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Necip Fazıl Bulvarı Keyap Sitesi E2 Blok No:44/84 Yukarı Dudullu Ümraniye, İstanbul / TURKEY

TEST REPORT

Report Date:06.05.2020

Report Number: 05-2020-T-081

CLIENT and SAMPLE INFORMATION

TEST OWENER	ÖZBERİM TEKSTİL SANAYİ VE TİCARET LTD. ŞTİ.		
ADDRESS	M. Nesih Özmen Mah. Ladin Sok. No:6 Kat:1 Güngören İSTANBUL / TÜRKİYE		
SAMPLE DESCRIPTION	The device is a white material, one piece coverall incorporating elasticated cuffs, ankles, waist and hood. There is a double action zip at the front of the suit which runs from crotch to the neck and is covered during use by a flap which is sealed onto the suit material by means of integral double side adhesive tape		
BRAND NAME – MODEL	LENASSO – AB-K75000LNS		
CASE NUMBER: Sample Numbers:	PPE-2113		
SAMPLE RECEIVE DATE	06.04.2020	TESTING START DATE	07.04.2020
DISINFECTION INSTRUCTION <i>If applicable</i>	Not given, single use only		
NUMBER OF SAMPLES:	20	SAMPLE IDs:	1 - 20

The results given in this test report belongs to the samples tested. The report content cannot be recreated partially without the written consent of UNIVERSAL CERTIFICATION.


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Director

TEST SCOPE

Referring Product Standard	Test Standard	Test Name
EN 13034:	EN ISO 12947-2	Abrasion Resistance
	EN ISO 9073-4	Trapezoidal Tear Resistance
	EN ISO 13934-1	Tensile Strength
	EN 863	Puncture Resistance
	EN ISO 6530	Repellency to Liquids
	EN ISO 6530	Resistance to Penetration by Liquids
	Modified EN ISO 17491-4	Resistance to Penetration By Liquids In The Form Of A Light Spray (Mist Test)
	EN ISO 13935-2	Seam Strength
EN ISO 13982-1 (Additional Tests Only)	EN ISO 7854, Method B	Compression-Folding Flex Cracking Resistance
	EN ISO 13982-2	Inward Leakage of Aerosols of Solid Particles
EN 14126 (Additional Tests Only)	ISO 16603	Resistance to penetration by contaminated liquids under hydrostatic pressure
	ISO 16604	Penetration by blood and other body fluids-born pathogens. Phi-X174 bacteriophage
	EN ISO 22610	Resistance to penetration by infective agents due to mechanical contact with substances containing contaminated liquids
	EN ISO 22612	Resistance to penetration by contaminated solid particles
EN 1149-5	EN 1149-1	Electrostatic Property - Surface Resistivity
	EN 1149-3	Electrostatic Property - Measurement of Charge Decay



SECTION 1

EN 13034:2005+A1:2009

Protective clothing against liquid chemicals (Type 6)

1. SECTION SUMMARY

TEST STANDARD	TEST NAME	RESULT	EVALUATION
EN ISO 12947-2	Abrasion Resistance	P	Class 4
EN ISO 9073-4	Trapezoidal Tear Resistance	P	Class 2
EN ISO 13934-1	Tensile Strength	P	Class 1
EN 863	Puncture Resistance	P	Class 2
EN ISO 6530	Repellency to Liquids	P	Class 3
EN ISO 6530	Resistance to Penetration by Liquids	P	Class 2
Modified EN ISO 17491-4	Resistance to Penetration By Liquids In The Form Of A Light Spray (Mist Test)	P	-
EN ISO 13935-2	Seam Strength	P	Class 4

2. TEST RESULTS and EVALUATION

2.1 ABRASION RESISTANCE

Test Reference: EN 13034/A1:2009 Clause 4.1 - EN 14325:2018 Protective clothing against chemicals - Test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages

Test Method: EN ISO 12947-2 Annex-B

Martindale Test Machine (47.5±2 rpm) with Lissajous Figure.

9 kPa pressure, Performed in the conditioned room (20±2°C - 65%±4).

RESULT	EVALUATION (See Table 1)
No Abrasion @ 700 revs	Class 4

Determination of the highest number of abrasion rubs which does not cause damage to the material and which shall be used for the performance classification. The abrasion resistance of sample shall be Classified according to the levels of performance given in Table-1 below.

Table 1: Classification of Abrasion Resistance

Class	Number of Rubs
6	> 2.000
5	> 1.000
4	> 400
3	> 100
2	> 40
1	> 10

Lab A



2.2 TRAPEZOIDAL TEAR RESISTANCE

Test Reference: EN 13034/A1:2009 Clause 4.1 - EN 14325:2018 Protective clothing against chemicals - Test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages

Test Method: EN ISO 9073-4:2002

Instron 5969 Speed:100 ±10 mm/min, Gauge length: 5cm

The average results are given for width and length direction of five samples. 2 pre-tension applied

Performed in the conditioned room. (20±2°C - 65% ±4)

	RESULT	EVALUATION (See Table 2)
Width	22.46 N	Class 2
Height	33.22 N	

Table 2: Classification of Trapezoidal Tear Resistance

Class	Tear Strength
6	> 150 N
5	> 100 N
4	> 60 N
3	> 40 N
2	> 20 N
1	> 10 N

Lab A

2.3 TENSILE STRENGTH

Test Reference: EN 13034/A1:2009 Clause 4.1 - EN 14325:2018 Protective clothing against chemicals - Test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages

Test Method: EN ISO 13934-1:2013

Instron 5969 (Load: 50 kN), Strip Method. Speed: 100 mm/min ± 10, Gauge length 200 mm.

Pre-load was not applied. Without wetting samples. The average results are given for width and length direction of five samples.

Performed in the conditioned room. (20±2°C - 65% ±4)

	RESULT	EVALUATION (See Table 3)
Width	43.18 N	Class 1
Height	71.44 N	

Table 3: Classification of Tensile Strength

Class	Tear Strength
6	> 1000 N
5	> 500 N
4	> 250 N
3	> 100 N
2	> 60 N
1	> 30 N

Lab A



2.4 PUNCTURE RESISTANCE

Test Reference: EN 13034/A1:2009 Clause 4.1 - EN 14325:2018 Protective clothing against chemicals - Test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages

Test Method: EN 863:1995

SDL ATLAS M229 tester. Test area: 30.5 mm diameter

Rate of increase in volume; 29 cm³/min.

The average results are given of five samples. Performed in the conditioned room. (20±2°C - 65% ±4)

RESULT	EVALUATION (See Table 4)
28.5 N	Class 2

Table 4: Classification of Puncture Resistance

Class	Tear Strength
6	> 250 N
5	> 150 N
4	> 100 N
3	> 50 N
2	> 10 N
1	> 5 N

Lab A

2.5 REPELLENCY TO LIQUIDS

Test Reference: EN 13034/A1:2009 Clause 4.1 - EN 14325:2018 Protective clothing against chemicals - Test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages

Test Method: EN ISO 6530:2005

When tested in accordance with EN ISO 6530 for repellency to the liquid chemicals given in Table -5, the material shall be classified according to the levels performance in given Table-6 for each chemical tested.

Use those liquids against which protection is required, water is also convenient and safe liquid for general screening purposes. Performed in the conditioned room. (20±2°C - 65% ±4)

For each test liquid, cut six test specimens of (360±2) mm by (235±5) mm from the sample.

Chemicals shall be of analytical purity grade. Discharged the test liquid (10 cm³) within (10±1)s

Table-5 List of reference chemicals for absorption ,penetration and repellency testing

Chemical	Concentration weight %	Temperature of chemical (±2 °C)
Sulfuric Acid (H ₂ SO ₄)	30	20
Sodium Hydroxide (NaOH)	10	20
o-Xylene	Undiluted	20

	RESULT <i>I_R</i>	EVALUATION (See Table 6)
Sulfuric Acid (H ₂ SO ₄)	95.3 %	Class 3
Sodium Hydroxide (NaOH)	95.0 %	Class 3
o-Xylene	90.95 %	Class 3

Table 6: Classification of Repellency to liquids

Class	Repellency Index (<i>I_R</i>)
3	> 90 %
2	> 80 %
1	> 70 %

Lab A

2.6 RESISTANCE TO PENETRATION BY LIQUIDS

Test Reference: EN 13034/A1:2009 Clause 4.1 - EN 14325:2018 Protective clothing against chemicals - Test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages

Test Method: EN ISO 6530:2005

When tested in accordance with EN ISO 6530 for penetration by the liquid chemicals given in Table 5, the material shall be classified according to the levels of performance given in Table 7 for each chemical tested.

Performed in the conditioned room. (20±2°C - 65% ±4)

For each test liquid, cut six test specimens of (360±2) mm by (235±5) mm from the sample.

Chemicals shall be of analytical purity grade. Discharged the test liquid (10 cm³) within (10±1)s

	RESULT <i>I_P</i>	EVALUATION (See Table 7)
Sulfuric Acid (H ₂ SO ₄)	0 %	Class 3
Sodium Hydroxide (NaOH)	0 %	Class 3
o-Xylene	4.23 %	Class 2

Table 7: Classification of Repellency to liquids

Class	Repellency Index (<i>I_P</i>)
3	< 1 %
2	< 5 %
1	< 10 %

Lab A

2.7 SEAM STRENGTH – GRAB METHOD

Test Reference: EN 13034/A1:2009 Clause 4.2.2 - EN ISO 13935-2:2014 Seam tensile properties of fabrics and made-up textile articles - Part 2: Determination of maximum force to seam rupture using the grab method

Test Method: EN ISO 13935-2:2014

Jaw Speed: 50±5 mrnlmin, Gauge Length: 100 mm±1 mm.

Seam Type : 301. 100 %Polyester core-spun sewing-thread was used.

5kN. load was applied. The average results are given for width and length direction of five samples.

Performed in the conditioned room. (20±2°C - 65% ±4)

RESULT	Seam Strength (N)	Fail	EVALUATION (See Table 8)
Sleeve	210 N	FTJ	Class 4
Crotch	190 N	FTJ	
Inner side seam	180 N	FTJ	
Front center seam	190 N	FTJ	
Back ceter seam	200 N	FTJ	

Table 8: Classification of Seam Strength

Class	Repellency Index (<i>I_P</i>)
6	> 500 N
5	> 300 N
4	> 125 N
3	> 75 N
2	> 50 N
1	> 30 N

Lab A



2.8 RESISTANCE TO PENETRATION BY LIQUIDS IN THE FORM OF A LIGHT SPRAY (MIST TEST)

Test Reference: EN 13034/A1:2009 Clause 5.2 - EN ISO EN ISO 17491-4 Test methods for clothing providing protection against chemicals - Part 4: Determination of resistance to penetration by a spray of liquid (spray test)

Test Method: EN ISO EN ISO 17491-4

The test method modified as follows for low-level spray testing conditions:

- The four hydraulic nozzles are hollow cone type nozzles, with a spray testing angle of $(75 \pm 5)^\circ$ at 3 bar, each nozzle supplying liquid rate of $(0,47 \pm 0,05)$ l/min at 300 kPa pressure;
- The liquid used are modified to have a surface tension of $(52,5 \pm 7,5)10^{-3}$ N/m in order to form suitable spray droplets; the test apparatus is carried out with test liquid at the same surface tension.

The manufacturer claims the product for single use. No cleaning instruction was given, no cleaning conducted. The test subject (OK) carried out the seven movement exercise (as given in EN 13034 Clause 5.2) in advance of the mist test.

Performed in the conditioned room. $(20 \pm 2^\circ\text{C} - 65\% \pm 4)$

Undergarments as detailed in ISO 17491-4 and an absorbent suit were worn directly under the test garment.

The device is a white material one piece coverall incorporating elasticated cuffs, ankles, waist and hood. There is a double action zip at the front of the suit which runs from crotch to the neck and is covered during use by a flap which is sealed onto the suit material by means of integral double sided adhesive tape.

The coveralls were taped onto a full face mask, wellington boots and rubber gloves. The wearers were dressed in accordance with the manufacturer's dressing procedures.

Test Results:

In response to the question "does the suit fit", the test subject answered "Yes".

After testing in accordance with the practical movements defined in EN13034 Clause 5.2, the subject could able to do the exercises and no damage was observed on the suit.

Surface tension measurements of the test solution were recorded in the reservoir and at the nozzle before and after testing and these ranged from 50.0 to 51.5Nm-1x10⁻³ and 50.6 to 51.3Nm-1 x10⁻³ respectively.

The temperature measurement in the test chamber before and after testing and these ranged from 19.6 to 20.6°C

A Leakage stain was observed at the right upper waist area on the dosimeter suit of the second suit tested.

No leakage staining was observed on the dosimeter suits of the other two suits tested.

Leakage results in terms of area of leakage stains(s) on the dosimeter suit as a ratio of the calibration stain are shown in the following table;

<u>Suit Number</u>	<u>Calibration of Stain</u> <u>(cm²) (CS)</u>	<u>Total Leakage Stain</u> <u>(cm²) (TLS)</u>	<u>Ratio (TLS / CS)</u>	<u>EVALUATION</u> <u>(Max Allowed Ratio 3)</u>
1	8,42	0	0	Pass
2	8,42	0	0	Pass
3	8,42	0	0	Pass

Lab C

END of SECTION 1



SECTION 2

EN 13982-1:2004+A1:2010

Performance requirements for chemical protective clothing providing protection to the full body against airborne solid particulates

1. SECTION SUMMARY

TEST STANDARD	TEST NAME	RESULT	EVALUATION
EN ISO 7854, Method B	Compression-Folding Flex Cracking Resistance	P	-
EN ISO 13982-2	Inward Leakage of Aerosols of Solid Particles	P	-

2. TEST RESULTS and EVALUATION

2.1 FLEX CRACKING RESISTANCE

Test Reference: EN 13982-1/A1:2010 Clause 4.1 - EN 14325:2018 Protective clothing against chemicals - Test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages

Test Method: EN ISO 7854, Method B

Test Equipment: Flexometer

Test condition: (20 ± 2) °C , (65 ± 5) %RH

Sample size: 105x50mm

No. of sample: 6

No. of cycles: 100000

Mobile disk frequency: (8.3 ± 0.4) Hz compression pulse per minute

Stroke length of mob. disk: (11.7 ± 0.35)mm

Test results:

The test results obtained are given in the tables as follows

Max direction longitudinal	Result
Lowest value after 100.000 cycles	1-2 null
Max direction longitudinal	Result
Lowest value after 100.000 cycles	1-2 null

0- any deterioration, 1- slight deterioration, 3- moderated deterioration, 4- severe deterioration

Depth of cracking:

Null-no cracks,

A-surface or finish crack, not exposing the cellular or middle layer

B-cracking into but not right through the middle layer

C-cracking through the base fabric

D-cracking right the material

Lab A



2.2 INWARD LEAKAGE OF AEROSOLS OF SOLID PARTICLES

Test Reference: EN 13982-1/A1:2010 Clause 4.3.2 - EN 14325:2018 Protective clothing against chemicals - Test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages

Test Method: EN ISO 12947-2 Annex-B

Martindale Test Machine (47.5±2 rpm) with Lissajous Figure.

9 kPa pressure, Performed in the conditioned room (20±2°C - 65%±4).

Test Purpose:

This test method is used to determine the barrier efficiency of chemical protective clothing against aerosols of dry, fine dusts.

Sampling method:

At least 5 test subjects are involved, each testing 2 suits. So at least 10 suits are tested.

The device is a white material one piece hooded coverall incorporating elasticated ankles, waist, hood and wrists.

There is a double action zip at the front of the suit which runs from the crotch to the neck and is covered during use by a flap which is sealed onto the suit material by means of double sided tape.

Testing methods used:

Test agent: Sodium Chloride aerosol

Test conditions:

Temperature and relative humidity measurements were recorded in the test chamber before and after each test and these ranged from 24.5 to 27.4°C and 47.1 to 59.6%, respectively

Test Equipment:

Aerosol Test Chamber.

Test Procedure:

This test is performed using "real people" and is designed to simulate everyday use. The garment is donned according to the manufacturers' instructions, including any protective equipment.

Prior to entering the test chamber the test subject (real person) is asked to repeat the following sequence of movements 3 times at what is termed "normal working speed";

- 1) Kneel on both knees, lean forward and place both hands on the floor 45cm in front of the knees. Crawl forward on hands and knees over a distance of 3m and crawl backwards again over the same distance
- 2) Stand with feet shoulder width apart, arms at side. Raise arms until they are parallel to the floor in front of the body. Squat down as far as possible.
- 3) Kneel on right knee, place left foot on floor with left knee bent 90°, left arm hanging loosely at side. Raise left arm fully overhead. Once they have completed these movements the suit is inspected visually for tears or rips in the fabric, seams, closures or connections to gloves, boots or mask (if any). Any damage is mentioned in the test report, but the test would be discontinued if the damage was significant or hindered the test subjects' movement.

On entering the test chamber the test subject is asked to perform various test exercises in sequence. These are;

- 1) standing still
- 2) walking at 5 km/h
- 3) continuous squatting at a frequency of five squats per minute, between standing up straight and knees completely bent, while keeping both hands during all squats on a grip at a height of 1m (+/-0.05m) above the standing surface.
- 4) A 3 min rest is allowed (standing still) between the walking and squatting exercises.

Throughout the process various measurements are taken on the concentration of particulates inside and outside of the suit. A calculation is then used to ascertain the inward leakage during each test and the total inward leakage of particles into the suit.

The physical dimensions of the wearers are shown below;



Wearer	Height (cm)	Chest (cm)	Suit size
KL	180	113	XL
BK	178	100	XL
CK	179	102	XL
MF	183	109	XL
AZ	179	103	XL

Test results: The test results obtained are given in the tables as follows

Result-1) Aerosol Inward leakage (%) individual results

wearer	position	knee	waist	chest	average
KL	stand	1,158	1,754	1,266	1,393
	walk	1,766	1,757	1,349	1,624
	squat	14,940	14,659	15,549	15,049
	average	5,955	6,057	6,055	6,022
KL	stand	1,112	1,551	2,021	1,561
	walk	1,460	1,369	2,250	1,693
	squat	15,466	15,646	16,646	15,919
	average	6,013	6,189	6,972	6,391
BK	stand	1,216	2,150	2,694	2,020
	walk	2,050	2,394	2,665	2,370
	squat	12,156	18,110	16,156	15,474
	average	5,141	7,551	7,172	6,621
BK	stand	1,840	1,464	2,510	1,938
	walk	1,994	2,030	2,316	2,113
	squat	13,549	20,649	14,660	16,286
	average	5,794	8,048	6,495	6,779
CK	stand	2,020	1,151	0,942	1,371
	walk	2,240	1,751	1,964	1,985
	squat	17,959	16,644	15,666	16,756
	average	7,406	6,515	6,191	6,704
CK	stand	1,956	1,751	1,974	1,894
	walk	2,250	2,050	2,151	2,150
	squat	15,784	17,646	14,594	16,008
	average	6,663	7,149	6,240	6,684
MF	stand	1,656	1,255	1,879	1,597
	walk	1,949	2,054	2,150	2,051
	squat	17,649	15,640	18,640	17,310
	average	7,085	6,316	7,556	6,986
MF	stand	1,955	1,266	2,010	1,744
	walk	2,649	2,060	2,494	2,401
	squat	19,646	15,640	18,664	17,983
	average	8,083	6,322	7,723	7,376
AZ	stand	2,065	2,054	2,650	2,256
	walk	2,694	2,540	2,679	2,638
	squat	17,649	17,646	16,949	17,415
	average	7,469	7,413	7,426	7,436
AZ	stand	1,680	2,650	1,950	2,093
	walk	2,078	2,664	2,412	2,385
	squat	14,646	17,060	19,613	17,106
	average	6,135	7,458	7,992	7,195

Signature

Result-2) Total Inward leakage (%) (overall average, all wearers)

position	knee	waist	chest	average
stand	1,666	1,705	1,990	1,787
walk	2,113	2,067	2,243	2,141
squat	15,944	16,934	16,714	16,531
average	6,574	6,902	6,982	6,819

Result-3) Total Inward leakage per test object

wearer	average
KL	6,207
BK	6,700
CK	6,694
MF	7,181
AZ	7,316
average	6,819

Assessment of compliance:

EN ISO 13982-1 specifies the requirements and classes of type 5 suits as:

When tested in accordance with EN ISO 13982-2 the type 5 protective clothing shall be characterized by the following parameters:

Ljmn,82/90 : 90

LjmlL 82/90: the inward leakage value (in percent), equal to or superior to 82/90 (91.1%) of all IL values measured (all exercises, all sampling positions, all suits); TILS8/10: the "total inward leakage per suit" value, equal or superior to 80% of all TILS-values.

Type 5 chemical protective clothing shall meet at least the following requirements: IL 82/90

For this suit, all of the IL results are less than 30% and all of the TILS are less than 15%. The sample complies with the requirements of EN ISO 13982-1 for inward leakage of aerosol of solid.

Lab C

END of SECTION 2

SECTION 3

EN 14126:2003/AC:2004

Protective clothing - Performance requirements and tests methods for protective clothing against infective agents

1. SECTION SUMMARY

TEST STANDARD	TEST NAME	RESULT	EVALUATION	
ISO 16603	Resistance to penetration by contaminated liquids under hydrostatic pressure	P	Class 2	See Results
ISO 16604	Penetration by blood and other body fluids-born pathogens. Phi-X174 bacteriophage	P	-	See Results
EN ISO 22610	Resistance to penetration by infective agents due to mechanical contact with substances containing contaminated liquids	P	Class 1	See Results
EN ISO 22612	Resistance to penetration by contaminated solid particles	P	Class 2	See Results



2. TEST RESULTS and EVALUATION

2.1 RESISTANCE TO PENETRATION BY CONTAMINATED LIQUIDS UNDER HYDROSTATIC PRESSURE

Test Reference: EN 14126/AC:2004 Clause 4.1.4.1 - ISO 16603:2004 Determination of the resistance of protective clothing materials to penetration by blood and body fluids — Test method using synthetic blood

Test Purpose:

This test method is used to determine the resistance of protective clothing materials to penetration by blood and body fluids - test method using synthetic. This is a test conducted using synthetic blood, which establishes at what pressure the liquid will pass through the test material.

Sampling method:

3 samples used in this test. Sample size: 75x75mm

Testing methods used:

Time and pressure control: Procedure D used. 5 minutes each sample pressure tested.

Test conditions:

Min. 24hr, temperature of $(21 \pm 5) ^\circ\text{C}$ and a relative humidity of air of $(60 \pm 10) \%$.

Test Equipment:

Penetration test cell.

Test Procedure:

ISO 16603 uses synthetic blood in a simple visual penetration test to estimate the pressure at which strike through is likely to occur in ISO 16604. Testing to ISO 16604 can then proceed at this pressure as a starting point.

Test results:

The test results obtained are given in the tables as follows

No. of Sample	Hydrostatic pressure	Result	Evaluation (See Table 9)
1.sample	0 kPa	Pass	Class 1
2.sample	0 kPa	Pass	Class 1
3.sample	0 kPa	Pass	Class 1
1.sample	1.75 kPa	Pass	Class 2
2.sample	1.75 kPa	Pass	Class 2
3.sample	1.75 kPa	Pass	Class 2
1.sample	3.5 kPa	Fail	X
2.sample	3.5 kPa	Fail	X
3.sample	3.5 kPa	Fail	X
1.sample	7 kPa	Fail	X
2.sample	7 kPa	Fail	X
3.sample	7 kPa	Fail	X

*Pass: The sample resist to penetration and synthetic blood doesn't pass through the fabric

*Fail: The sample doesn't resist to penetration and synthetic blood pass through the fabric

Table 9: Classification of resistance to penetration by contaminated liquids under hydrostatic pressure (ISO 16604)

Class	Hydrostatic pressure at which the material passes the test
6	20 kPa
5	14 kPa
4	7 kPa
3	3,5 kPa
2	1,75 kPa
1	0 kPa

Lab B

2.2 DETERMINATION OF RESISTANCE OF PROTECTIVE CLOTHING MATERIALS TO PENETRATION BY BLOOD-BORNE PATHOGENS

Test Reference: EN 14126/AC:2004 Clause 4.1.4.1 - ISO 16604:2004 Determination of resistance of protective clothing materials to penetration by blood-borne pathogens — Test method using Phi-X 174 bacteriophage

Test Purpose: This test method is used to determine the resistance of protective clothing materials to penetration by blood and body fluids - test method using synthetic. This test is conducted using synthetic blood, which establishes at what pressure the liquid will pass through the test material.

Sampling method: 3 samples used in this test. Sample size: 75x75mm

Testing methods used:

Time and pressure control: Procedure D used. 5 minutes each sample pressure tested.

Penetration survey method is Plaque-forming units (PFU)

Name of test microorganism: Bacteriophage Phi-X 174

Test conditions:

Min. 24hr, temperature of $(21 \pm 5) ^\circ\text{C}$ and a relative humidity of air of $(60 \pm 10) \%$.

Test Equipment: Penetration test cell.

Test Procedure: It can be clearly seen that only the ISO 16604 test uses a contaminant – a bacteriophage (that is, a virus that parasitises a bacteria by infecting it, in this case Phi X174, selected, according to the standard, for its small size) – that is considerably smaller than the Coronavirus now filling the news. The other tests use bacteria considerably larger than Coronavirus. Thus, ISO 16604 is the only test providing a clear indication of effective resistance to penetration of that size of infectious agent.

It also describes a laboratory test method used to measure the resistance of the materials used in protective clothing to penetration by blood-borne pathogens using a surrogate microbe with continuous liquid contact. Protective clothing either passes or fails depending on whether viral penetration at a specific hydrostatic pressure can be detected.

Test results:

The test results obtained are given in the tables as follows

No. of Sample	Hydrostatic pressure	Result
1.sample	3.5 kPa	Pass
2.sample	3.5 kPa	Pass
3.sample	3.5 kPa	Pass
Negative control(PE 10µm)		Pass
Positive control		Fail

***Pass:** The sample resists to penetration and synthetic blood doesn't pass through the fabric

***Fail:** The sample doesn't resist to penetration and synthetic blood passes through the fabric

Pre-test bacteriophage titer: 4.5E+008 PPU/ml

Post-test bacteriophage titer: 4.5E+008 PPU/ml

Lab B



2.3 RESISTANCE TO PENETRATION BY INFECTIVE AGENTS DUE TO MECHANICAL CONTACT WITH SUBSTANCES CONTAINING CONTAMINATED LIQUIDS

Test Reference: EN 14126/AC:2004 Clause 4.1.4.2 – EN ISO 22610:2006 Test method to determine the resistance to wet bacterial penetration

Test Purpose:

This test method is designed to determine a material's resistance to penetration of bacteria in a liquid.

Sampling method:

Five pieces 25 cm x 25 cm or with a diameter of 25 cm shall be randomly cut under aseptic conditions from the material to be tested.

Testing methods used:

Testing time: 5 steps of 15 minutes

S. aureus strain, ATCC 29213, is cultured 18 to 24 h at (36 ± 1) °C on tryptic soy agar.

Culture medium: Nutrient agar

Donor material: Polyurethane membrane; 30 µm

Distance from agar surface to brim of petri dish: 3mm

Concentration of test suspension: 2.9×10^4 CFU/ml

Test conditions:

Min. 24hr, temperature of (20 ± 2) °C and a relative humidity of air of (65 ± 5) %.

Test Equipment:

The turntable consists of three parts:

- the motor compartment;
- the agar plate holder;
- the finger holder arm.

Test Procedure:

The material to be tested is put on a lidless agar plate, on a rotating disk on top of the test specimen, a piece of donor material and a piece of approximately 10 µm thick HD polyethylene film of corresponding size is placed and materials are fixed using a double steel ring. An abrasion resistant finger is placed on top of the donor material to exert a specified force on the donor and test specimen to bring them into contact with the agar.

The finger is applied to the material by a pivoted lever moved by an excenter cam in such a way that it moves over the entire surface of the plate within 15 minutes. The assemblage of materials is stretched by the weight of the steel ring so that only a small area of the test specimen is brought into contact with the agar surface at a time. Due to the combined effect of rubbing and liquid migration bacteria may spread from the donor material through the test specimen down to the agar surface.

After 15 minutes of testing, the agar plate is replaced and the test repeated. Within five periods of 15 minutes each, tests are performed with the same pair of donor material and test specimen. In that way the test allows for an estimation of the penetration over time. Finally the bacterial contamination on the test specimen is estimated using the same technique. The agar plates are incubated to visualise the bacterial colonies, which are then enumerated. The results are processed in accumulated form to characterize the barrier capability and penetration kinetics of the material.



Test results:

The test results obtained are given in the tables as follows

	Interval (Min)	n° colonies 1st sample	n° colonies 2nd sample	n° colonies 3rd sample	n° colonies 4th sample	n° colonies 5th sample	average
Petri dish 1 (X1)	0-15	19	16	17	14	20	17,2
Petri dish 2 (X2)	15-30	21	17	23	21	20	20,4
Petri dish 3 (X3)	30-45	28	23	22	26	21	24
Petri dish 4 (X4)	45-60	30	28	29	26	24	27,4
Petri dish 5 (X5)	60-75	42	44	52	46	27	42,2
Petri dish 6 (ref. Z)		142	158	149	160	165	154,8
T		282	286	292	293	277	286
b (EPP)		4,71	4,89	4,79	4,87	4,85	4,82

Legend

b (EPP) = Barrier index

$b (EPP) = 6 - (CUM1 + CUM2 + CUM3 + CUM4 + CUM5)$

where

$CUM1 = X1/T$

$CUM2 = (X2 + X1) / T$

$CUM3 = (X3 + X2 + X1) / T$

$CUM4 = (X4 + X3 + X2 + X1) / T$

$CUM5 = (X5 + X4 + X3 + X2 + X1) / T$

$T = Z + X1 + X2 + X3 + X4 + X5$

X1, X2, X3, X4, X5: number of colonies on the five plates from one of five samples

Z = number of colonies from the top side (plate nr. 6 reference)

Item	Unit	Result	Evaluation See Table 10
Breakthrough time	min	$T < 15$	Class 1

Table 10: Classification of resistance to penetration by infective agents due to mechanical contact with substances containing contaminated liquids

Class	Breakthrough time, t, min
6	$t > 75$
5	$60 < t \leq 75$
4	$45 < t \leq 60$
3	$30 < t \leq 45$
2	$15 < t \leq 30$
1	$\leq 15 \text{ min}$



Lab B

2.4 Resistance to penetration by contaminated solid particles.

Test Reference: EN 14126/AC:2004 Clause 4.1.4.4 – EN ISO 22612:2005 Test method for resistance to dry microbial penetration

Test Purpose:

This test method is designed to determine a material's resistance to penetration by biologically contaminated powders.

Sampling method:

Ten samples material tested, Sample size: 200x200mm

Testing methods used:

Test time: 30 minutes

Spores of Bacillus subtilis, ATCC 9372, Culture medium: TGE agar

Test conditions:

Min. 24hr, temperature of (20 ± 2) °C and a relative humidity of air of (65 ± 5) %.

Test Equipment:

Vibrating apparatus

Test Procedure:

To measure the barrier against contaminated dust, the test materials is pre-sterilised and then fixed into the test apparatus and dosed with contaminated (Bacillus Subtilis) talcum powder. An agar culture plate is located underneath. The test apparatus is agitated or shaken. The particles which penetrate the material are cultured and counted after incubation of the agar plate and a non-contaminated test specimen is run as a control. The results (mean values from 10 single results at a given time) are measured in penetration log units

Test results:

The test results obtained are given in the tables as follows

No. of Sample	Unit	Result
1.sample	CFU	12,0
2.sample	CFU	17,0
3.sample	CFU	16,0
4.sample	CFU	14,0
5.sample	CFU	9,0
6.sample	CFU	11,0
7.sample	CFU	10,0
8.sample	CFU	18,0
9.sample	CFU	19,0
10.sample	CFU	13,0
Average	CFU	13,9
No. of Sample	Unit	Result
1.sample	Log10 CFU	1,1
2.sample	Log10 CFU	1,2
3.sample	Log10 CFU	1,2
4.sample	Log10 CFU	1,1
5.sample	Log10 CFU	1,0
6.sample	Log10 CFU	1,0
7.sample	Log10 CFU	1,0
8.sample	Log10 CFU	1,3
9.sample	Log10 CFU	1,3
10.sample	Log10 CFU	1,1
Average	Log10 CFU	1,1
Talcum Concentration	CFU/g	7.7E+007



Classified as Class 2 See Table 11

Table 11: Classification of resistance to penetration by contaminated solid particles

Class	Penetration (log cfu)
3	≤ 1
2	$1 < \log \text{cfu} \leq 2$
1	$2 < \log \text{cfu} \leq 3$

Lab B

END of SECTION 3



SECTION 4

EN 1149-5:2018

Electrostatic properties - Part 5: Material performance and design requirements

1. SECTION SUMMARY

TEST STANDARD	TEST NAME	RESULT	EVALUATION
EN 1149-1	Test method for measurement of surface resistivity	P	See Results

2. TEST RESULTS and EVALUATION

2.1 ELECTROSTATIC PROPERTY - SURFACE RESISTIVITY

Test Reference: EN 1149-5:2018 – EN 1149-1 Test method for measurement of surface resistivity

Test procedure:

The sample is placed on an insulating base plate, then placed the group of electrodes on the sample, apply a continuous stream and measure the resistance of the sample

Requirements: Geometric mean of surface resistance shall be less than or equal to $2,5 \times 10^9 \Omega$, on at least one surface tested.

Test results:

The test results obtained are given in the tables as follows

Electric Surface Resistance (Ohm)							
Sample 1	Test 1	Test 2	Test 3	Test 4	Test 5	Geometric Mean	Evaluation
1.sample	$3,4 \cdot 10^8 \Omega$	$4,4 \cdot 10^8 \Omega$	$3,4 \cdot 10^8 \Omega$	$2,4 \cdot 10^8 \Omega$	$3,1 \cdot 10^8 \Omega$	$3,27 \cdot 10^8 \Omega$	Pass
3.sample	$5,9 \cdot 10^8 \Omega$	$3,6 \cdot 10^8 \Omega$	$3,2 \cdot 10^8 \Omega$	$3,0 \cdot 10^8 \Omega$	$6,9 \cdot 10^8 \Omega$	$4,26 \cdot 10^8 \Omega$	Pass

Lab C

END of SECTION 4

LABORATORY INFORMATION

Code	Laboratory Name	Competency Explanations
Lab A	EKOTEKS LABORATUVAR ve GÖZETİM HİZMETLERİ A.Ş.	Laboratory holds an accreditation by Turkish Accreditation Agency with number AB-0583-T according to EN ISO/IEC 17025:2017.
Lab B	ÇEVRE ENDÜSTRİYEL ANALİZ LABORATUVAR HİZM. TİC. A.Ş.	Laboratory holds an accreditation by Turkish Accreditation Agency with number AB-0363-T according to EN ISO/IEC 17025:2017.
Lab C	UNIVERSAL SERTİFİKASYON VE GÖZETİM HİZMETLERİ TİC. LTD. ŞTİ.	Internal Laboratory Services



- The laboratories are contracted bodies with UNIVERSAL CERTIFICATION and the technical competence of the laboratories is also under supervision / assessment of UNIVERSAL CERTIFICATION based on the provisions of EN ISO/IEC 17065 Requirements for bodies certifying products, processes and services standard.
- Each test result given in this test report shown with the issuing laboratory code.

- Rapor Sonu -

