

# Surface resistance tests.

## A statistical analysis of the pass/fail events.

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**W**hich are the most critical of the surface resistance tests? Is there a trend or a correlation between the fail events, the type of surface treatment and the substrate material? In this article we show a statistical analysis of the surface tests carried out in our lab in a period of 12 months comparing the results with the pass/fail requirements of the IKEA specifications.

In this article we present the results of 6966 surface resistance tests conducted in our lab in a period of 12 months. The tests included in this study are listed in Table 1, where an overview of the fail percentage of each test is shown. The pass/fail criteria are specified in the IOS-MAT 0066 AA-163938-II for surface resistance tests, and in the IOS-MAT-0135 for yellowing of knots in softwoods.

Test method	N° of tests performed	N° of tests potentially failed	% potential failure
EN 12720 - cold liquids	3022	346	11,4
IOS-TM 0002/2 - fat on scratches on wood substrates	1275	35	2,7
EN 12722 - dry heat	810	28	3,5
IOS-TM 0002/4 - colour fastness to rubbing on wood substrates	570	2	0,35
IOS-TM 0002/20 - micro-scratching	283	50	17,7
IOS-TM 0002/21 - impact	183	18	9,8
IOS-TM 0002/1 - scratch on metal substrates	166	13	7,8
IOS-TM 0002/3 - colour fastness to rubbing on metal substrates	129	14	10,9
EN 12721 - wet heat	106	10	9,4
IOS-TM 0002/19 - adhesion by scratch-plane testing	95	25	26,3
EN 438 - abrasion	80	4	5
IOS-TM 0002/13 - crazing	79	0	0
IOS-TM 0002/11 - damp and friction	9	1	11,1
IOS-TM 0002/10 - abrasion and fat	4	0	0
IOS-MAT-0135 - yellowing of knots	155	43	27,7

Table 1.

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In order to investigate on the possible correlation between the type of surface treatment, the substrate material and the pass/fail result, we made a statistical analysis of the pass/fail events for each type of material tested. The following categories of materials were considered:

Category	Materials
coated wood, veneer	solid wood and veneers coated with clear or pigmented lacquers
coated panels	PB, LDF , MDF, and HDF
lacquered or printed	carte, melamina e laminati applicati su pannello
paper coverings	melamine, paper foils and laminate, applied on panel
polymeric coverings	PS, PP, PMMA, PET and ABS, applied on panel or loose foils

For each relevant combination of test and material the potential pass/fail percentages are shown in the following graphics.

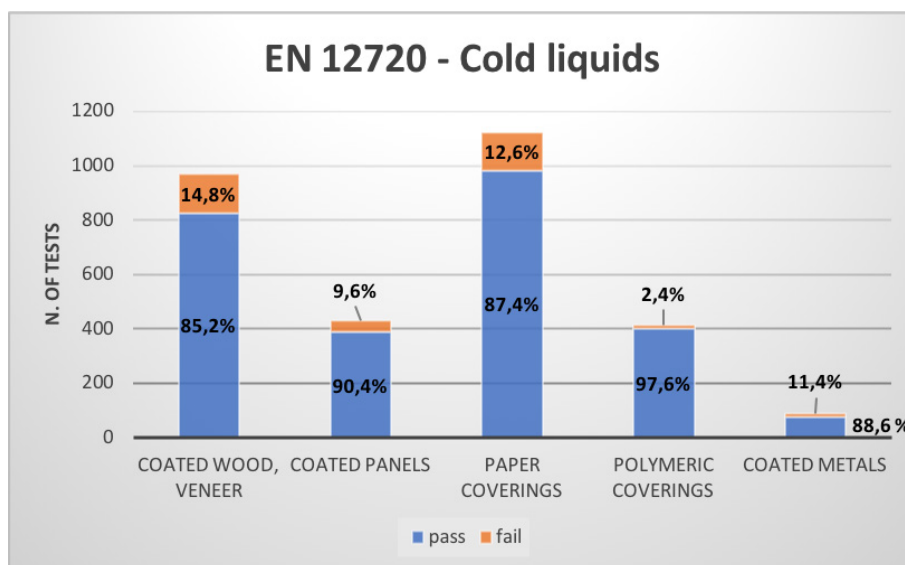


Fig. 1 EN 12720 Cold liquids. The fail percentage would be within the range 9,6 to 14,8 for all materials except the polymeric coverings, that scored a much lower 2,4% failure on test.

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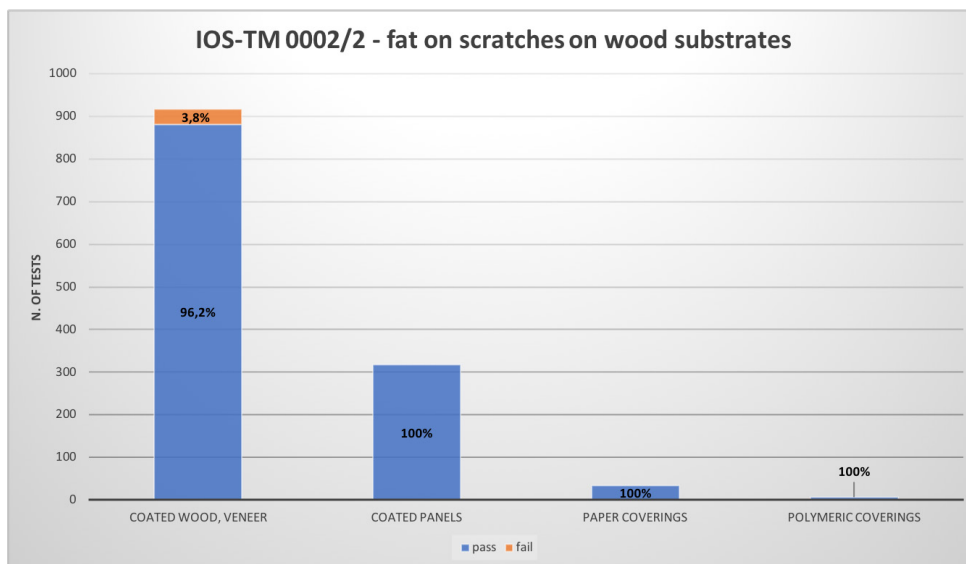


Fig. 2 IOS-TM 0002/2 Fat on scratches on wood substrates. The only potential failures occurred in coated wood/veneers, which represent the large majority of the samples tested, whereas all coated panels and all types of coverings would pass the test. It is important to point out that the test procedure and the pass/fail criteria are different for clear lacquered wood compared to all the other types of materials, in that the spread of fat is visible, and hence considered in the assessment, only for clear lacquered wood, whereas for the other materials the width of the scratch is the only valid criterion. All the fail events were related to clear lacquered wood/veneer samples.

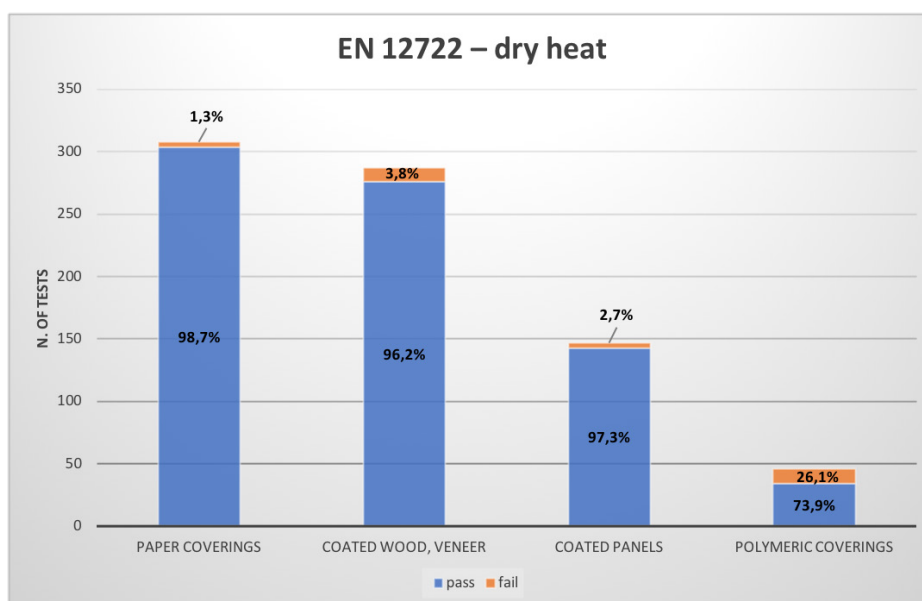


Fig. 3 EN 12722 Dry heat. The test was performed at 70 °C or 160 °C, depending on the resistance class required. The highest potential fail percentage (26%) was recorded for polymeric coverings tested at 70 °C, generally due to slight structural changes of the surface. The very few fail events on paper coverings would occur in laminates tested at 160 °C. Coated wood/veneer and coated panels were tested only at 70 °C, resulting in a fairly low percentage of potential failure.

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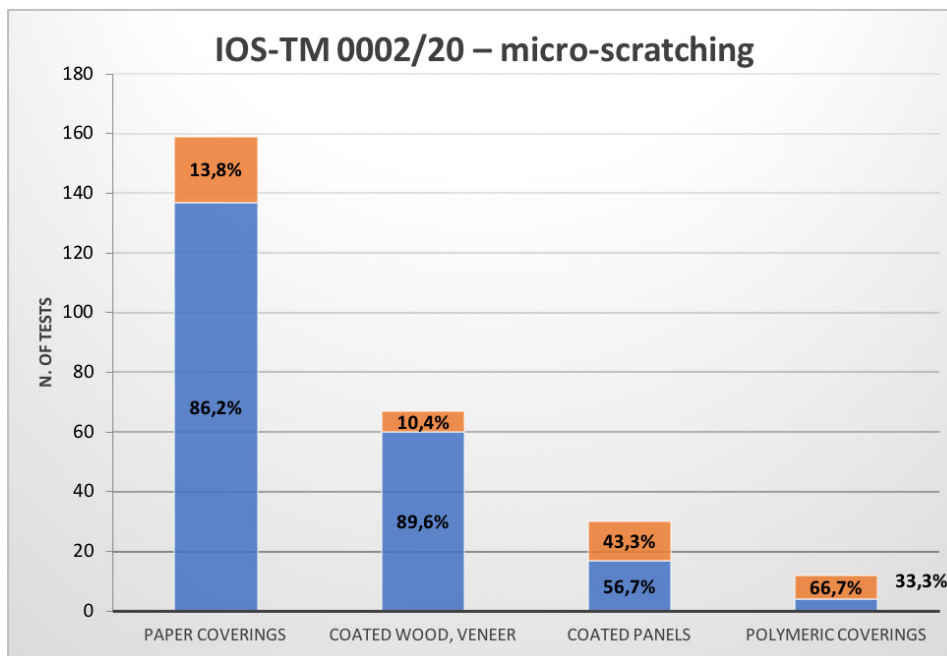


Fig. 4 IOS-TM 0002/20 Micro-scratching. The most critical materials are the polymeric coverings, with high gloss surfaces accounting for the highest potential fail percentage. Also critical were the coated panels (43,3% fail), whereas much lower fail percentages could be recorded with paper coverings and coated wood/veneers.

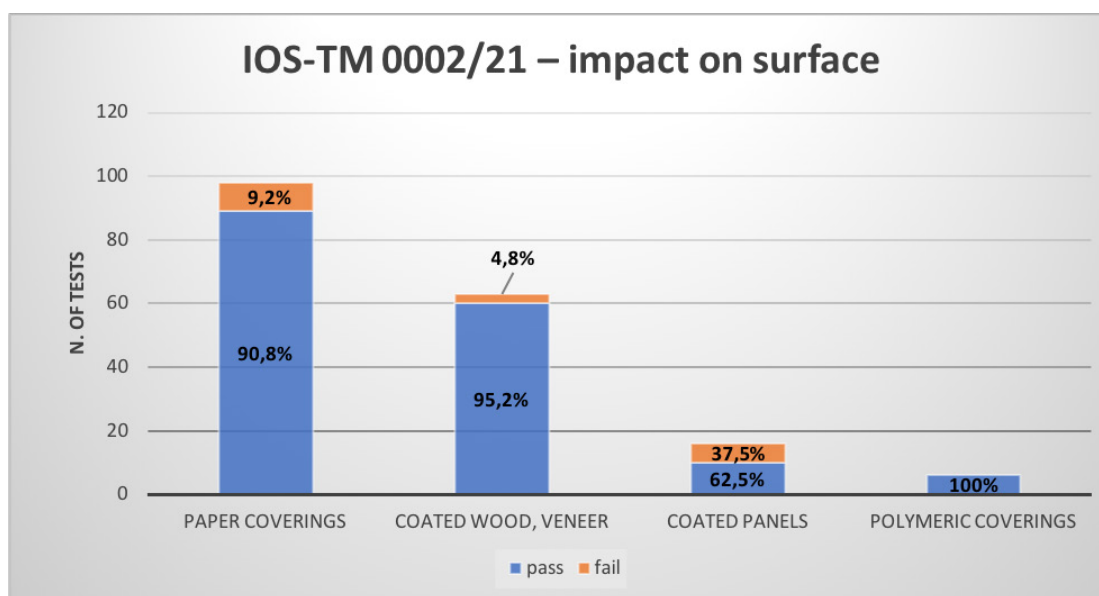


Fig. 5 IOS-TM 0002/21 Impact on surface. The highest fail percentage was calculated with coated panels, while a significantly lower figure was found with paper coverings and coated wood.

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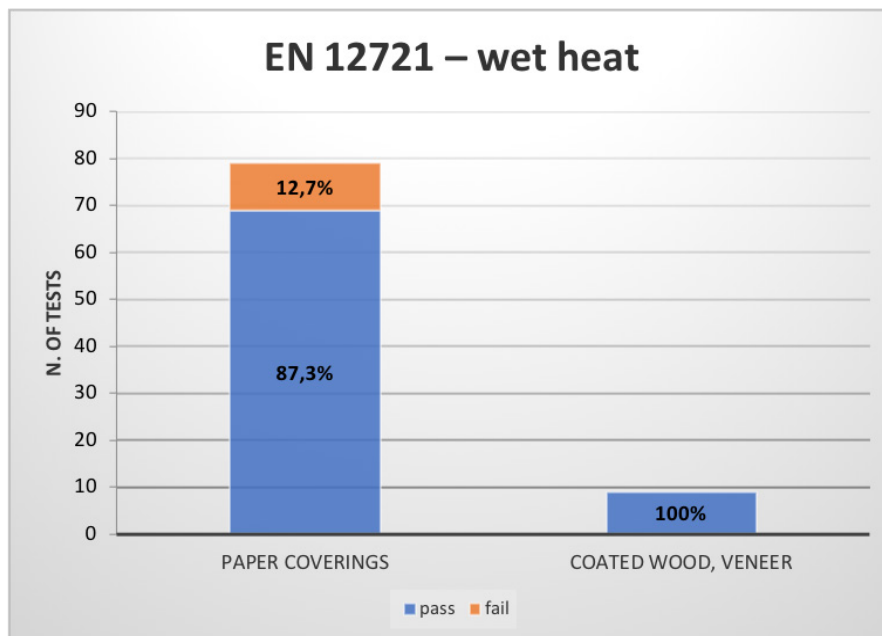


Fig. 6 EN 12721 Wet heat. This test is only applicable to worktops in class R1 and office furniture in class P1 accounting for 12,7% failure within the paper coverings category, whilst no fails were recorded for coated wood/veneer in the monitored period.

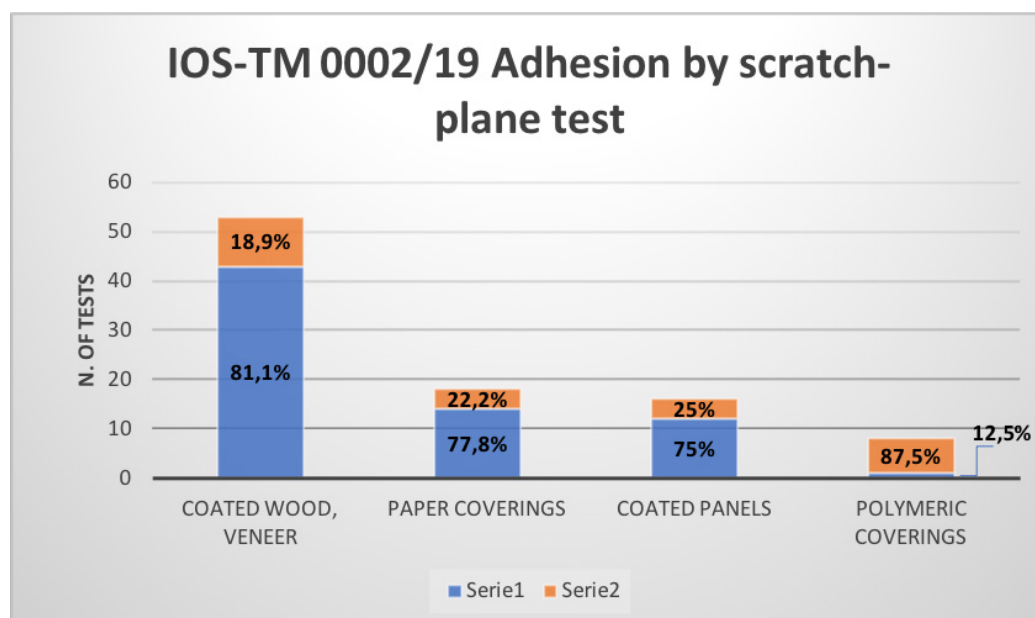


Fig. 7 IOS-TM 0002/19 Adhesion by scratch-plane test. The test proved highly critical for polymeric coverings, which potentially failed in 87,5% of cases. However, the test was quite critical for all materials considered, with fail percentages ranging from 19 to 25%.

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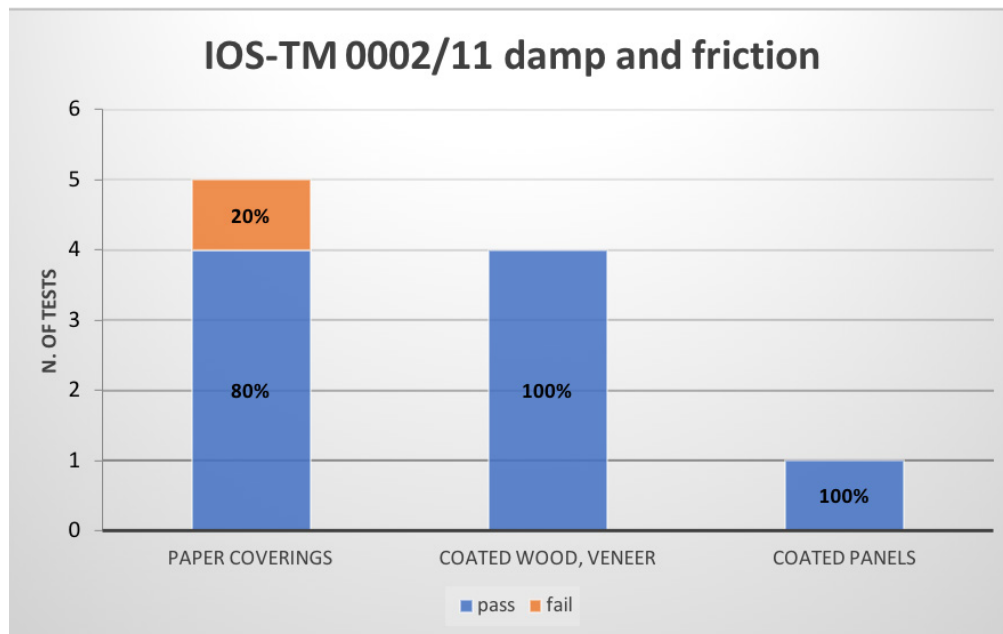


Fig. 8 IOS-TM 0002/11 Damp and friction. The test was requested only seldom, with only one fail event recorded for a melamine faced board.

All other surface resistance tests are applicable to only one type of material and their results are summarized in Table 1. These are:

Test method	Category of material
IOS-TM 0002/4 - colour fastness to rubbing on wood substrates	Coated wood
IOS-TM 0002/1 - scratch on metal substrates	Coated metals
IOS-TM 0002/3 - colour fastness to rubbing on metal substrates	Coated metals
EN 438 - abrasion	Paper coverings
IOS-TM 0002/13 - crazing	Paper coverings
IOS-TM 0002/10 - abrasion and fat	Coated wood
IOS-MAT-0135 - yellowing of knots	Softwood

A detailed statistical analysis of yellowing of knots was presented in a previous issue of CATAS Newsletter (09. XI.2018).

Tests on edges, which are covered by other IOS specifications, will be presented in a future issue.

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