Testing of Protective Clothing Material

Test item	**Protection Lite, knitted fabric**
Type	**Protective clothing** **-against heat and flame** **-electrostatic properties**
Customer	**Woolpower AB** **Chaufförvägen 29** **SE-83148 Östersund** **SWEDEN**
Applied method	**EN ISO 11612:2008 and EN 1149-5:2008**

Sanna Karkkula
Senior Specialist

Sanna-Kaisa Katajamäki
Occupational Hygiene Engineer

FINAS
Finnish Accreditation Service
T013 (EN ISO/IEC 17025)

ilac-MRA

1. Description and identification of test item

Tested item: Protection LITE , knitted fabric

60% Merino Wool/ 38% Lenzing FR/ 2% Beltron, 200 g/m^2 (±20g/m^2)

Washing instructions: 

2. Scope of testing

Testing dates: 2014-10-10 - 2014-11-19
The tests were performed at FIOH.

The following tests were carried out:

Requirement		*Test method*
Pre-treatment	EN ISO 11612:2008, 5.2	ISO 6330:2012
Heat resistance (180ºC) - after pre-treatment	EN ISO 11612:2008, 6.2.1	ISO 17493:2000
Limited flame spread -after pre-treatment	EN ISO 11612:2008, 6.3	EN ISO 15025:2000 method A1
Dimensional change	EN ISO 11612:2008, 6.4	ISO 5077:2007
Bursting strength -after pre-treatment	EN ISO 11612:2008, 6.5.3	EN ISO 13938-1:1999
Determination of pH-value -before pre-treatment	EN ISO 11612:2008, 6.9.2	EN ISO 3071:2006
Convective heat -after pre-treatment	EN ISO 11612:2008, 7.2	ISO 9151:1995
Radiation heat, 20 kW/m² -after pre-treatment	EN ISO 11612:2008, 7.3	ISO 6942:2002, method B
Electrical resistance -after pre-treatment	EN 1149-5:2008	EN 1149-3:2005, met 2

2.1 Sampling and conditioning

Receiving date: 2014-09-25

Condition: Intact

Sampling method: The customer supplied material samples.

Conditioning: Samples were conditioned at least 24 hours in an atmosphere having a temperature of (20 ± 2)°C and a relative humidity of (65 ± 5)% before testing unless otherwise specified in testing standard.

2.2 Pre-treatment

Washing parameters:

Washing machine:	Type A washer	Type of detergent:	IEC reference detergent
Washing procedure:	4M, temperature 40°C	Total dry mass:	2 kg
Drying procedure:	Procedure F, tumble dry	Ballast:	Knitted fabric (310 g/m^2)
After drying flat pressing:	No		

Material samples were washed five times and dried after last washing procedure.

3. Test results

3.1 Heat resistance

Dimensions of the specimen: 375 mm x 375 mm
Test temperature: (180±5)°C Time of exposure: 5 min

Material after pre-treatment	Shrinkage warp [%]	Shrinkage weft [%]	Ignition	Melting of dripping	Splitting or delimitation	Other observations
1	1,0	3,4	no	no	no	no
2	0,7	3,7	no	no	no	no
3	0,7	1,7	no	no	no	no
Mean	+0,8	+2,9	no	no	no	no

3.2 Limited flame spread

Surface ignition (code A1)

Specimen after pre-treatment	Afterflame [s]	Afterglow [s]	Flaming to top or either side edge	Flaming, molten debris, hole
1 ↑	0	0	no	no
2 ↑	0	0	no	no
3 ↑	0	0	no	no
4 →	0	0	no	no
5 →	0	0	no	no
6 →	0	0	no	no
Mean	0	0		

3.3 Dimensional change

Washing machine: Type A washer
Washing procedure: 4M, temperature 40°C
Drying procedure: Procedure F, tumble dry
After drying flat pressing: No
Type of detergent: IEC reference detergent
Total dry mass: 2 kg
Ballast: Knitted fabric (310 g/m²)
Amount of samples 1

Pairs of marks	Warp direction before washes (mm)	Warp direction after washes (mm)	Change (%)	Weft direction before washes (mm)	Weft direction after washes (mm)	Change (%)
1	356	350	-1,7	350	360	+2,9
2	360	353	-1,9	354	366	+3,9
3	357	356	-0,3	357	377	+5,6
Mean			-1,3			+3,9

3.4 Bursting strength

Mean bursting: 210 kPa
Mean height at burst: 9,1 mm
The test was subcontracted from another accredited laboratory.

3.5 Determination of pH

Sample before pre-treatment	pH-value
1	7,4
2	7,6
Mean	7,5

3.6 Convective heat

Specimen	HTI t_{24} [s]
1	7,2
2	7,5
3	7,4
Lowest value	7,2

3.7 Radiant heat

Specimen	RHTI t_{24} [s]
1	13,9
2	13,8
3	13,4
Lowest value	13,4

3.8 Electrostatic properties

Conditioning: 23±1°C, relative humidity 25±5% (≥ 24 h)

EN 1149-3 Induction decay method	sample after pre-treatment
Shielding factor S	0,61
Half decay time t_{50} (s)	<0,01

The test was subcontracted from another accredited laboratory.

4. Summary of the test results

Test	Requirement	Result
Heat resistance -after pre-treatment	EN ISO 11612:2008,6.2.1 At (180±5)°C not ignite or melt, shrinkage ≤ 5%	The fabric **meets** the requirement
Limited flame spread, code A1 -after pre-treatment	EN ISO 11612:2008, 6.3 no flaming to the top or either side edge; no flaming or molten debris; afterglow shall not spread, no hole formation Afterflame time ≤ 2s, Afterglow time ≤ 2s	The fabric **meets** the requirement Level of performance: **A1**
Dimensional change	EN ISO 11612:2008, 6.4 ≤ ± 5% both warp and weft	The fabric **meets** the requirement
Bursting strength -after pre-treatment	EN ISO 11612:2008, 6.5.3 ≥ 200 kPa	The fabric **meets** the requirement
Determination of pH -before pre-treatment	EN ISO 11612:2008, 6.9.2 3 < pH value < 9,5	The fabric **meets** the requirement
Convective heat, code B -after pre-treatment	EN ISO 11612:2008, 7.2 Heat Transfer Index HTI 24 [s] B1 4,0-10,0 B2 10,0-20,0 B3 over 20,0	The fabric **meets** the requirement Level of performance: **B1**
Radiation heat, 20 kW/m² -after pre-treatment	EN ISO 11612:2008, 7.3 Radiant Heat Transfers factor RHTI24 [s] C1 7,0-20,0 C2 20,0-50,0 C3 50,0-95,0 C4 over 95,0	The fabric **meets** the requirement Level of performance: **C1**
Electrostatic properties -after pre-treatment	EN 1149-5:2008, 4.2.1 Shielding factor S >0,2 OR Half decay time t50 (s) < 4 s (test method EN 1149-3)	The fabric **meets** both of the requirements

End of test report