

Specified Requirements of Moisture Transferring and Quick Drying Textiles

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Version: 2.0

1. Purpose and Scope

This criterion is applicable to evaluate the ability of moisture transferring and quick drying textiles in perspiration (simulated by water) transferring and quick drying.

2. Terminology

Moisture Transferring and Quick Drying Textiles: to keep dry and comfortable in wearing, the performance of textiles in absorbing, transferring, evaporating and drying of perspiration.

3. Classification

3.1 The grading for the textiles performance in water diffusion ability

Table 1. The grading of water diffusion ability

Index of diffusion area in 20 seconds		Grade	Classification
Knitted	Woven		
$X \geq 10$	$X \geq 9$	5	Excellent
$5 \leq X < 10$	$5 \leq X < 9$	4	Very Good
$3 \leq X < 5$	$3 \leq X < 5$	3	Good
$1.6 \leq X < 3$	$1 \leq X < 3$	2	Moderate
$X < 1.6$	$X < 1$	1	Fair

3.2 The grading for the textiles performance in drying ability

Table 2. The grading of drying ability

Remained water ratio at the 40 th minute (%)		Grade	Classification
Knitted	Woven		
$X < 5$	$X < 3$	5	Excellent
$5 \leq X < 15$	$3 \leq X < 10$	4	Very Good
$15 \leq X < 40$	$10 \leq X < 30$	3	Good
$40 \leq X < 60$	$30 \leq X < 50$	2	Moderate
$X \geq 60$	$X \geq 50$	1	Fair

3.3 The grading for the textiles performance in wet isolation ability

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Table 3. The grading of wet isolation ability

Moisture Picking Ratio (%)	Grade	Classification
$X \leq 2$	5	Excellent
$2 < X \leq 5$	4	Very Good
$5 < X \leq 10$	3	Good
$10 < X \leq 30$	2	Moderate
$X > 30$	1	Fair

3.4 The grading for the textiles performance in absorbency speed—dropping method

Recommendation: For knitted fabric, the average time for no reflection of water droplet shall not be more than 2 seconds; for woven fabric, the average time shall not be more than 5 seconds to meet the performance requirement of moisture transferring and quick drying textiles in absorbency.

3.5 The grading for the textiles performance in absorbency speed—Byreck method

To meet the requirement, both woven and knitted fabrics shall be performed in wicking height of warpwise (wale) and fillingwise (course) direction as follows.

Table 4. The grading of absorbency speed

Wicking height (mm)	Grade	Classification
Woven/knitted fabric warpwise (wale)/ fillingwise (course) direction		
$X \geq 100$	3	Excellent
$50 \leq X < 100$	2	Good
$X < 50$	1	Fair

4. Testing Method

4.1 Testing method for the textiles performance in water diffusion ability

4.1.1 Definition: the rate of water drop diffusing in the surface of textiles, it also represents the conductivity of water instantly in the mechanism of water (perspiration) absorbency in textiles.

4.1.2 Scope: textiles emphasizing the fast water absorbency and transferring ability, including woven, knitted and non woven fabrics, with no limitation to color, construction and density. Terry or pile fabric and heavy-weight fabric are improperly in adopting the test.

4.1.3 Condition: following the CNS 5611, the standard condition shall be in $20 \pm 2^\circ\text{C}$, $65 \pm 2\%$ relative humidity.

4.1.4 Sample preparation: following the CNS 12915, section 3.

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<p>4.1.5 Procedure: specimen with face layer (or absorbing layer for double or multi-layered fabric) up, flatten out without tension and focused by the CCD camera. Drip a drop of water of 0.2 mL from the height of 1 cm above the surface of specimen with a micropipette. The diffusion images of the water droplet were captured by the image analysis system at 5th, 10th, 20th, 30th, 60th, and 90th second individually, and the diffusion areas were calculated in mm². Repeat the process in five different places of the specimen, calculate the average and draw time- diffusion area curve. Choose the diffusion area at the 20th-second to convert as the “Diffusion Area Index (DAI)” as follows,</p> <p>DAI = (the diffusion area at the 20th-second × fabric thickness in mm)/ 0.2×10⁻³.</p> <p>If necessary, the result shall be indicated as the result of “non-washed” or “after X-time washed”. The recommended washing condition shall be after 5-time washed by AATCC 135-1995.</p> <p>4.2 Testing method for the textiles performance in drying ability</p> <p>4.2.1 Definition: the drying (or evaporation) rate of textiles wetted by water (perspiration)</p> <p>4.2.2 Scope: woven, knitted or non-woven textiles which emphasizing the quick-drying ability as wetted by water (perspiration)</p> <p>4.2.3 Condition: following the CNS 5611, the standard condition shall be in 20±2°C, 65±2 % relative humidity.</p> <p>4.2.4 Sample preparation: following the CNS 12915, section 3.</p> <p>4.2.5 Procedure: testing condition is standardized by section 4.2.3. Specimen is cut as 5cm×5cm square, put the face side up in the weighing plate of the microbalance with three-decimal precision, and record the dry weight as W_f (in grams) by computerized system. Use the micropipette to drip water with 0.2 mL in volume from the 1cm high above the center of the testing square, and record the wet weight as W_o(in grams). Record the changing weight of water, W_i (in grams) with every 1-minute or 10-minute intervals continuously for the 100-minute observation. Calculate the “Remained Water Ratio (RWR) by the formula to express the change of water remained in the specimen by time, to draw the evaporating curve from 100% to 0%. Choose the RWR of the 40th minute to be index of assessment. The formula is as follow:</p> <p>Remained water ratio at the 40th minute (%) = (W_i-W_f)/(W_o-W_f)×100%</p> <p>If necessary, the result shall be indicated as the result of “non-washed” or “after X-time washed”. The recommended washing condition shall be after 5-time washed by AATCC 135-1995.</p> <p>4.3 Testing method for the textiles performance in wet isolation ability</p>	
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<p>4.3.1 Definition: the ability of preventing the moisture (perspiration) retained or revealed on the inside surface of double layered moisture transferring and quick drying (moisture management) textiles. The better the wet isolation ability is, the drier the inside of the fabrics keeps the skin free from cling but feel dry and comfortable.</p> <p>4.3.2 Scope: woven, knitted or non-woven textiles which emphasize the moisture transferring and quick-drying ability as wetted by water (perspiration)</p> <p>4.3.3 Condition: follow the CNS 5611, the standard condition shall be in 20±2°C, 65±2 % relative humidity.</p> <p>4.3.4 Sample preparation: follow the CNS 12915, section 3.</p> <p>4.3.5 Procedure: drip the water of 0.2 mL in volume onto the glass plate. Put the specimen with the size of 10cm×10cm square with inner side down on the drop of water for 1 minute. Then put the wetted specimen on a piece of filter paper (with dry weight of W₀) and add on another loading of 0.5 g/cm² above the combination of specimen and filter for 30 seconds. Weigh the filter paper as W_a. Repeat 5 times and average the results of the Moisture Picking Ratio (abbreviated as MPR) by formula following: $\text{MPR} (\%) = (W_a - W_0) / 0.2 \times 100 \%$ If necessary, the result shall be indicated as the result of “non-washed” or “after X-time washed”. The recommended washing condition shall be after 5-time washed by AATCC 135-1995.</p> <p>4.4 Test method for the textiles performance in absorbency speed—dropping method</p> <p>4.4.1 Definition: absorbency speed is tested by AATCC 79-2000 (Absorbency of Bleached Textiles) and JIS L 1907-1994 methods. This is a simple and fast method to know if the fabric can absorb a drop of water at a very short time or not.</p> <p>4.4.2 Scope: woven, knitted or non-woven textiles which emphasize the moisture transferring and quick-drying ability as wetted by water (perspiration).</p> <p>4.4.3 Condition: follow the CNS 5611, the standard condition shall be in 20±2°C, 65±2 % relative humidity.</p> <p>4.4.4 Sample preparation: follow the CNS 12915, section 3.</p> <p>4.4.5 Procedure: sample five specimens with the size of 20cm×20cm square randomly and mount them by the embroidery hoops. Place the hoop about 1cm below the tip of the burette, and drip a droplet with 0.04 mL in volume approximately, start the stopwatch simultaneously. Record the elapsed time from the droplet falling onto the surface of specimen, gradually absorbed, till the mirror reflection diminished and leave a dull wet spot, report to the nearest 0.5 second.</p>	
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4.4.6 Record:

- (1) classification of test.
- (2) tested side of the material.
- (3) individual absorbency speed (in seconds)(the time with no light reflection of water droplet on fabric) and the average.
- (4) test method: refer to the CNS 13905(Methods of test for water absorbency of textiles), JIS L 1907-1994 and AATCC 79-2000.
- (5) If necessary, the result shall be indicated as the result of “non-washed” or “after X-time washed”. The recommended washing condition shall be after 5-time washed by AATCC 135-1995.

4.5 Test method for the textiles performance in absorbency speed—Byreck method

4.5.1 Definition: a method to determine the water absorption rate that showing the capillary ability of a strip of fabric against gravity.. The specimen is hung vertically, immersed into water bath for a specified time interval, and determine the height of wicking to represent the water absorption rate of textiles.

4.5.2 Scope: this method shall be mainly applied to other than the textiles with high water absorbency.

4.5.3 Condition: follow the CNS 5611, the standard condition shall be in $20\pm 2^{\circ}\text{C}$, $65\pm 2\%$ relative humidity.

4.5.4 Sample preparation: follow the CNS 12915, section 3.

4.5.5 Procedure: the apparatus shall consist of the following items

- (1)Water bath, of such a size as its walls do not contact the supporting frame of horizontal bar.
- (2)Supporting frame of horizontal bar, capable of fixing a horizontal bar which descends vertically to the water bath.
- (3)Horizontal bar, water proofing and made of the material capable of fixing the specimen.
- (4)Scale, specified as CNS 7548.

Take each five specimens with the size of 200mm×25mm with the length direction parallel to warp and weft for woven fabrics and to wale and course for knitted fabrics respectively. Fix the specimens onto the horizontal bar supported over the water bath. The bath water shall be specified as CNS 9179, at temperature of $20\pm 2^{\circ}\text{C}$. Lower the horizontal bar for adjusting, so the lower ends of the specimens are immersed with 0.5 cm depth into the water. Record the wicking height by capillarity to 1mm after immersed for 10 minutes. If it is difficult to recognize the water mark on fabric, water-soluble dye can be added slightly into the water.

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The test result shall be expressed by the mean value of five measurements of the height of water raised in warpwise/wale and fillingwise/course directions respectively by rounding off to an integer according to CNS 2925.

4.5.6 Record:

- (1) classification of test
- (2) name of dye (when water soluble dye is used)
- (3) water absorbency speed (wicking height of water raised) in warpwise/wale and fillingwise/course directions (mm) and the mean value of respective water absorbency speed (mm/10min).

5. Mark

Type * ¹	Diffusion ability	Drying ability	Wet Isolation ability	Absorbency speed (Dropping)	Absorbency speed (Byreck)	Grade	Classification
I	5	5	5	Pass* ²	3	AAAAA	Excellent
II	4	4	4	Pass* ²	3	AAAA	Very Good
III	3	3	3	Pass* ²	2	AAA	Good
IV	2	2	2	Pass* ²	2	AA	Moderate

*1 : It is necessary to pass at least two items of “Diffusion ability, Drying ability, and Wet isolation ability”, and both of “Absorbency speed-dropping and Absorbency speed-Byreck” must be passed.

*2 : The average time for no light reflection of water droplet shall be less than 2 seconds for knitted fabric and less than 5 seconds for woven fabric to meet the performance requirement of moisture transferring and quick drying textiles in absorbency speed.

6. Reference

- CNS 13905 L 3246 Method of Test for Absorbency of Textiles-5.1.1(Dropping)
Method of Test for Absorbency of Textiles-5.1.2(Byreck)
- JIS L 1907-1994 Test Methods for Water Absorbency of Textiles-5.1.1(Dropping)
Test Methods for Water Absorbency of Textiles-5.1.2(Byreck)
- AATCC 79-2000 Absorbency of Bleached Textiles

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