC 76)

Type II: point to point electrical resistance meter (refer to ESD STM2.1)

Remark: The resistance meter in conjunction with the electrode system should be capable of measuring values in the range of 10^3 to 10^{12} .

4.2.6 Test Procedure

- (1) turn on the main power of the electrical resistance meter
- (2) 100volt should be applied for the test voltage.
- (3) for type I, lay the specimen flatly and place the detector on the tested specimen; for type II, lay the garment flatly and place two detectors in both sleeves respectively.
- (4) Record the data(Ω) from the meter
- (5) Repeat the procedure (1) to (4) 4 more times
- (6) calculate the average resistivity.

4.3 Electrostatic Dissipation Test

4.3.1 Test Condition: Tests shall be carried out at $23\pm 2^\circ\text{C}$ and the relative humidity should be below 15%RH; for special requirements, other relative humidity and temperature may be used but it should be marked on the report.

4.3.2 Test Specimen: 3 pieces of specimen in the size of 125mm (5inches) by 75mm (3 inches).

4.3.3 Apparatus: Electrostatic Dissipation Tester

4.3.4 Test Procedure

- (1) turn on the main power of the tester and preheat it for 5 minutes.
- (2) place the specimen onto the tester, charge the specimen with 5000volt, then, measure the duration by which this charged electrostatic potential attenuates to 500volts. This is the electrostatic dissipation time.
- (3) record the electrostatic dissipation time
- (4) repeat the procedure (2) to (3)
- (5) test 3 times for each specimens on both positive electrode and negative electrode. Record all test results and report the highest reading.