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TEST REPORT n. 221.I.2305.547.EN.01

AT THE REQUEST OF:

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CONCERNING:

SAMPLE:	**FINISHING PROCESSES ON DIFFERENT SUBSTRATES**
TEST:	**SEVERAL SURFACE RESISTANCE TEST**

SAMPLES RECEPTION DATE:	**16/03/2023**
TESTING STARTING DATE:	**23/03/2023**
TESTING FINISHING DATE:	**26/04/2023**

Document digitally signed by legal electronic signature.

THIS REPORT CONSISTS OF 14 CONSECUTIVELY NUMBERED PAGES.

The samples object of test in this report will remain at AIDIMME for a period of one month starting from the report issue date. That period having expired, they will be destroyed. Hence, any verification must be made within this time limit.

1. DESCRIPTION AND IDENTIFICATION OF THE SAMPLE. INSPECTION BEFORE TESTING.

Samples of different materials with pigmented finish. The samples are referenced by the customer as:

- Rotomolded polyethylene lacquered WHITE 3101
- Rotomolded polyethylene lacquered BLACK 3102
- Extrusion aluminum lacquered WHITE 5001
- Extrusion aluminum lacquered BLACK 5002
- Injection polypropylene lacquered WHITE 3101
- Stainless steel lacquered WHITE

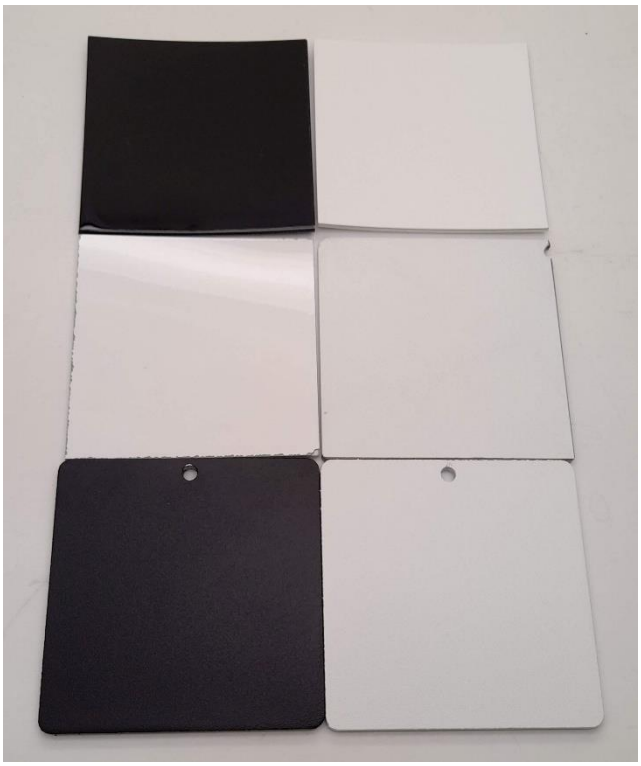


Image 1. Example of samples received at AIDIMME's laboratory.

2. ORIGIN OF THE SAMPLE

Sample supplied by the customer.

3. TESTS REQUESTED

- Resistance to scratching.
- Resistance to cold liquids: commonly used products and cleaning products.
- Adhesion

4. STANDARD TEST METHOD

Test methods are carried out according to the standards:

➢ Resistance to cold liquids	EN 12720
➢ Resistance to scratching	EN 15186, method B
➢ Cross cut adhesion	EN ISO 2409

5. DESCRIPTION OF THE TEST METHOD

RESISTANCE TO COLD LIQUIDS AND CLEANING PRODUCTS

On the test sample, drops of the staining liquids are placed directly on the surface to be tested (see table of results).

Once covered with glass Petri dishes, they are kept at room temperature for 1 hour (time equivalent according to standard to the removal or cleaning after a meal or similar) and for 16 hours (time equivalent according to standard to the removal or cleaning the next day as soon as possible). At the end of the different contact periods, the remains of the test liquid are removed with filter paper without rubbing. It is then kept for 16-24 hours at room temperature.

At the end of this period the test surface is washed with the cleaning solution and then with distilled water and dried with an absorbent cloth.

After 30 minutes, it is examined under different angles, evaluating the possible discolorations, changes of brightness or colour, and other defects produced according to the evaluation of the following table:

Description	Assessment
No change. Test area indistinguishable from adjacent surrounding area	5
Slight change. Test area distinguishable from adjacent surrounding area, only when the light source is mirrored on the test surface and is reflected towards the observer's eye, e. g. discoloration, change in gloss and colour. No change in the surface structure, e.g., swelling, fibre raising, cracking, blistering.	4
Moderate change. Test area distinguishable from adjacent surrounding area, so visible from several viewing anglers, e. g. discoloration, change in gloss and colour. No change in the surface structure, e.g., swelling, fibre raising, cracking, blistering	3
Significant change. Test area clearly distinguishable from adjacent surrounding area, so visible from any angle of view, e. g. discoloration, change in gloss and colour, and / or structure of the surface slightly changed, e.g., swelling, fibre raising, cracking, blistering	2
Strong change. The surface structure has clearly changed, and / or discoloration, change brightness and colour, and / or surface material is removed in whole or in part, and / or polyamide fibre cloth has been attached to the surface.	1

RESISTANCE TO SCRATCHING

Scratch resistance is the minimum load applied to a diamond tip, of radius of curvature (0.090 ± 0.003) mm and conicity (90 ± 1) °, that produces a visible scratch mark on at least six of the 8 grids of the standardized evaluation template.

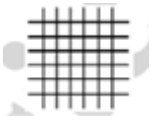
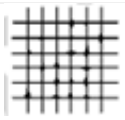
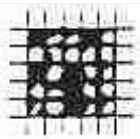
Any visible scratch mark is considered including gloss variations. The scratch resistance is expressed in Newtons.

The test is started by making two marks with a load of 5 N separated from each other by 1 mm to 2 mm. The procedure is repeated on the same specimen decreasing the load by 0.5 N up to 2.0 N. If no visible mark is observed, then 0.2 N load decreases up to 1 N and 0.1 N below 1 N are applied.

After 24 hours the sample is assessed in a standardized cabinet. The result is expressed in Newtons, and the type of damage that occurs (variation of brightness, plastic deformation, breakage, etc.) is indicated.

ADHESION. CROSS CUT TEST.

Two perpendicular sets of 6 parallel cuts are carried out on the test sample by a standardized tool. Each two adjacent cuts are separated 2mm. The cuts have to arrive to the substrate, without penetrating in it. The surface is assessed according to the description in the following table:

Description		Rating
The edges of the cuts are completely smooth; none of the squares of the lattice is detached.		0
Detachment of small flakes of the coating at the intersections of the cuts. A cross-cut area not greater than 5% is affected.		1
The coating has flaked along the edges and/or at the intersections of the cuts. A cross-cut area greater than 5%, but not greater than 15%, is affected.		2
The coating has flaked along the edges of the cuts partly or wholly in large ribbons, and/or it has flaked partly or wholly on different parts of the squares. A cross-cut area greater than 15%, but not greater than 35%, is affected.		3
The coating has flaked along the edges of the in large ribbons and/or some squares have detached partly or wholly. A cross-cut area greater than 35%, but not greater than 65%, is affected.		4
Any degree of flaking that cannot even be classified by classification 4.	--	5

6. TEST RESULTS

- SAMPLE: Rotomolded polyethylene lacquered WHITE 3101

Test	Standard	RESULT	
Cold liquid resistance (assessment)	EN 12720	1 hour	16 hours
Coffee		5	4
Tea		5	4
Acetone		3	3
Ethanol 48%		5	5
Ethanol 96%		5	4
Soap solution		5	5
Butyl Acetate		4	4
Water		5	5
Ammonia for cleaning (commercial product, 100 ml/10 l)		5	4
Bleach (commercial product, 40 g active chlorine/litre)		5	4
Vinegar for cleaning (undiluted)		5	4
DISICLIN multi-surface disinfectant		5	5
SANYTOL multipurpose disinfectant		5	5
VIAKAL		5	4
KH7 degreaser		5	4
GLASSEX multipurpose		5	5
TENN multi-surface with bio alcohol		5	5
Resistance to scratching (N)	EN 15186. Method B	0,4	
Adhesion (assessment)	EN ISO 2409	0	

- SAMPLE: Rotomolded polyethylene lacquered BLACK 3102

Test	Standard	RESULT	
Cold liquid resistance (assessment)	EN 12720	1 hour	16 hours
Coffee		5	4
Tea		5	4
Acetone		3	2
Ethanol 48%		5	3
Ethanol 96%		5	1
Soap solution		5	5
Butyl Acetate		3	3
Water		5	5
Ammonia for cleaning (commercial product, 100 ml/10 l)		5	4
Bleach (commercial product, 40 g active chlorine/litre)		5	4
Vinegar for cleaning (undiluted)		5	4
DISICLIN multi-surface disinfectant		5	5
SANYTOL multipurpose disinfectant		5	5
VIAKAL		5	4
KH7 degreaser		5	3
GLASSEX multipurpose		5	4
TENN multi-surface with bio alcohol		5	4
Resistance to scratching (N)	EN 15186. Method B	0,4	
Adhesion (assessment)	EN ISO 2409	0	

- SAMPLE: Extrusion aluminum lacquered WHITE 5001

Test	Standard	RESULT	
Cold liquid resistance (assessment)	EN 12720	1 hour	16 hours
Coffee		5	5
Tea		5	5
Acetone		1	1
Ethanol 48%		5	5
Ethanol 96%		5	5
Soap solution		5	5
Butyl Acetate		1	1
Water		5	5
Ammonia for cleaning (commercial product, 100 ml/10 l)		5	5
Bleach (commercial product, 40 g active chlorine/litre)		5	5
Vinegar for cleaning (undiluted)		5	5
DISICLIN multi-surface disinfectant		5	5
SANYTOL multipurpose disinfectant		5	5
VIAKAL		5	5
KH7 degreaser		5	5
GLASSEX multipurpose		5	5
TENN multi-surface with bio alcohol		5	5
Resistance to scratching (N)	EN 15186. Method B	3,5	
Adhesion (assessment)	EN ISO 2409	0	

- SAMPLE: Extrusion aluminum lacquered BLACK 5002

Test	Standard	RESULT	
Cold liquid resistance (assessment)	EN 12720	1 hour	16 hours
Coffee		5	5
Tea		5	5
Acetone		1	1
Ethanol 48%		5	5
Ethanol 96%		5	5
Soap solution		5	5
Butyl Acetate		1	1
Water		5	5
Ammonia for cleaning (commercial product, 100 ml/10 l)		5	5
Bleach (commercial product, 40 g active chlorine/litre)		5	5
Vinegar for cleaning (undiluted)		5	5
DISICLIN multi-surface disinfectant		5	5
SANYTOL multipurpose disinfectant		5	5
VIAKAL		5	5
KH7 degreaser		5	5
GLASSEX multipurpose		5	5
TENN multi-surface with bio alcohol		5	5
Resistance to scratching (N)	EN 15186. Method B	2,0	
Adhesion (assessment)	EN ISO 2409	0	

- SAMPLE: Injection polypropylene lacquered WHITE 3101

Test	Standard	RESULT
Resistance to scratching (N)	EN 15186. Method B	0,4
Adhesion (assessment)	EN ISO 2409	0

- SAMPLE: Stainless steel lacquered WHITE

Test	Standard	RESULT
Resistance to scratching (N)	EN 15186. Method B	2,0
Adhesion (assessment)	EN ISO 2409	0

Image 2. Chemical attack of acetone and 96% ethanol, after 16 hours of contact, on the black lacquered polyethylene sample. The same effect is produced on the white sample, but it is more disguised.

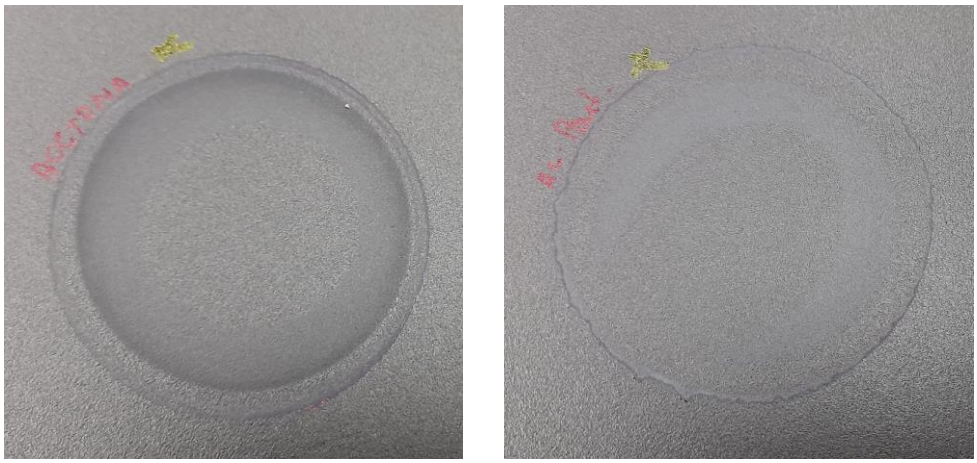


Image 3. Chemical attack of acetone and ethyl acetate on the black lacquered aluminum sample. The same effect is observed on the white sample, but it is more disguised.

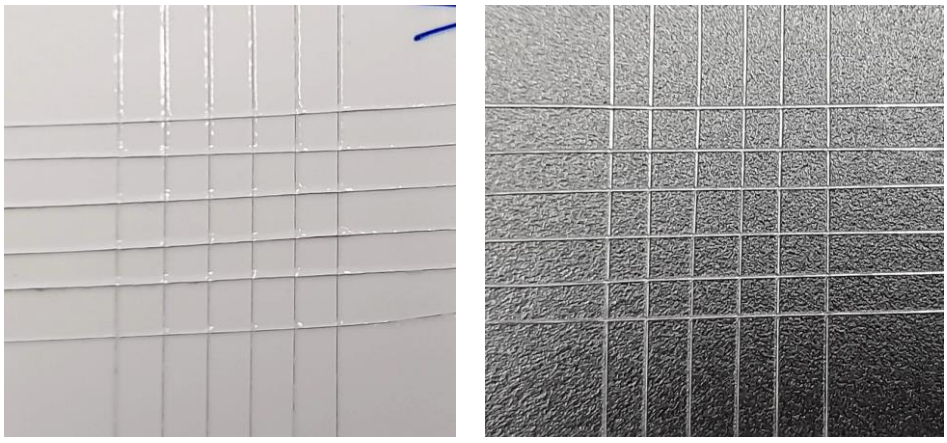


Image 4. Adhesion by cross-cutting. Left, white lacquered polyethylene sample. Right, black lacquered aluminium sample. The same behaviour is observed in all the samples.

Image 5. White lacquered aluminium sample. Circular scratch. Applied loads (N), increasing from inside to outside: 5 -4,5 – 4 – 3,5 – 3 - 2,5 – 2 (N).

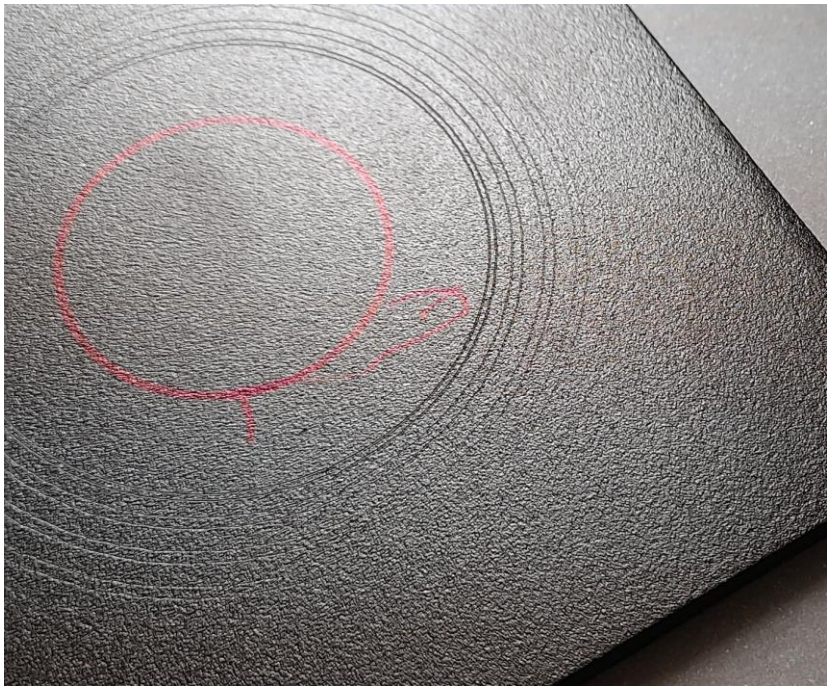


Image 6. Black lacquered aluminium sample. Circular scratch. Applied loads (N), increasing from inside to outside: 4 – 3 - -2,5 – 2 – 1,5 - 1 (N).

Image 7. Black lacquered polyethylene sample. Circular scratches. Applied loads (N) increasing from inside to outside: 1,6 – 1,4 – 1,2 – 1 – 0,8 - 0,6 - 0,4 - 0,3 (N). The same effect is observed in the white lacquered polyethylene and propylene sample.

Image 8. White lacquered stainless-steel sample. Circular scratches. Applied loads (N) increasing from inside to outside.: 3,5 – 3 - 2,5 – 2 – 1,5 – 1 (N).

The results of the tests apply only to the tested samples.

Date: 4th May, 2023

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