Test Method of Specified Requirements of Water-Vapor Permeable and Liquid-Water Impermeable Textiles

FTTS-FA-005

FTTS-FA-005 Water-Vapor Permeable and Liquid-Water Impermeable Textiles

These textiles allow vapor to pass through but not liquid. Thus perspiration vapor readily departs from the skin, while water outside the garment cannot enter. The inside of the garment remains free of moisture droplets and the wearer stays warm and dry. **Water-vapor permeable** means the vapor emitted from the surface of an exercising body can evaporate outside the textile, so the temperature decreases and maintain the comfortableness from dryness. **Liquid-water impermeable** means the textile resists water penetration. Most commonly, the surface of this type of textile is coated with PU, PTFE, TPU, TPE or other materials. The same effect can also be achieved by laminating fabric to a water-impermeable film.

Water-vapor permeable and liquid-water impermeable textiles are manufactured in three ways:

1. Direct coating
2. Lamination
3. High-density weave structure

Two kinds of materials are employed for direct coating or lamination:

1. Micro-multi-aperture
2. Hydrophile(no apertures)

The micro-multi-aperture material contains thousands of micro apertures on every square-centimeter surface. These apertures are far smaller than water droplets. Consequently, even under pressure the materials completely prevent water from penetrating while simultaneously driving out moisture from inside.

Hydrophile materials utilize the hydrophilic group to absorb moisture which then evaporates through diffusion and air convection. Manufactured for specific environmental demands, these textiles are described according to their degrees of hydrostatic pressure and permeability.

The current technology in Taiwan for laminating textiles has reached hydrostatic pressure endurance of 40,000 mmH_2O and higher (ISO 811), water vapor permeability of 20,000 $g/m^2 \cdot 24hr$ or more (JIS L2099-B1), Ret6 (m^2pa/w) or less. Coatings have reached a hydrostatic pressure endurance of a minimum of 10,000mmH_2O (ISO 811), water vapor permeability of 10,000 $g/m^2 \cdot 24hr$ or more (JIS L1099-B1).

1. Scope

This criterion is applicable to the evaluation and testing of water vapor permeability & water resistance of textiles.

2. Terminology

Water vapor resistance: Resistance of water vapor evaporating from textile and apparel.

3. Performance specification

3.1 Water vapor resistance, Ret

Ret Water vapor resistance, Ret (m^2 · Pa/W)	Grade	Classification
Ret＜6	5	Excellent
Ret＜13	4	Very good
Ret＜27	3	Good
Ret＜40	2	Moderate
Ret＜50	1	Fair

3.2 Water resistance

Hydrostatic Pressure(mmH2O)	Grade	Classification
Hydrostatic Pressure	5	Excellent
Hydrostatic Pressure＜15000	4	Very good
Hydrostatic Pressure＜8000	3	Good
Hydrostatic Pressure＜4000	2	Moderate
Hydrostatic Pressure＜2000	1	Fair

3.3 General requirement for pretreatment

Choose the proper general requirement by product end-use

Item	Requirement	Test method
Washing durability	Evaluate the appearance after wash first. No damaged appeared, determine the hydrostatic pressure. Cycles of washing decided by the type of textile	ISO 6330
Flexing resistance	Evaluating the appearance after 2000 cycles flexing	ISO 7854
Adhesion strength	200 g/cm	ISO 2411

4. Test method

4.1 Testing method for the textiles performance in water-vapor resistance

Refer to ISO 11092, the testing condition shall be set in 35℃, 40±3 % relative humidity and air speed to 1 m/s, adjust the hot plate to the temperature of 35℃. Test specimens shall be placed flatly in the hot plate, record the heat flux of hot plate reaching the steady state, calculate the water-vapor resistance of tested specimens.

4.2 Testing method for the textiles performance in water resistance

Refer to ISO 811, the water shall be distilled or fully deionized water maintained at either 20±2℃ or 27±2℃, the rate of increase of water pressure shall be 60±3 cmH_2O/min, record the water pressure at which the water penetrates the fabric at the third place is noted.

4.3 Testing method for the textiles performance in durability of home laundering

Refer to ISO 6330 procedure 6A, wash by wascator (tumble washer) and dry flat; or choose ISO 6330 procedure 7A alternatively.

4.4 Testing method for the textiles performance in flexing resistance

Refer to ISO 7854 method C, cut specimens in size of 22cm×19cm with longer dimension paralleling to the longitudinal and transverse direction of the material respectively. Each test piece shall be sewn into a cylindrical shape 19cm long × 6.4cm inside diameter. Condition the specimens in the -20℃ for 24 hours, mount the cylindrical test piece between the two discs. One disc shall be capable of moving at 152 compression strokes per minute; the second disc shall be at the speed of 200 twist insertions per minute. Set the apparatus in motion and stop it after specified number of flexes, assess the flexing damage.

4.5 Testing method for the textiles performance in adhesive strength

Refer to ISO 2411, take five test specimens cut with the length parallel to the longitudinal and transverse direction respectively. Separate the layers of test specimen 5cm along with its longer dimension. Clamp each side by the jaw of the tensile strength testing machine, separating the layer of specimen in the specified speed to determine the adhesive strength. Where the layer is not sufficiently strong to be stripped, choose the seal of HIPSTER, model no. HP168 or other correspondent with the good adhesive property, bonded with the layer of test specimen by heat to determine the adhesive strength accordingly. When the three-layered material is tested, each combination shall be tested respectively and choose the lower adhesive strength in bonding to be reported.