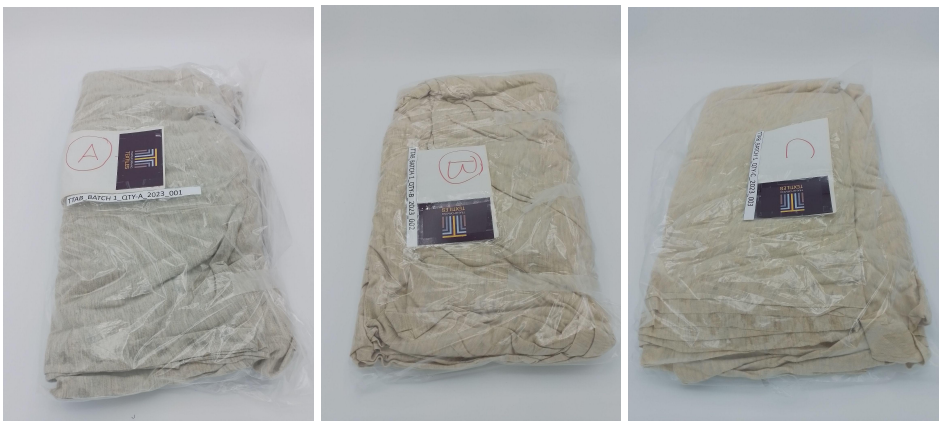
Test report ID 6992

Assignment Measurlabs provided testing services as requested by the customer.

Sample(s) Sampling was performed by the customer.

Sample name	Performed measurements
A - TTAB BATCH 1 QTY-A 2023 001	• Washing and drying procedures EN ISO 6330 • Electrostatic properties EN 1149-2 • Tensile strength and elongation ISO 13934-2 • Dimensional change of textiles as a result of washing and drying (EN ISO 3759, EN ISO 5077, EN ISO 6330) • General appearance after washing (Inhouse method) • Antibacterial activity of textile fabrics, absorption method ISO 20743
B - TTAB BATCH 1 QTY-B 2023 002	
C - TTAB BATCH 1 QTY-C 2023 003	

Photograph of the sample(s)



Samples received 25/07/2023 (dd/mm/yyyy)

Results The results presented on the next page(s) relate to the tested sample(s) only.

On Thursday, 28 September 2023, issued by

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Test results - Electrostatic properties

Methods

Vertical resistance of textiles - EN 1149-2:2000

Testing was performed by an ISO/IEC 17025 accredited external service provider.

Additional information

Device: apparatus for determination of electrostatic properties of fabrics (assembly of electrodes, thermometer 6206).
Applied potential: (10 ± 5) V - before washing and (100 ± 5) V - after washing.
Pre-treatment: washing and drying according to EN ISO 6330: 2022, washing procedure **7N (70±3°C)** and **9N (90±3°C);** drying procedure **F — tumble dry (maximum temperature 80 °C)**; 5 washing cycles.

Number of test specimen: 5

According to an agreement with customer - conditioning according to EN ISO 11611:2015 p.6.10 for 24 h and testing of samples in testing atmosphere: temperature (20±2) °C, relative humidity (85 ±5) %.

Results

The results of vertical resistance are presented as R_V (Ω).

Sample name	Specimen	Before washing/drying	After 5 washing and drying cycles	
			Washing temperature (70±3°C)	Washing temperature (90±3°C)
A - TTAB BATCH 1 QTY-A 2023 001	1	$<2{\cdot}10^3$	$2{,}2{\cdot}10^3$	$8{,}37{\cdot}10^6$
	2	$<2{\cdot}10^3$	$2{,}0{\cdot}10^3$	$9{,}48{\cdot}10^6$
	3	$<2{\cdot}10^3$	$2{,}0{\cdot}10^3$	$7{,}66{\cdot}10^6$
	4	$<2{\cdot}10^3$	$2{,}1{\cdot}10^3$	$8{,}95{\cdot}10^6$
	5	$<2{\cdot}10^3$	$2{,}0{\cdot}10^3$	$7{,}56{\cdot}10^6$
Arithmetic mean		**$2{,}0{\cdot}10^3$**	**$2{,}1{\cdot}10^3$**	**$8{,}40{\cdot}10^6$**
B - TTAB BATCH 1 QTY-B 2023 002	1	$<2{\cdot}10^3$	$6{,}63{\cdot}10^5$	$4{,}75{\cdot}10^6$
	2	$<2{\cdot}10^3$	$4{,}85{\cdot}10^5$	$4{,}62{\cdot}10^6$
	3	$<2{\cdot}10^3$	$3{,}44{\cdot}10^5$	$5{,}81{\cdot}10^6$
	4	$<2{\cdot}10^3$	$4{,}73{\cdot}10^5$	$6{,}23{\cdot}10^6$
	5	$<2{\cdot}10^3$	$6{,}20{\cdot}10^5$	$6{,}01{\cdot}10^6$
Arithmetic mean		**$<2{\cdot}10^3$**	**$5{,}17{\cdot}10^5$**	**$5{,}48{\cdot}10^6$**
C - TTAB BATCH 1 QTY-C 2023 003	1	$<2{\cdot}10^3$	$1{,}70{\cdot}10^5$	$3{,}21{\cdot}10^6$
	2	$<2{\cdot}10^3$	$4{,}86{\cdot}10^5$	$2{,}26{\cdot}10^6$
	3	$<2{\cdot}10^3$	$2{,}25{\cdot}10^5$	$1{,}84{\cdot}10^6$
	4	$<2{\cdot}10^3$	$1{,}70{\cdot}10^5$	$1{,}97{\cdot}10^6$
	5	$<2{\cdot}10^3$	$2{,}27{\cdot}10^5$	$3{,}34{\cdot}10^6$
Arithmetic mean		**$<2{\cdot}10^3$**	**$2{,}56{\cdot}10^5$**	**$2{,}52{\cdot}10^6$**

Test results - Dimensional change

Methods

Dimensional change in washing and drying - ISO 5077: 2008, EN ISO 6330: 2022

Testing was performed by an ISO/IEC 17025 accredited external service provider.

Additional information

Preparation: Marking and measuring according to EN ISO 3759: 2011, p. 6
Number of specimen: for each sample - 2, size (500 x 500) mm
Number of measurements on test specimen: for each sample - 3 in longitudinal and cross directions
Distance between the measurement points: 350 mm
Washing procedure: EN ISO 6330: 2022, washing procedure **7N (70±3) °C**
Apparatus: washing machine WASCATOR FOM71MP'— Lab, type A2
Number of washing cycles: 40
Used detergent: ECE non phosphate reference detergent 98 without optical brightener - reference detergent No. 3 with sodium-perborate tetrahydrate
Total dry mass of the specimens and ballast: (2 ±0,2) kg
The ballast used: 100 % polyester knitted fabric, type III
Drying procedure: EN ISO 6330: 2022, drying procedure **F - tumble dry (maximum temperature 80 °C)**
Apparatus: drying machine WASCATOR T2130, type A1

Conditioning and testing of samples in standard atmosphere: temperature (20±2) °C, relative humidity (65±4) % (according to EN ISO 139: 2006).

Results

The results of dimensional change are presented in unit %.

The average of dimensional change in 40 washing and drying cycles, with uncertainty					
A - TTAB BATCH 1 QTY-A 2023 001		B - TTAB BATCH 1 QTY-B 2023 002		C - TTAB BATCH 1 QTY-C 2023 003	
Longitudinal direction	Cross direction	Longitudinal direction	Cross direction	Longitudinal direction	Cross direction
-19,5 ±1,0	-6,0 ±1,0	-19,5 ±1,0	-6,5 ±1,0	-22,0 ±1,0	-6,0 ±1,0

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, which provides a level of confidence of approximately 95 %.

Test results - Tensile strength

Methods

Maximum force using the grap method (before and after washing) - ISO 13934-2: 2014

Testing was performed by an ISO/IEC 17025 accredited external service provider.

Additional information

Apparatus: universal tensile machine MICRO350/10AX
Gauge length: for each sample -100 mm
Rate of extension: (50±10) mm/min
Pretension: without pretension
Sample width: for each sample -100 mm
Number of test specimen: for each sample -5 in longitudinal direction and 5 in cross direction
Pro-treatment (washing): washing and drying according to EN ISO 6330: 2022, washing procedure **7N (70±3°C)**; drying procedure **F - tumble dry (maximum temperature 80 °C)**; 5 washing cycles

Conditioning and testing of samples in standard atmosphere: temperature (20±2) °C, relative humidity (65±4) % (according to EN ISO 139: 2006).

Results

The results of dimensional change are presented in unit Newton (N).

Specimen	The maximum force (N) - Before washing/drying					
	A - TTAB BATCH 1 QTY-A 2023 001		B - TTAB BATCH 1 QTY-B 2023 002		C - TTAB BATCH 1 QTY-C 2023 003	
	Longitudinal direction	Cross direction	Longitudinal direction	Cross direction	Longitudinal direction	Cross direction
1	200	130	190	160	250	170
2	180	120	190	150	260	160
3	210	120	200	140	240	170
4	190	130	210	150	220	160
5	200	120	200	150	260	160

Specimen	The maximum force (N) - After 5 washing/drying cycles					
	A - TTAB BATCH 1 QTY-A 2023 001		B - TTAB BATCH 1 QTY-B 2023 002		C - TTAB BATCH 1 QTY-C 2023 003	
	Longitudinal direction	Cross direction	Longitudinal direction	Cross direction	Longitudinal direction	Cross direction
1	180	130	180	150	180	170
2	210	120	200	150	200	180
3	160	140	180	150	190	170
4	190	130	190	150	190	170
5	190	120	180	150	200	180

Note: during the test all the specimens had broken near the jaws, therefore according to EN ISO 13934-22014 standard, individual results should be reported.

End of the test report

Test results - Appearance

Methods General appearance after washing - In-house method

Testing was performed by an ISO/IEC 17025 accredited external service provider.

Additional information Treatment (washing): washing and drying according to EN ISO 6330: 2022, washing procedure **7N (70±3°C)**; drying procedure **F — tumble dry (maximum temperature 80 °C); 40 and 47** washing cycles

Results The results of dimensional change are presented as a description.

Sample	General appearance of tested sample after 40 washing and drying cycles	General appearance of tested sample after 47 washing and drying cycles
A - TTAB BATCH 1 QTY-A 2023 001	There is no fiizzing on the surface; surface; No pilling on the surface; Change in colour - grade 4.	There is no fiizzing on the surface; No pilling on the surface; Change in colour - grade 3- 4; Some holes were noted in cross direction of fabric, length of the max hole - 8 mm, many holes were noted on the comer of fabric (across comer).
B - TTAB BATCH 1 QTY-B 2023 002	There is no fiizzing on the surface; surface; No pilling on the surface; Change in colour - grade 4. The openings were noted in cross direction of tested sample.	There is no fiizzing on the surface; No pilling on the surface; Change in colour - grade 3- 4; Some holes were noted in cross direction of fabric, length of the max hole - 40 mm, many holes were noted on the comer of fabric in cross direction.
C - TTAB BATCH 1 QTY-C 2023 003	There is no fuzzing on the There is no fiizzing on the surface; surface; No pilling on the surface; Change in colour - grade 4-5.	There is no fiizzing on the surface; No pilling on the surface; Change in colour - grade 3- 4; Some holes were noted in cross direction of fabric, length of the max hole - 26 mm, many holes were noted on the comer of fabric in cross direction.

Note: the visual assessment of change in colour is made according to the grey scale for assessing change in colour EN 20105-A02:1997. Assessment of change in colour is given from 1 to 5, grade 5 is given only when there is no difference between tested and untested example.

Test results - Antibacterial activity

Methods

Determination of antibacterial activity of textile products. Absorption method - EN ISO 20743:2021-12

Testing was performed by an ISO/IEC 17025 accredited external service provider.

Additional information

Pre-treatment: no treatment
Storage and testing conditions: room temperature
Testing microorganisms: *Staphylococcus aureus* (ATCC 6538), *Klebsiella pneumoniae* (ATCC 4352)

Results

The results of antibacterial activity are presented below in individual tables.

Sample A - TTAB BATCH 1 QTY-A 2023 001

The name of bacteria species (strain number)	**Staphylococcus aureus (ATCC 6538)**	**Klebsiella pneumoniae (ATCC 4352)**
Concentration of inoculum (CFU/ml)	ok. $1,4 \times 10^5$	ok. $2,9 \times 10^5$
The growth on *the control* sample CFU/ml	C_0 - $3,2 \times 10^4$ C_t - $5,4 \times 10^7$	C_0 - $9,7 \times 10^4$ C_t - $6,9 \times 10^8$
The growth on *the control* sample F [log CFU] $F = lg\ C_t - lg\ C_0$	3,22 $lgC_{0:}$ - 4,51 $lgC_{t:}$ - 7,73	3,85 $lgC_{0:}$ - 4,99 $lgC_{t:}$ - 8,84
The growth on the *test sample* CFU/ml	$T_{0:}$ - $4,5 \times 10^4$ $T_{t:}$ - $6,1 \times 10^2$	$T_{0:}$ - $4,0 \times 10^4$ $T_{t:}$ - $<2,0 \times 10^1$
The growth on the *test sample* G [log CFU] $G = lg\ T_t - lg\ T_0$	-1,86 $lgT_{0:}$ - 4,65 $lgT_{t:}$ - 2,79	-3,30 $lgT_{0:}$ - 4,60 $lgT_{t:}$ <1,30
Antibacterial activity value A C_0-T_t >0 $_{K.p.}A = (lg\ C_t - lg\ C_0) - lg\ T_t - lg\ T_0$ C_0-T_t <0 $_{S.a.}A = (lg\ C_t - lg\ C_0) - lg\ T_t - lg\ T_0 = F - G$	**5,08**	**> 7,54**
Measuring method	Plate count method	
Incubation conditions	22h+24h+24h, (37±2)°C	

C_0 - the number of the bacteria colonies received from the control sample after "0" contact time; C_t — the number of the bacteria colonies received from the control sample after "18h + 24h" contact time.

T_0 - the number of the bacteria colonies received from the control sample after "0" contact time; C_t — the number of the bacteria colonies received from the control sample after "18h + 24h" contact time.

Sample B - TTAB BATCH 1 QTY-B 2023 002

The name of bacteria species (strain number)	**Staphylococcus aureus (ATCC 6538)**	**Klebsiella pneumoniae (ATCC 4352)**
Concentration of inoculum (CFU/ml)	ok. $1,4 \times 10^5$	ok. $2,9 \times 10^5$
The growth on *the control* sample CFU/ml	C_0 - $3,2 \times 10^4$ C_t - $5,4 \times 10^7$	C_0 - $9,7 \times 10^4$ C_t - $6,9 \times 10^8$
The growth on *the control* sample F [log CFU] $F = lg\ C_t - lg\ C_0$	3,22 $lgC_{0:}$ - 4,51 $lgC_{t:}$ - 7,73	3,85 $lgC_{0:}$ - 4,99 $lgC_{t:}$ - 8,84
The growth on the *test sample* CFU/ml	$T_{0:}$ - $3,1 \times 10^4$ $T_{t:}$ <$2,0 \times 10^1$	$T_{0:}$ - $1,8 \times 10^4$ $T_{t:}$ - <$2,0 \times 10^1$
The growth on the *test sample* G [log CFU] $G = lg\ T_t - lg\ T_0$	-3,19 $lgT_{0:}$ - 4,49 $lgT_{t:}$ - 1,30	-2,95 $lgT_{0:}$ - 4,25 $lgT_{t:}$ <1,30
Antibacterial activity value **A** C_0-T_t >0 $_{K.p.}A = (lg\ C_t - lg\ C_0) - lg\ T_t - lg\ T_0$ C_0-T_t <0 $_{S.a.}A = (lg\ C_t - lg\ C_0) - lg\ T_t - lg\ T_0 = F - G$	**> 6,43**	**> 7,54**
Measuring method	Plate count method	
Incubation conditions	22h+24h+24h, (37±2)°C	

C_0 - the number of the bacteria colonies received from the control sample after "0" contact time; C_t — the number of the bacteria colonies received from the control sample after "18h + 24h" contact time.

T_0 - the number of the bacteria colonies received from the control sample after "0" contact time; C_t — the number of the bacteria colonies received from the control sample after "18h + 24h" contact time.

Sample C - TTAB BATCH 1 QTY-C 2023 003

The name of bacteria species (strain number)	**Staphylococcus aureus (ATCC 6538)**	**Klebsiella pneumoniae (ATCC 4352)**
Concentration of inoculum (CFU/ml)	ok. 1,4 x 10^5	ok. 2,9 x 10^5
The growth on *the control* sample CFU/ml	C_0 - 3,2 x 10^4 C_t - 5,4 x 10^7	C_0 - 9,7 x 10^4 C_t - 6,9 x 10^8
The growth on *the control* sample F [log CFU] F = lg C_t - lg C_0	3,22 lg$C_{0:}$ - 4,51 lg$C_{t:}$ - 7,73	3,85 lg$C_{0:}$ - 4,99 lg$C_{t:}$ - 8,84
The growth on the *test sample* CFU/ml	$T_{0:}$ - 1,2 x 10^4 $T_{t:}$ - 1,0 x 10^4	$T_{0:}$ - 2,0 x 10^3 $T_{t:}$ - 2,7 x 10^4
The growth on the *test sample* G [log CFU] G = lg T_t - lg T_0	-0,07 lg$T_{0:}$ - 4,07 lg$T_{t:}$ - 4,00	-1,13 lg$T_{0:}$ - 3,30 lg$T_{t::}$ - 4,43
Antibacterial activity value **A** C_0-T_t >0 $_{K.p.}$A= (lg C_t - lg C_0) - lg T_t - lg T_0 C_0-T_t <0 $_{S.a.}$A= (lg C_t - lg C_0) - lg T_t - lg T_0 = F - G	**> 3,73**	**> 4,41**
Measuring method	Plate count method	
Incubation conditions	22h+24h+24h, (37±2)°C	

C_0 - the number of the bacteria colonies received from the control sample after "0" contact time; C_t — the number of the bacteria colonies received from the control sample after "18h + 24h" contact time.

T_0 - the number of the bacteria colonies received from the control sample after "0" contact time; C_t — the number of the bacteria colonies received from the control sample after "18h + 24h" contact time.

Evaluation criteria in accordance with EN ISO 20743:2021 Annex F	
Efficacy of antibacterial property	Growth reduction Antibacterial value A
Low	A < 2
Significant	2 ≤ A < 3
Strong	A ≥ 3

End of the test report