

The Committee for Conformity Assessment of Accreditation and Certification on
Functional and Technical Textiles

Liquid Moisture Management Properties of Textile Fabrics

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Document Version Resume

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1.0	Newly issued		

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<p>1. Purpose and Scope</p> <p>This criterion is applicable for capacity assessment for wicking textile and apparel products, especially as evaluation criteria and test methods on conductivity and insulation of liquid moisture in double or multi-layered structure designed wicking textiles and apparel products, with conductive (or barrier) and absorption layers.</p> <p>2. Terminology</p> <p>2.1 Wicking fabric: a fabric that can absorb sweat and rapidly transfer the moisture away from the skin, a function that maintains the skin surface dry and comfortable.</p> <p>2.2 Wetting Time – Top/Bottom: time needed for the fabric to begin absorb liquid moisture, starting from the liquid touching the fabric’s surface. The definition of time from the fabric beginning to absorb liquid moisture indicates the time when a slope greater than or equal to $\tan 15^\circ$ appears for the first time on the water content versus time curve. Note: according to the experiment definition, when test samples placed on the instruments, Top indicates the side that comes in contact with the top of the electrical current sensors; Bottom indicates the side that comes in contact with the bottom of the electrical current sensor. During actual wear or use, Top is the side that comes into contact with the skin, also called conductive layer, and Bottom is the outer front side, also called absorption layer.</p> <p>2.3 Absorption Rate – Top/Bottom: rate of increase of water content in fabrics per unit time. It indicates the slope average on the moisture content change curve during test time.</p> <p>2.4 Maximum Wetted Radius – Top/Bottom: maximum radius of moist area from the beginning of fabric wetting to the time of experiment termination. On the water content curve, it indicates the maximum radius of moist area from the time a slope greater than or equal to $\tan 15^\circ$ appears for the first time on the curve until the test termination time.</p> <p>2.5 Spreading Speed – Top/Bottom: the cumulative conduction speed of liquid moisture along the radius from the time moisture begins to spread on the fabric’s surface until maximum moist radius.</p> <p>2.6 Accumulative One-way Transport Capability: the capability of liquids to be transmitted from the fabric conductive layer (next to skin surface or inner layer) to the absorption layer (outside surface). It is expressed by the difference of liquid moisture absorption between both fabric sides and test time.</p> <p>2.7 Overall Moisture Management Capability – OMMC: overall performance of the fabric’s wicking ability for liquids. It is expressed by weighted value of liquid moisture absorption rate of the fabric’s absorption layer, one-way transmission index and rate of diffusion of absorption layer.</p>	
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3. Classification

3.1 Grading standards for liquid moisture transfer properties in fabrics.

Table 1. The grading of liquid moisture transfer properties in fabrics

Grade	1	2	3	4	5
Wetting Time (sec)*	≥ 120	≥ 20	≥ 6	≥ 3	< 3
Absorption Rate (%/sec)*	≥ 0	≥ 10	≥ 30	≥ 50	≥ 100.0
Maximum Wetting Radius (mm)*	≥ 0	≥ 8	≥ 13	≥ 18	≥ 22.0
Spread Speed (mm/sec)*	≥ 0.0	≥ 1.0	≥ 2.0	≥ 3.0	≥ 4.0
One-way transmission index R (%)	< -50	≥ -50	≥ 100	≥ 200	≥ 400
OMMC	< 0.20	≥ 0.20	≥ 0.40	≥ 0.60	≥ 0.80

*Note: both the fabric's Top (next to skin surface during use) and Bottom (front surface during use) have respective classifications, and grading are required to be the same. Grade 5 has the best performance, while grade 1 has the worst.

4. Testing Method (Summary)

4.1 Liquid Moisture Management Properties of Textile Fabrics:

Determine the liquid moisture conduction performance in accordance with the provisions of ATCC TM 195-2010,

- (1) Wetting Time – Top/Bottom (sec)
- (2) Absorption Rate – Top/Bottom (%/sec)
- (3) Maximum Wetted Radius – Top/Bottom (mm)
- (4) Spreading Speed – Top/Bottom (mm/sec)
- (5) Accumulative One-way Transport Capability (%)
- (6) Overall Moisture Management Capability – OMMC

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<p>4.2 Principle: the sample is placed horizontally between the top and bottom layers of the electrical current sensor; both layers are made from 7 metal needles arranged in concentric circles, when liquid moisture and the sample's "conductive layer" (in this experiment, it is the sample's upper layer, next to skin surface) comes into contact, liquid moisture spreads along the conductive layer, moving from upper to bottom layer (front layer during actual wear or use, also called "absorption layer"), and spreading in the bottom layer, the electrical resistance change during this process is recorded and calculate various liquid moisture conduction performance indicators, to evaluate wicking performance of fabrics.</p> <p>4.3 Equipment and materials</p> <p>4.3.1 Equipment: Moisture Management Tester – MMT (refer to Attachment 1).</p> <p>4.3.2 Test solution: Sodium Chloride solution, 0.9% NaCl.</p> <p>4.4 Sampling and preparation: in accordance with DNS 12915 section 3. Before cutting the samples, proceed with the washing according to AATCC 135 or to the washing method and frequency agreed by all parties</p> <p>4.5 Test procedures: place the adjusted 8x8 cm² square sample, with the conductive layer worn next to the skin facing upward, levelly and smoothly between the two electrical current sensors of the Moisture Management Tester, activate the instrument, drip 0.22 ml of test solution on the sample's top; testing time 120 seconds; the instrument will automatically calculate and display the test results. After the end of the test, pull up and fix the top of the electrical current sensor, verify that there is no residual liquid moisture on both the top and bottom of the current sensor, proceed to test the next sample only after ensuring that the sensor is kept dry, repeat the procedure until 5 samples have completed the test.</p>	
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5. Mark:

Type	Top wetting time	Bottom absorption speed	Bottom maximum radius	Bottom spread speed	One-way transfer index	OMMC	Classification
I	5	5	5	5	5	5	Excellent
II	4	4	4	4	4	4	Very Good
III	3	3	3	3	3	3	Good

Note 1: minimum value is used to determine “type” in each test grade of the same sample group.

Note 2: the 4 grading of Top wetting time, Bottom absorption speed, Bottom maximum radius, Bottom spread speed are especially suitable for moisture absorption requirements.

6. References

6.1.1 AATCC 195-2010 Liquid Moisture Management Properties of Textile Fabrics

7. Supplement

This standard has been reviewed by the convener of the Normative Validation Implementation Group, presented to the chairman of the Committee for approval then issuing, to be implemented from announcement day.

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Annex

1. Test equipment

Picture 1. Moisture Management Tester

Picture 2. Sectional side drawing of instrument

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<p>2. Formula: the formula used by the instrument software is as follows.</p> <p>2.1 Absorption rate AR_T and AR_B (%/sec) $AR_T = \text{Average (SLOPE}_T)$ and $AR_B = \text{Average (SLOPE}_B)$</p> <p>2.2 Spreading speed (SS_T and SS_B)</p> <p>Among which, Concentric ring = i ($i = 1, 2, 3, 4, 5, \text{ or } 6$) Wetting time + t_i, $I =$ spreading speed (S_i) of liquid moisture from $i-1$ ring to i ring Distance between ring i and ring $i-1 = \Delta\gamma_i$</p> <p>2.3 Accumulative Spreading Speed (SS_T and SS_B)</p> <p>Among which, N_T and N_B are the maximum moisture ring numbers of the Top and Bottom.</p> <p>2.4 Accumulative one-way transport capability (R)</p> <p>$R = [\text{Area (U}_B) - \text{Area (U}_T)] / \text{Total Test Time}$</p>	
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<p>2.5 Overall Moisture Management Capability – OMMC</p> $OMMC = C_1 * AR_{B_ndv} + C_2 * R_{ndv} + C_3 * SS_{B_ndv}$ <p>Among which,</p> <p>C₁, C₂ and C₃ are the weighted values *of AR_{B_ndv}, R_{ndv} and C₃*SS_{B_ndv}</p> <p>(AR_B) = absorption rate</p> <p>(R) = one-way transport capability</p> <p>(SS_B) = spreading speed</p>	
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<p>AR_{B_max}, AR_{B_min}, R_{max}, R_{min}, SS_{B_max} and SS_{B_min} are the maximum and minimum values of all fabric sample groups in all</p> <p>C_2 and C_3 are the weighted values *of AR_{B_ndv}, R_{ndv} and $C_3*SS_{B_ndv}$</p> <p>(AR_B) = absorption rate (R) = one-way transport capability (SS_B) = spreading speed</p>	
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