BELGIAN BUILDING RESEARCH INSTITUTE
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All tests in this report are executed according to the ISO 9001 certified Quality management system of the BBRI.

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TEST REPORT

Laboratory	BUILDING CHEMISTRY	**O/References**	DE-CH-0198 CH-20-079-02 PAGE 1/11

Requested by	AKZO NOBEL PAINTS BELGIUM NV/SA *Mevr. Goetstouwers* Everst Office Park – Leuvensesteenweg 248B B-1800 Vilvoorde		
Date of the order	23.04.2020	**Samples registration**	S2020-20-31
		Date of reception of samples	16.04.2020
Date of issue of the report	11.03.2021		
Test carried out	**Resistance to liquids, scratch resistance**		
References	*NBN EN 13442 (2013), NBN EN ISO 1518-2 (2019)*		

Disclaimer
The laboratory is not responsible for the accuracy and completeness of the information provided by the customer and taken over in this report. The sampling was not carried out by the laboratory and thus the results of this report apply only to the sample as received by the laboratory. The equivalence between the tested product covered by this report and the commercialised product lies entirely under the responsibility of the requestor.

This test report contains 11 pages. This test report may only be reproduced in its entirety. Each page of the original report has been stamped (in red) by the laboratory and initialled by the head of laboratory.

- ☐ *No sample*
- ☐ *Sample(s) subjected to destructive test*
- ☑ *Sample(s) to be removed from our laboratories 30 calendar days after sending of the report, save in the case of a further written request*

Technical responsible of the tests	Responsible in charge of the tests	Head of laboratory
		
Julien Delaet	Emmanuel Cailleux	Pascale Steenhoudt

1. INTRODUCTION

At the request of the company Akzo Nobel Paints Belgium NV/SA, the BBRI laboratory "Building Chemistry" has carried out characterization tests on different types of wood paints. *Table 1* below describes the tests performed.

Table 1: List of the tests carried out.

Test	Standard	Criteria / class
Resistance to liquids	NBN EN 13442 (2013)	non mentioned
Scratch resistance	NBN EN ISO 1518-2 (2019)	non mentioned

2. SAMPLES

Date of reception of the sample at BBRI: 16.04.2020
Conditioning after reception: Climate chamber regulated at a temperature of 23±2°C and at a relative humidity of 50±5%
Description: See *table 2.*

Table 2: Description of the received samples provided by the requestor.

Laboratory number of the product (BBRI reference)	Description	Received quantity	Application tool	WB/SB*
DE-CH-0198-A-1	*Akzonobel product - XY Werkbladolie – WC LB WR AC INT P09300509600*	2.5 l	brush & cloth	WB
DE-CH-0198-A-2	*Colorless oil for worktops (Werkbladolie)*	0.5 l	brush & cloth	SB
DE-CH-0198-A-3	*Oil for worktops – natural color (Werkbladolie)*	0.75 l	brush & cloth	SB
DE-CH-0198-A-4	*Akzonobel product - XY Parketvernis Natuurlijk effect – invisible – 11.03.2020*	1 l	roller	WB
DE-CH-0198-A-5	*Colorless parquet varnish*	0.75 l	roller	WB
DE-CH-0198-A-6	*Colorless parquet varnish ultra Mat*	0.5 l	roller	WB

* WB: water based / SB: solvent based

On requestor demand, not all the tests, summarized in *table 1*, were performed on all the paints. The tables below give an overview of the tests carried out on each paint and the corresponding sample numbers.

Table 3: Tests performed on wood paints and their sample numbers

Laboratory number of the product	Reference of the samples used for each test	
	Determination of the resistance to liquids*	Determination of the scratch resistance
DE-CH-0198-A-1	DE-CH-0198-A-RL-1	/
DE-CH-0198-A-2	DE-CH-0198-A-RL-2	/
DE-CH-0198-A-3	DE-CH-0198-A-RL-3	/
DE-CH-0198-A-4	DE-CH-0198-A-RL-4	DE-CH-0198-A-RS-4
DE-CH-0198-A-5	DE-CH-0198-A-RL-5	DE-CH-0198-A-RS-5
DE-CH-0198-A-6	DE-CH-0198-A-RL-6	DE-CH-0198-A-RS-6

* three chemical agents were tested

3. SAMPLE PREPARATION

3.1. Test substrates

Table 4 describes the substrates used for each test.

Table 4: Substrates used for the tests

Test	Standard	Substrate		
		type	dimensions	minimum amount for each paint
Resistance to liquids	NBN EN 13442	oak panels	37,5 x 7,5 cm²	3
Scratch resistance	NBN EN ISO 1518-2	oak panels	15 x 7,5 cm²	3

3.2. Paint application

The paints to be tested were applied by BBRI on the substrates mentioned in *table 4*.

For the determination of the resistance to liquids, one wood substrate of dimensions 37,5x7,5x2 cm³ was used for each configuration (one paint and one staining agent).

For the scratch resistance tests, each paint was applied on two wood pieces of dimensions 37,5x7,5x2 cm³ which were cut afterwards to obtain four samples of 15 cm long. The paints were applied by brush and cloth or by roller according to the recommendations of the requestor.

The data received from the requestor concerning the application of the paints are summarized in *table 5*. The test piece numbers, the execution date and the amounts of product applied are mentioned in *tables 6 and 7*.

Execution conditions: in the laboratory with a temperature of 23 ± 2 °C and a relative humidity of 50 ± 5 %.

Application method: according to the recommendations of the requestor

Conditioning after application: in a climatic chamber with a temperature of 23 ± 2 °C and a relative humidity of 50 ± 5 %.

Table 5: *Data received from the requestor concerning the application of the paints*.

Laboratory number of the product	Number of layers	Spread rate [m²/l]	Wet paint density [kg/l]
DE-CH-0198-A-1	2	15	1.038
DE-CH-0198-A-2	2	20	0.862
DE-CH-0198-A-3	2	12-15	0.90
DE-CH-0198-A-4	2 – 3	12	1.054
DE-CH-0198-A-5	2	12	1.042
DE-CH-0198-A-6	2 - 3	13	1.02

Table 6: Amount of paint applied per test specimen – Test of resistance to liquids.

Laboratory number of the product	Sample number	Layer 1		Layer 2	
		Date	*Quantity [g]*	*Date*	*Quantity [g]*
DE-CH-0198-A-1	DE-CH-0198-A-RL-1-o	28.05.2020	2.06	29.05.2020	1.88
	DE-CH-0198-A-RL-1-c		1.95		1.93
	DE-CH-0198-A-RL-1-e		2.03		2.07
DE-CH-0198-A-2	DE-CH-0198-A-RL-2-o	28.05.2020	1.26	29.05.2020	1.09
	DE-CH-0198-A-RL-2-c		1.24		1.08
	DE-CH-0198-A-RL-2-e		1.24		1.13
DE-CH-0198-A-3	DE-CH-0198-A-RL-3-o	28.05.2020	1.90	29.05.2020	1.29
	DE-CH-0198-A-RL-3-c		1.81		1.62
	DE-CH-0198-A-RL-3-e		1.88		1.39
DE-CH-0198-A-4	DE-CH-0198-A-RL-4-o	28.05.2020	2.56	29.05.2020	1.64
	DE-CH-0198-A-RL-4-c		2.58		1.73
	DE-CH-0198-A-RL-4-e		3.27		1.71
DE-CH-0198-A-5	DE-CH-0198-A-RL-5-o	28.05.2020	2.32	29.05.2020	1.87
	DE-CH-0198-A-RL-5-c		2.52		1.99
	DE-CH-0198-A-RL-5-e		2.48		1.77
DE-CH-0198-A-6	DE-CH-0198-A-RL-6-o	28.05.2020	2.22	29.05.2020	1.71
	DE-CH-0198-A-RL-6-c		2.53		1.65
	DE-CH-0198-A-RL-6-e		2.51		2.28

Table 7: *Wood paints* - Amount of paint applied per test specimen – Test of scratch resistance.

Laboratory number of the product	Sample number	Layer 1		Layer 2	
		Date	*Quantity [g]*	*Date*	*Quantity [g]*
DE-CH-0198-A-4	DE-CH-0198-A-RS-4-A	29.05.2020	2.13	02.06.2020	1.53
	DE-CH-0198-A-RS-4-B		1.97		1.64
	DE-CH-0198-A-RS-4-C		1.85		1.65
DE-CH-0198-A-5	DE-CH-0198-A-RS-5-A	29.05.2020	2.39	02.06.2020	2.33
	DE-CH-0198-A-RS-5-B		2.35		2.19
	DE-CH-0198-A-RS-5-C		2.32		2.46
DE-CH-0198-A-6	DE-CH-0198-A-RS-6-A	29.05.2020	2.17	02.06.2020	2.11
	DE-CH-0198-A-RS-6-B		1.99		2.02
	DE-CH-0198-A-RS-6-C		1.88		1.91

4. DESCRIPTIONS OF THE TESTS PERFORMED AND RESULTS

4.1. Resistance to liquids

4.1.1. Test description

The test was carried out according to NBN EN 13442. The tested staining agents were distilled water, coffee, and olive oil. Recommendations concerning the formulation and characteristics of staining agents are given in the standard NBN EN 13442.

Three tests were executed for each paint and each staining agent (*Photo 1*). To perform the test, a small piece of filter paper was immersed in the staining agent for 30 seconds, and quickly placed on the test area. The paper was then covered with a petri dish (*Photo 2 & Photo 3*). After 24 hours of contact, the petri dish and piece of paper were removed with tweezers. Subsequently the excess of the staining agents was removed by applying an absorbent paper without rubbing. The samples were left to dry for a period of 16 to 24 hours in dust free environment. Hereafter, the test surface was cleaned by rubbing it with an absorbent paper or cloth soaked in a cleaning solution and following with absorbent paper soaked in distilled water. The reference samples, without cleaning agents, were cleaned in the same way. After 30 minutes, the remaining stains were separately observed by 2 observers under direct and diffuse light.

The test areas have been rated by comparison with the reference area according to the following numerical rating code:

5	No visible changes (no damage)
4	Slight change in gloss level and colour visible only when the light source is mirrored in the test surface on or quite near the mark and is reflected towards the observer's eye, or a few isolated marks just visible.
3	Slight mark, visible in several viewing directions; for example, almost the complete shape of the filter paper is just visible.
2	Strong mark, the structure of the surface being however largely unchanged.
1	Strong mark, the structure of the surface being changed, or the surface material being totally or partially removed or the filter paper adhering to the surface.

Photo 1: the six types of wood paint with the coffee stain agent under a petri dish

Photo 2: detail of the water stain agent applied on the test surfaces

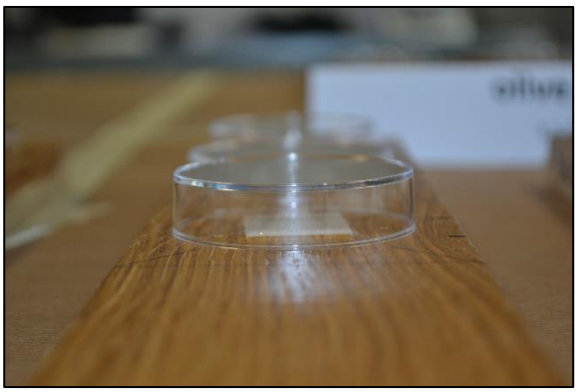

Photo 3: detail of the paper with olive under a petri dish

4.1.2. Test results

Execution date: from 29th June 2020 to 1 July 2020
Test conditions: in a laboratory conditioned at a temperature of 23 ± 2 °C and a relative humidity of 50 ± 5 %

The tables below show the results of the observations by two observers of the possibly remaining stain after cleaning. The observations were made under direct as under diffuse light. The average was calculated and rounded for all the observations of one type of staining agent per lighting conditions. *Photo 4* to *photo 6* give an overview of the obtained results for the three test agents.

Table 8: The results of the observations of the stains for the wood paint DE-CH-0198-A-1

DE-CH-0198-A-RL-1							
Test Agent		**Water**		**Coffee**		**Olive oil**	
Lighting		*Direct*	*Diffuse*	*Direct*	*Diffuse*	*Direct*	*Diffuse*
Observer 1	***Stain n° 1***	5	5	5	5	5	5
	Stain n° 2	5	5	5	5	5	5
	Stain n° 3	5	5	5	5	5	5
Observer 2	***Stain n° 1***	5	5	5	5	5	5
	Stain n° 2	5	5	5	5	5	5
	Stain n° 3	5	5	5	5	5	5
Average		**5**	**5**	**5**	**5**	**5**	**5**

Table 9: The results of the observations of the stains for the wood paint DE-CH-0198-A-2.

DE-CH-0198-A-RL-2							
Test Agent		**Water**		**Coffee**		**Olive oil**	
Lighting		*Direct*	*Diffuse*	*Direct*	*Diffuse*	*Direct*	*Diffuse*
Observer 1	***Stain n° 1***	2	2	5	5	3	3
	Stain n° 2	2	2	5	5	3	3
	Stain n° 3	2	2	5	5	3	3
Observer 2	***Stain n° 1***	2	3	5	5	3	3
	Stain n° 2	2	3	5	5	3	3
	Stain n° 3	2	3	5	5	3	3
Average		**2**	**3**	**5**	**5**	**3**	**3**

Table 10: The results of the observations of the stains for the wood paint DE-CH-0198-A-3.

DE-CH-0198-A-RL-3							
Test Agent		**Water**		**Coffee**		**Olive oil**	
Lighting		*Direct*	*Diffuse*	*Direct*	*Diffuse*	*Direct*	*Diffuse*
Observer 1	***Stain n° 1***	3	2	4	5	3	3
	Stain n° 2	3	3	5	5	3	3
	Stain n° 3	3	3	5	5	4	4
Observer 2	***Stain n° 1***	3	2	4	5	3	3
	Stain n° 2	3	3	4	5	3	3
	Stain n° 3	3	3	4	5	3	3
Average		**3**	**3**	**4**	**5**	**3**	**3**

Table 11: The results of the observations of the stains for the wood paint DE-CH-0198-A-4

DE-CH-0198-A-RL-4							
Test Agent		**Water**		**Coffee**		**Olive oil**	
Lighting		*Direct*	*Diffuse*	*Direct*	*Diffuse*	*Direct*	*Diffuse*
Observer 1	***Stain n° 1***	5	5	2	5	4	4
	Stain n° 2	5	5	2	5	4	3
	Stain n° 3	5	5	2	5	4	3
Observer 2	***Stain n° 1***	5	5	3	3	4	5
	Stain n° 2	5	5	3	3	4	4
	Stain n° 3	4	5	3	3	3	4
Average		**5**	**5**	**3**	**4**	**4**	**4**

Table 12: The results of the observations of the stains for the wood paint DE-CH-0198-A-RL-5

DE-CH-0198-A-RL-5							
Test Agent		**Water**		**Coffee**		**Olive oil**	
Lighting		*Direct*	*Diffuse*	*Direct*	*Diffuse*	*Direct*	*Diffuse*
Observer 1	***Stain n° 1***	4	5	2	5	5	5
	Stain n° 2	5	5	2	5	5	5
	Stain n° 3	5	5	2	5	5	5
Observer 2	***Stain n° 1***	5	5	2	5	5	5
	Stain n° 2	5	5	2	5	5	5
	Stain n° 3	5	5	2	5	5	5
Average		**5**	**5**	**2**	**5**	**5**	**5**

Table 13: The results of the observations of the stains for the wood paint DE-CH-0198-A-6

DE-CH-0198-A-RL-6							
Test Agent		**Water**		**Coffee**		**Olive oil**	
Lighting		*Direct*	*Diffuse*	*Direct*	*Diffuse*	*Direct*	*Diffuse*
Observer 1	***Stain n° 1***	5	5	2	2	4	3
	Stain n° 2	5	5	2	2	4	3
	Stain n° 3	5	5	2	2	4	3
Observer 2	***Stain n° 1***	5	5	2	2	4	3
	Stain n° 2	5	5	2	2	3	3
	Stain n° 3	5	5	2	2	3	3
Average		**5**	**5**	**2**	**2**	**4**	**3**

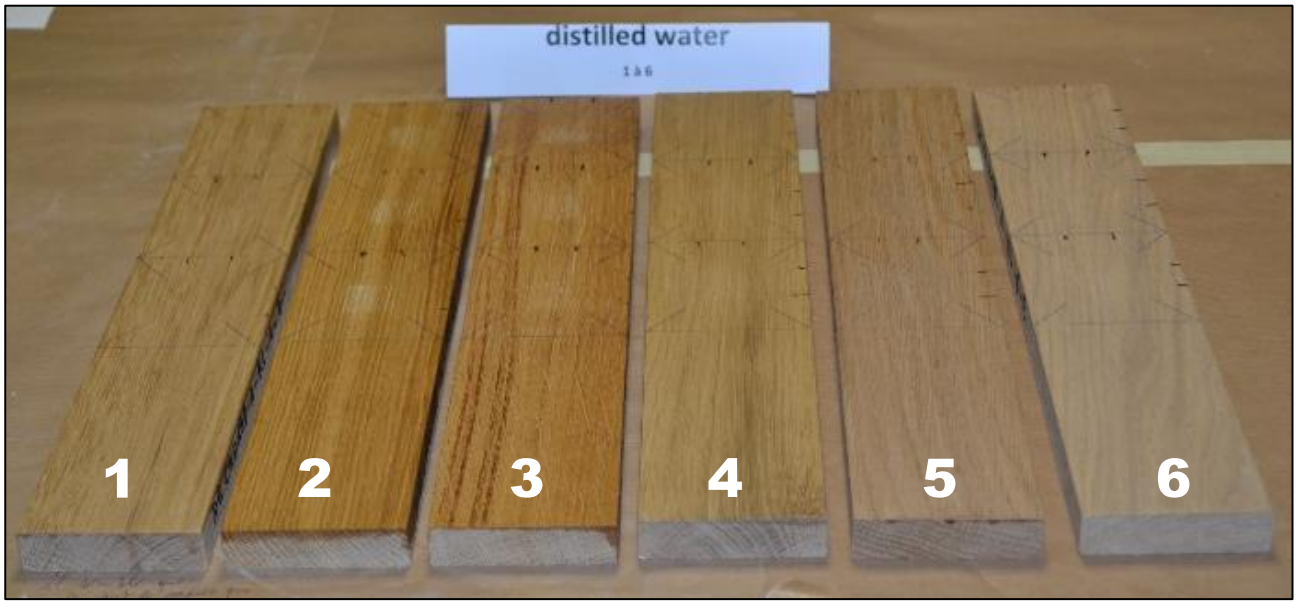

Photo 4: results of the staining test with distilled water on DE-CH-0198-A-1 (1), DE-CH-0198-A-2 (2 DE-CH-0198-A-3 (3), DE-CH-0198-A-4 (4), DE-CH-0198-A-5 (5) & DE-CH-0198-A-6 (6).

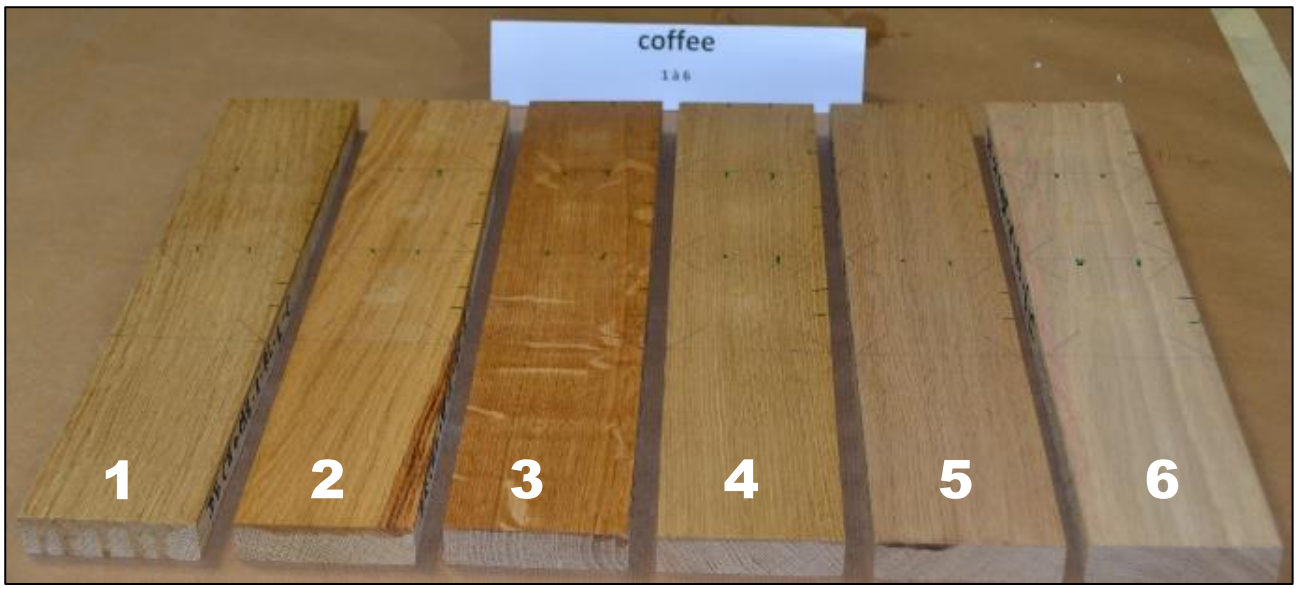

Photo 5: results of the staining test with coffee on DE-CH-0198-A-1 (1), DE-CH-0198-A-2 (2 DE-CH-0198-A-3 (3), DE-CH-0198-A-4 (4), DE-CH-0198-A-5 (5) & DE-CH-0198-A-6 (6).

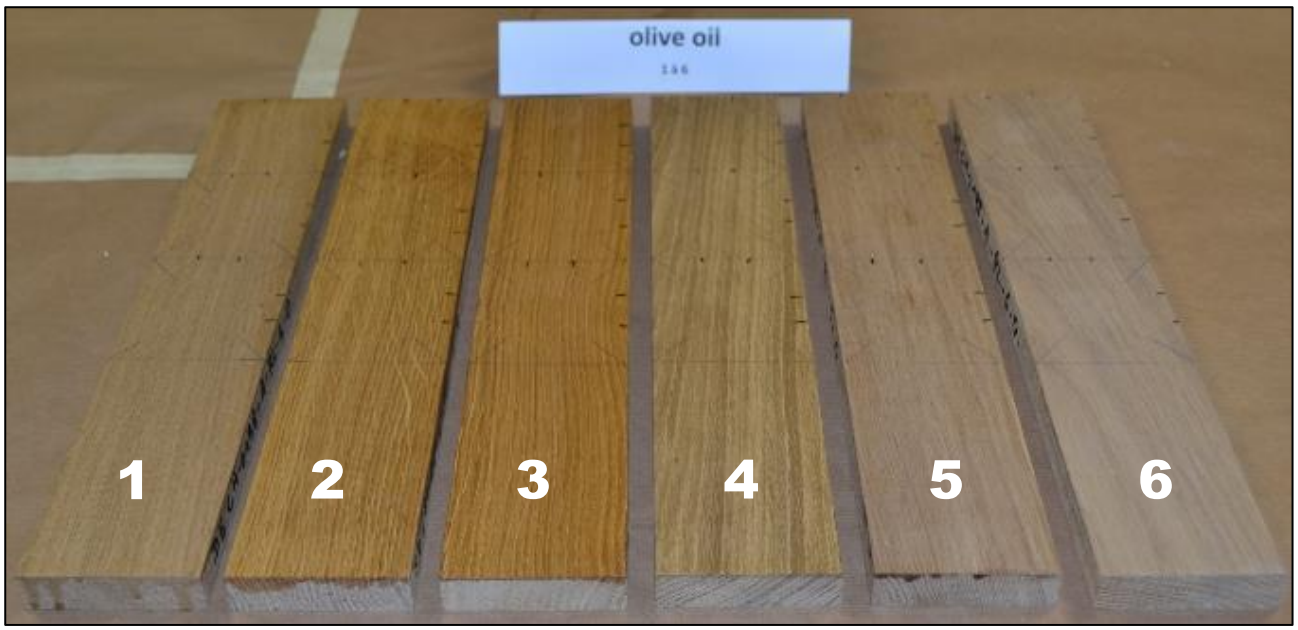

Photo 6: results of the staining test with olive oil on DE-CH-0198-A-1 (1), DE-CH-0198-A-2 (2 DE-CH-0198-A-3 (3), DE-CH-0198-A-4 (4), DE-CH-0198-A-5 (5) & DE-CH-0198-A-6 (6).

4.2. Scratch resistance

4.2.1. Test description

The test was carried out according to the standard NBN EN ISO 1518-2. Two or three samples per paint type were selected to perform the test on. The scratch resistance was determined using an automatic instrument which pushes the panels beneath a pointed stylus mounted so that it presses down perpendicularly on the surface of the test panel. The load on the test piece was increased for each line with 1 N (or ± 10 g). Afterwards an observation was made by a stereomicroscope to determine the type of damage.

The test area has been rated according to the following rating code:

x	No visible changes (no damage)
a	Plastic deformation: the permanent indentation of the surface with or without any surface blemish or cohesive fracture
b	Surface blemish: a superficial surface effect caused by a difference in the scattering of light between the line of test and the adjacent surface
c	Surface scratch: a continuous cut through the surface
d	Cohesive fracture: the presence of a visible surface break or rupture
e	Combination of the above

4.2.2. Test results

Execution date: 16th July 2020
Test conditions: in a laboratory conditioned at a temperature of 23 ± 2 °C and a relative humidity of 50 ± 5 %

The table below gives an overview of the observations after the scratch test with different loads (1 to 10 N). For all the configurations, no scratch of the paints was observed. The damages correspond mainly to indentations of the coatings and of the wood substrates.

Table 14: Test results of the determination of scratch resistance

Load [N]	DE-CH-0198-A-RS-4		DE-CH-0198-A-RS-5			DE-CH-0198-A-RS-6	
	A	C	A	B	C	A	C
1	x	x	x	/	x	x	x
2	x	x	x	/	a	x	x
3	a	x	a	/	a	x	x
4	a	a	a	/	a	a	a
5	a	a	a	/	a	a	a
6	a	a	/	a	a	a	a
7	a	a	/	a	a	a	a
8	a	a	/	a	a	a	a
9	a	a	/	a	a	a	a
10	a	a	/	a	a	a	a

Photo 7: test piece *DE-CH-0198-RS-4-C* - result of the scratch test

Photo 8: test piece *DE-CH-0198-RS-5-C* - result of the scratch test

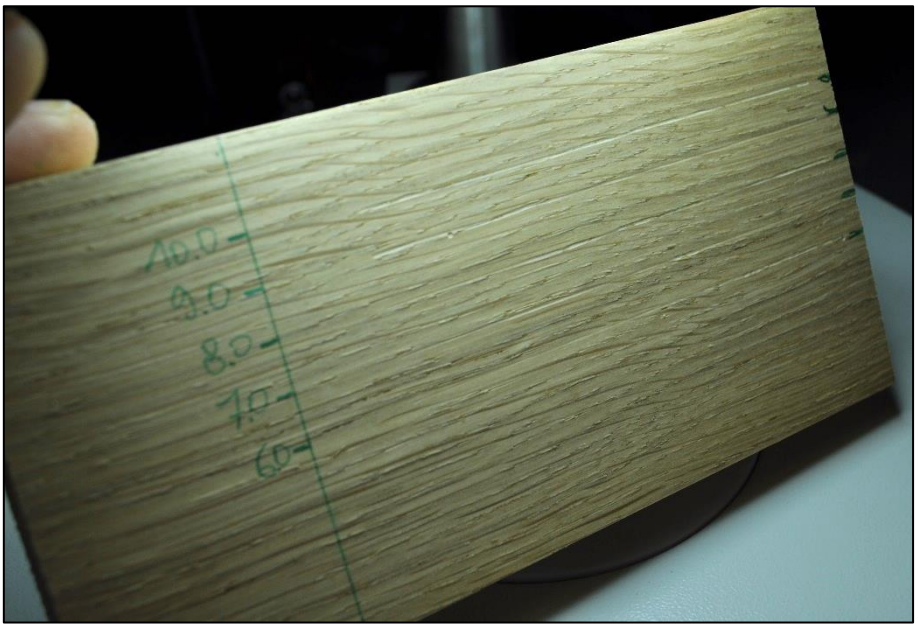

Photo 9: test piece *DE-CH-0198-RS-6-C* - result of the scratch test