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TECHNICAL UPDATE: REVIEW OF COMMON WATER VAPOR PERMEABILITY TESTING METHODS

Many outdoor jackets or rainwear may be labeled with functional claims such as waterproof breathable. The shell fabrics may be treated with finishes, coating or lamination to achieve the waterproof breathable function. However, if an improper treatment is applied, it may reduce the breathability and therefore inhibit the evaporation of sweat from skin, which may cause discomfort. There are various methods used to assess the water vapor permeability of textiles. The tables below summarize the common methods and their differences.

COMPARISON OF TESTING METHODS

TESTING METHOD	CHARACTERISTICS OF THE METHODS
ASTM E96	• Cup methods • Upright cup for water permeable fabric • Inverted cup for water impermeable fabric
JIS L 1099	• Cup methods • Upright cup for water permeable fabric • Inverted cup for water impermeable fabric (for single membrane method) • Inverted cup for water permeable or water impermeable fabric (for double membrane method)
ISO 15496	• Cup method • Inverted cup for water permeable or water impermeable fabric (double membrane method)
BS 7209	• Cup method • Only upright orientation • Cup is moving on a turntable
ISO 11092 / ASTM F1868	• Sweating hot plate method • Simulate sweating skin • Commonly applied to water impermeable fabric

WATER VAPOR TRANSMISSION ASTM E96

PROCEDURE	METHOD	CUP ORIENTATION	TEMPERATURE	RELATIVE HUMIDITY
A	Solid Desiccant	Upright	73.4℉ (23 ℃)	50%
B#	Water	Upright	73.4℉ (23 ℃)	50%
BW#	Water	Inverted	73.4℉ (23 ℃)	50%
C	Solid Desiccant	Upright	90 ℉ (32.2 ℃)	50%
D	Water	Upright	90 ℉ (32.2 ℃)	50%
E	Solid Desiccant	Upright	100℉ (37.8 ℃)	90%

(#)More common procedures adopted in the market

WATER VAPOR TRANSMISSION JIS L 1099

PROCEDURE	METHOD	CUP ORIENTATION	TEMPERATURE	RELATIVE HUMIDITY
A-1	Solid Desiccant	Upright	40℃	90%
A-2	Water	Upright	40℃	50%
B1	Liquid Desiccant, Single membrane	Inverted	30℃	/
B2	Liquid Desiccant, Double membrane	Inverted (for water permeable or water impermeable fabric)	30℃	/

WATER VAPOR TRANSMISSION ISO 15496

PROCEDURE	METHOD	CUP ORIENTATION	TEMPERATURE	RELATIVE HUMIDITY
/	Liquid Desiccant, Double membrane	Inverted (for water permeable or water impermeable fabrics)	23℃	/

WATER VAPOR PERMEABILITY (WVP), BS 7209

PROCEDURE	METHOD	CUP ORIENTATION	TEMPERATURE	RELATIVE HUMIDITY
Rotating	Water	Upright	20℃	65%

DIFFERENCES BETWEEN BS 7209 AND OTHER CUP METHODS

	BS 7209	JIS L 1099, ISO 15496, ASTM E96
Testing Result	• WVP index (%) Breathability compared to a control	• WVP (gm/m^2/24hours)
Momentum	Kinetic Motion	Static Motion

DIFFERENCES BETWEEN CUP METHODS AND SWEATING HOT PLATE METHODS

	CUP METHOD	SWEATING HOT PLATE METHOD
Testing Result	• WVP (gm/m^2/24hours) • WVP index (%) for BS 7209	• water vapor resistance (m^{2}Pa/W)
Testing apparatus	Fabric was mounted on a cup with water or desiccant	Fabric in contact with sweating and warm skin (hot plate)

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