Decoral LAB

www.decoral-system.com

QUALITY BOOK - ENG

Index

THE COMPANY

ALUMINIUM TREATMENT is our job, our passion, our experience.

In 1973, the founding partners join their previous experiences creating the first company for aluminium anodizing. After 10 years, they found a new company for coating.

In 1993 they get the patent for decoration with wood and marble effect on profiles and sheets. Since 1995, this brand new idea has been industrially produced, making the company a worldwide leader.

Decoral® Group consists of 26 Companies in Italy and abroad, with a total sheltered surface of 83.000 sqm. They are specialized in manufacturing the system **Decoral**® and the raw materials for it: Polyurethane Powder and Heat Transfer Film.

The continuous technological improvements are certified by the quality brands **QUALITYDECORAL®, AAMA, QUALICOAT and QUALIDECO.**

Introducing Decoral® Process

WHAT IS DECORAL® PROCESS?

Decoral® process is a process for **DECOR**ating **AL**luminium. It is based based on Sublimation, a phisycal-chemical process, which is the direct transition of a substance from the solid phase to the gas phase.

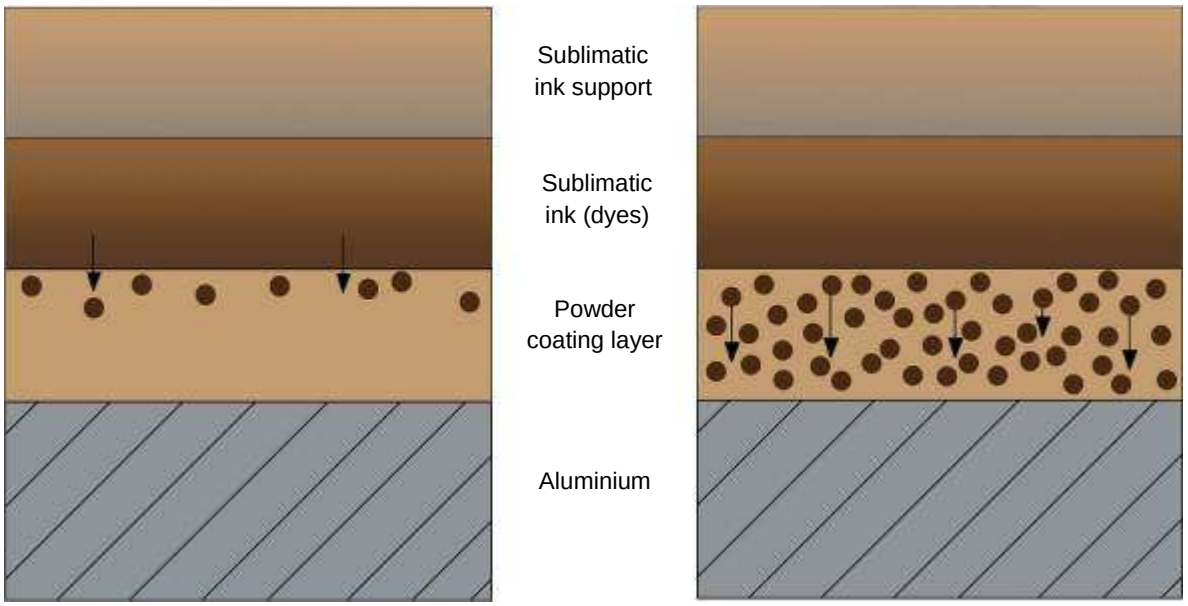
Such technology is also named Heat-Transfer Process.

The **Decoral®** process can be also extended to other materials (metal, glass, plastic, ceramic), the basic requirement being that these materials can resist at temperature of 200° C for about 10 minutes with no deformation.

Through **Decoral®** process, countless effects and patterns such as woodgrain, marble, granite, fancies, pictures can be transferred on surfaces.

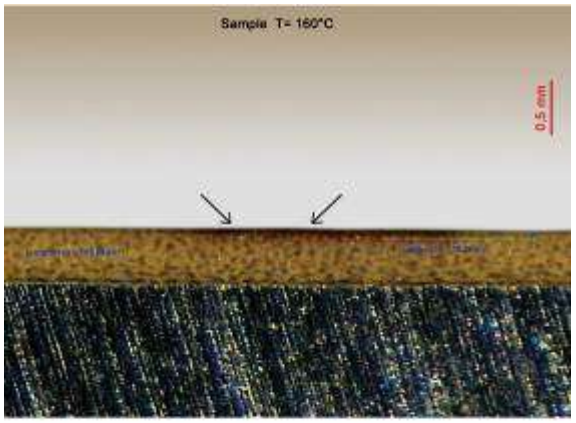
Decoral System® was the first Company worldwide to use the Heat-transfer process on aluminium extruded and laminated items.

PHISICAL PROCESS BY WHICH SOME SUBSTANCES AT GIVEN TEMPERATURE MOVE DIRECTLY FROM SOLID TO GAS PHASE



DECORAL® STEP BY STEP

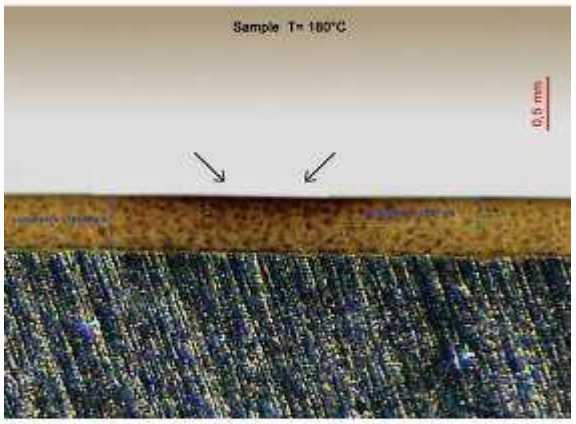
PENETRATION LEVEL ACCORDING TO APPLIED TEMPERATURE



ALUMINIUM PROFILE DECORATED AT 160°C

Enlarged by 120 times
Powder coating thickness = 104,88 µm
Ink penetration depth = 19.32 µm

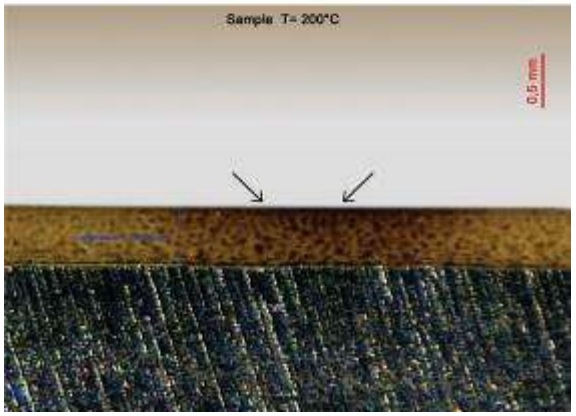
LOW TEMPERATURE



ALUMINIUM PROFILE DECORATED AT 180°C

Enlarged by 120 times
Powder coating thickness = 104,88 µm
Ink penetration depth = 53,82 µm

MEDIUM TEMPERATURE



ALUMINIUM PROFILE DECORATED AT 200°C

Enlarged by 120 times
Powder coating thickness = 107,64 µm
Ink penetration depth = 107,64 µm

BEST TEMPERATURE

MAIN ACTIVITIES OF THE DECORAL® SYSTEM LAB:

1 – Quality control

The quality of the finish is inspected using the lab equipment.

2 – New products development

The newest finishes, before passing through the industrial cycle, are tested in the lab for a preliminary analysis on their resistance.

3 – Customer assistance

Thanks to our tools it is possible to test a finish, chosen by the customer, and to give a first impression (after the accelerated weathering process) about the durability of the product for external use.

4 – Technical documentation

The lab draws up particular documents showing the performance of **Decoral® System** products, based on the results of the tests:

REFERRED SPECIFICATIONS:

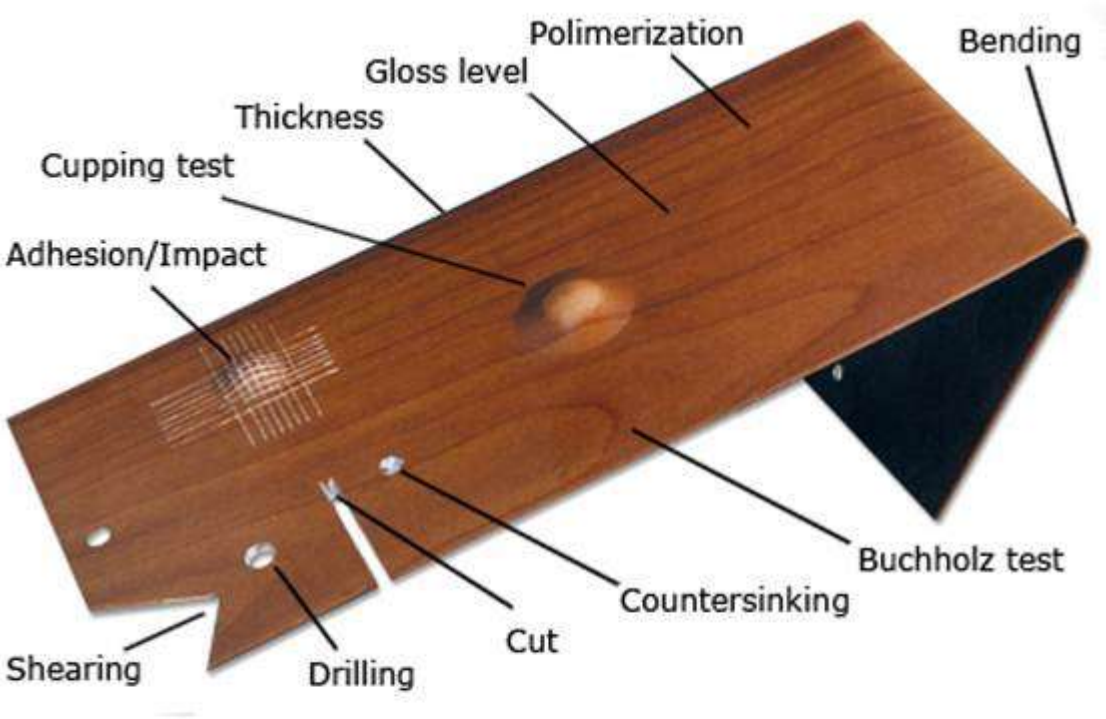
- QUALICOAT 13th edition
- GSB Al 631
- AAMA 2603, 2604

REFERRED REGULATIONS:

- UNI, EN, ISO
- ASTM
- Internal procedures

VARIETY OF TESTS:

1) **CHARACTERIZATION**
2) **MECHANICAL RESISTANCE**
3) **WEATHERING**
4) **CHEMICAL RESISTANCE**
5) **VERIFYING THE CORRECT PENETRATION OF INKS**



Accelerated weathering test

Natural exposure

Test for saline-acetic resistance

1) CHARACTERIZATION TESTS

a) VISUAL APPEARANCE

Purpose

Specific test for the visual comparison of the colour of film, of paints or similar products, against a sample. It includes the use of natural daily light sources or artificial ones in a standard cabin

Equipment and references

- Color comparison cabin
- UNI EN ISO 3668

Principle of method

The colours of the paint films that have to be compared are observed in the following lighting conditions:

- **Natural daily light:** Widespread light preferably with partially cloudy sky at north; reflections by any intensely coloured object must be avoided. Direct sun light should also be avoided.
- **Artificial light** (colour comparison cabin): the cabin must be a room without any external light and lit by a glowing source that provides a spectral power distribution falling back into the sample, being close to the one of CIE illuminant D 65 e CIE illuminant normalized A.

The test samples are flat (dimensions of about 150x100 cm) and the light source must be placed plumbed at them and observed by the operator with an angle of around 45° degrees.

b) BRIGHTNESS MEASUREMENT

Purpose

The test is about a non-destructive method of measuring the specular brightness of paint films using a 60° geometry glossmeter

Equipment and references

- Glossmeter
- UNI EN ISO 2813

Testing procedures

The painted samples must be conditioned in a humidity cabinet at a 23 ± 2°C temperature and with a relative humidity of 50 ± 5% for at least 16 hours. Measurements have to be done in six different areas of the same sample or in different directions (except for samples having a directional structure)

c) THICKNESS MEASUREMENT

Purpose

The test is about a non destructive method of measuring the thickness of non-conductive platings on metals using tools based on inductive currents.

Equiment and references

- Thickness gauge
- UNI EN ISO 2360

Testing procedures

Thickness must be measured on 5 different points of the sample, in every point 3 readings have to be done and the average value must be calculated.

2) MECHANICAL RESISTANCE TESTS

a) ADHESION TEST

Purpose

This test is for evaluating the resistance to detachment of a paint film from the sample by engraving a chequer work on the coating, thus reaching the sample.

Equiment and references

- Cross Cut Tester
- Soft bristle brush
- Adhesive tape 3M 616 with adhesive strength of 10 ± 1 N, 50 mm width
- UNI EN ISO 2409

Testing procedures

The painted samples must be conditioned in a humidity cabinet at a 23 ± 2°C temperature and with a relative humidity of 50 ± 5% for at least 16 hours.
The test must be done in at least 3 different points of the surface of the same sample. On this surface orthogonal incisions are made, deep into the metal.
After a soft brush, a 3M adhesive tape nr 616 is applied on the surface, taking care of removing air bubbles.

The spacing between the incisions must be the same for both directions and depends on the thickness of the paint film, as shown in the following chart:

Film Thickness (μm)	Spacing (mm)
0 – 60	1
61 – 120	2
121 – 250	3

The previously engraved and then ripped surface is examined with the naked eye, without any help of magnifying glasses.

The classification is made in accordance to the prospect below:

Classification	Description
0	Margins are completely smooth and no block has yet detached.
1	Small flakes detach at the intersections of incisions with a surface area no bigger than 5%
2	Detachment along the margins and/or intersections of incisions with a surface area between 5% and 35%
3	The coating has totally or partially detached along the margins of incisions in big pieces and/or it has totally or partially detached in many points of the chequer work with an affected area between 5% and 35%.
4	The coating has detached in big pieces along the margins of incisions and/or totally in many parts of the chequer work. The affected area is between 35% and 65%
5	All spalling degrees that cannot be considered at level 4

b) BUCHHOLZ INDENTATION TEST

Purpose

Test for evaluating the penetration in a single coat or in a coating cycle, using a specific tool: Buchholz.

Equipment and references

- Buchholz penetration tool
- UNI EN ISO 2815

Testing procedures

The painted samples must be conditioned in a humidity cabinet at a 23 ± 2°C temperature and with a relative humidity of 50 ± 5% for at least 16 hours.
The sample must be placed on a plain surface with the painted part on the upside, then the penetration tool is gently leaned ensuring the blade not to slither on the surface.
After 30 ± 1 seconds time, the weight is removed. 35 ± 5 seconds time after the blade is removed, the length of the sign is measured using the appropriate magnifier. The test has to be done
5 times in different points of the sample.

$$PENETRATION\_RESISTANCE = \frac{100}{Length(mm)}$$

c) PENCIL HARDNESS TEST

Purpose

Test for determining the reactive hardness of an organic coating on a metal support, using pencils of known hardness.

Equipment and references

- Pencil Hardness Tester
- Set of pencils with different hardness
- ISO 15184

Testing procedures

The painted samples must be conditioned in a humidity cabinet at a 23 ± 2°C temperature and with a relative humidity of 50 ± 5% for at least 16 hours.

Preparation of pencils:

- Remove approximately 5-6 mm of wood from the tip of each pencil which will be used with the sharpener fit to the kind of lead. Pay attention not to damage the cylindrical shape of the lead. Flatten the lead keeping the pencil vertically on the surface of the sandpaper. Continue until you obtain a circular and smooth section without smears on the margins.

Put the sample horizontally.

Lock the pencil inside the tool and place the lead on the surface of the panel. Immediately after that, push dismissing the tool from the operator.
Inspect the panel after 30 seconds with the naked eye:

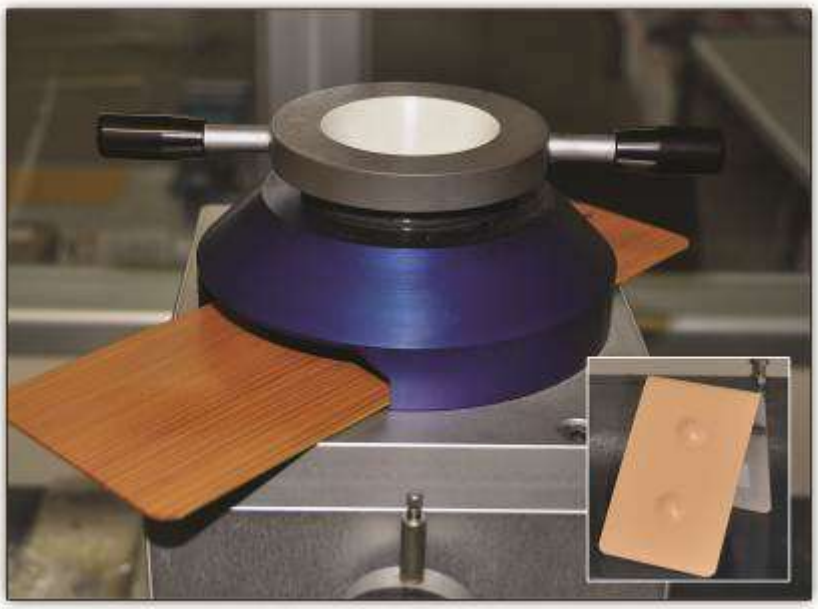
- If no damage is seen, perform the test again, using the pencil with the highest hardness, paying attention not to overlap the test area. Continue until you have a 3 mm marking at least.

- If the surface is damaged, repeat the test again using the pencil with the lowest hardness until the surface isn't damaged any more.

d) DEEP DRAWING TEST

Purpose

Test for evaluating the resistance of a paint coat to chaps and/or to the detachment from a metal support when it is exposed to gradual deformation by means of deep drawing in normalized conditions. It can be relevant as a test system or, gradually increasing the depth of the deep drawing, to evaluate the minimum depth to which the paint can show chaps and/or detachment from the support.



Equipment and references

- Tool for manual deep drawing
- ISO 1520

Testing procedures

The coated samples must be conditioned in a humidity cabinet at a 23 ± 2°C temperature and with a relative humidity of 50 ± 5% for at least 16 hours.

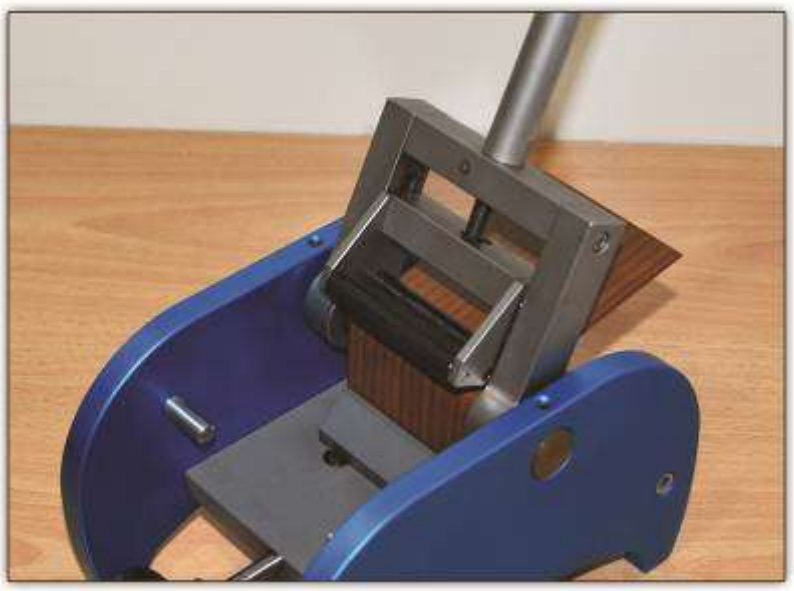
The test must be performed on at least 3 different samples and the centres of deep drawing should be distant at least 35 mm from any margin. The sample is placed into the tool with the testing surface facing upwards and firmly fixed without using excessive pressure. At this point move forward the center punch at a constant speed until you reach the specified depth (5mm according the Qualicoat terms). Immediately after the deep drawing, remove the sample and analyze the surface with the naked eye to verify the presence of chaps and/or detachments from the support.

e) FOLDING TEST

Purpose

Test for evaluating the resistance or the flexibility of a paint coat when it is subject to bending on a cylindrical mandrel on normalized conditions.

It can be relevant as a test system or to determine the limit of the diameter until the coating cracks and/or starts detaching from the support.



Equipment and references

- Folding tool with a complete series of mandrels
- ISO 1519

Test procedures

The painted samples must be conditioned in a humidity cabinet at a 23 ± 2°C temperature and with a relative humidity of 50 ± 5% for at least 16 hours.

The test must be performed in at least 2 different panels. The sample is placed into the tool with the testing surface outwards the folding itself. Folding is performed up to 180° in an interval between 1 and 2 seconds. Immediately after the folding process, the sample is examined with the naked eye to verify if there are chaps and/or detachments from the support.

The coating surface under 10 mm from the sample end must be disregarded.

f) IMPACT RESISTANCE TEST

Purpose

Test for evaluating the resistance or flexibility of a paint coat when it is exposed to a quick deformation due to the impact with a determined weight dropped from a determined height.
It can be relevant as a test system or to determine the height limit until the coat chaps and/or starts detaching from the support.

Equipment and references

- Impact tester at variable height
- ISO 6272

Test procedures

The painted samples must be conditioned in a humidity cabinet at a 23 ± 2°C temperature and with a relative humidity of 50 ± 5% for at least 16 hours.

The testing panel must be placed under the center punch on the sample holder mold surface with the painted surface pointing upwards (direct impact) or downwards (opposite impact). Take the center punch at your desired height and release the hammer mass which, while free falling, will cause the panel to dent.

Generally maximum height for the hammer mass to fall is considered to be 25 cm.
This way you have an energy of 1Kg x 0.25m x 9.8 m/s^2 = 2.5 N × m.
Right after the series of direct and opposite impacts, the panel is checked with the naked eye.

3) WEATHERING TESTS

a) ACCELERATED WEATHERING TEST

All samples are exposed to radiation of Xenon lamps and to wet/dry cycles by special equipment (Q-Sun, SOLARBOX). Such equipment is used in accordance with international standards imposed by norm ISO 11341, i.e. complying with the following parameters:

- light intensity, 550 ± 20 W / m ^{2} (290-800 nm)
- black panel temperature, 65 ± 5 ° C
- wet cycle 18 minutes
- dry cycle 102 minutes.

At the end of the test, whose minimum duration is 1000 hours, Residual Gloss (EN ISO 2813, with an angle of incidence 60°) and Colour Variation ΔE (CIELAB method - ISO 7724 / 3) are measured comparing pre-test values. In this way it is possible to evaluate the weathering of surfaces using standard indexes. The accuracy of the test is verified through the use of samples in white, whose weathering behaviour is known.

b) NATURAL EXPOSURE TEST

Natural Exposure Test is conducted in Atlas Weathering Service Sites – Florida. South Florida climate indeed is hot, wet and highly exposed to UV-rays. All samples are subjected to natural irradiation in Florida according to the international standard ISO 2810, i.e. complying with the following specifications:

- facing south
- tilt angle 5° from the horizontal
- open backing

After 12 months exposure period, residual gloss (EN ISO 2813, with an angle of incidence 60°) and colour variation ΔE (CIELAB method - ISO 7724 / 3) are measured comparing pre-test values. Even the Natural Exposure Test accuracy is verified through the use of white samples, whose weathering behaviour is known.

4) CHEMICAL RESISTANCE TESTS

a) Salt spray (NSS) and acetic acid salt spray (AASS) resistance test

Referred regulation: UNI EN ISO 9227, ISO 4628 (for evaluation)

Destructive test which allows to gather information about the support behaviour and the paint applied, in extremely severe conditions, simulating hostile climates.

NSS test is performed on:

- metals and related alloys;
- metal coatings
- conversion coatings;
- anodizing coatings;
- organic coatings on metal materials

AASS test is particularly fit for organic coatings on aluminum and its alloys.

The test duration varies from 2 to 1000 hours according to the kind of sample. Generally, as regards aluminium alloy substrates which are powder painted the total test duration is 1000 hours

After staying in the chamber, the surface alteration is visually examined in terms of:

- Blistering
- Rustiness
- Chap
- Flaking
- Color and brightness variations
- Evaluation of the notch done on the sample surface (raising, blistering, etc.)

b) WET CLIMATES RESISTANCE TEST

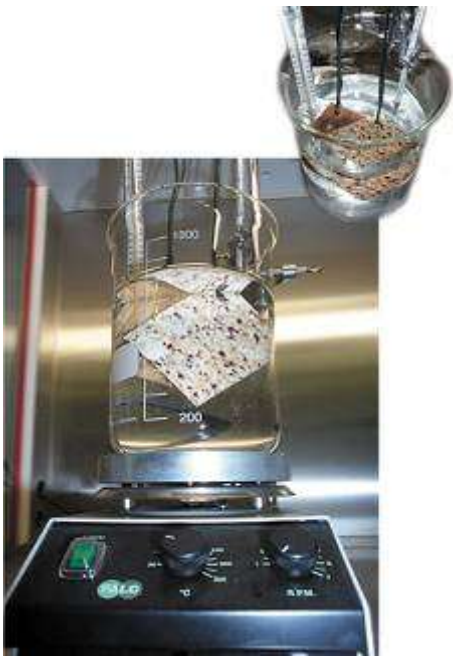
Referred regulation: UNI EN ISO 6270, ISO 4628 (for evaluation)

Test for determining the resistance of the paint film in high-humidity conditions. By working in constantly controlled temperature conditions and with high humidity it's possible to notice some damages to the coat and to the support on the coated sample, caused by the penetration of umidity.

After staying inside the chamber, the surface alteration is visually examined in terms of:

- Blistering
- Rustiness
- Cracking
- Flaking
- Color and brightness variations
- Evaluation of the notch done on the sample surface (raising, blistering, etc.)

c) MACHU TEST



This destructive test provides parameters on the resistance to detachment of the paint film from the support, in immersion conditions or with high condensation.

More particularly, this test discriminates pre-treatment quality.

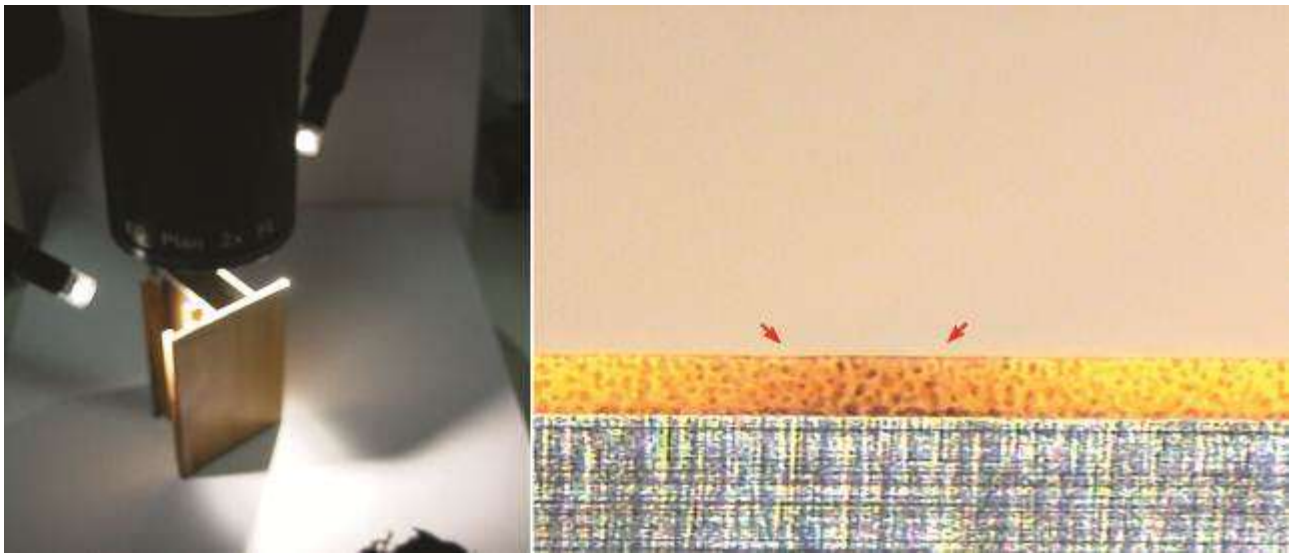
The engraved samples are immersed for 48 hours in a lukewarm, oxidative and slightly acid solution so as to facilitate the attachment, which is particularly localized near the incisions thus generating a gradual detachment of the film from them, and also in other parts where the film has some flaws.

5) CORRECT INK PENETRATION EVALUATION

Observing the ink penetration is valuable to know if the sublimation process has been done correctly.

More specifically, a complete and correct sublimation is done when the sublimation inks penetrate deep inside the paint product up to the metal substrate so as to receive the best protection from weather conditions and UV radiations.

A profile or some other product is conveniently sectioned, mechanically smoothed and in the end it's observed using an optical microscope focusing on some parts of the paint layer which can have decoration.



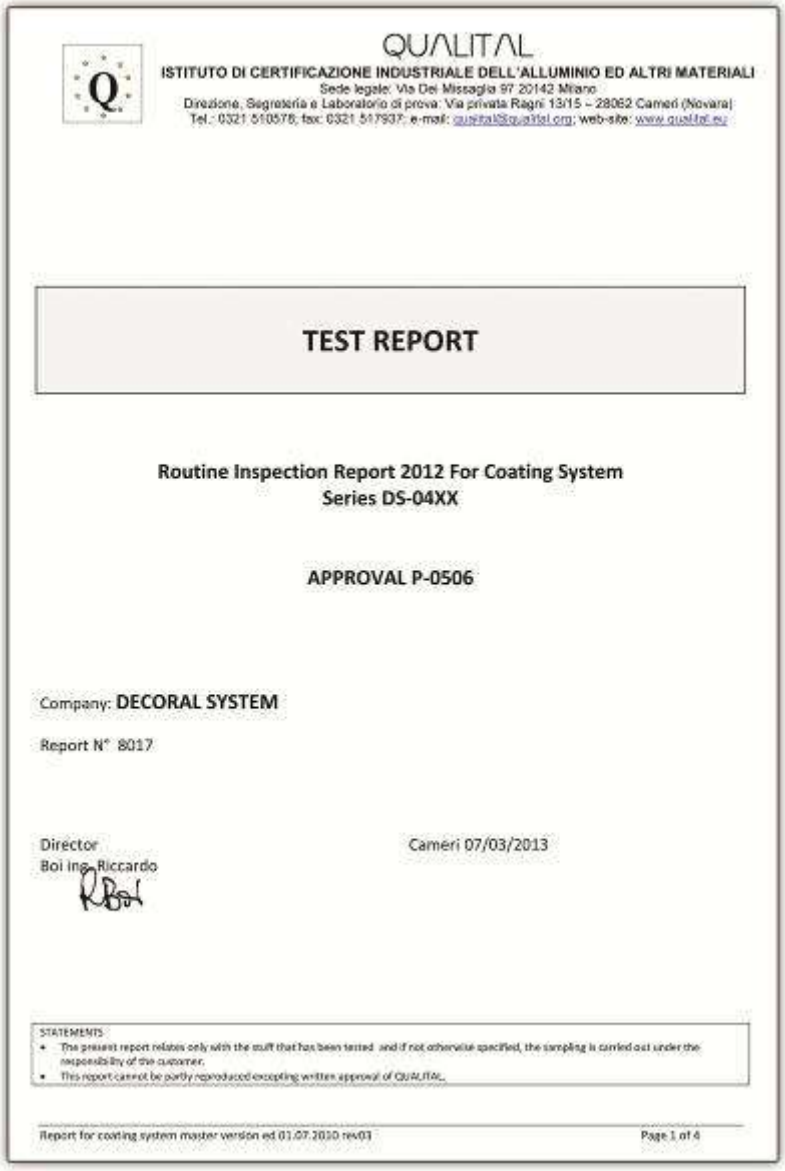
Total penetration is a necessary condition but it's not enough to guarantee the resistance of the finished product.

For more evaluations about resistance to aging please consider looking at possible accelerated weathering lab tests or at natural exposure tests in Florida.

QUALICOAT

Qualicoat is a European quality label organisation committed to maintaining and promoting the quality of coating on aluminium and its alloys for architectural applications. Qualicoat's mission is to provide best practice rules to obtain a good quality coating on aluminium, establishing specifications for processes, products and tests to be used by the coating plants.

TEST REPORT PERFORMED FOR CERTIFYING SERIE DS-04XX



QUALITAL

ISTITUTO DI CERTIFICAZIONE INDUSTRIALE DELL'ALLUMINIO ED ALTRI MATERIALI

Sede legale: Via Dei Missaglia 97 20142 Milano

Direzione, Segreteria e Laboratorio di prova: Via privata Ragni 13/15 – 28062 Cameri (Novara)

Tel.: 0321 510578; fax: 0321 517937; e-mail: qualital@qualital.org; web-site: www.qualital.eu

TEST REPORT

Routine Inspection Report 2012 For Coating System
Series DS-04XX

APPROVAL P-0506

Company: **DECORAL SYSTEM**

Report N° 8017

Director
Bol Ing. Riccardo

Cameri 07/03/2013

STATEMENTS

- The present report relates only with the stuff that has been tested and if not otherwise specified, the sampling is carried out under the responsibility of the customer.
- This report cannot be partly reproduced excepting written approval of QUALITAL.

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Report n° 8017 QUALITAL

REPORT FOR COATING SYSTEMS

	Granting of approval
X	Renewal (**P-0506**)
	Repetition (**P-0506**)

COMPANY: DECORAL SYSTEM

ADDRESS: Viale del lavoro, 5 - 37040 Arcole (VR)

COUNTRY: Italy

CONTACT PERSON: Mr. Pandolfi

PHONE/FAX: 045/7639195 E-MAIL: pandolfi@viv.it

SYSTEM:

FULL DESIGNATION: DS 04XX

QUALICOAT CODE[1]: DS4

TYPE[2]: [ ] 1 [X] 1s [ ] 2a [ ] 2b [ ] 2c [ ] 2d [ ] 2e

COATS (No): [X] 1 [ ] 2

GLOSS CATEGORY: [X] 1 [ ] 2 [ ] 3

CLASS: [X] 1 [ ] 1.5 [ ] 2 [ ] 3

STRUCTURED FINISH[3]: [ ] a [ ] b [ ] c [X] NO

APPLICATION: [X] QUALICOAT [X] QUALIDECO

SAMPLING: Date: **16/10/2012**

During routine inspection at the coating plants [ ]

Sent by the supplier to the laboratory [X]

LABORATORY:

Laboratory in charge of the preparation of the samples:	QUALITAL
Laboratory in charge of the tests:	QUALITAL
Comm. Int.:	299-12
Contact person:	Dott.ssa Barbato
Date of application:	23/11/2012
Approval number of alternative pre-treatment used:	A-53
Curing temperature:	200°C
Curing time:	20'

1) Code given by QUALICOAT to the laboratory
2) Coating types: 1) Powder coating 1s) for sublimation only 2) Liquid coating 2a) Two-coat PVDF 2b) Three-coat PVDF (metallic) 2c) Silicon Polyester without primer 2d) Other thermosetting paints 2e) Two-components paints
3) Structured finishes: a) Leathered b) Textured c) Wrinkled

Report n° 8017 QUALITAL

TESTS Specified minimum thickness: 60 µm	COLOURS TESTED	
	BEIGE-02	BROWN-03
	a.v.	a.v.
	75 µm	91 µm
Checking RAL compliance (ΔE referring to standard 841GL)	//	//
1. Gloss (EN ISO 2813) *Gloss from Technical Data Sheet (Cat. 1)*	15+/-5	15+/-5
Gloss measured (average value)	11	13
2. Thickness (EN ISO 2360)	75 µm	91 µm
3. Adhesion (EN ISO 2409) *Spacing of cutters: 1mm up to 60 µm, 2 mm above*	68 µm	93 µm
Acceptable value: 0	Result 0	Result 0
4. Buchholz Indentation (EN ISO 2815)	68 µm	93 µm
Minimum value: 80	Result 91	Result 91
5. Cupping (EN ISO 1520) *No detachment at a diameter of 5 mm*	68 µm	93 µm
Class 1: No cracking or detachment at a depth of 5 mm *Class 2 and 3: No detachment at a depth of 5 mm after tape test*	Satisfactory? Y	Satisfactory? Y
6. Bending (EN ISO 1519) *No detachment at a diameter of 5 mm*	72 µm	84 µm
Class 1: No cracking or detachment at a diameter of 5 mm *Class 2 and 3: No detachment at a depth of 5 mm after tape test*	Satisfactory? Y	Satisfactory? Y
7. Impact test (EN ISO 6272-1) *No detachment at 2,5 Nm*	68 µm	93 µm
Class 1: No cracking or detachment at 2,5 Nm *Class 2 and 3: No detachment at 2,5 Nm after tape test*	Satisfactory? Y	Satisfactory? Y
8. Kesternich (EN ISO 3231)	86 µm	103 µm
No penetration or detachment beyond 1 mm *No infiltration exceeding 1 mm on both sides of the scratches, and no change in colour or blistering in excess of 2(S2)*	Satisfactory? Y	Satisfactory? Y
9. Acetic Salt Spray (EN ISO 9227) *Section 2.10 of QUALICOAT Specifications*	79 µm	93 µm
Length of filaments: max 4mm *Infiltration: max 16mm²/10 cm* *No blistering in excess of 2(S2)*	Satisfactory? Y	Satisfactory? Y

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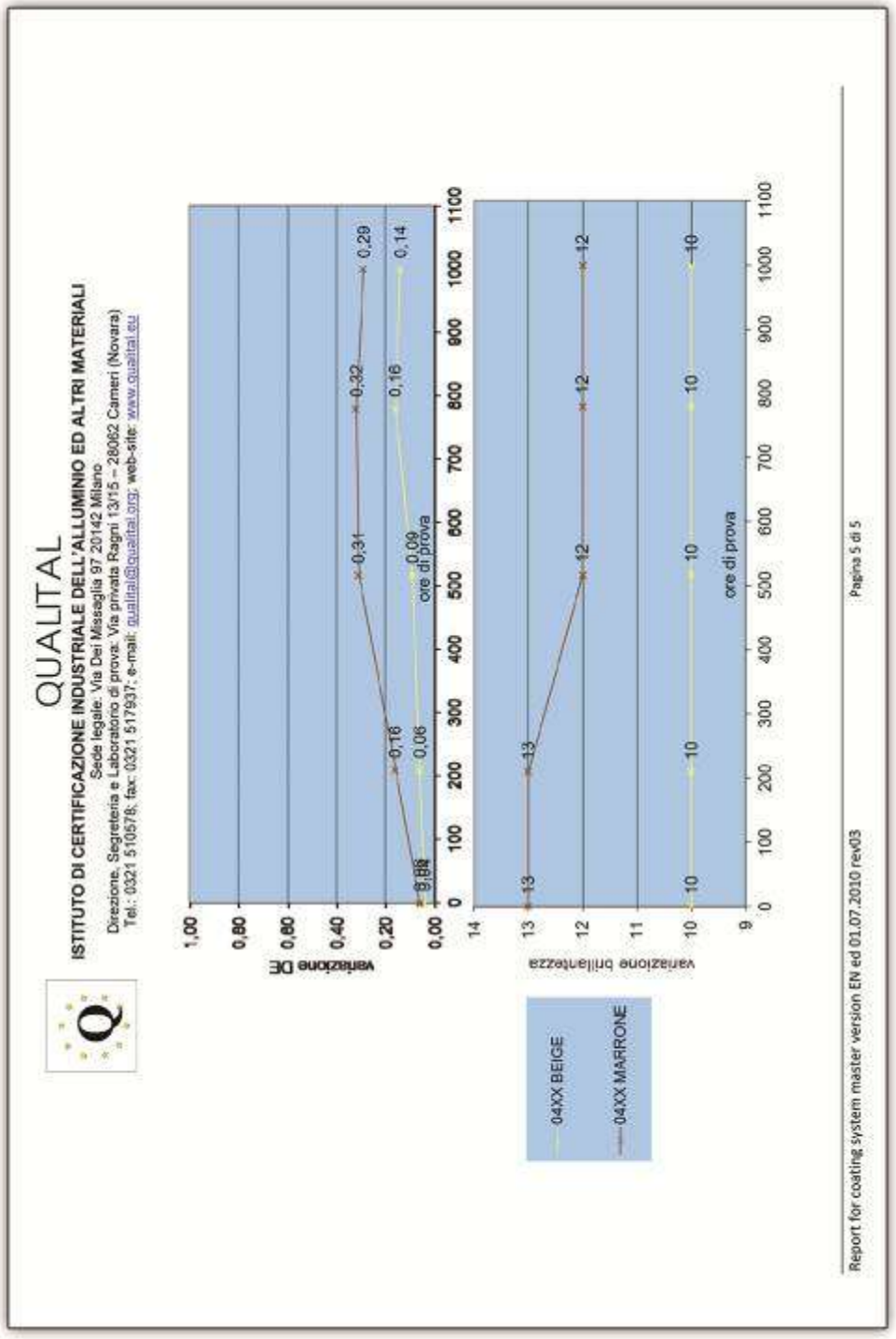
Report n° 8017 QUALITAL

TESTS *Specified minimum thickness: 60 µm*	COLOURS TESTED			
	BEIGE-02		BROWN-03	
10. Accelerated weathering (EN ISO 11341)	71 µm		96 µm	
Test time: 1000 h for class 1, 1.5 and 2 *Test time: 2000 h for class 3*	1	2	1	2
1. Initial gloss 2. Final gloss	10	10	13	12
Gloss retention % *Class 1: Residual value not less than 50%* *Class 1.5: Residual value not less than 75%* *Class 2 and 3: Residual value not less than 90%*	100		92	
	Satisfactory?		Satisfactory?	
Color variation ΔE	Spec. ΔE	Meas. ΔE	Spec. ΔE	Meas. ΔE
Spec. ΔE = limit value of ΔE *Meas. ΔE = ΔE measured value*	2,0	0,2	3,0	0,3
Acceptable limit for class 1: see Appendix A7 *Acceptable limit for class 1.5: 75% of the limits prescribed for class 1* *Acceptable limit for class 2 and 3: 50% of the limits prescribed for class 1*	Satisfactory? Y		Satisfactory? Y	
11. Resistance to boiling water / Pressure cooker (EN 12206-1 Par. 5.10)	75 µm		92 µm	
No defects, no detachments	Satisfactory? Y		Satisfactory? Y	
12. Constant climate condensation water (EN ISO 6270-2)	74 µm		83 µm	
No infiltration exceeding 1 mm on both sides of the scratch *No blistering in excess of 2(S2)*	Satisfactory? Y		Satisfactory? Y	
13. Polymerisation (only for liquid painting)	µm		µm	
	Satisfactory?		Satisfactory?	
14. Resistance to mortar (EN 12206-1)	76 µm		89 µm	
No defects *No color change* *No residues of the mortar*	Satisfactory? Y		Satisfactory? Y	
15. Weathering test (ISO 2810)	Period of exposure in Florida:			
1 year exposure in Florida (class 1) *2 years exposure in Florida (class 1.5)* *3 years exposure in Florida (class 2)* *10 years exposure in Florida (class 3)*	2013-2014		2013-2014	

	General licensee's recommendation to QUALICOAT	
Firma del responsabile del laboratorio Rossella Barbato	X	RESULT SATISFACTORY
		RESULT UNSATISFACTORY (SPECIFY)
Date: 07/03/2013	REMARKS:	


QUALITAL
ISTITUTO DI CERTIFICAZIONE INDUSTRIALE DELL'ALLUMINIO ED ALTRI MATERIALI
Sede legale: Via Dei Missaglia 97 20142 Milano
Direzione, Segreteria e Laboratorio di prova: Via privata Ragni 13/15 – 28062 Cameri (Novara)
Tel.: 0321 510578; fax: 0321 517937; e-mail: qualital@qualital.org; web-site: www.qualital.eu
variazione ΔE
ore di prova
variazione brillantezza
ore di prova
04XX BEIGE
04XX MARRONE
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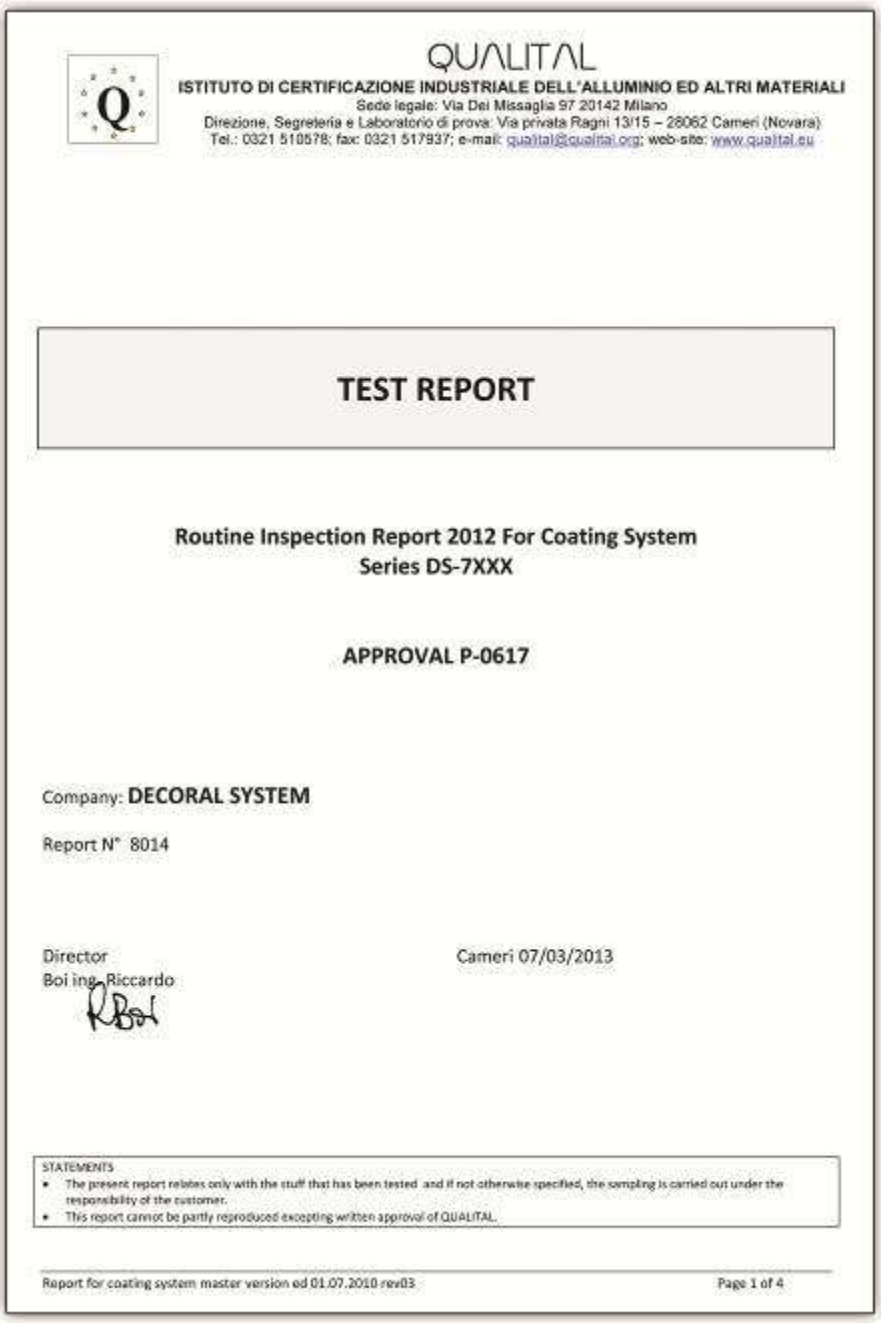
TEST REPORT PERFORMED FOR CERTIFYING SERIE DS-7XXX



QUALITAL

ISTITUTO DI CERTIFICAZIONE INDUSTRIALE DELL'ALLUMINIO ED ALTRI MATERIALI

Sede legale: Via Dei Missaglia 97 20142 Milano

Direzione, Segreteria e Laboratorio di prova: Via privata Ragni 13/15 – 28062 Cameri (Novara)

Tel.: 0321 510578; fax: 0321 517937; e-mail: qualital@qualital.org; web-site: www.qualital.eu

TEST REPORT

Routine Inspection Report 2012 For Coating System
Series DS-7XXX

APPROVAL P-0617

Company: **DECORAL SYSTEM**

Report N° 8014

Director
Boi ing. Riccardo

Cameri 07/03/2013

STATEMENTS
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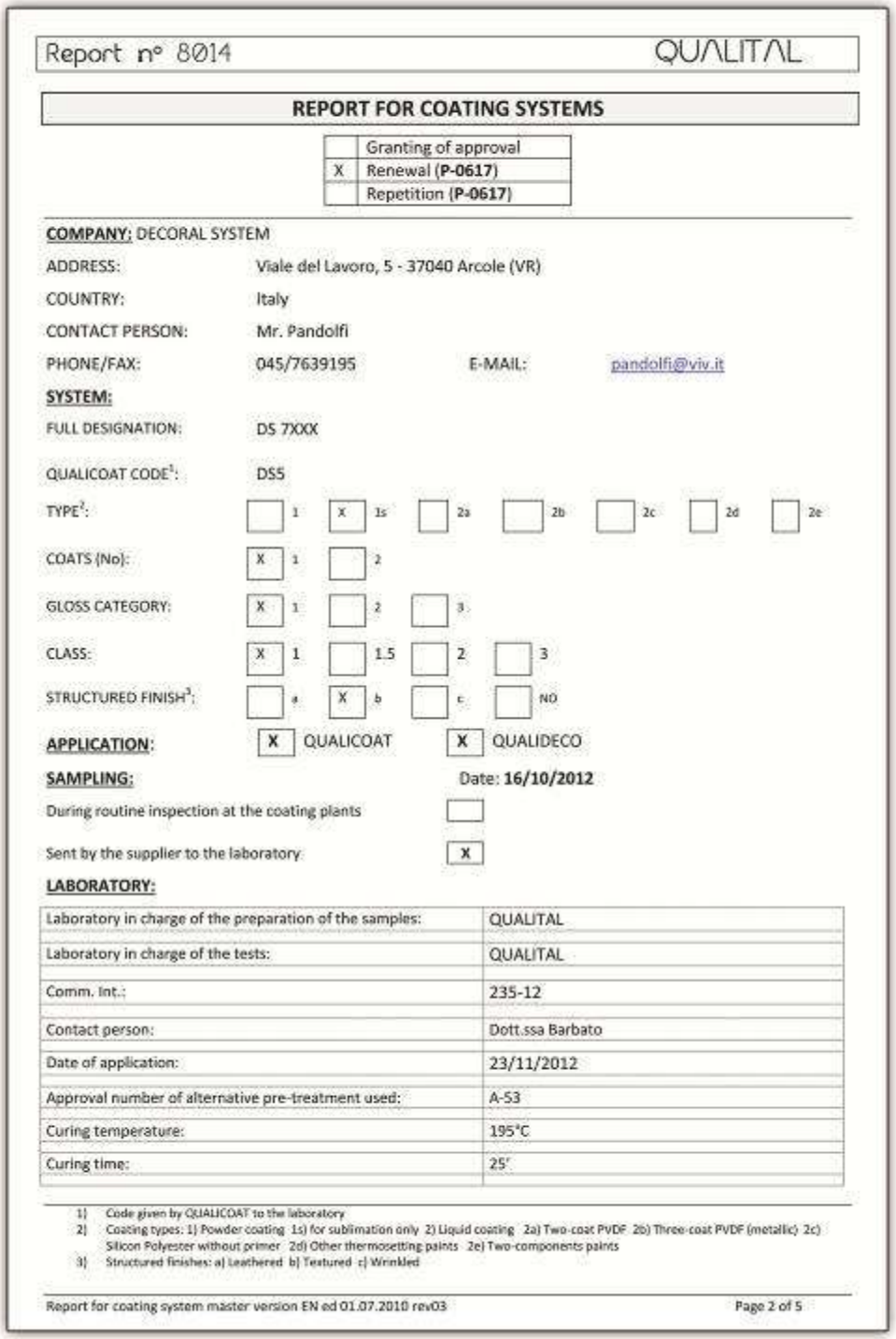
Report for coating system master version ed 01.07.2010 rev03 Page 1 of 4



Report n° 8014 QUALITAL

REPORT FOR COATING SYSTEMS

	Granting of approval
X	Renewal (**P-0617**)
	Repetition (**P-0617**)

COMPANY: DECORAL SYSTEM

ADDRESS: Viale del Lavoro, 5 - 37040 Arcole (VR)

COUNTRY: Italy

CONTACT PERSON: Mr. Pandolfi

PHONE/FAX: 045/7639195 E-MAIL: pandolfi@viv.it

SYSTEM:

FULL DESIGNATION: DS 7XXX

QUALICOAT CODE[1]: DS5

TYPE[2]: [ ] 1 [X] 1s [ ] 2a [ ] 2b [ ] 2c [ ] 2d [ ] 2e

COATS (No): [X] 1 [ ] 2

GLOSS CATEGORY: [X] 1 [ ] 2 [ ] 3

CLASS: [X] 1 [ ] 1.5 [ ] 2 [ ] 3

STRUCTURED FINISH[3]: [ ] a [X] b [ ] c [ ] NO

APPLICATION: [X] QUALICOAT [X] QUALIDECO

SAMPLING: Date: **16/10/2012**

During routine inspection at the coating plants [ ]

Sent by the supplier to the laboratory [X]

LABORATORY:

Laboratory in charge of the preparation of the samples:	QUALITAL
Laboratory in charge of the tests:	QUALITAL
Comm. Int.:	235-12
Contact person:	Dott.ssa Barbato
Date of application:	23/11/2012
Approval number of alternative pre-treatment used:	A-53
Curing temperature:	195°C
Curing time:	25'

1) Code given by QUALICOAT to the laboratory
2) Coating types: 1) Powder coating 1s) for sublimation only 2) Liquid coating 2a) Two-coat PVDF 2b) Three-coat PVDF (metallic) 2c) Silicon Polyester without primer 2d) Other thermosetting paints 2e) Two-components paints
3) Structured finishes: a) Leathered b) Textured c) Wrinkled

Report for coating system master version EN ed 01.07.2010 rev03 Page 2 of 5

TESTS *Specified minimum thickness: 60 µm*	COLOURS TESTED	
	BEIGE 02	BROWN 03
	a.v.	a.v.
	93 µm	90 µm
Checking RAL compliance (ΔE referring to standard 841GL)	//	//
1. Gloss (EN ISO 2813) *Gloss from Technical Data Sheet (Cat. 1)*	7+/-3	7+/-3
Gloss measured (average value)	8	7
2. Thickness (EN ISO 2360)	93 µm	90 µm
3. Adhesion (EN ISO 2409) *Spacing of cutters: 1mm up to 60 µm, 2 mm above*	88 µm	84 µm
Acceptable value: 0	Result 0	Result 0
4. Buchholz Indentation (EN ISO 2815)	88 µm	84 µm
Minimum value: 80	Result ND	Result ND
5. Cupping (EN ISO 1520) *No detachment at a diameter of 5 mm*	88 µm	84 µm
Class 1: No cracking or detachment at a depth of 5 mm *Class 2 and 3: No detachment at a depth of 5 mm after tape test*	Satisfactory? Y to limit	Satisfactory? Y to limit
6. Bending (EN ISO 1519) *No detachment at a diameter of 5 mm*	95 µm	84 µm
Class 1: No cracking or detachment at a diameter of 5 mm *Class 2 and 3: No detachment at a depth of 5 mm after tape test*	Satisfactory? Y	Satisfactory? Y
7. Impact test (EN ISO 6272-1) *No detachment at 2,5 Nm*	88 µm	84 µm
Class 1: No cracking or detachment at 2,5 Nm *Class 2 and 3: No detachment at 2,5 Nm after tape test*	Satisfactory? Y to limit	Satisfactory? Y to limit
8. Kesternich (EN ISO 3231)	94 µm	103 µm
No penetration or detachment beyond 1 mm *No infiltration exceeding 1 mm on both sides of the scratches, and no change in colour or blistering in excess of 2(S2)*	Satisfactory? Y	Satisfactory? Y
9. Acetic Salt Spray (EN ISO 9227) *Section 2.10 of QUALICOAT Specifications*	92 µm	72 µm
Length of filaments: max 4mm *Infiltration: max 16mm²/10 cm* *No blistering in excess of 2(S2)*	Satisfactory? Y	Satisfactory? Y

Report nº 8014 QUALITAL

TESTS *Specified minimum thickness: 60 µm*	COLOURS TESTED			
	BEIGE 02		BROWN 03	
10. Accelerated weathering (EN ISO 11341)	93 µm		104 µm	
Test time: 1000 h for class 1, 1.5 and 2 *Test time: 2000 h for class 3*	1	2	1	2
1. Initial gloss 2. Final gloss	8,6	8,2	7,8	7,7
Gloss retention % *Class 1: Residual value not less than 50%* *Class 1.5: Residual value not less than 75%* *Class 2 and 3: Residual value not less than 90%*	95		99	
	Satisfactory? Y		Satisfactory? Y	
Color variation ΔE	Spec. ΔE	Meas. ΔE	Spec. ΔE	Meas. ΔE
Spec. ΔE = limit value of ΔE *Meas. ΔE = ΔE measured value*	2,0	1,0	3,0	0,9
Acceptable limit for class 1: see Appendix A7 *Acceptable limit for class 1.5: 75% of the limits prescribed for class 1* *Acceptable limit for class 2 and 3: 50% of the limits prescribed for class 1*	Satisfactory? Y		Satisfactory? Y	
11. Resistance to boiling water / Pressure cooker (EN 12206-1 Par. 5.10)	102 µm		98 µm	
No defects, no detachments	Satisfactory? Y		Satisfactory? Y	
12. Constant climate condensation water (EN ISO 6270-2)	85 µm		81 µm	
No infiltration exceeding 1 mm on both sides of the scratch *No blistering in excess of 2(S2)*	Satisfactory? Y		Satisfactory? Y	
13. Polymerisation (only for liquid painting)	µm		µm	
	Satisfactory?		Satisfactory?	
14. Resistance to mortar (EN 12206-1)	94 µm		96 µm	
No defects *No color change* *No residues of the mortar*	Satisfactory? Y		Satisfactory? Y	
15. Weathering test (ISO 2810)	Period of exposure in Florida:			
1 year exposure in Florida (class 1) *2 years exposure in Florida (class 1.5)* *3 years exposure in Florida (class 2)* *10 years exposure in Florida (class 3)*	2013-2014		2013-2014	

	General licensee's recommendation to QUALICOAT	
Firma del responsabile del laboratorio Rossella Barbato	X	RESULT SATISFACTORY
		RESULT UNSATISFACTORY (SPECIFY)
Date: 07/03/2013	REMARKS:	

Report for coating system master version EN ed 01.07.2010 rev03 Page 4 of 5

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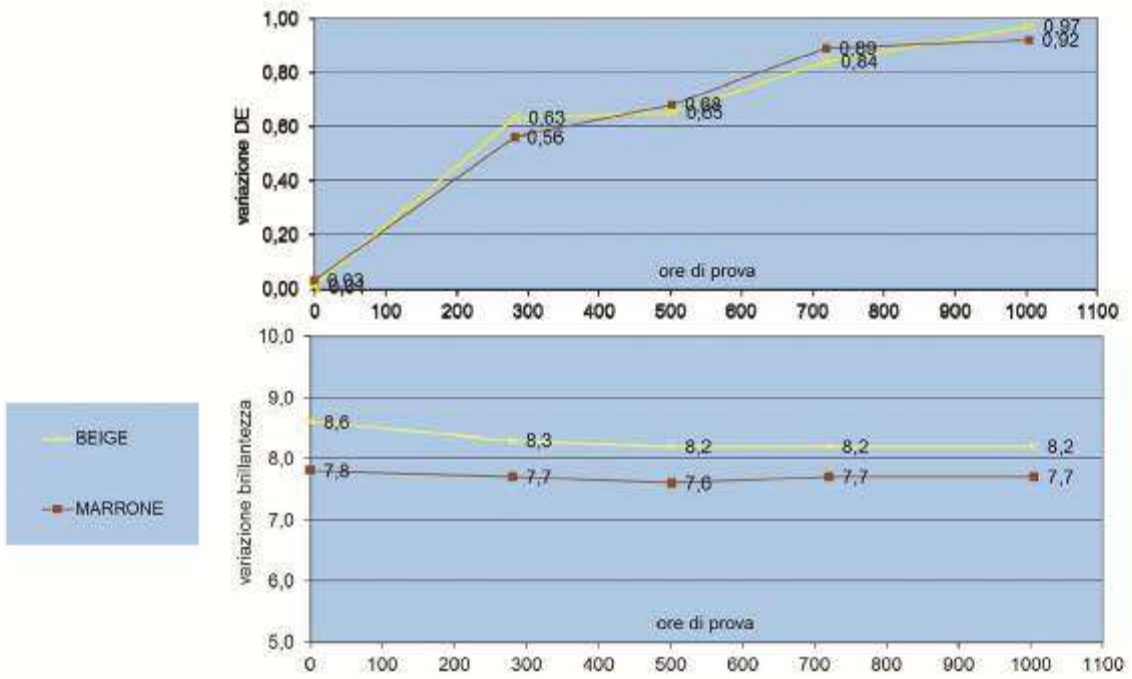
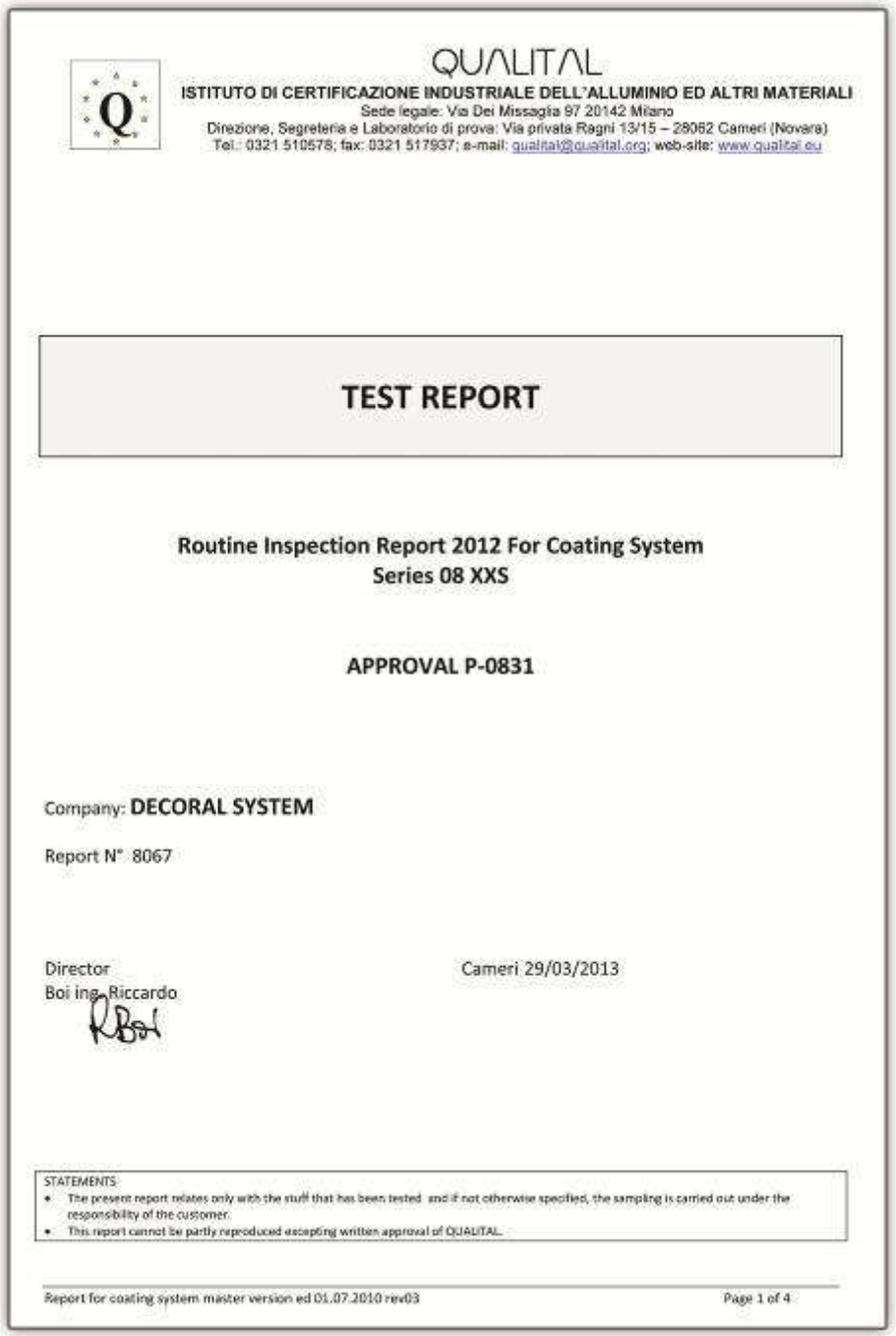
Tel.: 0321 510578; fax: 0321 517937; e-mail: qualital@qualital.org; web-site: www.qualital.eu



TEST REPORT PERFORMED FOR CERTIFYING SERIE DS 08XXS



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TEST REPORT

Routine Inspection Report 2012 For Coating System
Series 08 XXS

APPROVAL P-0831

Company: **DECORAL SYSTEM**

Report N° 8067

Director
Boi ing. Riccardo

Cameri 29/03/2013

STATEMENTS
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Report for coating system master version ed 01.07.2010 rev03 Page 1 of 4

Report n° 8067 QUALITAL

REPORT FOR COATING SYSTEMS

	Granting of approval
X	Renewal (**P-0831**)
	Repetition (**P-0831**)

COMPANY: DECORAL SYSTEM

ADDRESS: Viale del Lavoro, 5 - 37040 Arcole (VR)

COUNTRY: Italy

CONTACT PERSON: Mr. Pandolfi

PHONE/FAX: 045/7639195 E-MAIL: pandolfi@viv.it

SYSTEM:

FULL DESIGNATION: 08XXS

QUALICOAT CODE[1]: DS8

TYPE[2]: [ ] 1 [X] 1s [ ] 2a [ ] 2b [ ] 2c [ ] 2d [ ] 2e

COATS (No): [X] 1 [ ] 2

GLOSS CATEGORY: [ ] 1 [ ] 2 [X] 3

CLASS: [ ] 1 [ ] 1.5 [X] 2 [ ] 3

STRUCTURED FINISH[3]: [ ] a [ ] b [ ] c [X] NO

APPLICATION: [X] QUALICOAT [X] QUALIDECO

SAMPLING: Date: **09/11/2012**

During routine inspection at the coating plants [ ]

Sent by the supplier to the laboratory [X]

LABORATORY:

Laboratory in charge of the preparation of the samples:	QUALITAL
Laboratory in charge of the tests:	QUALITAL
Comm. Int.:	317-12
Contact person:	Dott.ssa Barbato
Date of application:	12/12/2012
Approval number of alternative pre-treatment used:	A-53
Curing temperature:	200°C
Curing time:	20'

1) Code given by QUALICOAT to the laboratory
2) Coating types: 1) Powder coating 1s) for sublimation only 2) Liquid coating 2a) Two-coat PVDF 2b) Three-coat PVDF (metallic) 2c) Silicon Polyester without primer 2d) Other thermosetting paints 2e) Two-components paints
3) Structured finishes: a) Leathered b) Textured c) Wrinkled

Report n° 8067 QUALITAL

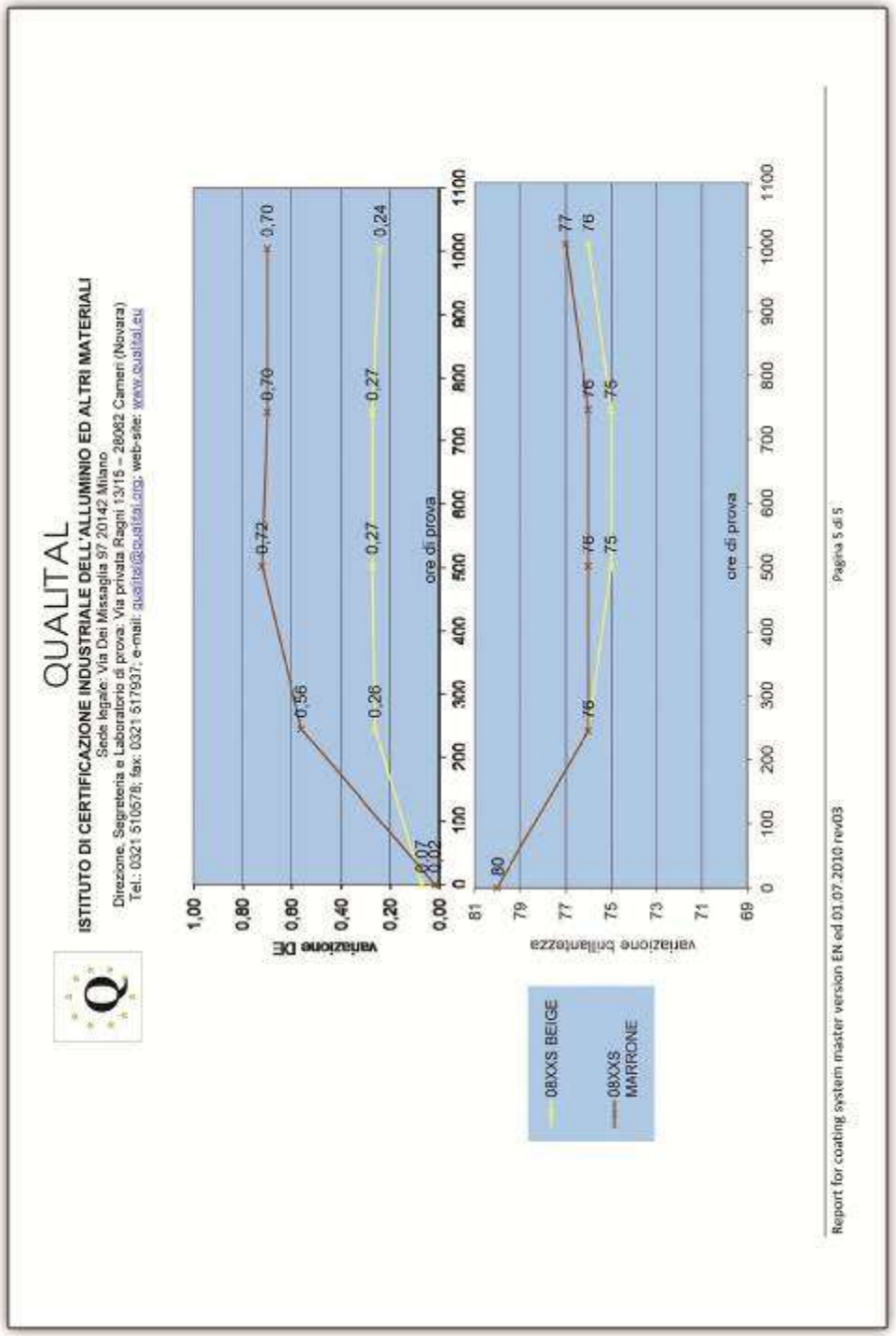
TESTS Specified minimum thickness: 60 µm	COLOURS TESTED	
	BEIGE	BROWN
	a.v.	a.v.
	90 µm	89 µm
Checking RAL compliance (ΔE referring to standard 841GL)	//	//
1. Gloss (EN ISO 2813) *Gloss from Technical Data Sheet (Cat. 1)*	80+/-15	80+/-15
Gloss measured (average value)	84	85
2. Thickness (EN ISO 2360)	90 µm	89 µm
3. Adhesion (EN ISO 2409) *Spacing of cutters: 1mm up to 60 µm, 2 mm above*	80 µm	71 µm
Acceptable value: 0	Result 0	Result 0
4. Buchholz Indentation (EN ISO 2815)	80 µm	71 µm
Minimum value: 80	Result 100	Result 83
5. Cupping (EN ISO 1520) *No detachment at a diameter of 5 mm*	80 µm	71 µm
Class 1: No cracking or detachment at a depth of 5 mm *Class 2 and 3: No detachment at a depth of 5 mm after tape test*	Satisfactory? Y	Satisfactory? Y
6. Bending (EN ISO 1519) *No detachment at a diameter of 5 mm*	76 µm	63 µm
Class 1: No cracking or detachment at a diameter of 5 mm *Class 2 and 3: No detachment at a depth of 5 mm after tape test*	Satisfactory? Y	Satisfactory? Y
7. Impact test (EN ISO 6272-1) *No detachment at 2,5 Nm*	80 µm	71 µm
Class 1: No cracking or detachment at 2,5 Nm *Class 2 and 3: No detachment at 2,5 Nm after tape test*	Satisfactory? Y	Satisfactory? Y
8. Kesternich (EN ISO 3231)	96 µm	101 µm
No penetration or detachment beyond 1 mm *No infiltration exceeding 1 mm on both sides of the scratches, and no change in colour or blistering in excess of 2(S2)*	Satisfactory? Y	Satisfactory? Y
9. Acetic Salt Spray (EN ISO 9227) *Section 2.10 of QUALICOAT Specifications*	106 µm	111 µm
Length of filaments: max 4mm *Infiltration: max 16mm²/10 cm* *No blistering in excess of 2(S2)*	Satisfactory? Y	Satisfactory? Y

Report for coating system master version EN ed 01.07.2010 rev03 Page 3 of 5

Report n° 8067 QUALITAL

TESTS Specified minimum thickness: 60 µm	COLOURS TESTED			
	BEIGE		BROWN	
10. Accelerated weathering (EN ISO 11341)	96 µm		87 µm	
Test time: 1000 h for class 1, 1.5 and 2 *Test time: 2000 h for class 3*	1	2	1	2
1. Initial gloss 2. Final gloss	80	76	80	77
Gloss retention % *Class 1: Residual value not less than 50%* *Class 1.5: Residual value not less than 75%* *Class 2 and 3: Residual value not less than 90%*	95		96	
	Satisfactory? Y		Satisfactory? Y	
Color variation ΔE	Spec. ΔE	Meas. ΔE	Spec. ΔE	Meas. ΔE
Spec. ΔE = limit value of ΔE *Meas. ΔE = ΔE measured value*	1,0	0,2	1,5	0,7
Acceptable limit for class 1: see Appendix A7 *Acceptable limit for class 1.5: 75% of the limits prescribed for class 1* *Acceptable limit for class 2 and 3: 50% of the limits prescribed for class 1*	Satisfactory? Y		Satisfactory? Y	
11. Resistance to boiling water / Pressure cooker (EN 12206-1 Par. 5.10)	88 µm		91 µm	
No defects, no detachments	Satisfactory? Y		Satisfactory? Y	
12. Constant climate condensation water (EN ISO 6270-2)	95 µm		103 µm	
No infiltration exceeding 1 mm on both sides of the scratch *No blistering in excess of 2(S2)*	Satisfactory? Y		Satisfactory? Y	
13. Polymerisation (only for liquid painting)	µm		µm	
	Satisfactory?		Satisfactory?	
14. Resistance to mortar (EN 12206-1)	86 µm		91 µm	
No defects *No color change* *No residues of the mortar*	Satisfactory? Y		Satisfactory? Y	
15. Weathering test (ISO 2810)	Period of exposure in Florida:			
1 year exposure in Florida (class 1) *2 years exposure in Florida (class 1.5)* *3 years exposure in Florida (class 2)* *10 years exposure in Florida (class 3)*	2013-2016		2013-2016	

	General licensee's recommendation to QUALICOAT	
Firma del responsabile del laboratorio Rossella Barbato	X	RESULT SATISFACTORY
		RESULT UNSATISFACTORY (SPECIFY)
Date: 29/03/2013	REMARKS:	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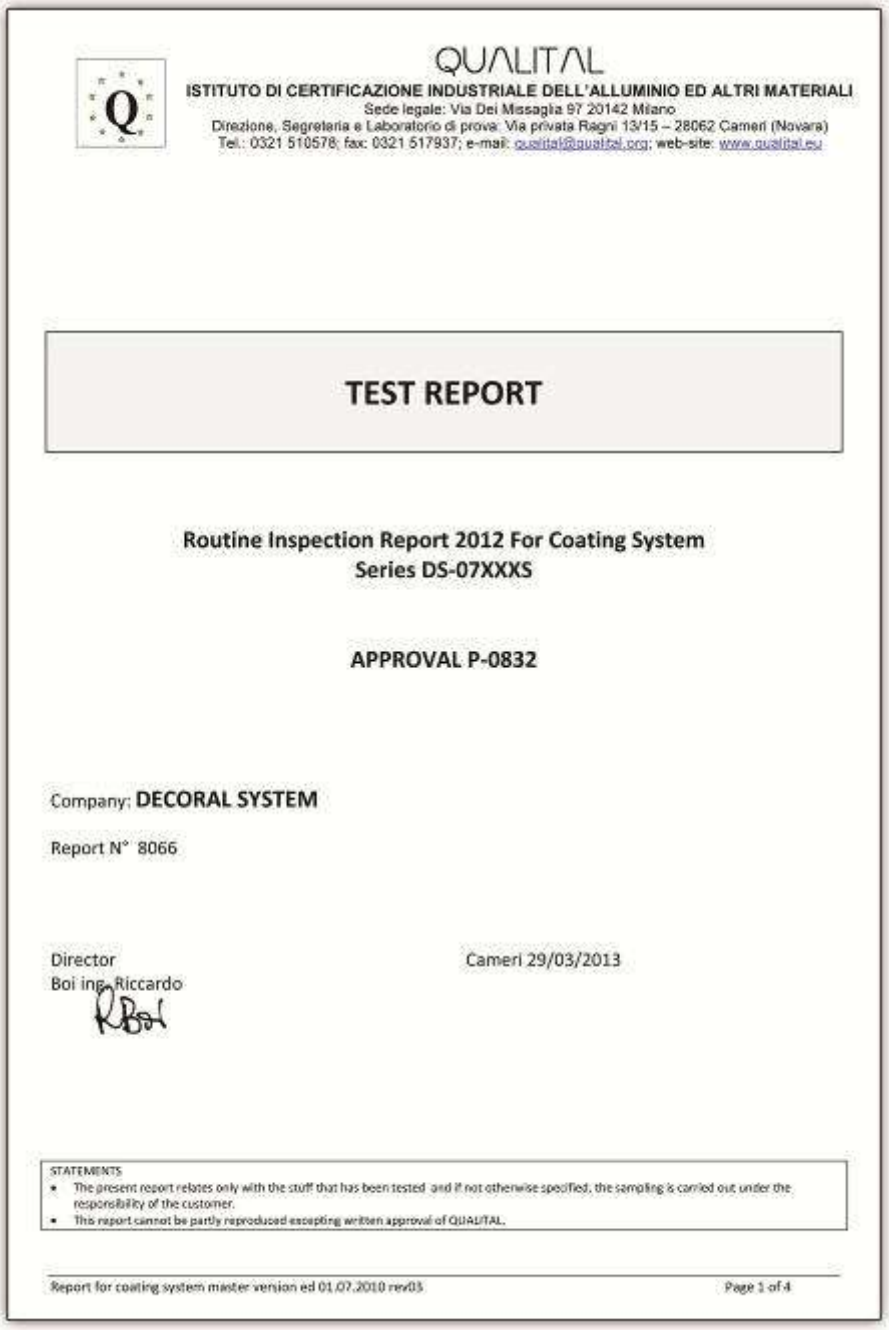
Tel.: 0321 510578; fax: 0321 517937; e-mail: qualital@qualital.org; web-site: www.qualital.eu
variazione DE
ore di prova
variazione brillantezza
ore di prova
08XXS BEIGE
08XXS MARRONE
Report for coating system master version EN ed 01.07.2010 rev03
Pagina 5 di 5

TEST REPORT PERFORMED FOR CERTIFYING SERIE DS-07XXXS



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Direzione, Segreteria e Laboratorio di prova: Via privata Ragni 13/15 – 28062 Cameri (Novara)

Tel.: 0321 510578; fax: 0321 517937; e-mail: qualital@qualital.org; web-site: www.qualital.eu

TEST REPORT

Routine Inspection Report 2012 For Coating System
Series DS-07XXXS

APPROVAL P-0832

Company: **DECORAL SYSTEM**

Report N° 8066

Director
Boi ing. Riccardo

Cameri 29/03/2013

STATEMENTS
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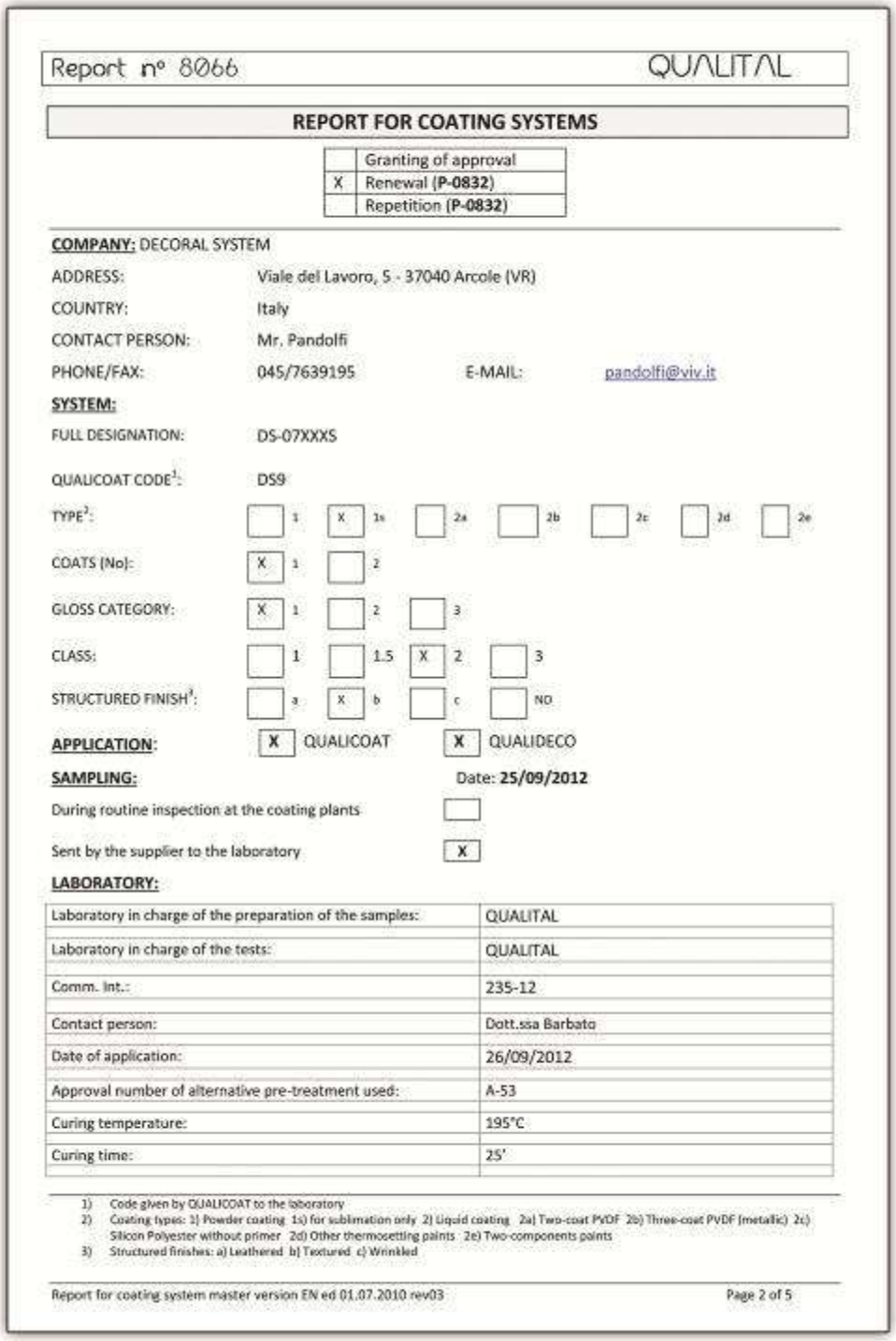

Report n° 8066 QUALITAL

REPORT FOR COATING SYSTEMS

	Granting of approval
X	Renewal (**P-0832**)
	Repetition (**P-0832**)

COMPANY: DECORAL SYSTEM

ADDRESS: Viale del Lavoro, 5 - 37040 Arcole (VR)

COUNTRY: Italy

CONTACT PERSON: Mr. Pandolfi

PHONE/FAX: 045/7639195 E-MAIL: pandolfi@viv.it

SYSTEM:

FULL DESIGNATION: DS-07XXXS

QUALICOAT CODE[1]: DS9

TYPE[2]: [ ] 1 [X] 1s [ ] 2a [ ] 2b [ ] 2c [ ] 2d [ ] 2e

COATS (No): [X] 1 [ ] 2

GLOSS CATEGORY: [X] 1 [ ] 2 [ ] 3

CLASS: [ ] 1 [ ] 1.5 [X] 2 [ ] 3

STRUCTURED FINISH[3]: [ ] a [X] b [ ] c [ ] NO

APPLICATION: [X] QUALICOAT [X] QUALIDECO

SAMPLING: Date: **25/09/2012**

During routine inspection at the coating plants [ ]

Sent by the supplier to the laboratory [X]

LABORATORY:

Laboratory in charge of the preparation of the samples:	QUALITAL
Laboratory in charge of the tests:	QUALITAL
Comm. Int.:	235-12
Contact person:	Dott.ssa Barbato
Date of application:	26/09/2012
Approval number of alternative pre-treatment used:	A-53
Curing temperature:	195°C
Curing time:	25'

1) Code given by QUALICOAT to the laboratory
2) Coating types: 1) Powder coating 1s) for sublimation only 2) Liquid coating 2a) Two-coat PVDF 2b) Three-coat PVDF (metallic) 2c) Silicon Polyester without primer 2d) Other thermosetting paints 2e) Two-components paints
3) Structured finishes: a) Leathered b) Textured c) Wrinkled

Report for coating system master version EN ed 01.07.2010 rev03 Page 2 of 5

TESTS *Specified minimum thickness: 60 µm*	COLOURS TESTED	
	BEIGE 16	**BROWN 33**
	a.v.	***a.v.***
	81 µm	81 µm
Checking RAL compliance (ΔE referring to standard 841GL)	//	//
1. Gloss (EN ISO 2813) *Gloss from Technical Data Sheet (Cat. 1)*	7+/-3	7+/-3
Gloss measured (average value)	8	7
2. Thickness (EN ISO 2360)	81 µm	81 µm
3. Adhesion (EN ISO 2409) *Spacing of cutters: 1mm up to 60 µm, 2 mm above*	69 µm	72 µm
Acceptable value: 0	Result 0	Result 0
4. Buchholz Indentation (EN ISO 2815)	69 µm	72 µm
Minimum value: 80	Result 125	Result 91
5. Cupping (EN ISO 1520) *No detachment at a diameter of 5 mm*	69 µm	72 µm
Class 1: No cracking or detachment at a depth of 5 mm *Class 2 and 3: No detachment at a depth of 5 mm after tape test*	Satisfactory? Y	Satisfactory? Y
6. Bending (EN ISO 1519) *No detachment at a diameter of 5 mm*	66 µm	73 µm
Class 1: No cracking or detachment at a diameter of 5 mm *Class 2 and 3: No detachment at a depth of 5 mm after tape test*	Satisfactory? Y	Satisfactory? Y
7. Impact test (EN ISO 6272-1) *No detachment at 2,5 Nm*	69 µm	72 µm
Class 1: No cracking or detachment at 2,5 Nm *Class 2 and 3: No detachment at 2,5 Nm after tape test*	Satisfactory? Y	Satisfactory? Y
8. Kesternich (EN ISO 3231)	79 µm	91 µm
No penetration or detachment beyond 1 mm *No infiltration exceeding 1 mm on both sides of the scratches, and no change in colour or blistering in excess of 2(S2)*	Satisfactory? Y	Satisfactory? Y
9. Acetic Salt Spray (EN ISO 9227) *Section 2.10 of QUALICOAT Specifications*	74 µm	75 µm
Length of filaments: max 4mm *Infiltration: max 16mm²/10 cm* *No blistering in excess of 2(S2)*	Satisfactory? Y	Satisfactory? Y

Report nº 8066 QUALITAL

TESTS Specified minimum thickness: 60 µm	COLOURS TESTED			
	BEIGE 16		BROWN 33	
10. Accelerated weathering (EN ISO 11341)	104 µm		91 µm	
Test time: 1000 h for class 1, 1.5 and 2 Test time: 2000 h for class 3	1	2	1	2
1. Initial gloss 2. Final gloss	8,3	8,3	7,7	7,7
Gloss retention % Class 1: Residual value not less than 50% Class 1.5: Residual value not less than 75% Class 2 and 3: Residual value not less than 90%	100		100	
	Satisfactory? Y		Satisfactory? Y	
Color variation ΔE	Spec. ΔE	Meas. ΔE	Spec. ΔE	Meas. ΔE
Spec. ΔE = limit value of ΔE Meas. ΔE = ΔE measured value	1,0	0,5	1,5	0,6
Acceptable limit for class 1: see Appendix A7 Acceptable limit for class 1.5: 75% of the limits prescribed for class 1 Acceptable limit for class 2 and 3: 50% of the limits prescribed for class 1	Satisfactory? Y		Satisfactory? Y	
11. Resistance to boiling water / Pressure cooker (EN 12206-1 Par. 5.10)	93 µm		80 µm	
No defects, no detachments	Satisfactory? Y		Satisfactory? Y	
12. Constant climate condensation water (EN ISO 6270-2)	74 µm		86 µm	
No infiltration exceeding 1 mm on both sides of the scratch No blistering in excess of 2(S2)	Satisfactory? Y		Satisfactory? Y	
13. Polymerisation (only for liquid painting)	µm		µm	
	Satisfactory?		Satisfactory?	
14. Resistance to mortar (EN 12206-1)	86 µm		82 µm	
No defects No color change No residues of the mortar	Satisfactory? Y		Satisfactory? Y	
15. Weathering test (ISO 2810)	Period of exposure in Florida:			
1 year exposure in Florida (class 1) 2 years exposure in Florida (class 1.5) 3 years exposure in Florida (class 2) 10 years exposure in Florida (class 3)	2013-2016		2013-2016	

	General licensee's recommendation to QUALICOAT	
Firma del responsabile del laboratorio Rossella Barbato	X	RESULT SATISFACTORY
		RESULT UNSATISFACTORY (SPECIFY)
Date: 29/03/2013	REMARKS:	

Report for coating system master version EN ed 01.07.2010 rev03 Page 4 of 5

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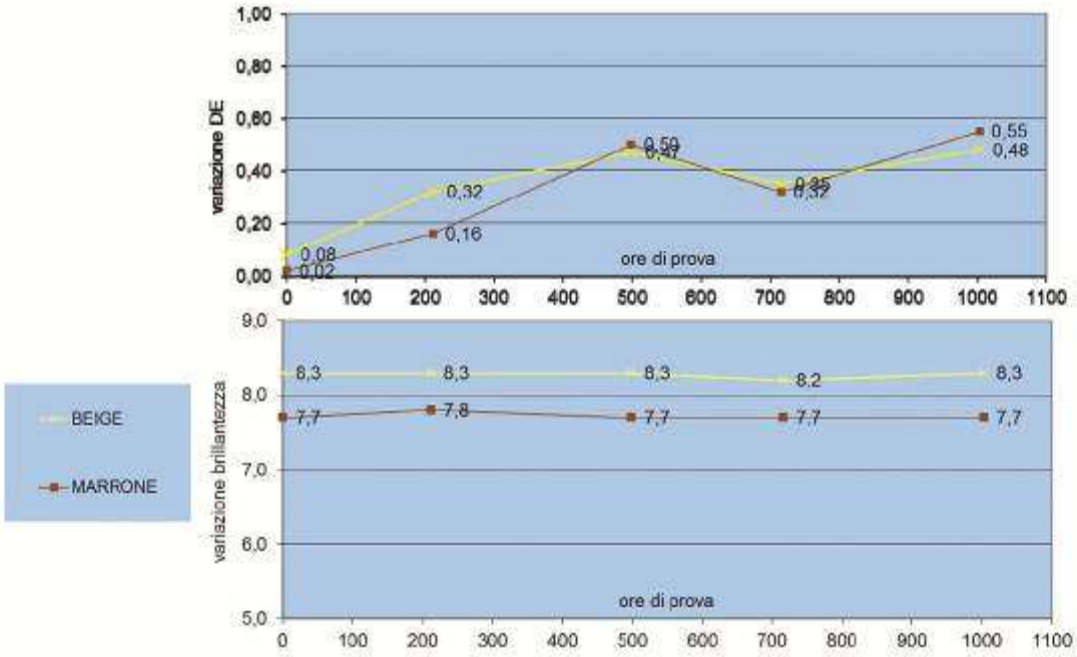
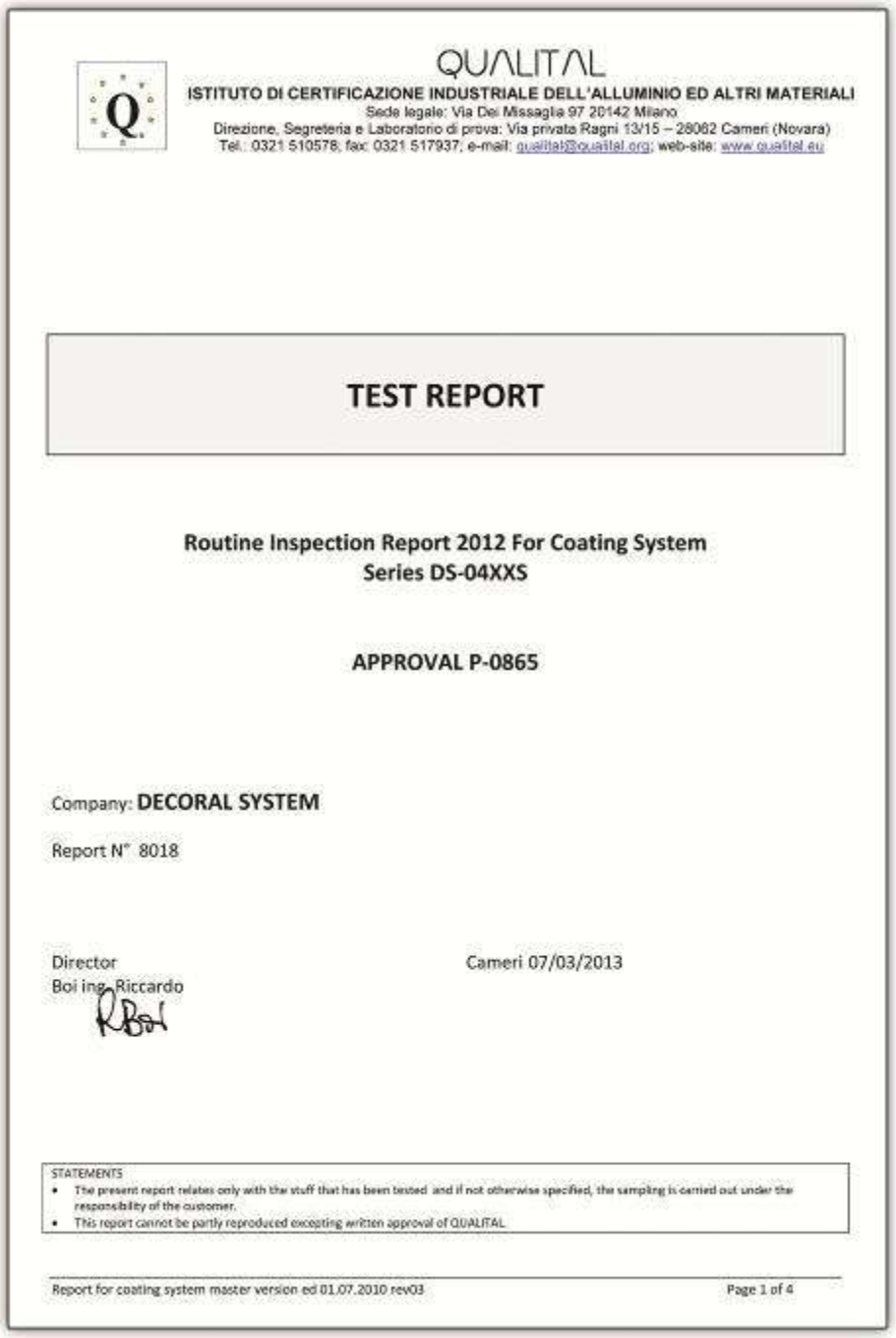


TEST REPORT PERFORMED FOR CERTIFYING SERIE DS-04XXS



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Tel.: 0321 510578; fax: 0321 517937; e-mail: qualital@qualital.org; web-site: www.qualital.eu

TEST REPORT

Routine Inspection Report 2012 For Coating System
Series DS-04XXS

APPROVAL P-0865

Company: **DECORAL SYSTEM**

Report N° 8018

Director
Boi ing. Riccardo

Cameri 07/03/2013

STATEMENTS
- The present report relates only with the stuff that has been tested and if not otherwise specified, the sampling is carried out under the responsibility of the customer.
- This report cannot be partly reproduced excepting written approval of QUALITAL

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Report n° QUALITAL

REPORT FOR COATING SYSTEMS

	Granting of approval
X	Renewal (**P-0865**)
	Repetition (**P-0865**)

COMPANY: DECORAL SYSTEM

ADDRESS: Viale del lavoro,5 - 37040 Arcole (VR)

COUNTRY: Italy

CONTACT PERSON: Mr. Pandolfi

PHONE/FAX: 045/7639195 E-MAIL: pandolfi@viv.it

SYSTEM:

FULL DESIGNATION: DS 04XXS

QUALICOAT CODE[1]: DS10

TYPE[2]: [ ] 1 [X] 1s [ ] 2a [ ] 2b [ ] 2c [ ] 2d [ ] 2e

COATS (No): [X] 1 [ ] 2

GLOSS CATEGORY: [X] 1 [ ] 2 [ ] 3

CLASS: [X] 1 [ ] 1.5 [ ] 2 [ ] 3

STRUCTURED FINISH[3]: [ ] a [ ] b [ ] c [X] NO

APPLICATION: [X] QUALICOAT [X] QUALIDECO

SAMPLING: Date: **16/10/2012**

During routine inspection at the coating plants [ ]

Sent by the supplier to the laboratory [X]

LABORATORY:

Laboratory in charge of the preparation of the samples:	QUALITAL
Laboratory in charge of the tests:	QUALITAL
Comm. Int.:	299-12
Contact person:	Dott.ssa Barbato
Date of application:	23/11/2012
Approval number of alternative pre-treatment used:	A-53
Curing temperature:	200°C
Curing time:	20'

1) Code given by QUALICOAT to the laboratory
2) Coating types: 1) Powder coating 1s) for sublimation only 2) Liquid coating 2a) Two-coat PVDF 2b) Three-coat PVDF (metallic) 2c) Silicon Polyester without primer 2d) Other thermosetting paints 2e) Two-components paints
3) Structured finishes: a) Leathered b) Textured c) Wrinkled

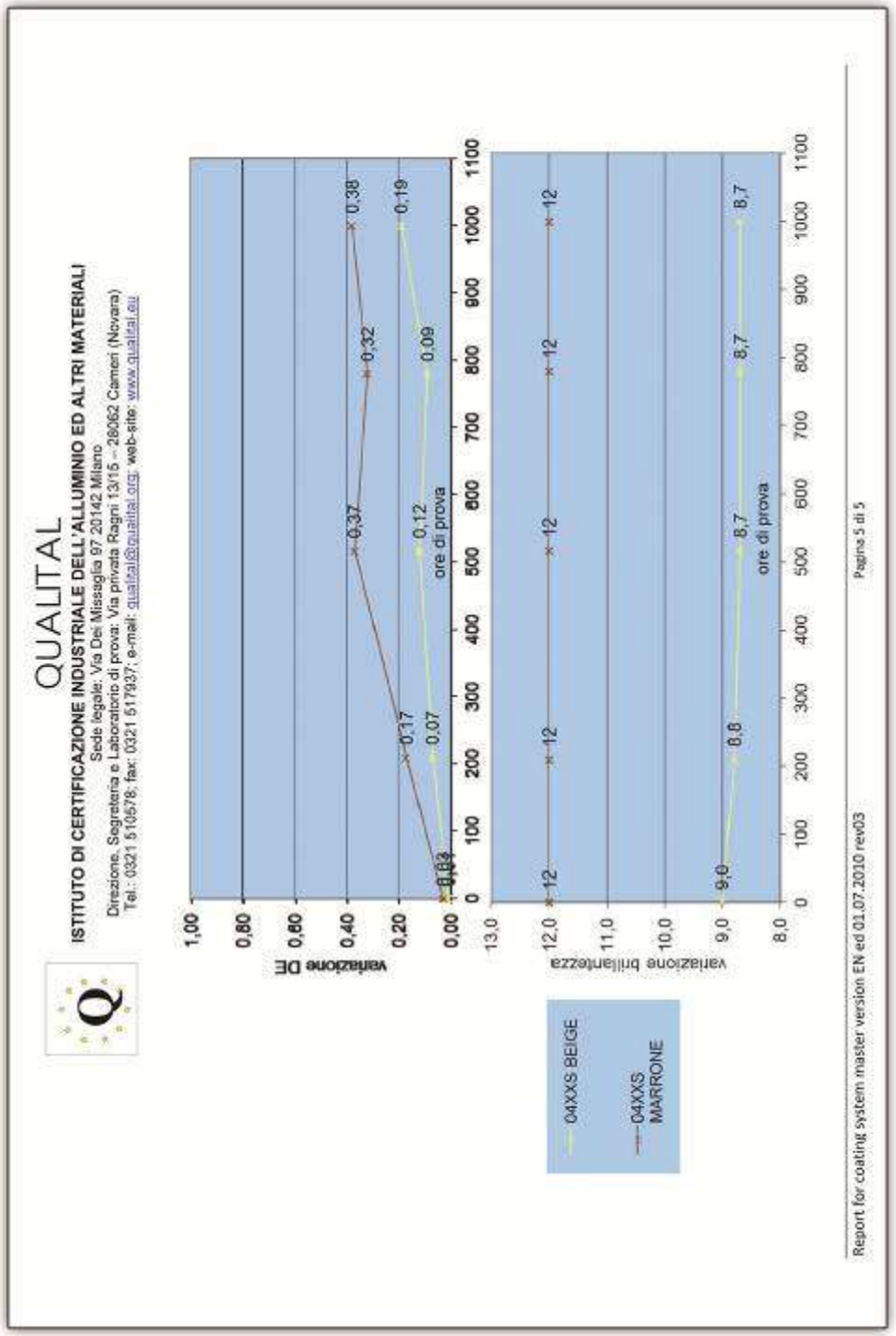
Report n° QUALITAL

TESTS Specified minimum thickness: 60 µm	COLOURS TESTED	
	BEIGE-02	BROWN-03
	a.v.	a.v.
	64 µm	75 µm
Checking RAL compliance (ΔE referring to standard 841GL)	//	//
1. Gloss (EN ISO 2813) *Gloss from Technical Data Sheet (Cat. 1)*	15+/-5	15+/-5
Gloss measured (average value)	10	12
2. Thickness (EN ISO 2360)	64 µm	75 µm
3. Adhesion (EN ISO 2409) *Spacing of cutters: 1mm up to 60 µm, 2 mm above*	60 µm	66 µm
Acceptable value: 0	Result 0	Result 0
4. Buchholz Indentation (EN ISO 2815)	60 µm	66 µm
Minimum value: 80	Result 91	Result 91
5. Cupping (EN ISO 1520) *No detachment at a diameter of 5 mm*	60 µm	66 µm
Class 1: No cracking or detachment at a depth of 5 mm *Class 2 and 3: No detachment at a depth of 5 mm after tape test*	Satisfactory? Y	Satisfactory? Y
6. Bending (EN ISO 1519) *No detachment at a diameter of 5 mm*	62 µm	61 µm
Class 1: No cracking or detachment at a diameter of 5 mm *Class 2 and 3: No detachment at a depth of 5 mm after tape test*	Satisfactory? Y	Satisfactory? Y
7. Impact test (EN ISO 6272-1) *No detachment at 2,5 Nm*	60 µm	66 µm
Class 1: No cracking or detachment at 2,5 Nm *Class 2 and 3: No detachment at 2,5 Nm after tape test*	Satisfactory? Y	Satisfactory? Y
8. Kesternich (EN ISO 3231)	77 µm	83 µm
No penetration or detachment beyond 1 mm *No infiltration exceeding 1 mm on both sides of the scratches, and no change in colour or blistering in excess of 2(S2)*	Satisfactory? Y	Satisfactory? Y
9. Acetic Salt Spray (EN ISO 9227) *Section 2.10 of QUALICOAT Specifications*	82 µm	76 µm
Length of filaments: max 4mm *Infiltration: max 16mm²/10 cm* *No blistering in excess of 2(S2)*	Satisfactory? Y	Satisfactory? Y

Report n° QUALITAL

TESTS Specified minimum thickness: 60 µm	COLOURS TESTED			
	BEIGE-02		BROWN-03	
10. Accelerated weathering (EN ISO 11341)	70 µm		79 µm	
Test time: 1000 h for class 1, 1.5 and 2 Test time: 2000 h for class 3	1	2	1	2
1. Initial gloss 2. Final gloss	9	8,7	12	12
Gloss retention % Class 1: Residual value not less than 50% Class 1.5: Residual value not less than 75% Class 2 and 3: Residual value not less than 90%	97		100	
	Satisfactory?		Satisfactory?	
Color variation ΔE	Spec. ΔE	Meas. ΔE	Spec. ΔE	Meas. ΔE
Spec. ΔE = limit value of ΔE Meas. ΔE = ΔE measured value	1,0	0,2	1,5	0,4
Acceptable limit for class 1: see Appendix A7 Acceptable limit for class 1.5: 75% of the limits prescribed for class 1 Acceptable limit for class 2 and 3: 50% of the limits prescribed for class 1	Satisfactory? Y		Satisfactory? Y	
11. Resistance to boiling water / Pressure cooker (EN 12206-1 Par. 5.10)	66 µm		80 µm	
No defects, no detachments	Satisfactory? Y		Satisfactory? Y	
12. Constant climate condensation water (EN ISO 6270-2)	69 µm		68 µm	
No infiltration exceeding 1 mm on both sides of the scratch No blistering in excess of 2(S2)	Satisfactory? Y		Satisfactory? Y	
13. Polymerisation (only for liquid painting)	µm		µm	
	Satisfactory?		Satisfactory?	
14. Resistance to mortar (EN 12206-1)	63 µm		79 µm	
No defects No color change No residues of the mortar	Satisfactory? Y		Satisfactory? Y	
15. Weathering test (ISO 2810)	Period of exposure in Florida:			
1 year exposure in Florida (class 1) 2 years exposure in Florida (class 1.5) 3 years exposure in Florida (class 2) 10 years exposure in Florida (class 3)	2013-2016		2013-2016	

	General licensee's recommendation to QUALICOAT	
Firma del responsabile del laboratorio Rossella Barbato	X	RESULT SATISFACTORY
		RESULT UNSATISFACTORY (SPECIFY)
Date: 07/03/2013	REMARKS:	


QUALITAL
ISTITUTO DI CERTIFICAZIONE INDUSTRIALE DELL'ALLUMINIO ED ALTRI MATERIALI
Sede legale: Via Dei Missaglia 97 20142 Milano
Direzione, Segreteria e Laboratorio di prova: Via privata Ragni 13/15 – 28062 Cameri (Novara)
Tel.: 0321 510578; fax: 0321 517937; e-mail: qualital@qualital.org; web-site: www.qualital.eu
variazione DE
ore di prova
variazione brillantezza
ore di prova
04XXS BEIGE
04XXS MARRONE
Report for coating system master version EN ed 01.07.2010 rev03
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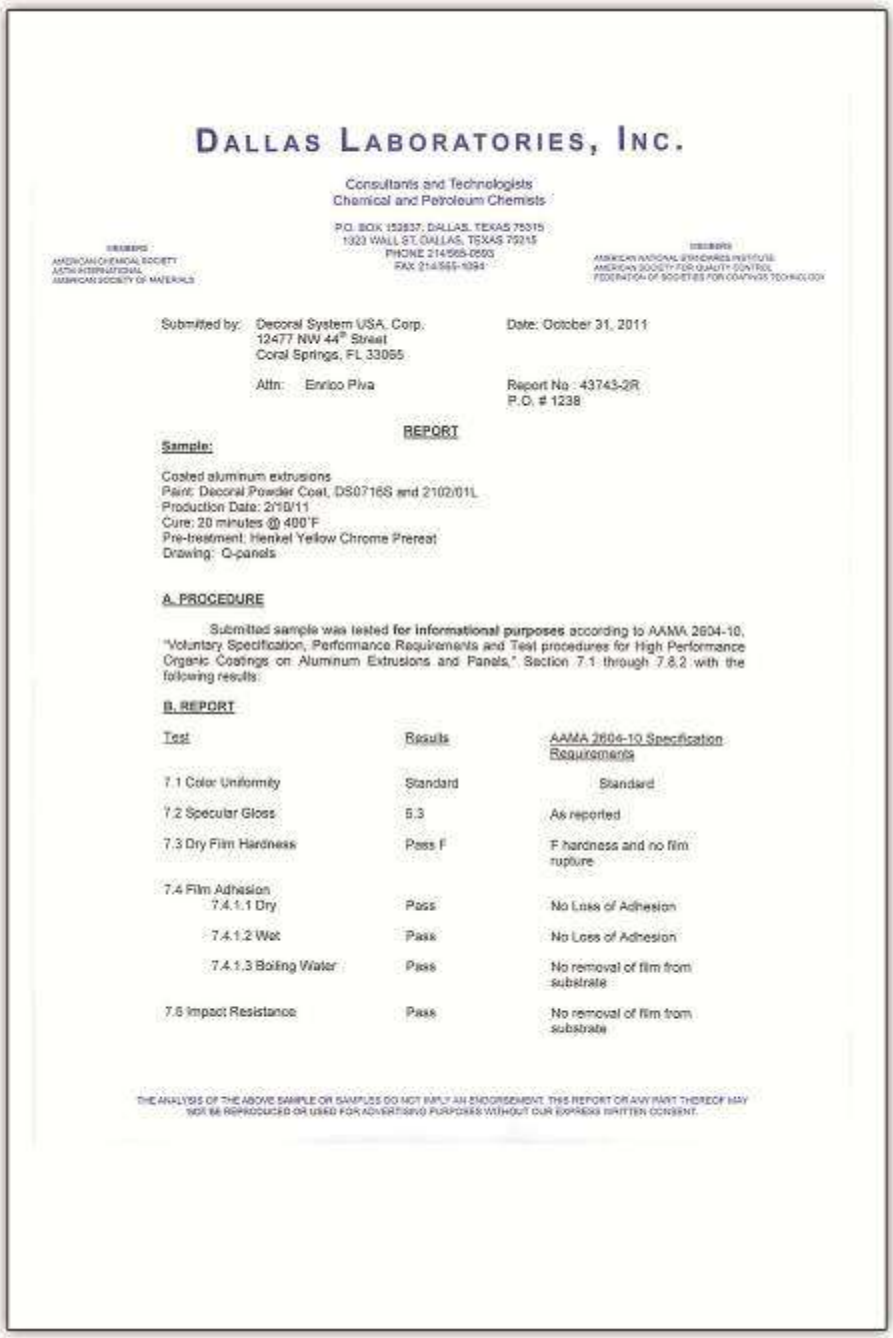
TEST REPORT RELATED TO TRIALS DONE ACCORDING TO AAMA (AMERICAN ARCHITECTURAL MANUFACTURES ASSOCIATION) SPECIFICATIONS



DALLAS LABORATORIES, INC.

Consultants and Technologists
Chemical and Petroleum Chemists

P.O. BOX 152837, DALLAS, TEXAS 75315
1323 WALL ST, DALLAS, TEXAS 75215
PHONE 214/565-0593
FAX 214/565-1094

Submitted by: Decoral System USA, Corp.
12477 NW 44th Street
Coral Springs, FL 33065

Date: October 31, 2011

Attn: Enrico Piva

Report No : 43743-2R
P.O. # 1238

REPORT

Sample:

Coated aluminum extrusions
Paint: Decoral Powder Coat, DS0716S and 2102/01L
Production Date: 2/10/11
Cure: 20 minutes @ 400°F
Pre-treatment: Henkel Yellow Chrome Preeat
Drawing: Q-panels

A. PROCEDURE

Submitted sample was tested **for informational purposes** according to AAMA 2604-10, "Voluntary Specification, Performance Requirements and Test procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels," Section 7.1 through 7.8.2 with the following results:

B. REPORT

Test	Results	AAMA 2604-10 Specification Requirements
7.1 Color Uniformity	Standard	Standard
7.2 Specular Gloss	5.3	As reported
7.3 Dry Film Hardness	Pass F	F hardness and no film rupture
7.4 Film Adhesion		
7.4.1.1 Dry	Pass	No Loss of Adhesion
7.4.1.2 Wet	Pass	No Loss of Adhesion
7.4.1.3 Boiling Water	Pass	No removal of film from substrate
7.6 Impact Resistance	Pass	No removal of film from substrate

THE ANALYSIS OF THE ABOVE SAMPLE OR SAMPLES DO NOT IMPLY AN ENDORSEMENT. THIS REPORT OR ANY PART THEREOF MAY NOT BE REPRODUCED OR USED FOR ADVERTISING PURPOSES WITHOUT OUR EXPRESS WRITTEN CONSENT.

Test	Results	AAMA 2604-10 Specification Requirements
7.6 Abrasion Resistance	Pass 86 L, (58 L = 20 ACV)	ACV 20 minimum
7.7 Chemical Resistance		
7.7.1 Muriatic Acid	Pass	No Blistering or Visible Change
7.7.2 Mortar	Pass	No Blistering or Visible Change
7.7.3 Nitric Acid	Pass (Delta E = 0.42)	Hunter Delta E=5 maximum
7.7.4 Detergent	Pass	No Film Adhesion Loss or Visible Change
7.7.5 Window Cleaner Resistance	Pass	No blistering or noticeable change in appearance and no film loss
7.8 Corrosion Resistance		
7.8.1 Humidity	Pass (No Blisters)	Not greater than Few & No. 8
7.8.2 Salt spray	Pass	
Scribe	10	7 Minimum rating
Field	10	8 Minimum rating

Date Testing Started: 5/10/11

Date Testing Completed: 10/31/11

Date Test Report Expires: N/A

Sampled by : N/A

Testing Conducting At: Dallas Laboratories, Inc., 1323 Wall St., Dallas, Texas 75215.

The test results indicate that the sample tested **for informational purposes** is in compliance with all of the performance requirements of AAMA 2604-10 for High Performance Organic Coatings on Aluminum Extrusions and Panels, except for section 7.9 WEATHERING which must be furnished by the coating supplier for full compliance to AAMA 2604-10 as specified by AAMA.

DALLAS LABORATORIES, INC.

Kevan W. Jones, Vice President

Analyst: GF
KWJ/ss

DALLAS LABORATORIES, INC.

Consultants and Technologists
Chemical and Petroleum Chemists

P.O. BOX 152837, DALLAS, TEXAS 75315
1323 WALL ST. DALLAS, TEXAS 75215
PHONE 214/565-0569
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Submitted by: Decoral System USA Corp.
12477 NW 44th Street
Coral Springs, FL 33065
Attn: Enrico Piva

Date: October 31, 2011

Report No. 43743-1R
P.O. #1238

REPORT

Sample:

Coated aluminum extrusions
Paint: Decoral Powder Coat, DS0402S and 2102/01L
Production Date: 2/10/11
Cure: 20 minutes @400°F
Pre-treatment: Henkel Yellow Chrome Pretreat
Drawing: Q-panels

A. PROCEDURE

Submitted sample was tested **for informational purposes** according to AAMA 2605-11, "Voluntary Specification,
Performance Requirements and Test procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels," Section 7.1 through 7.8, with the following results:

B. REPORT

Test	Results	AAMA 2605-11 Specification Requirements
7.1 Color Uniformity	Standard	Standard
7.2 Specular Gloss	12.9	As reported
7.3 Dry Film Hardness	Pass F	F hardness and no film rupture
7.4 Film Adhesion	Pass	
7.4.1.1 Dry	None	No removal of film from substrate
7.4.1.2 Wet	None	No removal of film from substrate
7.4.1.3 Boiling Water	None	No removal of film from substrate

Test	Results	AAMA 2605-11 Specification Requirements
7.5 Impact Resistance	Pass None	No removal of film from substrate
7.6 Abrasion Resistance	Pass	ACV 40 minimum
7.7 Chemical Resistance	Pass	
7.7.1 Muriatic Acid	None	No Blistering or Visible Change
7.7.2 Mortar	None	No Blistering or Visible Change
7.7.3 Nitric Acid	Pass (Delta E = 1.72)	Hunter, Delta E = 5 maximum
7.7.4 Detergent	None	No Film Adhesion Loss or Visible Change
7.7.5 Window Cleaner Resistance	None	No blistering or noticeable change in appearance and no film loss
7.8 Corrosion Resistance	Pass	
7.8.1 Humidity	(No Blisters)	Not greater than Few & No. 8
7.8.2 Salt spray	Pass	
Scribe	10	7 Minimum rating
Field	10	8 Minimum rating

Date Testing Started: 5/10/11

Date Testing Completed: 10/31/11

Date Test Report Expires: N/A

Sampled by: N/A

Testing Conducted at: Dallas Laboratories, Inc., 1323 Wall St., Dallas, TX 75215

The test results indicate that the sample tested **for informational purposes** is in compliance with all of the performance requirements of AAMA 2605-11 for Superior Performing Organic Coatings on Aluminum Extrusions and Panels, except for section 7.9 WEATHERING which must be furnished by the by the coating supplier for full compliance to AAMA 2605-11 as specified by AAMA.

DALLAS LABORATORIES, INC.

Kevan W. Jones, Vice President

Analyst: GF
KWJ: ss

Q-LAB

INSTRUMENTAL COLOR REPORT

Q-Lab Weathering Research Service

CLIENT:	**Decoral System USA Corporation**
ADDRESS:	**12477 NW 44 Street** **Coral Springs, FL 33065**
ATTN:	**Mr. Enrico Piva**
YOUR REFERENCE:	**PO #1237**
CONTENTS:	**Cover Sheet: Page 1** **Report: Page 2**
Inspected By:	**Marie Jones** Marie Jones
Approved By:	**Ian Collishaw** I. Collishaw

TEST NO:	**DSC-1**
REPORT NO:	**1**
DATE:	**2 February 2012**
DATE EXPOSED:	**2 February 2011**
DURATION:	**12 Months**
TYPE:	**Direct Inland, 45° South-Florida**
SPECIMENS:	**12 painted metal panels**
RADIATION LOG:	**TOTAL = 6,342.90 MJ/m²** **TUVR = 337.84 MJ/m²**

NOTES:
Please refer to the legend on our website located at www.myweathertest.com for an explanation of the values and scales used in this report.

The bottom half of each specimen was washed with deionized water prior to present color measurements.
An average of three readings is reported.

COLOR DATA INFORMATION:
INSTRUMENT: X-Rite Color i7 (d/8° sphere)
COLOR SCALE: Hunter L a b
ILLUMINANT: D65
OBSERVER: 10°
SPEC. IN/OUT: Included

Q-Lab Florida: 1005 SW 18th Avenue PO Box 349490 Homestead, FL 33034 Telephone: 305-245-5600 Fax: 305-245-5656 Email: q-lab@q-lab.com

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INSTRUMENTAL COLOR REPORT — **Q-Lab Weathering Research Service**

TEST NO: DSC-1 — **REPORT NO: 1** — **DATE: 2 February 2012**

Specimen ID	Original			Present			Difference			Delta		
	L	a	b	L	a	b	L	a	b	E	C	H
DS 07163-2102/OIL-1	55.64	9.61	22.82	55.46	9.46	22.69	-0.18	-0.15	-0.13	0.27	-0.18	0.09
DS 07163-2102/OIL-1-UV	55.64	9.61	22.82	54.69	9.93	22.39	-0.95	0.32	-0.43	1.09	-0.27	-0.46
DS 07163-2102/OIL-2	54.48	9.26	22.05	54.93	8.84	22.16	0.45	-0.42	0.11	0.63	-0.08	0.43
DS 07163-2102/OIL-2-UV	54.48	9.26	22.05	54.65	9.51	22.21	0.17	0.25	0.16	0.34	0.24	-0.17
DS 07163-2102/OIL-3	54.54	9.18	22.07	55.74	8.94	22.71	1.20	-0.24	0.64	1.38	0.50	0.46
DS 07163-2102/OIL-3-UV	54.54	9.18	22.07	54.98	9.33	22.35	0.44	0.15	0.28	0.54	0.32	-0.03
DS 04028-2102/OIL-1	55.98	8.38	21.13	56.44	8.05	21.25	0.46	-0.33	0.12	0.58	-0.01	0.35
DS 04028-2102/OIL-1-UV	55.98	8.38	21.13	54.50	8.31	20.62	-1.48	-0.07	-0.51	1.57	-0.50	-0.12
DS 04028-2102/OIL-2	55.98	8.32	21.12	56.28	8.02	21.14	0.30	-0.30	0.02	0.42	-0.09	0.29
DS 04028-2102/OIL-2-UV	55.98	8.32	21.12	54.55	8.99	20.88	-1.43	0.67	-0.24	1.60	0.03	-0.71
DS 04028-2102/OIL-3	56.03	7.78	20.97	57.22	7.60	21.11	1.19	-0.18	0.14	1.21	0.07	0.22
DS 04028-2102/OIL-3-UV	56.03	7.78	20.97	54.29	8.02	20.24	-1.74	0.24	-0.73	1.90	-0.60	-0.49
DS 07335-1803/OIL-1	32.95	7.63	10.07	34.33	7.94	11.05	1.38	0.31	0.98	1.72	0.97	0.33
DS 07335-1803/OIL-1-UV	32.95	7.63	10.07	32.25	7.49	9.51	-0.70	-0.14	-0.56	0.91	-0.53	-0.23
DS 07335-1803/OIL-2	34.91	8.12	11.70	35.14	8.00	11.71	0.23	-0.12	0.01	0.26	-0.06	0.10
DS 07335-1803/OIL-2-UV	34.91	8.12	11.70	35.50	8.20	11.84	0.59	0.08	0.14	0.61	0.16	0.01
DS 07335-1803/OIL-3	34.21	7.96	11.05	35.63	8.24	12.27	1.42	0.28	1.22	1.89	1.16	0.47
DS 07335-1803/OIL-3-UV	34.21	7.96	11.05	34.55	7.97	11.19	0.34	0.01	0.14	0.37	0.12	0.07
DS 04035-1803/OIL-1	32.83	7.99	10.47	33.57	8.28	10.99	0.74	0.29	0.52	0.95	0.59	0.08
DS 04035-1803/OIL-1-UV	32.83	7.99	10.47	32.50	8.06	10.17	-0.33	0.07	-0.30	0.45	-0.19	-0.24
DS 04035-1803/OIL-2	33.54	8.34	11.19	34.34	8.40	11.47	0.80	0.06	0.28	0.85	0.28	0.12
DS 04035-1803/OIL-2-UV	33.54	8.34	11.19	32.85	8.13	10.37	-0.69	-0.21	-0.82	1.09	-0.78	-0.33
DS 04035-1803/OIL-3	32.42	8.31	10.69	33.10	8.23	10.57	0.68	-0.08	-0.12	0.70	-0.14	-0.01
DS 04035-1803/OIL-3-UV	32.42	8.31	10.69	33.23	8.21	10.56	0.81	-0.10	-0.11	0.82	-0.15	0.01

2 of 2

Q-Lab Florida: 1005 SW 19th Avenue PO Box 349480 Homestead, FL 33034 Telephone: 305 245-9600 Fax: 305 245-5655 Email: q-lab@q-lab.com

Q-LAB

INSPECTION REPORT

Q-Lab Weathering Research Service

CLIENT:	**Decoral System USA Corporation**
ADDRESS:	**12477 NW 44 Street** **Coral Springs, FL 33065**
ATTN:	**Mr. Enrico Piva**
YOUR REFERENCE:	**PO #1237**
CONTENTS:	**Cover Sheet: Page 1** **Report: Page 2-3**

TEST NO:	**DSC-1**
REPORT NO:	**1**
DATE:	**2 February 2012**
DATE EXPOSED:	**2 February 2011**
DURATION:	**12 Months**
TYPE:	**Direct Inland, 45° South-Florida**
SPECIMENS:	**12 painted metal panels**
RADIATION LOG:	**TOTAL = 6,342.90 MJ/m²** **TUVR = 337.84 MJ/m²**

NOTES:
The bottom half of each specimen was washed with deionized water prior to present gloss and inspection.

Gloss and DFT were recorded with a Byk micro-TRI-gloss. DFT is reported in mils.

Please refer to the legend located on our website at www.myweatertest.com for an explanation of the ratings used in this report.

Inspected By: **Melissa Bragassa** Melissa Bragassa

Approved By: **Ian Collishaw** I. Collishaw

Q-Lab Florida: 1005 SW 18th Avenue PO Box 349490 Homestead, FL 33034 Telephone: 305-245-5600 Fax: 305-245-5656 Email: q-lab@q-lab.com

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INSPECTION REPORT

Q-Lab Weathering Research Service

TEST NO: DSC-1 REPORT NO: 1 DATE: 2 February 2012

Specimen Number	Gen App	60° Gloss			DFT		Color	Dirt	Mildew	Chalk	Erosion	Comments
		O	P	Δ	O	P	Δ					
DS 07165-2102/OIL-1	8	5	5	0	2.9	3.0	-0.1	8 F	9	9	10	10	
DS 07165-2102/OIL-2	8	5	5	0	2.9	2.8	0.1	8 F	9	9	10	10	
DS 07165-2102/OIL-3	8	5	12	-7	2.8	3.0	-0.4	8 F	9	9	10	10	
DS 04025-2102/OIL-1	8	11	13	-2	3.0	2.7	0.3	9 F	9	9	10	10	
DS 04025-2102/OIL-2	8	12	15	-3	3.0	2.8	0.2	9 F	9	9	10	10	
DS 04025-2102/OIL-3	8	12	6	6	2.7	2.5	0.2	9 F	9	9	10	10	
DS 07335-1803/OIL-1	9	6	5	1	2.9	2.5	0.4	9 F	10	10	10	10	
DS 07335-1803/OIL-2	10	5	5	0	2.9	2.8	0.1	10	10	10	10	10	
DS 07335-1803/OIL-3	10	6	14	-8	2.8	2.5	0.3	10	10	10	10	10	
DS 04035-1803/OIL-1	10	11	17	-6	3.3	2.9	0.4	10	10	10	10	10	
DS 04035-1803/OIL-2	10	14	15	-1	2.7	2.8	0.0	10	10	10	10	10	
DS 04035-1803/OIL-3	10	11	11	0	2.7	2.3	0.4	10	10	10	10	10	

2 of 3

Q-Lab Florida: 1005 SW 18th Avenue PO Box 349480 Homestead, FL 33034 Telephone: 305-245-9600 Fax: 305-245-9656 Email: q-lab@q-lab.com

Q-LAB

INSPECTION REPORT

Q-Lab Weathering Research Service

TEST NO: DSC-1 REPORT NO: 1 DATE: 2 February 2012

Specimen Number					DFT (under mask)									Comments
					O	P	Δ							
DS 0716S-2102/OIL-1					2.9	3.2	-0.3							
DS 0716S-2102/OIL-2					2.9	2.9	0.0							
DS 0716S-2102/OIL-3					2.6	3.0	-0.4							
DS 0402S-2102/OIL-1					3.0	3.0	0.0							
DS 0402S-2102/OIL-2					3.0	3.0	0.0							
DS 0402S-2102/OIL-3					2.7	2.8	-0.1							
DS 0733S-1803/OIL-1					2.9	3.0	-0.1							
DS 0733S-1803/OIL-2					2.9	2.6	0.3							
DS 0733S-1803/OIL-3					2.8	3.0	-0.2							
DS 0403S-1803/OIL-1					3.3	2.9	0.4							
DS 0403S-1803/OIL-2					2.7	2.7	0.0							
DS 0403S-1803/OIL-3					2.7	2.8	0.0							

Q-Lab Florida: 1005 SW 18th Avenue PO Box 348490 Homestead, FL 33034 Telephone: 305-245-5600 Fax: 305-245-5656 Email: q-lab@q-lab.com

Q-LAB

INSTRUMENTAL COLOR REPORT

Q-Lab Weathering Research Service

This inspection report contains only findings and results arrived at after employing the specific test procedures listed in the Test Confirmation. It does not constitute a recommendation for, endorsement of, or certification of the product or material tested. Q-Lab Weathering Research Service makes no warranty, expressed or implied, except that the test has been performed, and a report prepared, based upon the specimen or specimens furnished by the client. Extrapolation of data from the specimen or specimens relating to the batch or lot from which it was obtained may not correlate and should be interpreted accordingly with extreme caution. We assume no responsibility for variations in quality, composition, appearance, performance, or other feature of similar subject matter produced by other persons or under conditions over which we have no control. This report shall not be reproduced except in full without the written approval of Q-Lab Weathering Research Service.

CLIENT:	**Decoral System USA Corporation**
ADDRESS:	**12477 NW 44 Street** **Coral Springs, FL 33065**
ATTN:	**Mr. Enrico Piva**
YOUR REFERENCE:	**PO #1237**
CONTENTS:	**Cover Sheet: Page 1** **Report: Page 2**
Inspected By:	**Marie Jones** Marie Jones
Approved By:	**Ian Collishaw** I. Collishaw

TEST NO:	**DSC-1**
REPORT NO:	**2**
DATE:	**2 February 2013**
DATE EXPOSED:	**2 February 2011**
DURATION:	**24 Months**
TYPE:	**Direct Inland, 45° South-Florida**
SPECIMENS:	**12 painted metal panels**
RADIATION LOG:	**TOTAL = 12,615.23 MJ/m²** **TUVR = 658.29 MJ/m²**

NOTES:
Please refer to the legend on our website located at www.myweathertest.com for an explanation of the values and scales used in this report.

The bottom half of each specimen was washed with deionized water prior to evaluation.
An average of three readings is reported.
UW = Unwashed
COLOR DATA INFORMATION:
INSTRUMENT: X-Rite Color i7 (d/8° sphere)
COLOR SCALE: Hunter L a b
ILLUMINANT: D65
OBSERVER: 10°
SPEC. IN/OUT: Included

1 of 2

Q-Lab Florida: 1005 SW 18th Avenue PO Box 349490 Homestead, FL 33034 Telephone: 305-245-5800 Fax: 305-245-5656 Email: q-lab@q-lab.com

Q-LAB

INSTRUMENTAL COLOR REPORT

Q-Lab Weathering Research Service

TEST NO: DSC-1 **REPORT NO: 2** **DATE: 2 February 2013**

	Original			Present			Difference			Delta		
Specimen ID	L	a	b	L	a	b	L	a	b	E	C	H
DS 0716S-2102/OIL-1	55.64	9.61	22.82	55.70	9.15	22.54	0.06	-0.46	-0.28	0.54	-0.43	0.32
DS 0716S-2102/OIL-1-U/W	55.64	9.61	22.82	54.66	8.87	22.17	-0.98	-0.74	-0.65	1.39	-0.88	0.44
DS 0716S-2102/OIL-2	54.48	9.26	22.05	54.94	8.68	22.02	0.46	-0.58	-0.03	0.74	-0.25	0.53
DS 0716S-2102/OIL-2-U/W	54.48	9.26	22.05	53.71	8.50	21.50	-0.77	-0.76	-0.55	1.21	-0.80	0.50
DS 0716S-2102/OIL-3	54.54	9.18	22.07	56.06	8.83	22.78	1.52	-0.35	0.71	1.71	0.53	0.59
DS 0716S-2102/OIL-3-U/W	54.54	9.18	22.07	54.14	8.34	21.71	-0.40	-0.84	-0.36	1.00	-0.65	0.65
DS 0402S-2102/OIL-1	55.98	8.38	21.13	56.25	8.05	21.03	0.27	-0.33	-0.10	0.44	-0.21	0.27
DS 0402S-2102/OIL-1-U/W	55.98	8.38	21.13	55.96	8.04	21.15	-0.02	-0.34	0.02	0.34	-0.10	0.32
DS 0402S-2102/OIL-2	55.98	8.32	21.12	56.83	7.92	21.20	0.85	-0.40	0.08	0.94	-0.07	0.40
DS 0402S-2102/OIL-2-U/W	55.98	8.32	21.12	55.85	8.05	21.10	-0.13	-0.27	-0.02	0.30	-0.12	0.24
DS 0402S-2102/OIL-3	56.03	7.78	20.97	56.90	7.59	21.01	0.87	-0.19	0.04	0.89	-0.03	0.19
DS 0402S-2102/OIL-3-U/W	56.03	7.78	20.97	55.88	7.58	20.89	-0.15	-0.20	-0.08	0.26	-0.14	0.16
DS 0733S-1803/OIL-1	32.95	7.63	10.07	34.81	7.94	11.39	1.86	0.31	1.32	2.30	1.25	0.52
DS 0733S-1803/OIL-1-U/W	32.95	7.63	10.07	32.97	7.59	10.49	0.02	-0.04	0.42	0.42	0.31	0.28
DS 0733S-1803/OIL-2	34.91	8.12	11.70	35.29	8.07	11.95	0.38	-0.05	0.25	0.46	0.18	0.18
DS 0733S-1803/OIL-2-U/W	34.91	8.12	11.70	35.25	8.17	12.41	0.34	0.05	0.71	0.79	0.62	0.36
DS 0733S-1803/OIL-3	34.21	7.96	11.05	35.20	8.07	11.74	0.99	0.11	0.69	1.21	0.63	0.31
DS 0733S-1803/OIL-3-U/W	34.21	7.96	11.05	34.17	7.96	11.54	-0.04	0.00	0.49	0.49	0.40	0.28
DS 0403S-1803/OIL-1	32.83	7.99	10.47	33.25	8.10	10.54	0.42	0.11	0.07	0.44	0.12	-0.04
DS 0403S-1803/OIL-1-U/W	32.83	7.99	10.47	32.53	7.86	10.26	-0.30	-0.13	-0.21	0.39	-0.25	-0.02
DS 0403S-1803/OIL-2	33.54	8.34	11.19	35.09	8.46	11.94	1.55	0.12	0.75	1.73	0.68	0.34
DS 0403S-1803/OIL-2-U/W	33.54	8.34	11.19	34.85	8.33	12.07	1.31	-0.01	0.88	1.58	0.71	0.52
DS 0403S-1803/OIL-3	32.42	8.31	10.69	33.57	8.17	10.80	1.15	-0.14	0.11	1.16	0.00	0.18
DS 0403S-1803/OIL-3-U/W	32.42	8.31	10.69	32.70	7.93	10.40	0.28	-0.38	-0.29	0.55	-0.46	0.12

Q-Lab Florida: 1005 SW 18th Avenue PO Box 349490 Homestead, FL 33034 Telephone: 305-245-5800 Fax: 305-245-5656 Email: q-lab@q-lab.com

Q-LAB

INSPECTION REPORT

Q-Lab Weathering Research Service

This inspection report contains only findings and results arrived at after employing the specific test procedures listed in the Test Confirmation. It does not constitute a recommendation for, endorsement of, or certification of the product or material tested. Q-Lab Weathering Research Service makes no warranty, expressed or implied, except that the test has been performed, and a report prepared, based upon the specimen or specimens furnished by the client. Extrapolation of data from the specimen or specimens relating to the batch or lot from which it was obtained may not correlate and should be interpreted accordingly with reference caution. We assume no responsibility for variations in quality, composition, appearance, performance, or other feature of similar subject matter produced by other persons or under conditions over which we have no control. This report shall not be reproduced except in full without the written approval of Q-Lab Weathering Research Service.

CLIENT:	Decoral System USA Corporation	TEST NO:	DSC-1
ADDRESS:	12477 NW 44 Street Coral Springs, FL 33065	REPORT NO:	2
		DATE:	2 February 2013
ATTN:	Mr. Enrico Piva	DATE EXPOSED:	2 February 2011
		DURATION:	24 Months
YOUR REFERENCE:	PO #1237	TYPE:	Direct Inland, 45° South-Florida
		SPECIMENS:	12 painted metal panels
		RADIATION LOG:	TOTAL = 12,615.23 MJ/m² TUVR = 658.29 MJ/m²
CONTENTS:	Cover Sheet: Page 1 Report: Page 2, 3 (DFT Masked)	NOTES:	Please refer to the legend on our website located at www.myweathertest.com for an explanation of the values and scales used in this report.
			The bottom half of each specimen was washed with deionized water prior evaluation.
Inspected By:	Marie Jones		Gloss and DFT were recorded with a BYK Micro TRI-Gloss.
Approved By:	Ian Collishaw		Dry film measurements were recorded in mils using a BYK Micro Tri-Gloss

1 of 3

Q-Lab Florida: 1005 SW 18th Avenue PO Box 349490 Homestead, FL 33034 Telephone: 305-245-5600 Fax: 305-245-5666 Email: q-lab@q-lab.com

Q-LAB

INSPECTION REPORT

Q-Lab Weathering Research Service

TEST NO: DSC-1 REPORT NO: 2 DATE: 2 February 2013

Specimen Number	Gen App	60° Gloss			DFT			Color	Dirt	Mildew	Chalk	Erosion		Comments
		O	P	Δ	O	P	Δ							
DS 0716S-2102/OIL-1	8	5	4	1	2.9	3.2	-0.3	8 F	9	8	10	10		
DS 0716S-2102/OIL-2	8	5	5	0	2.9	2.8	0.1	8 F	9	8	10	10		
DS 0716S-2102/OIL-3	8	5	4	1	2.6	2.7	-0.1	8 F	9	8	10	10		
DS 0402S-2102/OIL-1	8	11	13	-2	3.0	2.9	0.1	9 F	9	9	10	10		
DS 0402S-2102/OIL-2	8	12	13	-1	3.0	2.9	0.1	8 F	9	8	10	10		
DS 0402S-2102/OIL-3	8	12	14	-2	2.7	2.6	0.1	9 F	9	8	10	10		
DS 0733S-1803/OIL-1	9	6	5	1	2.9	2.2	0.7	9 F	10	10	10	10		
DS 0733S-1803/OIL-2	10	5	5	0	2.9	3.0	-0.1	10	10	10	10	10		
DS 0733S-1803/OIL-3	10	6	5	1	2.8	2.4	0.4	10	10	10	10	10		
DS 0403S-1803/OIL-1	10	11	14	-3	3.3	2.9	0.4	10	10	10	10	10		
DS 0403S-1803/OIL-2	10	14	18	-4	2.7	2.8	-0.1	10	10	10	10	10		
DS 0403S-1803/OIL-3	10	11	15	-4	2.7	2.4	0.3	10	10	10	10	10		

Q-Lab Florida: 1005 SW 18th Avenue PO Box 349490 Homestead, FL 33034 Telephone: 305-245-5600 Fax: 305-245-5656 Email: q-lab@q-lab.com

Q-LAB

INSPECTION REPORT

Q-Lab Weathering Research Service

TEST NO: DSC-1 **REPORT NO: 2** **DATE: 2 February 2013**

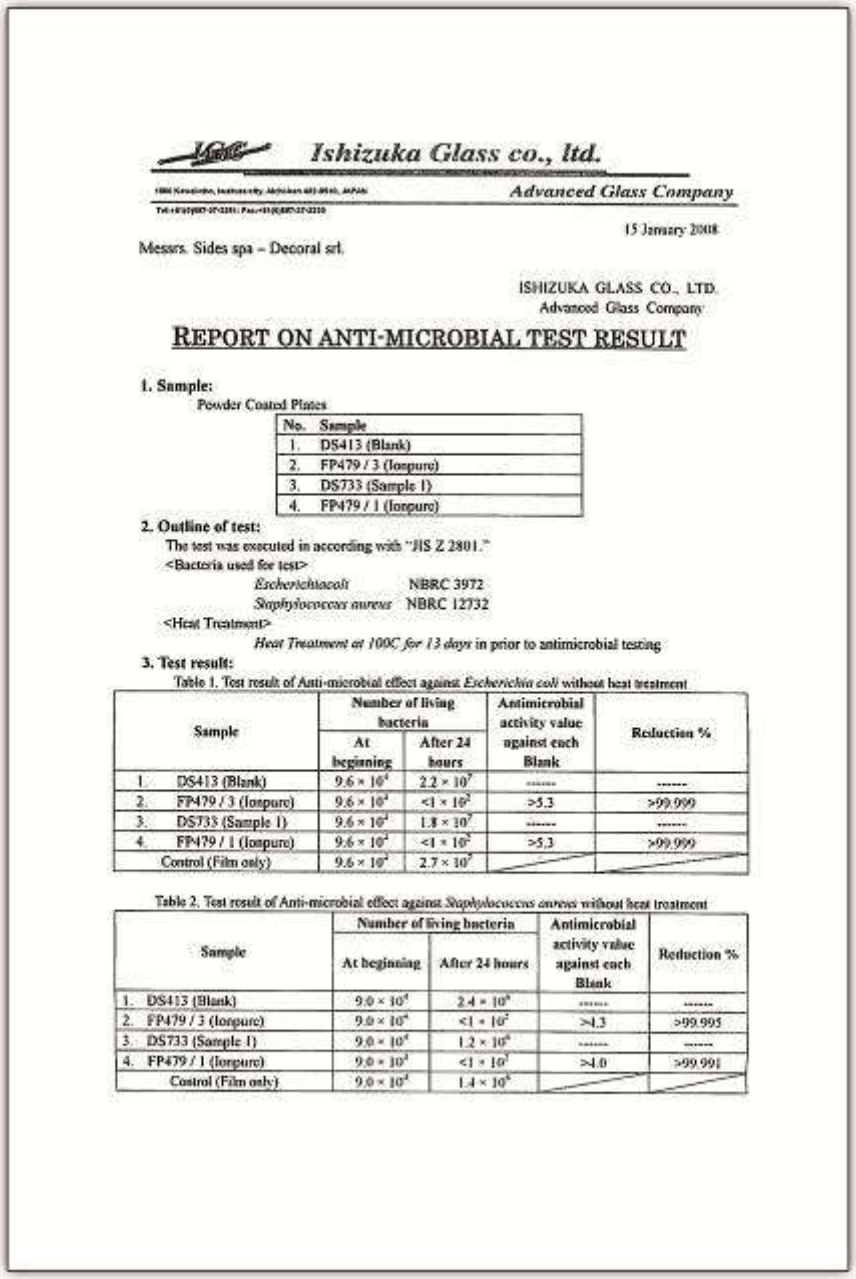
Specimen Number					DFT (under mask)									Comments
					Q	P	Δ							
DS 0716S-2102/OIL-1					2.9	3.1	-0.2							
DS 0716S-2102/OIL-2					2.9	3.0	-0.1							
DS 0716S-2102/OIL-3					2.6	2.6	0.0							
DS 0402S-2102/OIL-1					3.0	3.3	-0.3							
DS 0402S-2102/OIL-2					3.0	3.0	0.0							
DS 0402S-2102/OIL-3					2.7	2.7	0.0							
DS 0733S-1803/OIL-1					2.9	2.7	0.2							
DS 0733S-1803/OIL-2					2.9	2.7	0.2							
DS 0733S-1803/OIL-3					2.8	2.9	-0.1							
DS 0403S-1803/OIL-1					3.3	2.9	0.4							
DS 0403S-1803/OIL-2					2.7	2.9	-0.2							
DS 0403S-1803/OIL-3					2.7	2.6	0.1							

3 of 3

Q-Lab Florida: 1005 SW 18th Avenue PO Box 349480 Homestead, FL 33034 Telephone: 305-245-9600 Fax: 305-245-9656 Email: q-lab@q-lab.com

DETERMINATION OF THE ANTIMICROBIAL ACTIVITY – ISHIZUKA GLASS co., ltd

Special powders with certified antimicrobial skills against STAPHILOCOCCUS AUREUS and ESCHERICHIA COLI. Particularly fit for use in hospitals, nursery schools, kitchens and microwave ovens.



Ishizuka Glass co., ltd.

Advanced Glass Company

15 January 2008

Messrs. Sides spa – Decoral srl.

ISHIZUKA GLASS CO., LTD.
Advanced Glass Company

REPORT ON ANTI-MICROBIAL TEST RESULT

1. Sample:

Powder Coated Plates

No.	Sample
1.	DS413 (Blank)
2.	FP479 / 3 (Ionpure)
3.	DS733 (Sample 1)
4.	FP479 / 1 (Ionpure)

2. Outline of test:

The test was executed in according with "JIS Z 2801."

<Bacteria used for test>

Escherichiacoli NBRC 3972

Staphylococcus aureus NBRC 12732

<Heat Treatment>

Heat Treatment at 100C for 13 days in prior to antimicrobial testing

3. Test result:

Table 1. Test result of Anti-microbial effect against *Escherichia coli* without heat treatment

Sample	Number of living bacteria		Antimicrobial activity value against each Blank	Reduction %
	At beginning	After 24 hours		
1. DS413 (Blank)	9.6×10^4	2.2×10^7	------	------
2. FP479 / 3 (Ionpure)	9.6×10^4	$<1 \times 10^2$	>5.3	>99.999
3. DS733 (Sample 1)	9.6×10^4	1.8×10^7	------	------
4. FP479 / 1 (Ionpure)	9.6×10^4	$<1 \times 10^2$	>5.3	>99.999
Control (Film only)	9.6×10^4	2.7×10^7		

Table 2. Test result of Anti-microbial effect against *Staphylococcus aureus* without heat treatment

Sample	Number of living bacteria		Antimicrobial activity value against each Blank	Reduction %
	At beginning	After 24 hours		
1. DS413 (Blank)	9.0×10^4	2.4×10^8	------	------
2. FP479 / 3 (Ionpure)	9.0×10^4	$<1 \times 10^2$	>4.3	>99.995
3. DS733 (Sample 1)	9.0×10^4	1.2×10^8	------	------
4. FP479 / 1 (Ionpure)	9.0×10^4	$<1 \times 10^2$	>4.0	>99.991
Control (Film only)	9.0×10^4	1.4×10^8		

Ishizuka Glass co., ltd.

Advanced Glass Company

Table 3. Test result of Anti-microbial effect against *Escherichia coli* after heat treatment

Sample	Number of living bacteria		Antimicrobial activity value against each Blank	Reduction %
	At beginning	After 24 hours		
1. DS413 (Blank)	9.6×10^4	2.1×10^7	------	------
2. FP479 / 3 (Ionpure)	9.6×10^4	$<1 \times 10^2$	>5.3	>99.999
3. DS733 (Sample 1)	9.6×10^4	2.0×10^7	------	------
4. FP479 / 1 (Ionpure)	9.6×10^4	$<1 \times 10^2$	>5.3	>99.999
Control (Film only)	9.6×10^4	2.7×10^7		

Table 4. Test result of Anti-microbial effect against *Staphylococcus aureus* after heat treatment

Sample	Number of living bacteria		Antimicrobial activity value against each Blank	Reduction %
	At beginning	After 24 hours		
1. DS413 (Blank)	9.0×10^4	1.6×10^6	------	------
2. FP479 / 3 (Ionpure)	9.0×10^4	$<1 \times 10^2$	>4.2	>99.993
3. DS733 (Sample 1)	9.0×10^4	1.6×10^6	------	------
4. FP479 / 1 (Ionpure)	9.0×10^4	$<1 \times 10^2$	>4.2	>99.993
Control (Film only)	9.0×10^4	1.4×10^6		

4. Consideration:

Sample 2 and 4 had shown stable antimicrobial efficacy under the circumstance of with and without heat treatment as the reduction percentage exceeded 99.9%. Heat treatment of 100C for 13 days was given to sample in prior to antimicrobial testing in order to simulate 10 years of usage.

ISHIZUKA GLASS CO., LTD.

Hajime Motomatsu
MANAGER

Ishizuka Glass co., ltd.

Advanced Glass Company

28 August 2007

Messrs. Sides spa – Decoral

ISHIZUKA GLASS CO., LTD.
Advanced Glass Company

REPORT ON ANTI-MICROBIAL TEST RESULT

1. Sample:

PU Powder Coated Plates

No.	Sample
1.	FP 456 / 1
2.	FP 456 / 2
3.	FP 456 / 3

2. Outline of test:

The test was executed in according with "JIS Z 2801."

<Bacteria used for test>

Escherichiacoli NBRC 3972
Staphylococcus aureus NBRC 12732

<Density of Nutrient Broth>

1/50 NB

<Incubation Time>

5 Hours

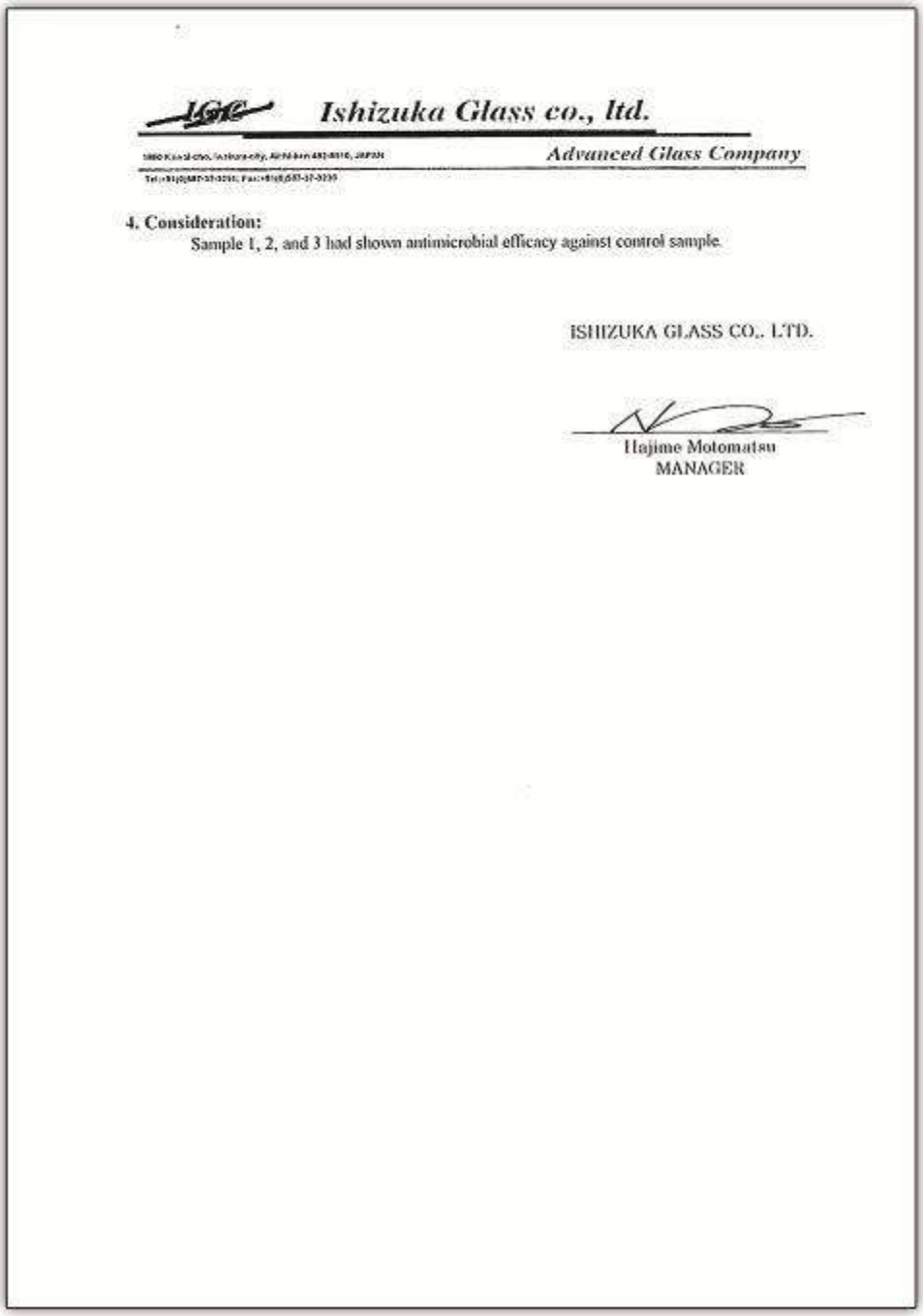
3. Test result:

Table 1. Test result of Anti-microbial effect against *Escherichia coli*

Sample	Number of living bacteria		Antimicrobial activity value against Control	Reduction %
	At beginning	After 5 hours		
1. FP 456 / 1	2.4×10^5	$<1 \times 10^2$	>3.8	>99.987
2. FP 456 / 2	2.4×10^5	$<1 \times 10^2$	>3.8	>99.987
3. FP 456 / 3	2.4×10^5	$<1 \times 10^2$	>3.8	>99.987
Control (Film only)	2.4×10^5	7.7×10^5		

Table 2. Test result of Anti-microbial effect against *Staphylococcus aureus*

Sample	Number of living bacteria		Antimicrobial activity value against Control	Reduction %
	At beginning	After 5 hours		
1. FP 456 / 1	2.0×10^5	$<1 \times 10^2$	>3.9	>99.987
2. FP 456 / 2	2.0×10^5	$<1 \times 10^2$	>3.9	>99.987
3. FP 456 / 3	2.0×10^5	$<1 \times 10^2$	>3.9	>99.987
Control (Film only)	2.0×10^5	8.0×10^5		



Ishizuka Glass co., ltd.

Advanced Glass Company

4. Consideration:

Sample 1, 2, and 3 had shown antimicrobial efficacy against control sample.

ISHIZUKA GLASS CO., LTD.

Hajime Motomatsu
MANAGER

Decoral System s.r.l.
Viale del Lavoro 5
IT-37040 Arcole (VR)

Burgdorf, 12.09.2012

Test order No. 2012-1257	**Determination of the antimicrobial activity**
Date of order:	04.09.2012
Responsible:	
Pages:	8
Enclosures:	Abstract: JIS Z 2801:2010

Method(s):

JIS Z 2801:2010	Quantitative analysis for determination of the bacteriostatic activity:

SANITIZED AG

Erich Rohrbach
Head Microbiology

The findings are valid for the tested object(s) only. Filing record of report and documentation is 10 years.

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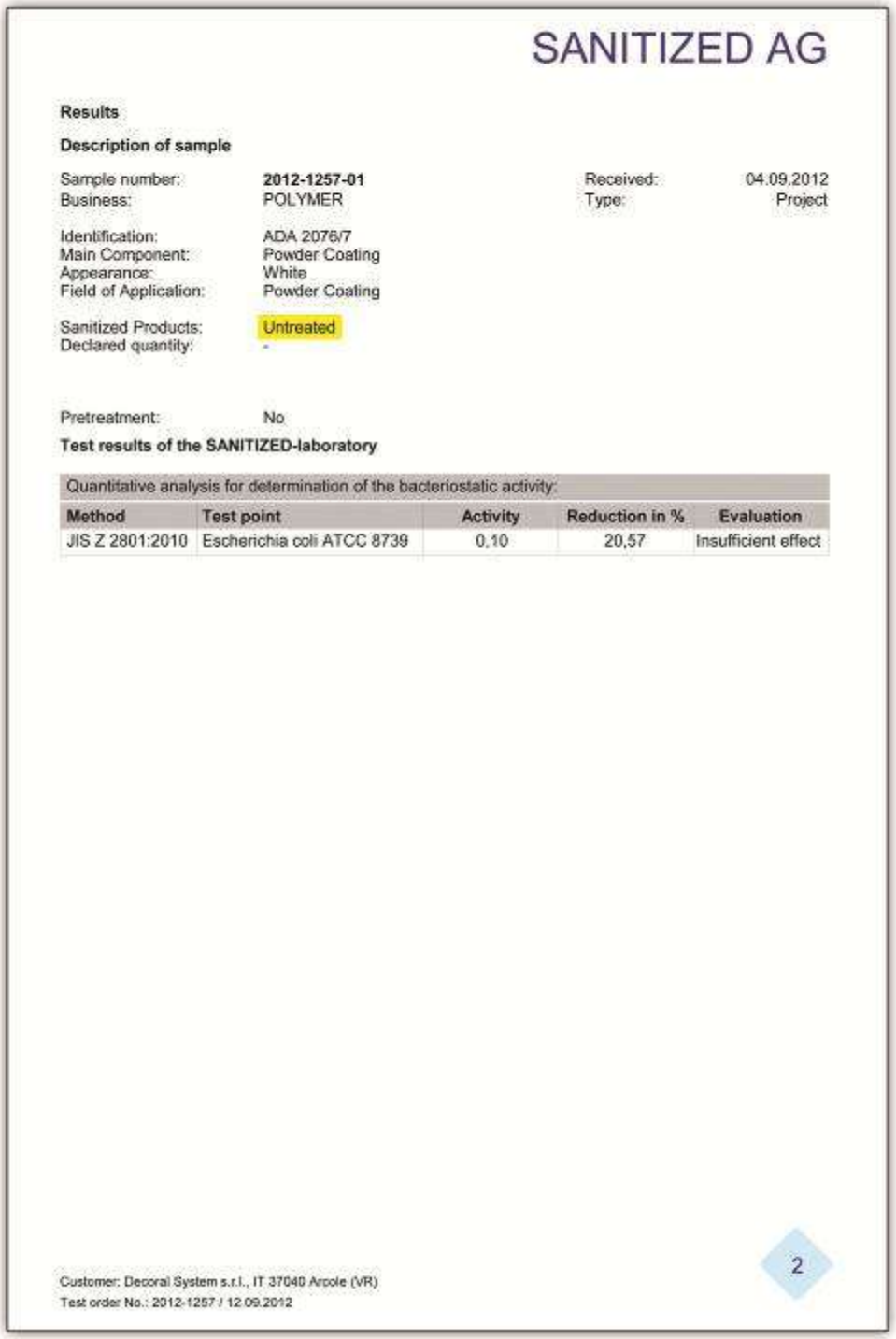


SANITIZED AG

Results

Description of sample

Sample number:	**2012-1257-01**	Received:	04.09.2012
Business:	POLYMER	Type:	Project
Identification:	ADA 2076/7		
Main Component:	Powder Coating		
Appearance:	White		
Field of Application:	Powder Coating		
Sanitized Products:	Untreated		
Declared quantity:	-		
Pretreatment:	No		

Test results of the SANITIZED-laboratory

Quantitative analysis for determination of the bacteriostatic activity:

Method	Test point	Activity	Reduction in %	Evaluation
JIS Z 2801:2010	Escherichia coli ATCC 8739	0,10	20,57	Insufficient effect

2

Customer: Decoral System s.r.l., IT 37040 Arcole (VR)
Test order No.: 2012-1257 / 12.09.2012

SANITIZED AG

Results

Description of sample

Sample number:	**2012-1257-07**	Received:	04.09.2012
Business:	POLYMER	Type:	Project

Identification:	ADA 2076/1
Main Component:	Powder Coating
Appearance:	White
Field of Application:	Powder Coating
Sanitized Products:	Sanitized® BC A 21-61
Declared quantity:	0.8%
Finishing Process(es):	Extrusion
Pretreatment:	No

Test results of the SANITIZED-laboratory

Quantitative analysis for determination of the bacteriostatic activity:

Method	Test point	Activity	Reduction in %	Evaluation
JIS Z 2801:2010	Escherichia coli ATCC 8739	>4,70	>99,99	Good effect

TABER TEST

The Taber Test consists in making a sample rotate in contact with two wheels covered with a special scraping paper. The number of turns (or cycles) needed to take the decoration off the aluminium support determines the scraping resistance.

In the Italian institute **Qualital** (Industrial Certification Institute for Aluminium) we ran some scraping endurance tests on aluminium sheets decorated in wood effect by the Decoral® sublimation process.

We ran the scraping endurance Taber Test on an aluminium alloy sample sheet painted and decorated in wood effect (see photo). The test was run complying with ISO 7784-2:1997 standards.

The **Decoral®** decorated sample got to **13500 cycles** without uncovering the aluminium substrate, overcoming the endurance of “melamine” surfaces, which are normally used within fields where considerable hardness and scraping endurance are needed.

THE TEST SHOWED A HIGH SCALPING ENDURANCE, PROVING THE HIGH QUALITY OF DECORAL® SYSTEM PRODUCTS ONCE AGAIN.

QUALITAL
ISTITUTO DI CERTIFICAZIONE INDUSTRIALE DELL'ALLUMINIO ED ALTRI MATERIALI
Sede legale: Via Dei Missaglia 97 20142 Milano
Direzione, Segreteria e Laboratorio di prova: Via privata Ragni 13/15 – 28062 Cameri (Novara)
Tel.: 0321 510578; fax: 0321 517937; e-mail: qualital@qualital.org; web-site: www.qualital.eu

TECHNICAL PAPER

TESTS RESULTS: TABER TEST ON DECORATED SAMPLES

SAMPLES DESCRIPTION

The 3 samples delivered were identified as follows:

1- Customer Sample, Reference decorated on "melamine" paper
2- FP 674/1 Decorated, Aluminium alloy sheet
3- FP 674/2 Decorated, Aluminium alloy sheet

TEST

The tests below were carried out to compare the behavior of samples 1 2 and 3, determining the number of cycles to determine the point of wearthrough:

1. Measurement of coating thickness (Eddy-current method)
2. Abrasion Resistance (TABER Test)

1. MEASUREMENT OF COATING THICKNESS (EDDY-CURRENT METHOD)

METHOD:	UNI EN ISO 2360:2004	PROCEDURE:	MP-2
EQUIPMENT:	Isoscope DUALSCOPE Mod. MP20E-S Probe: ETA 3.3	SERIAL N°:	SN070003878 probe 2530

RESULTS

SAMPLE	MEASURE (µm)					MEAN VALUE µm	STANDARD DEVIATION µm	COEFFICIENT OF VARIATION %
	1	2	3	4	5			
2	86,1	86,3	86,7	83,6	86,4	**85,8**	1,3	1
3	80,0	76,3	73,6	77,7	77,8	**77,1**	2,4	3

ABRASION RESISTANCE (TABER TEST)

METHOD:	ISO 7784-2:1997	PROCEDURE:	MP-26
EQUIPMENT:	Abraser TABER	SERIAL N°:	20011097
DESCRIPTION		CONDITIONS	
SUBSTRATE:	see table	GRINDING WHEEL TYPE:	CS10
SUBSTRATE THICKNESS:	see above	LOAD APPLIED:	1000g
COATINGS:	see above	VACUUM SET:	90%
PRELIMINARY ABRASION:	-	N° CYCLES DONE:	see table
TEMPERATURE; HUMIDITY:	START: 23,5°C ; 51,8%	END:	24,7°C; 52,6%

QUALITAL

RESULTS

SAMPLE	SUBSTRATE		COATING		N° CYCLES	PHOTO
	TYPE	THICKNESS (µm)	TYPE	THICKNESS (µm)		
1	n.a.	0,71	Melamine Paper	n.a.	13000	
2	Aluminium	1,38	FP674/1 Decorated	85,8	13500	
3	Aluminium	1,35	FP674/2 Decorated	77,1	10000	

Head Laboratory
(Dott.ssa Rossella Barbato)

The Manager
(Ing. Riccardo Boi)

CAMERI, 2013-09-25

Page 2 of 2

Decoral® Lab studies

Decoral® Lab, **Decoral® System** R&D center has sophisticated tools through which specialized technicians conduct accurate tests compliant to known laws and terms (Qualicoat) guaranteeing the best quality for products.

Decoral® Lab is able to conduct the following internal tests:

ACCELERATED AGING: COMPETITORS' PRODUCTS VS DECORAL PRODUCTS

In order to obtain quick information concerning the resistance to sunlight and environmental agents of the products, **DECORAL® SYSTEM LABORATORY IS EQUIPPED WITH EQUIPMENT FOR ACCELERATED AGEING** tests:

• SOLARBOX

• QSUN

These equipments, equipped with special Xenon lamps and systems for humidification and flooding, are used to artificially deteriorate the finishes.

1000 hour tests are conducted in compliance with current standards of "Paints and varnishes": EN ISO 11341

All the samples, artificially aged are evaluated on color (ΔE) and brightness variation, according to following international standards:

UNI EN ISO 2813: 2002

UNI EN ISO 7724 / 3: 1984

In **Decoral®** Laboratories, where many equipments for accelerated weathering tests are available, thousands of tests are conducted every year in order to ensure the quality and durability of raw materials **Decoral® System.**

The accelerated weathering tests have to be considered a necessary but not sufficient condition to certify resistance to atmospheric agents.

Natural exposure tests in Florida remains the ultimate test, according technical specifications imposed by Qualicoat.

Some tested samples are shown in the following pages. The tested area 80x40 mm has been relocated in the original source for a more accurate evaluation.

It is noticeable how **Decoral®** Samples (where original **Decoral®** raw materials are used) present a more performing behaviour compared to Competitors' samples (as found in the market).

POWDER COATING: DS 405

SUBLIMATIC FILM: 2001/01

after 800 hours of accelerated weathering test:
colour variation (ΔE): 7.31

POWDER COATING: DS 405

SUBLIMATIC FILM: COMPETITOR

after 800 hours of accelerated weathering test:
colour variation (ΔE): 21.69

FLORIDA NATURAL EXPOSURE: COMPARISON BETWEEN SEVERAL PATTERNS WITH POLYURETHANE BASE COATED OF DECORAL SYSTEM AND POLYESTER BASE COATED OF COMPETITORS, EXPOSED FOR 12 MONTHS

This document illustrates the substantial difference, in terms of resistance to Florida natural exposure, between polyurethane-based coating materials and polyester-based coating materials.

The samples shown here where simultaneously exposed to severe Florida climate conditions for 12 months.

To avoid other factors to interfere with the test, the same heat-transfer film was used.

It is immediately noticeable how polyurethane-based coating powders protect sublimation inks better against deterioration.

POWDER COATING:
DS 468

SUBLIMATIC FILM:
2002/01

POWDER COATING:
COMPETITOR

SUBLIMATIC FILM:
2002/01

ACCELERATED WEATHERING TEST: COMPARISON BETWEEN PATTERNS OBTAINED WITH STANDARD POWDERS AND WITH CLASS 2 POWDER COATING.

The aim of this is, to show evidence of the high resistance of **Decoral® System** Class 2 (superdurable) coating products through a comparative weathering accelerated test (standard products vs. Class 2).

This was possible by comparing the same accelerated ageing finish prepared with Class 2 and with standard coatings.

To highlight superdurable product features, the test was extended way beyond the limit suggested by the various international standards. The duration of the test was indeed over 3000 hours (three times the minimum requirements of **Qualicoat** requirement).

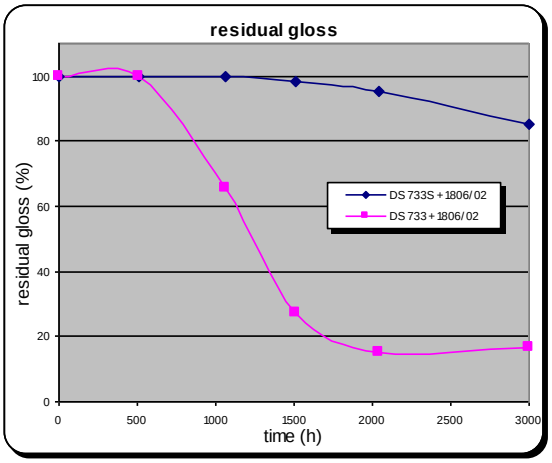
Data analysis confirms the first impression on gloss retention and on ΔE of higher performance of class 2 products.

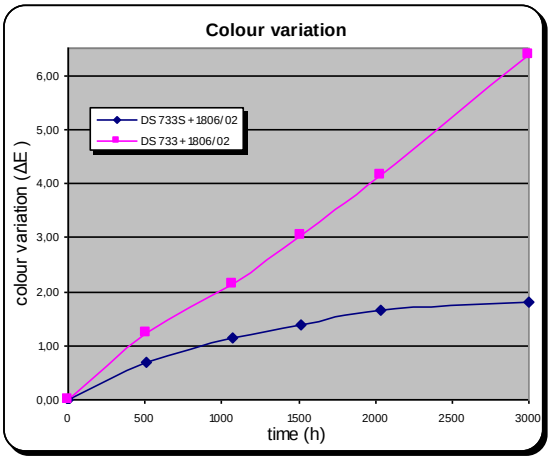
.

CLASS 2 POWDER COATING: HIGHER WEATHERING RESISTANCE

Accelerated weathering tests results:

	Time (h)	0	513	1066	1512	2037	3000
Finishes with superdurable Powder Coating: DS-0733S + 1806/02	**Brightness (Gloss)**	6	6,2	6,2	6,1	5,9	5,3
	Residual (%)	100	100	100	98	95	85
	Colour Variation (ΔE)	0.00	0.69	1.14	1.39	1.66	1.81
Finishes with standard Powder Coating: DS 733 + 1806/02	**Brightness (Gloss)**	7,2	7,3	4,8	2	1,1	1,2
	Residual (%)	100	100	66	27	15	16
	Colour Variation (ΔE)	0.00	1.22	2.15	3.03	4.15	6.38





Graphs 1 e 2: test results show that gloss retention and colour variation are better on sample prepared by using class 2 powder coating (super durable powder). *Tested according: UNI EN ISO 11341:2005. device: Qsun 3000, Q-LAB.*

POWDER COATING: DS-0733S
SUBLIMATIC FILM: 1806/02

after 3000 hours of accelerated weathering test:
colour variation (ΔE) =1.81
residual gloss = 88%

POWDER COATING: DS 733
SUBLIMATIC FILM: 1806/02

after 3000 hours of accelerated weathering test:
colour variation (ΔE) = 6.28
residual gloss = 17%

POWDER COATING: DS-0743S

after 3000 hours of accelerated weathering test:
colour variation (ΔE) = 0.36
residual gloss = 98%

POWDER COATING: DS 743

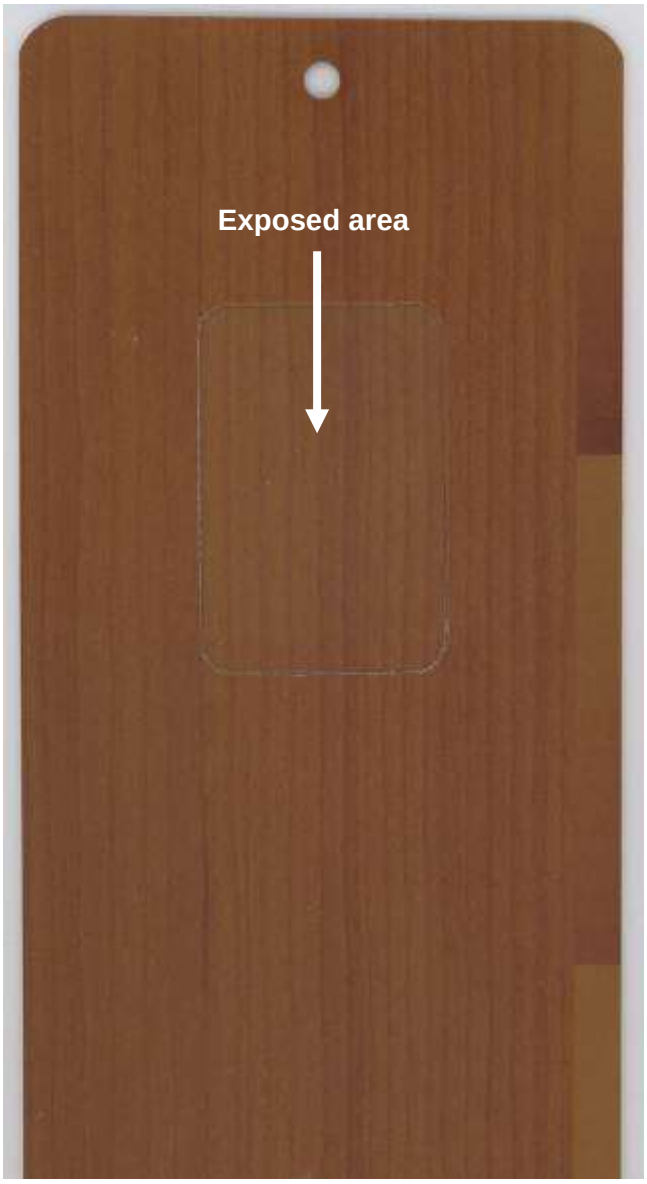
after 3000 hours of accelerated weathering test:
colour variation (ΔE) = 2.74
residual gloss = 11%

POWDER COATING: DS-0743S
SUBLIMATIC FILM: 1402/02 L

after 3000 hours of accelerated weathering test:
colour variation (ΔE) = 0.65
residual gloss = 89%

POWDER COATING: DS 743
SUBLIMATIC FILM: 1402/02 L

after 3000 hours of accelerated weathering test:
colour variation (ΔE) = 3.28
residual gloss = 11%



POWDER COATING: DS-0721S
SUBLIMATIC FILM: 1407/01

after 3000 hours of accelerated weathering test:
colour variation (ΔE) = 1.42
residual gloss = 96%

POWDER COATING: DS 721
SUBLIMATIC FILM: 1407/01

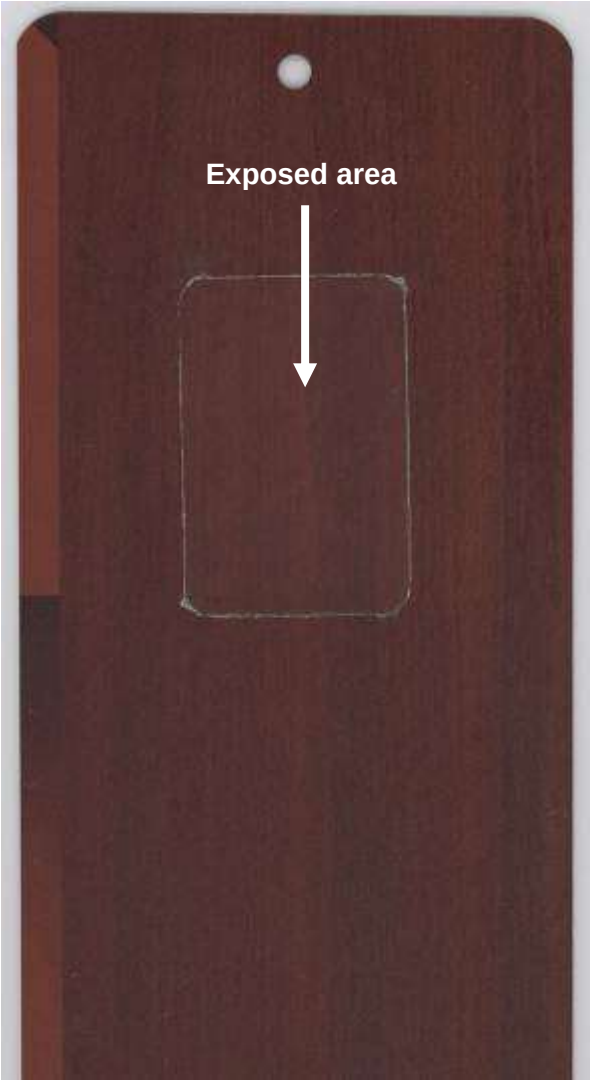
after 3000 hours of accelerated weathering test:
colour variation (ΔE) = 4.74
residual gloss = 17%

POWDER COATING: DS-0706S
SUBLIMATIC FILM: 1401/01

after 3000 hours of accelerated weathering test:
colour variation (ΔE) = 0.63
residual gloss = 91%

POWDER COATING: DS 706
SUBLIMATIC FILM: 1401/01

after 3000 hours of accelerated weathering test:
colour variation (ΔE) = 3.04
residual gloss = 9%



POWDER COATING: DS-0706S
SUBLIMATIC FILM: 1806/02

after 3000 hours of accelerated weathering test:
colour variation (ΔE) = 1.19
residual gloss = 91%

POWDER COATING: DS 706
SUBLIMATIC FILM: 1806/02

after 3000 hours of accelerated weathering test:
colour variation (ΔE) = 4.76
residual gloss = 11%

HYPER-DURABLE FILMS

Hyper-durable films (8XXXX/YY L4 serie) distinguish themselves from the others because of high-resistance cromophores used in the print.

Accelerated ageing tests are often done to evaluate the resistance of the finishes; these are controlled and repeatable tests, which faithfully simulate some of the natural exposures aspects.

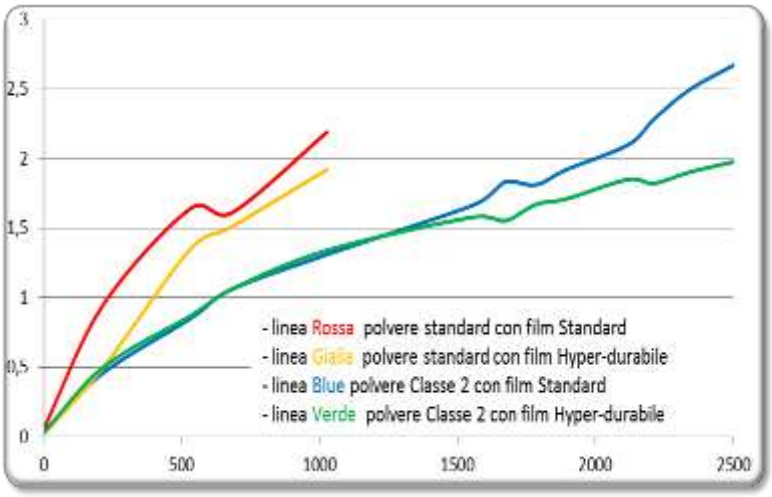
Testing samples have been prepared exchanging standard paint and Super-durable (Class 2) products with standard sublimatic and hyper-durable films. The following combinations have been prepared:

- DS 716 + 1401/01L (standard coating with Standard film)
- DS 716 + 81401/01L4 (standard coating with Hyper-durable film)
- DS-0716S + 1401/01L (Class 2 coating with Standard film)
- DS-0716S + 81401/01L4 (Class 2 coating with Hyper-durable film)

Samples are then exposed to accelerated ageing test for **1000 and 2500 hours.**

The chart on the following page shows the analysis about the colour variation tested on the samples. Notice how **Decoral® System Hyper-durable** sublimatic film substantially reduces ΔE value both with standard Powders and Class 2 Powders, yellow line the first and green the second. Paint products being equal, the improvement generated by **Decoral® System Hyper-durable films** is substancial. Yellow line towards red line for standard Powders; and green line towards blue line for **Hyper-durable (Class 2) films.**

Switching to heat transfer Hyper-durable film (series 8XXXX/YY L4) and to Powders series DS-04XXS and DS-07XXS, you can obtain decorated surfaces characterized by extreme resistance against weather conditions. All this, with an incredible durability.



DS 716 + 1401/01 L

DS 716 + 81401/01 L4

DS-0716S + 1401/01 L

DS-0716S + 81401/01 L4

NATURAL EXPOSURE TESTS IN FLORIDA: Decoral® System Standard products vs Decoral® System Class 2 products.

Natural exposure tests put samples through southern Florida's humid, hot climate and high UV radiations. So R&D Laboratories can reliably foresee the durability of the various patterns.

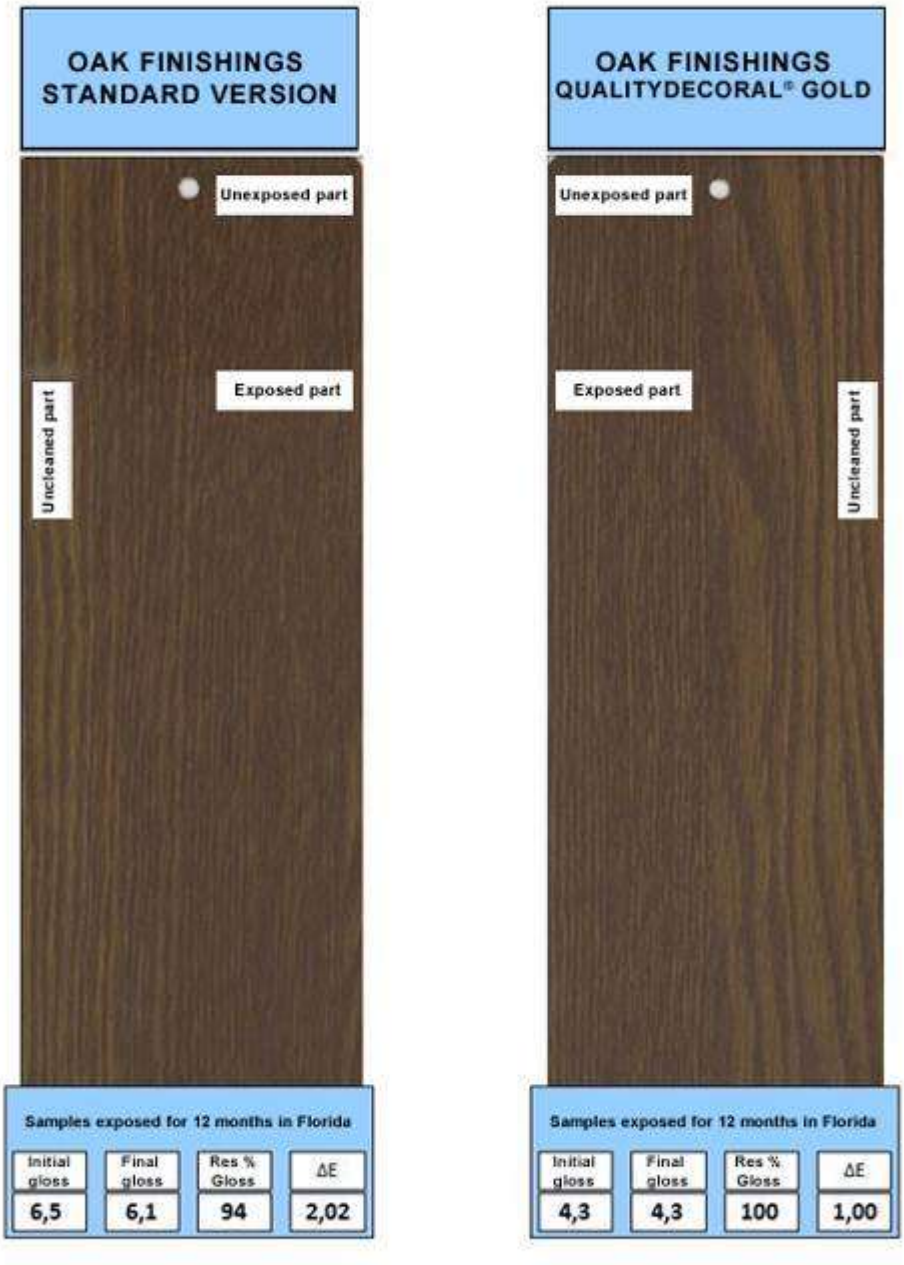
In particular, the products of the new series show incredibly higher resistance than the standard products.

The following pictures show the high durability of products decorated with super-durable Powders and hyper-durable transfer films, especially after long exposure periods. **Qualitydecoral® Gold** samples, which show a similar performance compared to standards samples after one year exposure, show a much better performance after a longer time span.

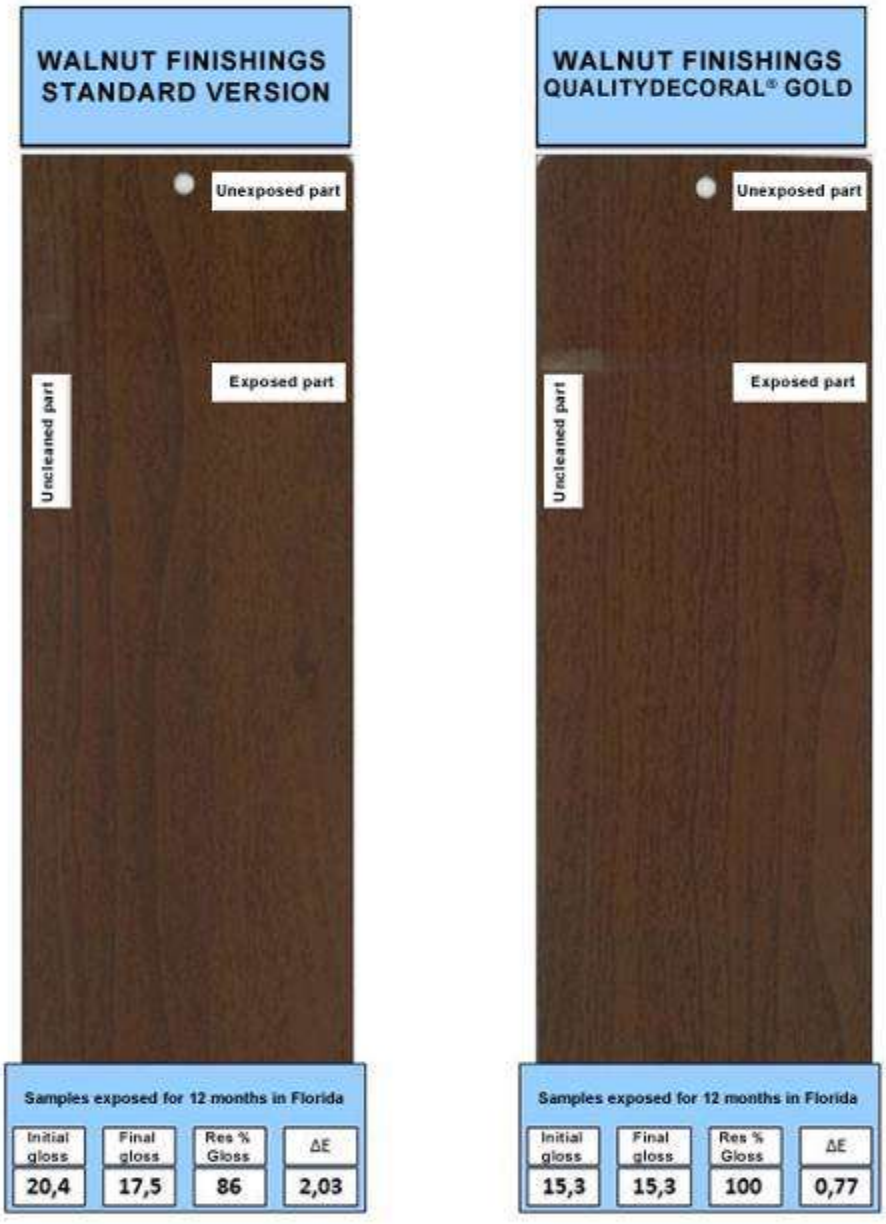
Indeed, comparing the images of samples exposed for three years, you can see the nearly nonexistent degradation of the high durability series (samples on the right), while normal finishings show a degradation that, though staying in the standards accepted by the market, bears the marks left by time.

The encouraging results we got up to now allow us to connect the new formulations to the higher performances of **Qualitydecoral® Gold** decorated finishings.

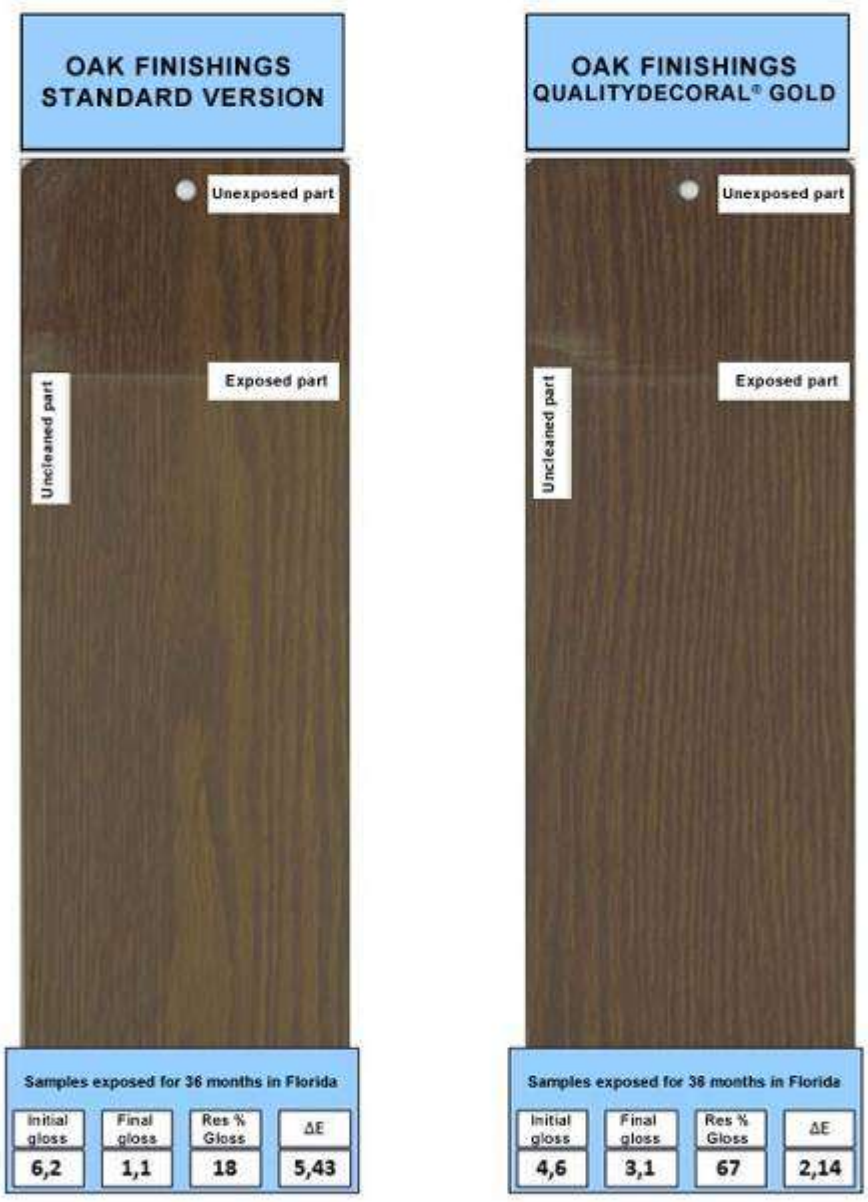
Choosing Powders series DS 04XX S and DS 07XX S and hyper-durable sublimation films (series 8XXXX/YY L4), we can get decorated surfaces with a very high resistance to the elements. All of this leads to an incredible durability and consequently to a very low environmental impact.



Picture 1: samples exposed for 12 months in Florida; comparison between standard and Qualitydecoral® Gold textured oak.



Picture 2: samples exposed for 12 months in Florida; comparison between standard and Qualitydecoral® Gold smooth walnut.



Picture 3: samples exposed for 36 months in Florida; comparison between standard and Qualitydecoral® Gold textured oak.

INK PENETRATION: RELATION BETWEEN INK PENETRATION AND ACCELERATE WEATHERING RESISTANCE

The penetration of sublimation inks is a fundamental parameter for the quality of the output. The printed inks, carried on the film, penetrate the layer of coating in a proportional way to the temperature of the metal.

Decoral® System recommends that metal should reach a temperature of 200°C.

A lower temperature could cause a not sufficient penetration of inks into the coated layer, i.e. resulting in a lower resistance to sunlight and elements of the output finish.

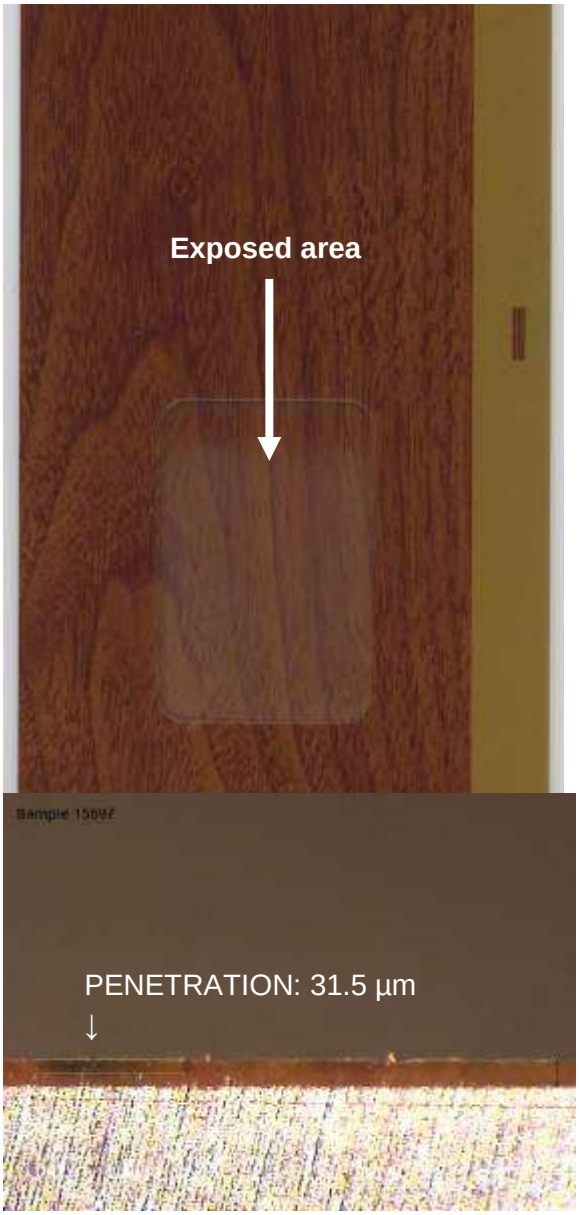
At the correct temperature, however, the best performance is achieved.

By means of optical microscopes and weathering accelerated test equipments, it is possible to demonstrate whether the process of decoration was carried out properly.

In this document we will analyze how ink penetration is modified by variations in temperature of curing.

It is noticeable that the maximum (total) penetration, and consequently the maximum resistance output performance, are achieved when reaching 200° C process temperature, recommended by **Decoral® System.**

The following pages show pictures of microscope-view sections of samples made with DS 403 + 2505/01L, processed at different temperatures and brightness, and color variation values after 1000 hrs aging test.



PEAK METAL TEMPERATURE: 180°C

after 1000 hours of accelerated weathering test:
colour variation (ΔE): 3.84

PEAK METAL TEMPERATURE: 190°C

after 1000 hours of accelerated weathering test:
colour variation (ΔE): 2.98

PEAK METAL TEMPERATURE: 200°C

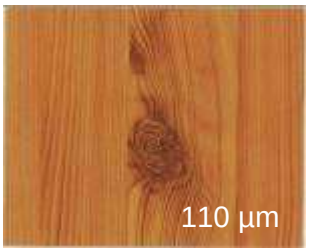
after 1000 hours of accelerated weathering test:
colour variation (ΔE): 1.6

PRE-TREATMENT: INFLUENCE ON PRE-TREATMENT COLOUR OF METAL SUBSTRATE AND OF THICKNESS OF PAINT PRODUCT

Decoral® System sublimation Powders are carefully studied with a lower pigmentation compared to traditional Powders; this makes the wood grain more visible.
So, two aspects of the heat transfer decoration technique become important:
- thickness of Powder layer: if it is thin, the material underneath is visible, and the base colour is different; instead, a thicker layer of Powder will produce a more intense colour.
- pre-treatment (which determines the colour) on the product before coating: pre-treatment with chrome produces a green-yellow shade to the metal; *chrome-free* pre-treatment lets the metal appear on the surface. The lower the Powder layer is, the more different the decoration is. For this reason it is always recommended to keep the colour of the pre-treatment (without mixing products with different pre-treatments) and the thickness of Powder as even as possible (we normally recommend to keep the thickness between 70 and 90µm, also not to change other characteristics of the coating, like for example its mechanical properties).

PRE-TREATMENT YELLOW CHROME DS 402 + 2103/01

PRE-TREATMENT CHROME FREE UNCOLOURED DS 402 + 2103/01



In this test you can see how the same combination of Powder and heat transfer film (DS 402 + 2103/01) shows slight variations of colour shade when the thickness of Powder changes (the thicker ones are on the right side) and according to the pre-treatment of the metal underneath (upper row: pre-treatment with chrome; lower row: chrome-free pre-treatment).

Indeed when the thickness is bigger, the colour of the Powder becomes more intense. Moreover, a bigger thickness makes less important the effect of pre-treatment on the final colour.

PAINTED AND DECORATED ALUMINIUM

PAINTED ALUMINIUM

PRE-TREATED ALUMINIUM

PRE-TREATMENT
CHROME FREE UNCOLOURED

DS 739 + 2301/02

PRE-TREATMENT
YELLOW CHROME

DS 739 + 2301/02

TEST ON ANTI-GRAFFITI: resistance of some Powders against graffiti and liquids

Marks with marker pens or spray paintings is a serious damage to monuments, public vehicles, curtain walls, etc., because removing graffiti is very expensive and may involve surface alteration.

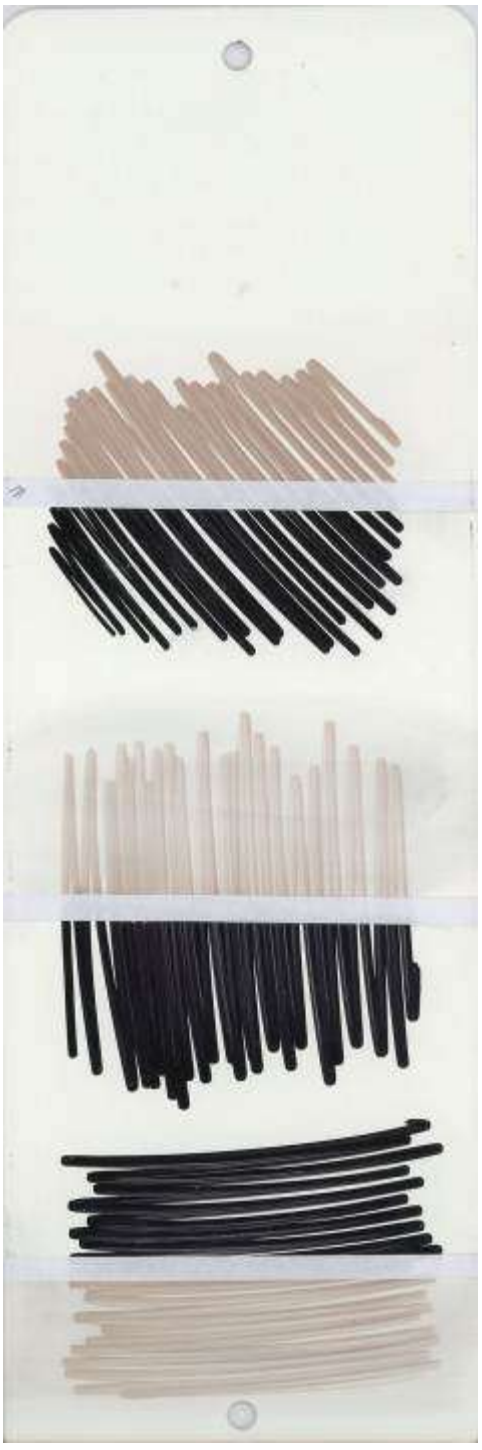
Polyurethane-based powder coatings have an high crosslinking density. This way they can prevent both the penetration of the graffiti paint and any damage caused by the solvent when cleaning.

This document shows the performance of some Powders **Decoral® System** after the graffiti test.

This test is to make some graffiti with pentel n 50 marker on the Powder perfectly cured.

After a proper drying time, the graffiti are removed and the damages to the surface are evaluated.

The cleaning phase is carried with both ethanol and with a 50%-50% mix of ethanol and mek.



Graffiti removal with blend 1:1 grain alcohol + MEK after 24 hours

Graffiti removal with blend 1:1 grain alcohol + MEK after 1 month

PAINT PRODUCT:
PE 411 + DS 810

Standard polyurethane

PAINT PRODUCT:
PE 411 + DS-0810SA

Specifically formulated class 2 polyurethane

OVERBAKING TEST

The colour of a Powder coating depends a lot on the temperature and on the cross link time.

Too high temperature or too long time in the oven can cause important difference in the colour.

The below test shows how the colour of a powder (DS 733) can change by incorrect curing conditions.

When the temperature is much higher than recommended by the technical data sheet, the colour is different.

POWDER COATING: DS 733
THICKNESS: 83µm

CURING TEMPERATURE: 200°C

POWDER COATING: DS 733
THICKNESS: 88µm

CURING TEMPERATURE: 225°C

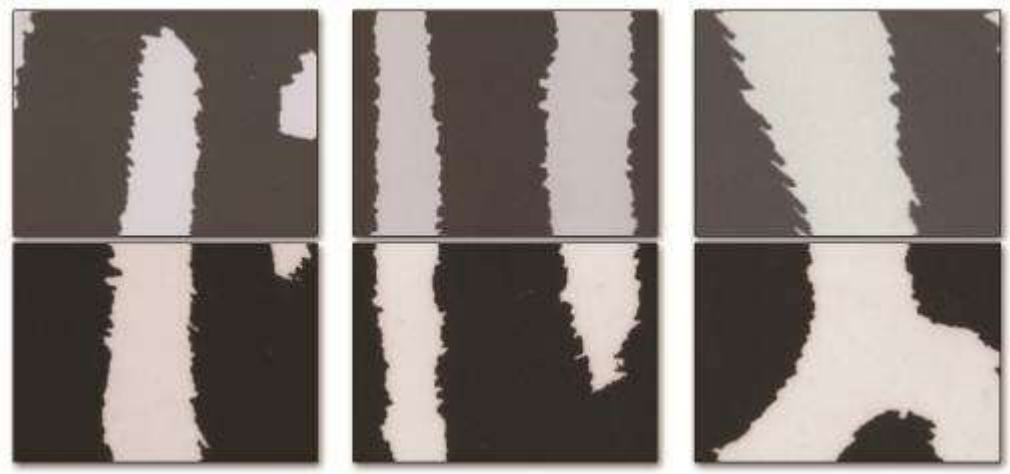
POWDER COATING: DS 733
THICKNESS: 88µm

CURING TEMPERATURE: 250°C

DOUBLE COATING

With two layers of powders chosen properly **(first layer: coloured; second layer: transparent)** the best definition of the heat transfer pattern can be achieved. Sublimatic inks in fact, while penetrating into the transparent surface paint coat, keep all the brightness of colours which could on the contrary be lost if inside coloured powders, where paint pigments tend to blur them, thus resulting in an intermediate colour between the two.

DS 804 + 6037/01 | DS 408 + 6037/01 | DS 734 + 6037/01



PE411 + DS 810 + 6037/01 | PE411 + DS 407 + 6037/01 | PE411 + DS 707 + 6037/01

In order to get this effects, the powder coating is done in 2 steps.

As first layer the base PE-411 white polyester Powder is used: the thickness must be 50 µm and it has to be polymerized for 15 minutes at 170°C. This way the base will be partially cured, thus allowing the adherence of the second powder layer to it. As second layer a transparent Powder is used, carefully keeping the two surfaces perfectly clean. The ideal thickness in this case is around 60 µm and the polymerization time for both powders is 20 minutes at 200°C degrees.

Depending on the chosen products for the second layer (top-coat) it is possible to modulate the aspect of the coating (you can have a smooth, matt, bright surface or some with special effects like Salt Lake, Ice Touch, etc.), and also its resistance and performance.

RESISTANCE OF HEAT TRANSFER FINISH TO HIGH TEMPERATURE

The finish obtained with **Decoral® System** raw materials can have different uses, beside the usual purpose as profile for frames.

This test is for evaluating the stability of heat transfer finish while exposed to high temperatures (90°C and 120°C).

The decorated samples, prepared at the lab, show a high resistance to temperature around 90°C, in terms of colour variation and pattern definition for an overall time of 1000 hours (see page 101).

Samples which reach 120°C show instead a gradual loss of pattern definition (see page 102).

You can therefore state that the finishes obtained with **Decoral® System** Powder, combined with the films manufactured with specific **Decoral® System** sublimatic inks, result stable at temperatures until 90°C and are then fit for applications with moderately high temperatures (i.e. radiators).

HIGH TEMPERATURES RESISTANCE TEST: 90°C

POWDER COATING: **PE411 + DS-0810SA**
HEAT TRANSFER FILM: **6044/09**

REFERENCE 150 h 300 h 500 h 1000 h

POWDER COATING: **PE411 + DS 810**
HEAT TRANSFER FILM: **6044/09**

GREAT RESISTANCE TO TEMPERATURES OF AROUND 90°C AFTER 1000 HOURS OF EXPOSURE

HIGH TEMPERATURE RESISTANCE TESTS: 120°C

POWDER COATING: **PE411 + DS-0810SA**
HEAT TRANSFER FILM: **6044/09**

REFERENCE 50 h 100 h 150 h

POWDER COATING: **PE411 + DS 810**
HEAT TRANSFER FILM: **6044/09**

GRADUAL LOSS OF DEFINITION OF THE DRAWING AT AROUND 120°C AFTER ONLY 150 HOURS OF EXPOSURE

QUALITY CONTROL HEAT TRANSFER FILM

The materials manufactured and sold by **Decoral® System** are subject to quality control. The pattern from heat transfer film decorates an aluminium small sheet. Half is decorated with film from the master store, and the other half is decorated with the film freshly manufactured, keeping in line the wood grain from one half and from the other half. The material is considered in compliance, and is then sent to the customer, only if the comparison is acceptable.

The control matching plate and a sheet (some square meters) of every roll produced are stored for possible future examinations.

COATING POWDER QUALITY CONTROL

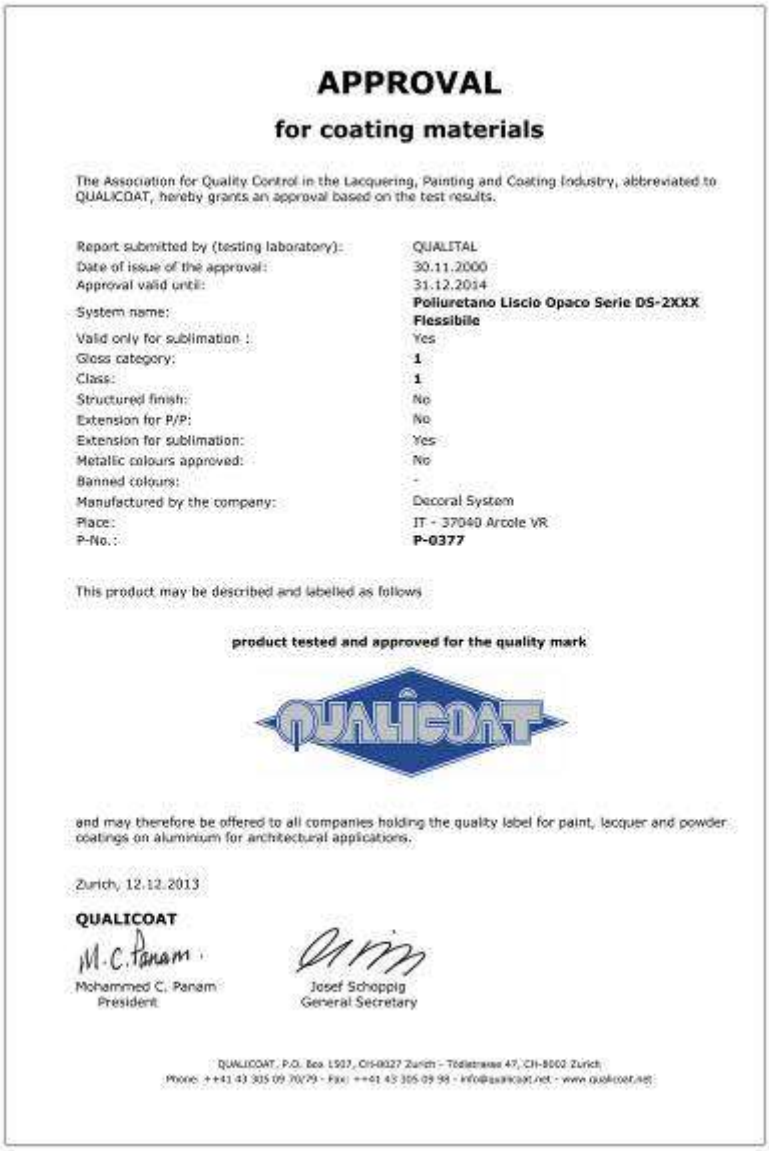
Materials produced and sold by **Decoral System®** are subject to a quality control. The Powders are used for coating some aluminium small sheets, according to the technical data sheets. At a later stage:

- A small sheet is visually compared to a reference master, and then it is stored in a specific file system
- A second small sheet goes to at the main mechanical tests as per **Qualicoat terms**
- A third small sheet is used for sublimation tests in order to find out possible non-conformity

500 g sample, every 4 boxes of Powder produced, is taken and stored for possible future examinations.

QUALICOAT

Qualicoat is an European organization dealing with a quality brand on aluminium and its alloys for architectural applications. Main purpose is to ensure production of high quality Powders, following specific rules that must be fulfilled by plants, raw materials and finished products.



APPROVAL

for coating materials

The Association for Quality Control in the Lacquering, Painting and Coating Industry, abbreviated to QUALICOAT, hereby grants an approval based on the test results.

Report submitted by (testing laboratory):	QUALITAL
Date of issue of the approval:	30.11.2000
Approval valid until:	31.12.2014
System name:	**Poliuretano Liscio Opaco Serie DS-2XXX Flessibile**
Valid only for sublimation :	Yes
Gloss category:	**1**
Class:	**1**
Structured finish:	No
Extension for P/P:	No
Extension for sublimation:	Yes
Metallic colours approved:	No
Banned colours:	-
Manufactured by the company:	Decoral System
Place:	IT - 37040 Arcole VR
P-No.:	**P-0377**

This product may be described and labelled as follows

product tested and approved for the quality mark

and may therefore be offered to all companies holding the quality label for paint, lacquer and powder coatings on aluminium for architectural applications.

Zurich, 12.12.2013

QUALICOAT

Mohammed C. Panam
President

Josef Schoppig
General Secretary

QUALICOAT, P.O. Box 1507, CH-8027 Zurich - Tödistrasse 47, CH-8002 Zurich
Phone: ++41 43 305 09 70/79 - Fax: ++41 43 305 09 99 - info@qualicoat.net - www.qualicoat.net

APPROVAL P-0377: POLYURETHANE SMOOTH MATT FLEXIBLE SERIES DS-2XXX

APPROVAL

for coating materials

The Association for Quality Control in the Lacquering, Painting and Coating Industry, abbreviated to QUALICOAT, hereby grants an approval based on the test results.

Report submitted by (testing laboratory):	QUALITAL
Date of issue of the approval:	30.11.2000
Approval valid until:	31.12.2014
System name:	**Poliuretano Liscio Opaco Serie DS-5XXX Flessibile**
Valid only for sublimation :	Yes
Gloss category:	**1**
Class:	**1**
Structured finish:	No
Extension for P/P:	No
Extension for sublimation:	Yes
Metallic colours approved:	No
Banned colours:	-
Manufactured by the company:	Decoral System
Place:	IT - 37040 Arcole VR
P-No.:	**P-0378**

This product may be described and labelled as follows

product tested and approved for the quality mark

and may therefore be offered to all companies holding the quality label for paint, lacquer and powder coatings on aluminium for architectural applications.

Zurich, 12.12.2013

QUALICOAT

M. C. Panam

Mohammed C. Panam
President

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QUALICOAT, P.O. Box 1507, CH-8027 Zurich - Tödistrasse 47, CH-8002 Zurich
Phone: ++41 43 305 09 70/79 - Fax: ++41 43 305 09 98 - info@qualicoat.net - www.qualicoat.net

APPROVAL P-0378: POLYURETHANE SMOOTH MATT FLEXIBLE SERIES DS-5XXX

APPROVAL

for coating materials

The Association for Quality Control in the Lacquering, Painting and Coating Industry, abbreviated to QUALICOAT, hereby grants an approval based on the test results.

Report submitted by (testing laboratory):	QUALITAL
Date of issue of the approval:	20.05.2003
Approval valid until:	31.12.2014
System name:	**Poliuretano Liscio Opaco Super Serie DS-4XXX**
Valid only for sublimation :	Yes
Gloss category:	**1**
Class:	**1**
Structured finish:	No
Extension for P/P:	No
Extension for sublimation:	Yes
Metallic colours approved:	No
Banned colours:	-
Manufactured by the company:	Decoral System
Place:	IT - 37040 Arcole VR
P-No.:	**P-0506**

This product may be described and labelled as follows

product tested and approved for the quality mark

and may therefore be offered to all companies holding the quality label for paint, lacquer and powder coatings on aluminium for architectural applications.

Zurich, 12.12.2013

QUALICOAT

M. C. Panam

Mohammed C. Panam
President

Josef Schoppig
General Secretary

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Phone: ++41 43 305 09 70/79 - Fax: ++41 43 305 09 98 - info@qualicoat.net - www.qualicoat.net

APPROVAL P-0506: POLYURETHANE SMOOTH MATT SERIES DS-4XXX

APPROVAL

for coating materials

The Association for Quality Control in the Lacquering, Painting and Coating Industry, abbreviated to QUALICOAT, hereby grants an approval based on the test results.

Report submitted by (testing laboratory):	QUALITAL
Date of issue of the approval:	04.03.2005
Approval valid until:	31.12.2014
System name:	**Poliuretano Raggrinzato Serie DS-7XXX**
Valid only for sublimation :	Yes
Gloss category:	**1**
Class:	**1**
Structured finish:	No
Extension for P/P:	No
Extension for sublimation:	Yes
Metallic colours approved:	No
Banned colours:	-
Manufactured by the company:	Decoral System
Place:	IT - 37040 Arcole VR
P-No.:	**P-0617**

This product may be described and labelled as follows

product tested and approved for the quality mark

and may therefore be offered to all companies holding the quality label for paint, lacquer and powder coatings on aluminium for architectural applications.

Zurich, 12.12.2013

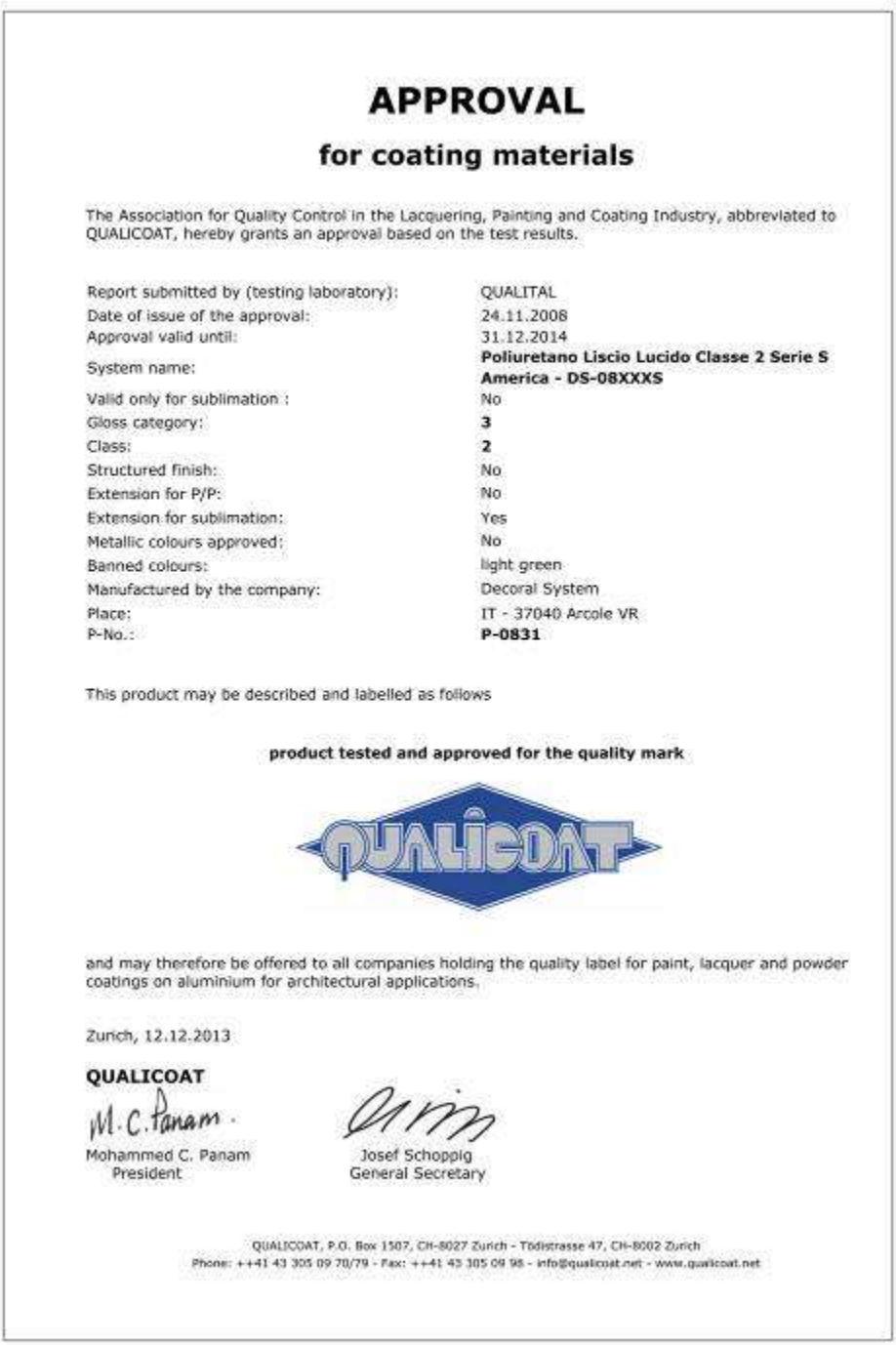
QUALICOAT

M. C. Panam

Mohammed C. Panam
President

Josef Schoppig
General Secretary

QUALICOAT, P.O. Box 1507, CH-8027 Zurich - Tödistrasse 47, CH-8002 Zurich
Phone: ++41 43 305 09 70/79 - Fax: ++41 43 305 09 98 - info@qualicoat.net - www.qualicoat.net



APPROVAL

for coating materials

The Association for Quality Control in the Lacquering, Painting and Coating Industry, abbreviated to QUALICOAT, hereby grants an approval based on the test results.

Report submitted by (testing laboratory):	QUALITAL
Date of issue of the approval:	24.11.2008
Approval valid until:	31.12.2014
System name:	**Poliuretano Liscio Lucido Classe 2 Serie S America - DS-08XXXS**
Valid only for sublimation :	No
Gloss category:	**3**
Class:	**2**
Structured finish:	No
Extension for P/P:	No
Extension for sublimation:	Yes
Metallic colours approved:	No
Banned colours:	light green
Manufactured by the company:	Decoral System
Place:	IT - 37040 Arcole VR
P-No.:	**P-0831**

This product may be described and labelled as follows

product tested and approved for the quality mark

and may therefore be offered to all companies holding the quality label for paint, lacquer and powder coatings on aluminium for architectural applications.

Zurich, 12.12.2013

QUALICOAT

M. C. Panam

Mohammed C. Panam
President

Josef Schoppig
General Secretary

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Phone: ++41 43 305 09 70/79 - Fax: ++41 43 305 09 98 - info@qualicoat.net - www.qualicoat.net

APPROVAL P-0831: POLYURETHANE SMOOTH GLOSSY CLASS 2. SERIES S

APPROVAL

for coating materials

The Association for Quality Control in the Lacquering, Painting and Coating Industry, abbreviated to QUALICOAT, hereby grants an approval based on the test results.

Report submitted by (testing laboratory):	QUALITAL
Date of issue of the approval:	24.11.2008
Approval valid until:	31.12.2014
System name:	**Poliuretano Raggrinzato Classe 2 Serie S America - DS-07XXXS**
Valid only for sublimation :	Yes
Gloss category:	**1**
Class:	**2**
Structured finish:	No
Extension for P/P:	No
Extension for sublimation:	Yes
Metallic colours approved:	No
Banned colours:	light brown
Manufactured by the company:	Decoral System
Place:	IT - 37040 Arcole VR
P-No.:	**P-0832**

This product may be described and labelled as follows

product tested and approved for the quality mark

and may therefore be offered to all companies holding the quality label for paint, lacquer and powder coatings on aluminium for architectural applications.

Zurich, 12.12.2013

QUALICOAT

M. C. Panam

Mohammed C. Panam
President

Josef Schoppig
General Secretary

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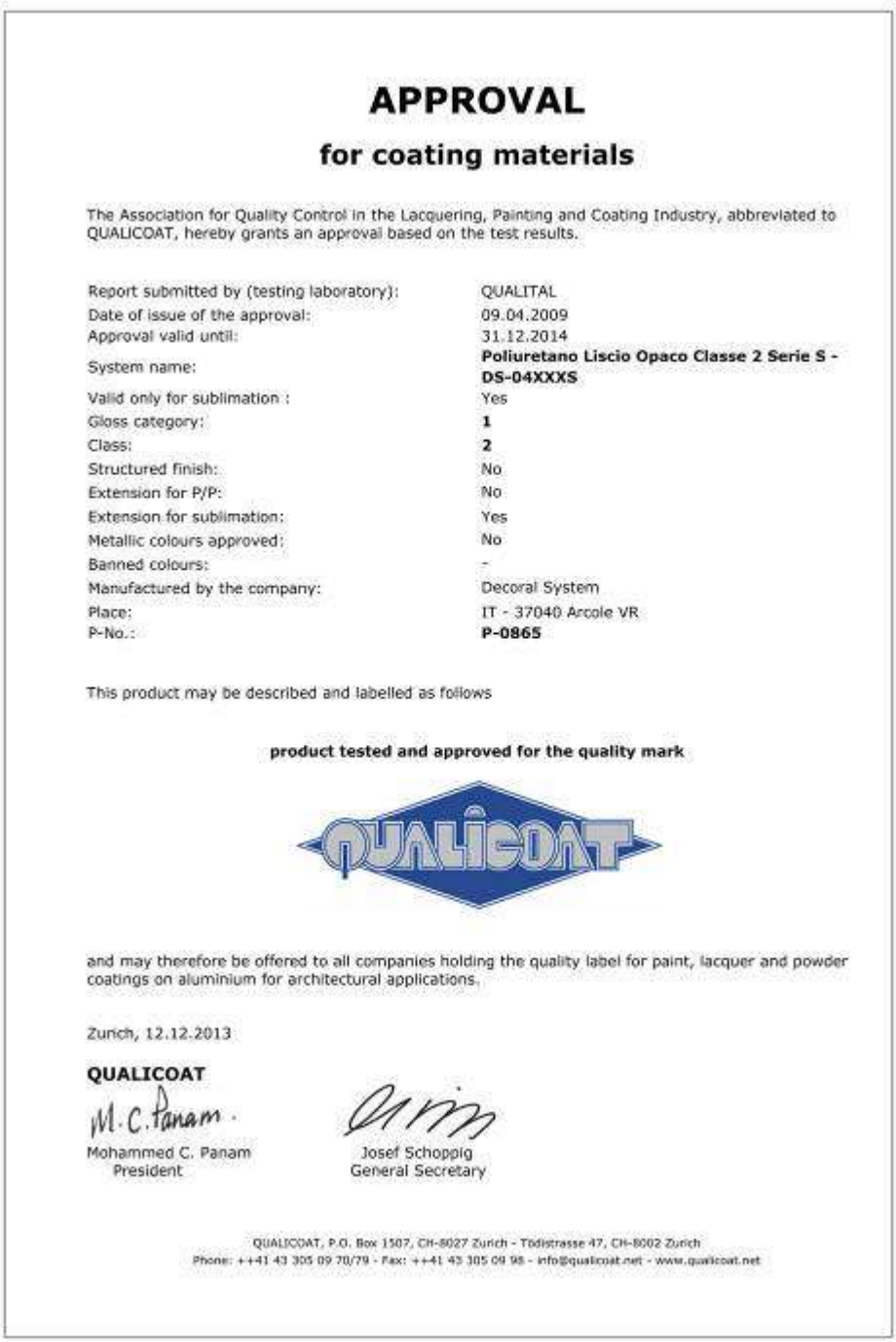
Phone: ++41 43 305 09 70/79 - Fax: ++41 43 305 09 98 - info@qualicoat.net - www.qualicoat.net

APPROVAL P-0832: POLYURETHANE TEXTURED CLASS 2. SERIES S



APPROVAL

for coating materials

The Association for Quality Control in the Lacquering, Painting and Coating Industry, abbreviated to QUALICOAT, hereby grants an approval based on the test results.

Report submitted by (testing laboratory):	QUALITAL
Date of issue of the approval:	09.04.2009
Approval valid until:	31.12.2014
System name:	**Poliuretano Liscio Opaco Classe 2 Serie S - DS-04XXXS**
Valid only for sublimation :	Yes
Gloss category:	**1**
Class:	**2**
Structured finish:	No
Extension for P/P:	No
Extension for sublimation:	Yes
Metallic colours approved:	No
Banned colours:	-
Manufactured by the company:	Decoral System
Place:	IT - 37040 Arcole VR
P-No.:	**P-0865**

This product may be described and labelled as follows

product tested and approved for the quality mark

and may therefore be offered to all companies holding the quality label for paint, lacquer and powder coatings on aluminium for architectural applications.

Zurich, 12.12.2013

QUALICOAT

M. C. Panam

Mohammed C. Panam
President

Josef Schoppig
General Secretary

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Phone: ++41 43 305 09 70/79 - Fax: ++41 43 305 09 98 - info@qualicoat.net - www.qualicoat.net

APPROVAL P-0865: POLYURETHANE SMOOTH MATT CLASS 2. SERIE S – DS-04XXXS

APPROVAL

for coating materials

The Association for Quality Control in the Lacquering, Painting and Coating Industry, abbreviated to QUALICOAT, hereby grants an approval based on the test results.

Report submitted by (testing laboratory):	QUALITAL
Date of issue of the approval:	23.07.2010
Approval valid until:	31.12.2014
System name:	**PE SERIE PS-0XXX RAGG**
Valid only for sublimation :	Yes
Gloss category:	**1**
Class:	**1**
Structured finish:	Yes (Textured)
Extension for P/P:	No
Extension for sublimation:	Yes
Metallic colours approved:	No
Banned colours:	-
Manufactured by the company:	Decoral System
Place:	IT - 37040 Arcole VR
P-No.:	**P-0964**

This product may be described and labelled as follows

product tested and approved for the quality mark

and may therefore be offered to all companies holding the quality label for paint, lacquer and powder coatings on aluminium for architectural applications.

Zurich, 12.12.2013

QUALICOAT

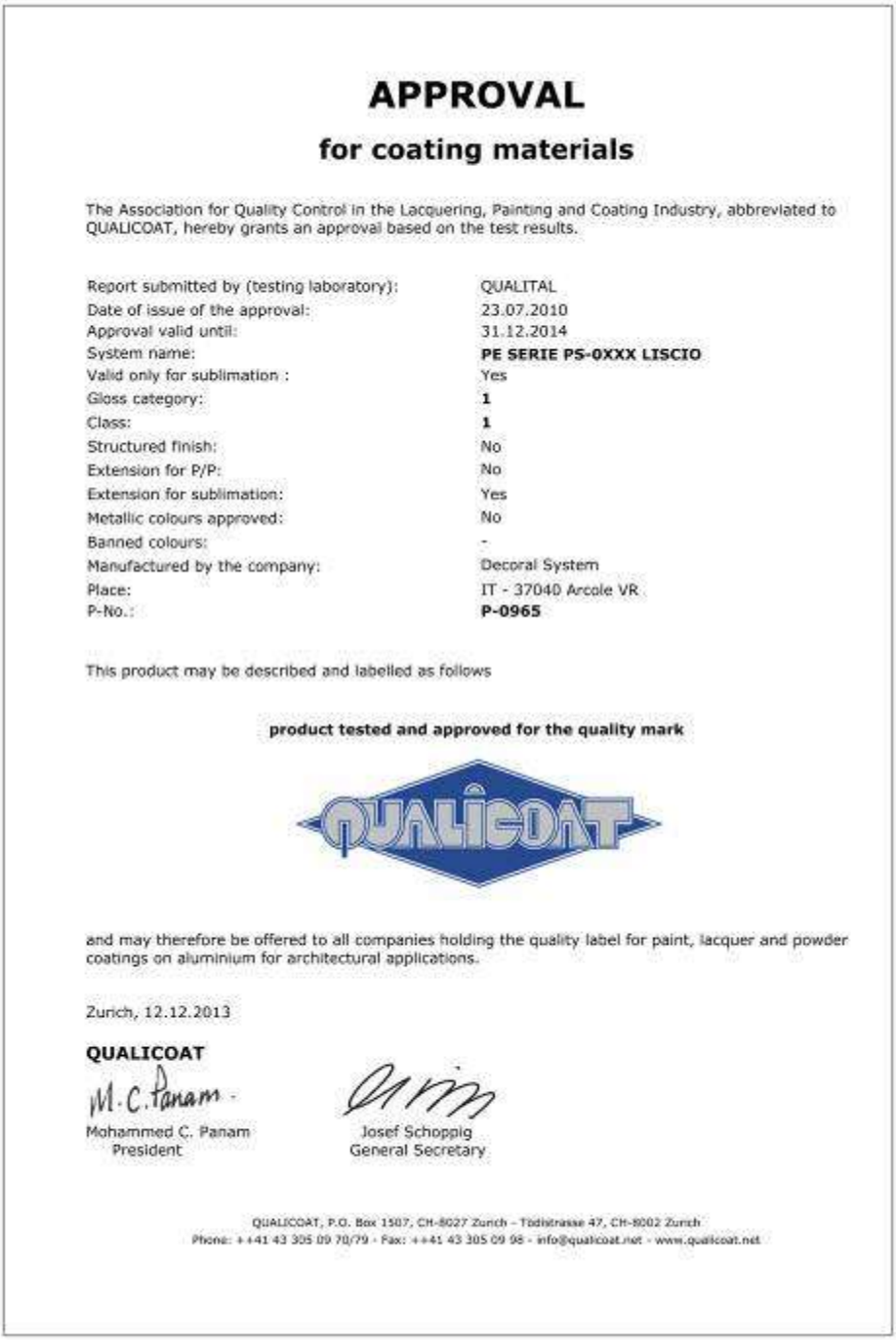
M. C. Panam

Mohammed C. Panam
President

Josef Schoppig
General Secretary

QUALICOAT, P.O. Box 1507, CH-8027 Zurich - Tödistrasse 47, CH-8002 Zurich
Phone: ++41 43 305 09 70/79 - Fax: ++41 43 305 09 98 - info@qualicoat.net - www.qualicoat.net

APPROVAL P-0964: POLYESTER TEXTURED. SERIES PS-0XXX



APPROVAL

for coating materials

The Association for Quality Control in the Lacquering, Painting and Coating Industry, abbreviated to QUALICOAT, hereby grants an approval based on the test results.

Report submitted by (testing laboratory):	QUALITAL
Date of issue of the approval:	23.07.2010
Approval valid until:	31.12.2014
System name:	**PE SERIE PS-0XXX LISCIO**
Valid only for sublimation :	Yes
Gloss category:	**1**
Class:	**1**
Structured finish:	No
Extension for P/P:	No
Extension for sublimation:	Yes
Metallic colours approved:	No
Banned colours:	-
Manufactured by the company:	Decoral System
Place:	IT - 37040 Arcole VR
P-No.:	**P-0965**

This product may be described and labelled as follows

product tested and approved for the quality mark

and may therefore be offered to all companies holding the quality label for paint, lacquer and powder coatings on aluminium for architectural applications.

Zurich, 12.12.2013

QUALICOAT

M. C. Panam

Mohammed C. Panam
President

Josef Schoppig
General Secretary

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APPROVAL P-0965: POLYESTER SMOOTH. SERIES PS-0XXX

QUALIDECO

Qualideco is a quality mark for decorative finishes using sublimation technology. The mark therefore guarantees that a decoration plant, a film and a coating powder manufacturer conforms to the requirements stipulated in the **Qualideco** specifications.

LICENCE CERTIFICATE

AUTHORIZATION TO USE
THE QUALITY MARK

QUALIDECO

CLASS 2 DECORATIONS

QUALITAL

This is to certify that

DECORAL SYSTEM
Viale del Lavoro, 37040 Arcole (VR)

Licence number: FS-001

is authorised to use the quality mark shown above on the class 2 decorated products listed in the annex A in accordance with the QUALIDECO Specifications.

Date of issue of the licence: 22.02.1999

Period of validity of the licence: until 31.12.2014

Zurich, 12 february 2014

QUALICOAT

M.C. Panam
Mohammed C. Panam
President

Josef Schoppig
General Secretary

Juan A. Bernabé
QUALIDECO Committee

Corrado Baroni
QUALITAL President

QUALIDECO LICENSE FS-001 CLASS 2:
DECORAL SYSTEM PRODUCES QUALITY FILMS

ANNEX A

QUALIDECO
CLASS 2 DECORATIONS

List of class 2 decorations produced by DECORAL SYSTEM (Lic. FS-001) successfully tested in a QUALIDECO laboratory

SYSTEM : SUBLIMATION (CLASS 2 DECORATIONS)				
DECORATIONS (SUPPLIER: DECORAL SYSTEM FS-001)			POWDER COATING (SUPPLIER: DECORAL SYSTEM PS-001)	
NAME	DATE OF APPROVAL	FILM (REFERENCE CODE)	BASE COAT (REFERENCE CODE)	QUALICOAT APPROVAL (*)
Noce Atlantico Gold	04.10.2011	81802-02-L4	DS-0733S	P-0832
Noce Pacifico Gold	04.10.2011	81802-21-L4	DS-0733S	P-0832
Quercia America Gold	04.10.2011	82301-02-L4	DS-0733S	P-0832
Rovere Grecia Gold	04.10.2011	82505-01-L4	DS-0733S	P-0832
Pino marittimo Gold	04.10.2011	82102-01-L4	DS-0716S	P-0832
Rovere italiano Gold	04.10.2011	82501-05-L4	DS-0716S	P-0832
Rovere francese Gold	04.10.2011	82502-01-L4	DS-0716S	P-0832
Rovere spagnolo Gold	04.10.2011	82506-02-M	DS-0716S	P-0832
Rovere portoghese Gold	04.10.2011	82507-01-L4	DS-0716S	P-0832
Ciliegio naturale Gold	04.10.2011	81406-01-L4	DS-0402S	P-0865
Ciliegio scuro Gold	04.10.2011	81406-11-L4	DS-0402S	P-0865
Ciliegio rustico Gold	04.10.2011	81416-01-L4	DS-0402S	P-0865
Faggio Giappone Gold	04.10.2011	81601-06-L4	DS-0402S	P-0865
Pino Svezia Gold	04.10.2011	82103-01-L4	DS-0402S	P-0865
Rovere chiaro Gold	04.10.2011	82501-05-L4	DS-0402S	P-0865
Rovere rigato Gold	04.10.2011	82502-01-L4	DS-0402S	P-0865
Rovere Germania Gold	04.10.2011	82506-02-M	DS-0402S	P-0865
Ciliegio fiammato Gold	04.10.2011	81401-01-L4	DS-0403S	P-0865
Ciliegio tinto Gold	04.10.2011	81401-11-L4	DS-0403S	P-0865
Noce Mediterraneo Gold	04.10.2011	81802-02-L4	DS-0403S	P-0865
Noce Tirreno Gold	04.10.2011	81802-21-L4	DS-0403S	P-0865
Quercia scura Gold	04.10.2011	82301-02-L4	DS-0403S	P-0865
Rovere collina Gold	04.10.2011	82505-01-L4	DS-0403S	P-0865

(*) Approved for QUALIDECO applications

QUALIDECO FS-001 LICENSE CLASS 2:
LIST OF APPROVED FINISHINGS WITH CLASS 2 FILMS

LICENCE CERTIFICATE

AUTHORIZATION TO USE THE QUALITY MARK

QUALIDECO

CLASS 2 DECORATIONS

QUALITAL

This is to certify that

DECORAL SYSTEM
Viale del Lavoro, 37040 Arcole (VR)

Licence number: PS-001

is authorised to use the quality mark shown above on the class 2 decorated products listed in the annex A in accordance with the QUALIDECO Specifications.

Date of issue of the licence: **22.02.1999**

Period of validity of the licence: **until 31.12.2014**

Zurich, 12 february 2014

QUALICOAT

M.C. Panam
Mohammed C. Panam
President

Josef Schoppig
General Secretary

Juan A. Bernabé
QUALIDECO Committee

Corrado Baroni
QUALITAL President

QUALIDECO PS-001 LICENSE CLASS 2:
DECORAL SYSTEM PRODUCES QUALITY FILMS

ANNEX A

QUALIDECO
CLASS 2 DECORATIONS

List of class 2 decorations produced by DECORAL SYSTEM (Lic. PS-001) successfully tested in a QUALIDECO laboratory

SYSTEM : SUBLIMATION (CLASS 2 DECORATIONS)				
DECORATIONS (SUPPLIER: DECORAL SYSTEM FS-001)			POWDER COATING (SUPPLIER: DECORAL SYSTEM PS-001)	
NAME	DATE OF APPROVAL	FILM (REFERENCE CODE)	BASE COAT (REFERENCE CODE)	QUALICOAT APPROVAL (*)
Noce Atlantico Gold	04.10.2011	81802-02-L4	DS-0733S	P-0832
Noce Pacifico Gold	04.10.2011	81802-21-L4	DS-0733S	P-0832
Quercia America Gold	04.10.2011	82301-02-L4	DS-0733S	P-0832
Rovere Grecia Gold	04.10.2011	82505-01-L4	DS-0733S	P-0832
Pino marittimo Gold	04.10.2011	82102-01-L4	DS-0716S	P-0832
Rovere italiano Gold	04.10.2011	82501-05-L4	DS-0716S	P-0832
Rovere francese Gold	04.10.2011	82502-01-L4	DS-0716S	P-0832
Rovere spagnolo Gold	04.10.2011	82506-02-M	DS-0716S	P-0832
Rovere portoghese Gold	04.10.2011	82507-01-L4	DS-0716S	P-0832
Ciliegio naturale Gold	04.10.2011	81406-01-L4	DS-0402S	P-0865
Ciliegio scuro Gold	04.10.2011	81406-11-L4	DS-0402S	P-0865
Ciliegio rustico Gold	04.10.2011	81416-01-L4	DS-0402S	P-0865
Faggio Giappone Gold	04.10.2011	81601-06-L4	DS-0402S	P-0865
Pino Svezia Gold	04.10.2011	82103-01-L4	DS-0402S	P-0865
Rovere chiaro Gold	04.10.2011	82501-05-L4	DS-0402S	P-0865
Rovere rigato Gold	04.10.2011	82502-01-L4	DS-0402S	P-0865
Rovere Germania Gold	04.10.2011	82506-02-M	DS-0402S	P-0865
Ciliegio fiammato Gold	04.10.2011	81401-01-L4	DS-0403S	P-0865
Ciliegio tinto Gold	04.10.2011	81401-11-L4	DS-0403S	P-0865
Noce Mediterraneo Gold	04.10.2011	81802-02-L4	DS-0403S	P-0865
Noce Tirreno Gold	04.10.2011	81802-21-L4	DS-0403S	P-0865
Quercia scura Gold	04.10.2011	82301-02-L4	DS-0403S	P-0865
Rovere collina Gold	04.10.2011	82505-01-L4	DS-0403S	P-0865

(*) Approved for QUALIDECO applications

QUALIDECO PS-001 LICENSE CLASS 2:
LIST OF APPROVED FINISHINGS WITH POWDER CLASS 2

LICENCE CERTIFICATE

AUTHORISATION TO USE THE QUALITY MARK

QUALIDECO

FILM SUPPLIER

This is to certify that

Decoral System

viale del Lavoro, 4 - IT-37040 Arcole VR

Licence Number: FS-001

is authorized to use the above quality sign for the film(s) specified in the following table, used in combination with the powder(s) stated in this certificate according to the Regulations for the use of the logo set out in Appendix A2 of the QUALICOAT Specifications (12th edition).

The approval is valid for all the decorations provided that the film(s) and the approved powder(s) are clearly indicated with their specific code / approval number(s).

Date of issue of the licence: **01.01.2010**

Period of validity of the licence: **until 31.12.2014**

Zurich, 12 February 2014

QUALICOAT

M. C. Panam

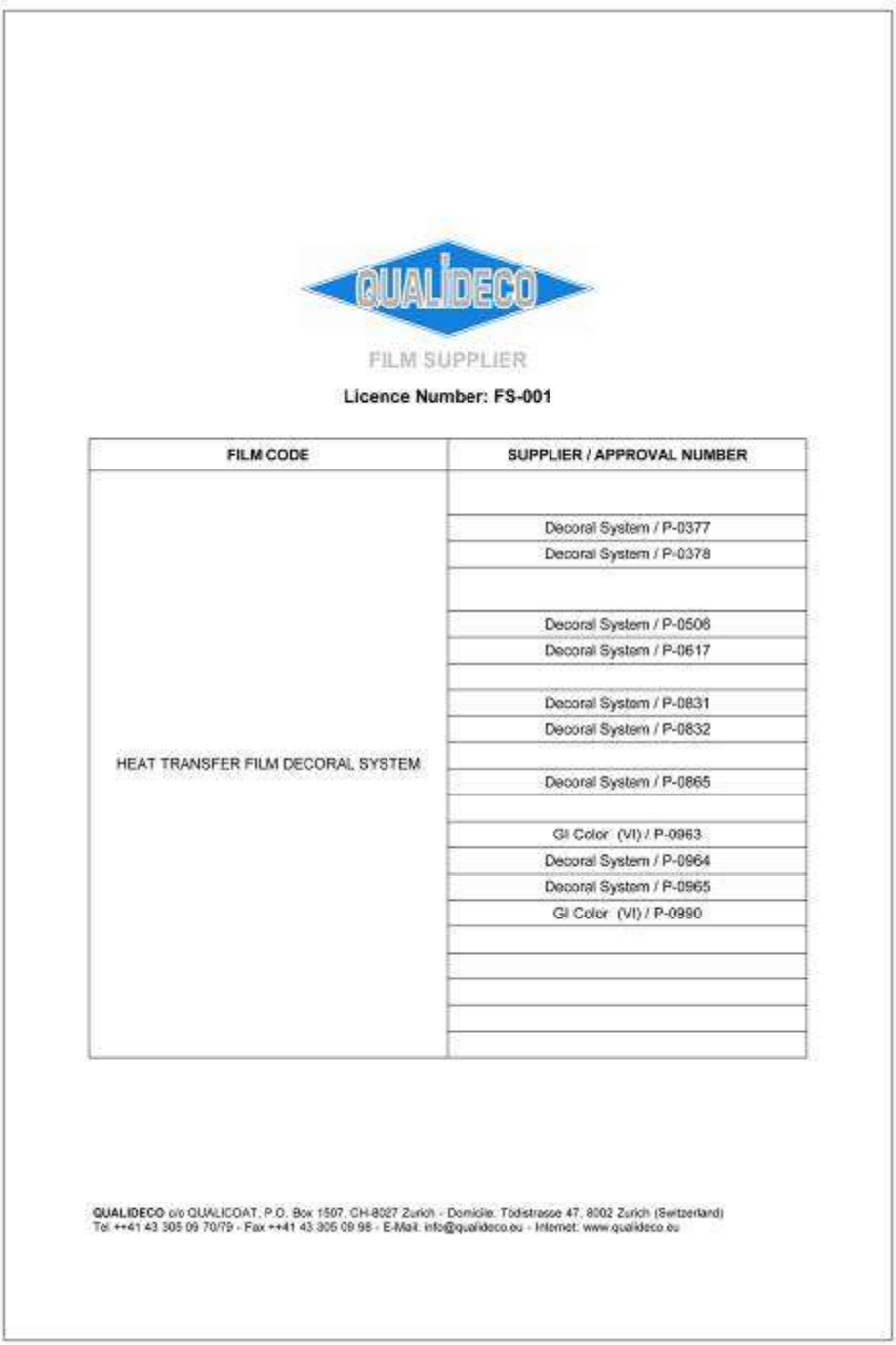
Mohammed C. Panam
President

Josef Schoppig
General Secretary

Juan A. Bernabé
QUALIDECO Committee

QUALIDECO c/o QUALICOAT, P.O. Box 1507, CH-8027 Zurich - Domicile: Tödistrasse 47, 8002 Zurich (Switzerland)
Tel. ++41 43 305 09 70/79 - Fax ++41 43 305 09 98 - E-Mail: info@qualideco.eu - Internet: www.qualideco.eu

QUALIDECO FS-001 LICENSE: DECORAL SYSTEM PRODUCES QUALITY FILMS APPROVED BY QUALIDECO



FILM SUPPLIER

Licence Number: FS-001

FILM CODE	SUPPLIER / APPROVAL NUMBER
HEAT TRANSFER FILM DECORAL SYSTEM	
	Decoral System / P-0377
	Decoral System / P-0378
	Decoral System / P-0506
	Decoral System / P-0617
	Decoral System / P-0831
	Decoral System / P-0832
	Decoral System / P-0865
	GI Color (VI) / P-0963
	Decoral System / P-0964
	Decoral System / P-0965
	GI Color (VI) / P-0990

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Tel. ++41 43 305 09 70/79 - Fax ++41 43 305 09 98 - E-Mail: info@qualideco.eu - Internet: www.qualideco.eu

QUALIDECO FS-001 LICENSE: DECORAL SYSTEM PRODUCES QUALITY FILMS APPROVED BY QUALIDECO

LICENCE CERTIFICATE

AUTHORISATION TO USE THE QUALITY MARK

QUALIDECO

POWDER SUPPLIER

This is to certify that

Decoral System

viale del Lavoro, 4 - IT-37040 Arcole VR

Licence Number: PS-001

is authorized to use the above quality mark for the powder(s) specified in the following table, used in combination with the film(s) stated in this certificate according to the Regulations for the use of the logo set out in the QUALIDECO Specifications.

The approval is valid for all the decorations provided that the powder(s) and the film(s) are clearly indicated with their specific approval number / code(s).

Date of issue of the licence: **01.01.2010**

Period of validity of the licence: **until 31.12.2014**

Zurich, 12 February 2014

QUALICOAT

M. C. Panam

Mohammed C. Panam
President

Josef Schoppig
General Secretary

Juan A. Bernabé
QUALIDECO Committee

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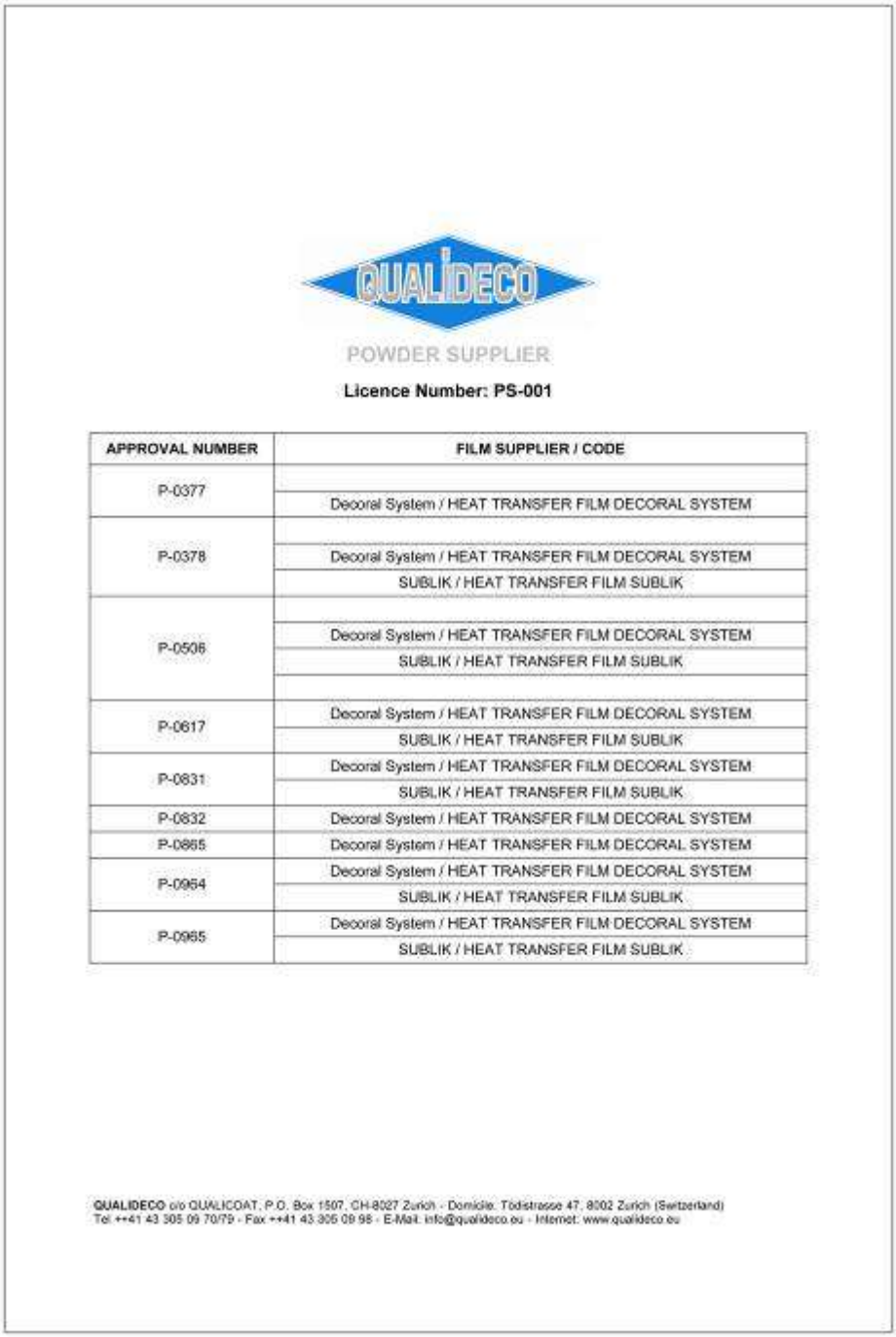
Tel ++41 43 305 09 70/79 - Fax ++41 43 305 09 98 - E-Mail: info@qualideco.eu - Internet: www.qualideco.eu

QUALIDECO PS-001 LICENSE: DECORAL SYSTEM PRODUCES QUALITY POWDER PAINTS APPROVED BY QUALIDECO



POWDER SUPPLIER

Licence Number: PS-001

APPROVAL NUMBER	FILM SUPPLIER / CODE
P-0377	
	Decoral System / HEAT TRANSFER FILM DECORAL SYSTEM
P-0378	
	Decoral System / HEAT TRANSFER FILM DECORAL SYSTEM
	SUBLIK / HEAT TRANSFER FILM SUBLIK
P-0506	
	Decoral System / HEAT TRANSFER FILM DECORAL SYSTEM
	SUBLIK / HEAT TRANSFER FILM SUBLIK
P-0617	Decoral System / HEAT TRANSFER FILM DECORAL SYSTEM
	SUBLIK / HEAT TRANSFER FILM SUBLIK
P-0831	Decoral System / HEAT TRANSFER FILM DECORAL SYSTEM
	SUBLIK / HEAT TRANSFER FILM SUBLIK
P-0832	Decoral System / HEAT TRANSFER FILM DECORAL SYSTEM
P-0865	Decoral System / HEAT TRANSFER FILM DECORAL SYSTEM
P-0964	Decoral System / HEAT TRANSFER FILM DECORAL SYSTEM
	SUBLIK / HEAT TRANSFER FILM SUBLIK
P-0965	Decoral System / HEAT TRANSFER FILM DECORAL SYSTEM
	SUBLIK / HEAT TRANSFER FILM SUBLIK

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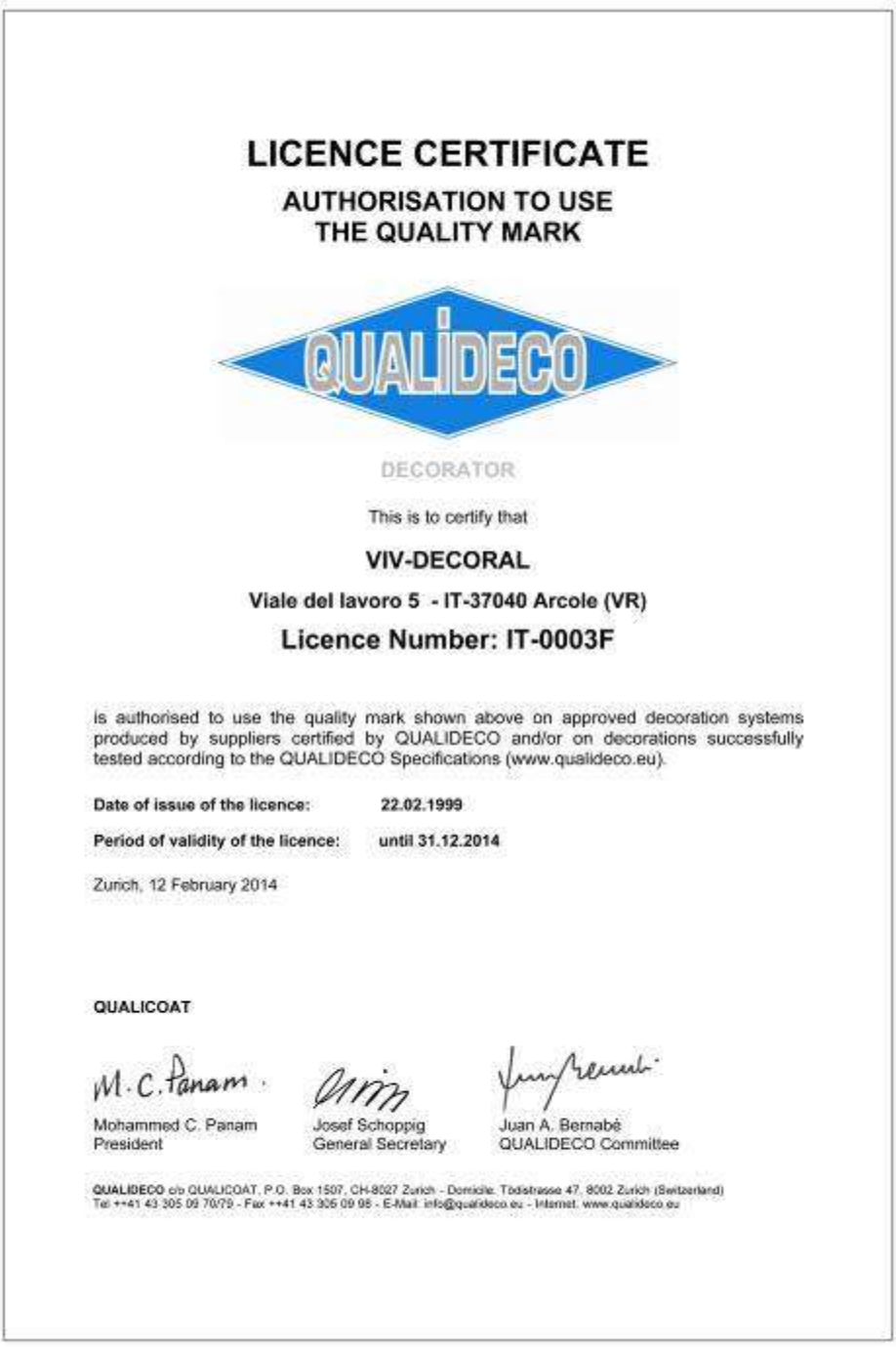
Tel. ++41 43 305 09 70/79 - Fax ++41 43 305 09 98 - E-Mail: info@qualideco.eu - Internet: www.qualideco.eu

QUALIDECO PS-001 LICENSE: DECORAL SYSTEM PRODUCES QUALITY POWDER PAINTS APPROVED BY QUALIDECO



LICENCE CERTIFICATE

AUTHORISATION TO USE THE QUALITY MARK

QUALIDECO

DECORATOR

This is to certify that

VIV-DECORAL

Viale del lavoro 5 - IT-37040 Arcole (VR)

Licence Number: IT-0003F

is authorised to use the quality mark shown above on approved decoration systems produced by suppliers certified by QUALIDECO and/or on decorations successfully tested according to the QUALIDECO Specifications (www.qualideco.eu).

Date of issue of the licence: **22.02.1999**

Period of validity of the licence: **until 31.12.2014**

Zurich, 12 February 2014

QUALICOAT

M. C. Panam
Mohammed C. Panam
President

Josef Schoppig
General Secretary

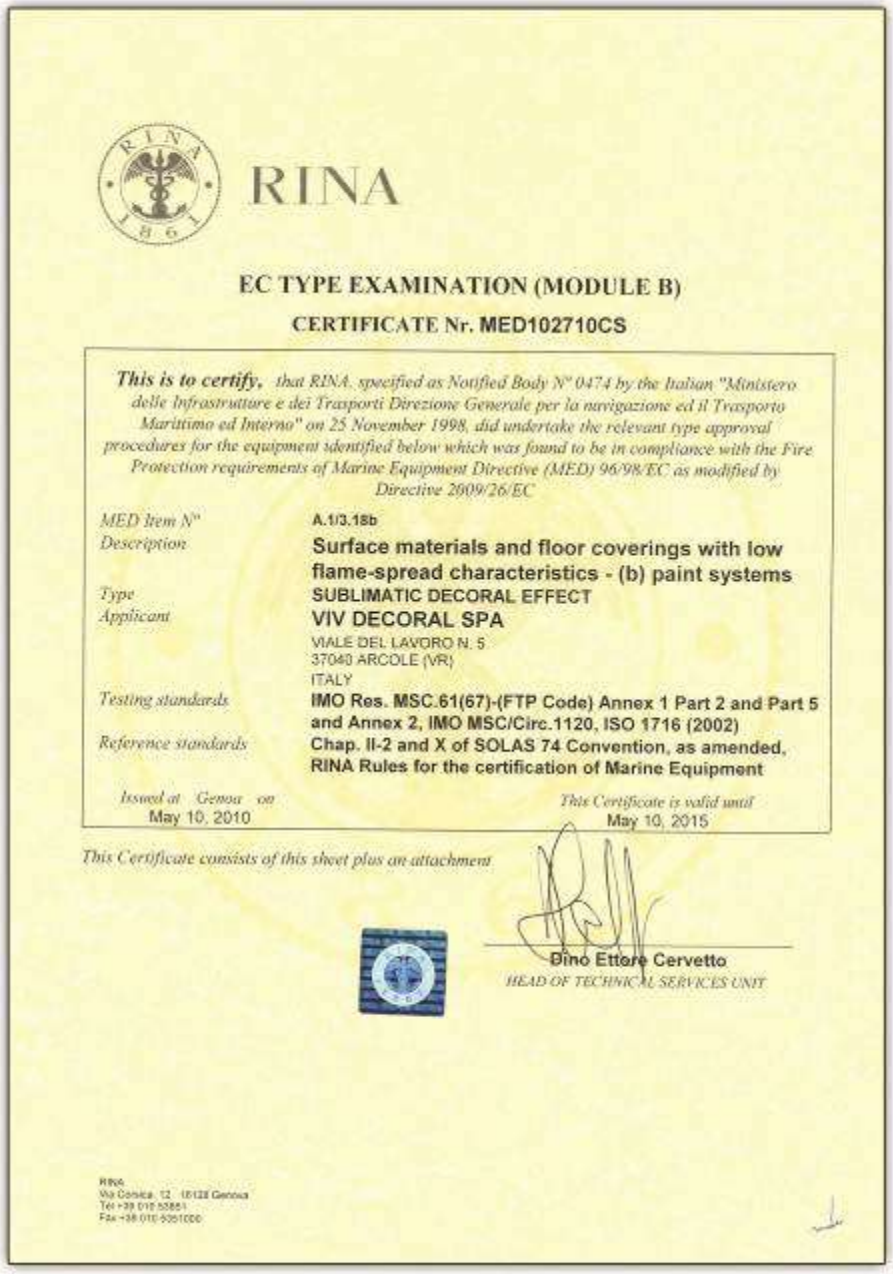
Juan A. Bernabé
QUALIDECO Committee

QUALIDECO c/o QUALICOAT, P.O. Box 1507, CH-8027 Zurich - Domicile: Tödistrasse 47, 8002 Zurich (Switzerland)
Tel ++41 43 305 09 70/79 - Fax ++41 43 305 09 95 - E-Mail: info@qualideco.eu - Internet: www.qualideco.eu

QUALIDECO LICENSE IT-0003F: VIV DECORAL SPA IS A DECORATOR COMPANY WITH QUALIDECO LICENSE WHICH USES CERTIFIED RAW MATERIALS

RINA

RINA SpA is the operational society of Italian Naval Register, market leader in certifying and evaluating the compliance in Italy, with a significant presence in different strategic areas worldwide, mainly working in the fields of naval classification, certificates and advanced services for industry.



RINA

EC TYPE EXAMINATION (MODULE B)

CERTIFICATE Nr. MED102710CS

This is to certify, that RINA, specified as Notified Body N° 0474 by the Italian "Ministero delle Infrastrutture e dei Trasporti Direzione Generale per la navigazione ed il Trasporto Marittimo ed Interno" on 25 November 1998, did undertake the relevant type approval procedures for the equipment identified below which was found to be in compliance with the Fire Protection requirements of Marine Equipment Directive (MED) 96/98/EC as modified by Directive 2009/26/EC

MED Item N° A.1/3.18b

Description Surface materials and floor coverings with low flame-spread characteristics - (b) paint systems

Type SUBLIMATIC DECORAL EFFECT

Applicant VIV DECORAL SPA
VIALE DEL LAVORO N. 5
37040 ARCOLE (VR)
ITALY

Testing standards IMO Res. MSC.61(67)-(FTP Code) Annex 1 Part 2 and Part 5 and Annex 2, IMO MSC/Circ.1120, ISO 1716 (2002)

Reference standards Chap. II-2 and X of SOLAS 74 Convention, as amended, RINA Rules for the certification of Marine Equipment

Issued at Genoa on May 10, 2010

This Certificate is valid until May 10, 2015

This Certificate consists of this sheet plus an attachment

Dino Ettore Cervetto
HEAD OF TECHNICAL SERVICES UNIT

RINA
Via Corsica, 12 - 16128 Genova
Tel +39 010 53851
Fax +39 010 5351000

RINA

ATTACHMENT TO
CERTIFICATE Nr. MED102710CS
Page 1 of 2

Manufacturer
VIV DECORAL SPA

Place of Manufacturer
VIALE DEL LAVORO N 5
37040 ARCOLE (VR)
ITALY

Product description

Surface product composed of:

- painting system composed of polyurethane powder named "Decoral System" (mass per area from 41.1 to 205.4 g/m^2 and thickness from 0.040 up to 0.200 mm)
- sublimation transfer system of thereftalate polyetlene film printed with pigments and resins named "heat transfer PET film Decoral System).

Field of application

As finishing material for all exposed interior and concealed or inaccessible surfaces.
When intended for bulkhead and ceiling the product may be applied to any metallic support having a thickness ≥ 0.52 mm. When intended for deck the product may be applied to any non-combustible support, any metallic support or any material having low flame spread characteristics.
On the basis of the value of the total heat release (Q_t) and on the basis of the value of the peak heat release (q_p) the material is deemed not generating excessive quantities of smoke nor toxic products in fire according to Annex 2 IMO Res. MSC. 61(67).

Tests carried out

Tests as per RINA Test Laboratory report No. 2010CS011027 issued on 06 May 2010 and 2010CS011027/1 issued on 11/05/2010 according to:

- IMO Res. A.653(16)
- ISO 1716. 2002.

RINA
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Tel. +39 010 53851
Fax +39 010 5351000

RINA

ATTACHMENT TO
CERTIFICATE Nr. MED102710CS
Page 2 of 2

The mark of conformity may only be affixed to the above type approved equipment and a Manufacturer's Declaration of Conformity issued when the production control phase module (D, E or F) of Annex B of the Directive is fully complied with a written inspection agreement with a Notified Body

XXXX/YY

"WHEELMARK FORMAT"
XXXX Notified Body number undertaking surveillance module
YY Last two digits of year mark affixed

General conditions for the approval

a) The initial conditions verified by RINA at the time of the approval are to be maintained

b) Any changes to the initial conditions are to be promptly communicated to RINA, which reserves the right to repeat the relevant assessment

c) This certificate will no be valid if the manufacturer makes any changes or modifications to the approved equipment, which have not been notified to, and agreed with RINA

d) RINA personnel are to be allowed to witness during the performances of activities upon their request

e) The activities are to be carried out in compliance with the RINA Rules and/or other applicable Rules

f) Should the specified regulations or standards be amended during the validity of this certificate, the product is to be reapproved prior to it being placed on board vessels to which the amended regulations or standards apply

Dino Ettore Cervetto

RINA
Via Corsica, 12 16128 Genova
Tel +39 010 53851
Fax +39 010 5351000

Architectural Testing

COATING PERFORMANCE TEST REPORT

Rendered to:

DECORAL SYSTEM ITALIA

PRODUCT: DS 403 (1803/01) Wood Grain,
Powder Coated Aluminum Panels

Report No:	**55329.02-106-31**
Report Date:	**06/15/06**
Expiration Date:	**12/15/07**
Revision 1:	**07/30/10**

130 Derry Court
York, PA 17406-8405
phone: 717-764-7700
fax: 717-764-4129
www.archtest.com

Architectural Testing

COATING PERFORMANCE TEST REPORT

Rendered to:

DECORAL SYSTEM ITALIA
Viale del Lavoro, 5
37040 Arcole (Verona), Italy

Report No:	55329.02-106-31
Test Date:	02/09/05
Through:	06/15/06
Report Date:	06/15/06
Expiration Date:	12/15/07
Revision 1:	07/30/10

Product: DS 403 (1803/01) Wood Grain, Powder Coated Aluminum Panels

Project Summary: Architectural Testing, Inc. was contracted by Decoral System Italia to conduct testing on their coated aluminum panels with overall dimensions of 6" long by 3" wide, supplied by Decoral System Italia. The coated aluminum panels were visually inspected before testing for surface flaws. The panels supplied meet all performance requirements listed in AAMA 2603-02.

Test Procedure: The following tests were performed in accordance with AAMA 2603-02, *Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.*

1. **Color Uniformity**

   Procedure: Extrusions were selected randomly and visually inspected under a uniform light source. Color must be consistent within a specified range. (This test was performed to evaluate the consistency of coating coloring between pieces).

2. **Specular Gloss**

   Procedure: This procedure was performed in accordance with ASTM-D523, using a 60° Gloss Meter. Gloss values must be within ±5 of a specified value except for the High Gloss Range, which must be a minimum of 80. Three duplicate tests are conducted.

3. **Dry Film Hardness**

   Procedure: An Eagle Turquoise Pencil, grade "H" minimum hardness is stripped leaving full diameter of lead exposed to length of 1/4" to 3/8" maximum. The end of the pencil is flattened to 90° of the pencil axis using fine grade emery paper. The pencil is held at 45° to film surface and then pushed forward 1/4" using as much downward pressure as can be applied without breaking lead, reference specification ASTM D 3363. Three duplicate tests are conducted. No film rupture is allowed.

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Test Procedure: (Continued)

4. **Film Adhesion**

   Dry Procedure: Eleven parallel cuts are made 1/16" apart through the film. Eleven similar cuts are made at 90° to and crossing the first eleven cuts. Permacel 99 or equivalent tape 3/4" wide is applied over the area of the cuts by pressing down firmly against coating to eliminate voids and air pockets. The tape is then sharply pulled off at a right angle to the plane of the surface being tested. Three duplicate tests are conducted. Test pieces are kept at room temperature, (approximately 74°F).

   Wet Procedure: The procedure is the same as above except that the aluminum extrusions are immersed in distilled water at 100°F for 24 hours. Samples are then removed and wiped dry. The test must be performed within five minutes after removal from water bath. Three duplicate tests are conducted. No removal of film under tape within or outside of crosshatched area or blistering anywhere on wet samples. Number of squares affected shall be reported as the failure percentage.

5. **Impact Resistance**

   Procedure: A 5/8" diameter round nosed impactor is used to perform the impact test. The impact load is applied directly to coated surface using a Gardner Variable Impact Tester (160 inch-pound range) of sufficient force to deform test sample a minimum of 0.10". Permacel 99 or equivalent tape 3/4" wide is applied over deformed area and firmly pressed against the surface to alleviate voids and air pockets. The tape is sharply pulled off at a right angle to the plane of the surface being tested. Three duplicate tests are conducted. Test pieces are kept at room temperature, (approximately 74°F).

6. **Chemical Resistance**

   Muriatic Acid Procedure: Ten drops of 10% (by volume) muriatic solution (37% commercial grade hydrochloric acid) in tap water is applied to the surface to be tested and covered with a watch glass to prevent evaporation. The acid solution and test are conducted at 74°F. After15 minutes of exposure, the sample was rinsed with running tap water. Three duplicate tests are conducted. No blistering and no visual change in appearance are allowed when examined by the unaided eye.

Architectural Testing

Test Method: (Continued)

6. **Chemical Resistance**: (Continued)

Mortar Procedure: Mortar is prepared by mixing 75 grams of building lime and 225 grams of dry sand, both passing through 10 mesh wire screen and sufficient water, approximately 100 grams, to make a soft paste. The mortar is immediately applied to an area 2" square and 1/2" thick onto the surface of the aluminum extrusions at two separate locations. The test sections are then immediately exposed for 24 hours to 100% relative humidity at 100°F. Three duplicate tests are conducted. The mortar shall dislodge easily and residue must be removable with 10% muriatic acid solution.

7. **Detergent Resistance**

Procedure: A 3% (by weight) solution was prepared of detergent and distilled water. Three test samples were then immersed in the solution at 100°F for 72 hours. Samples were removed and wiped dry. Tape (Permacel 99, or equivalent 3/4" wide) was immediately applied by pressing down firmly against the coating to alleviate voids and air pockets. The tape was placed longitudinally along the entire length of the test samples. Visibly blistered areas were taped and rated. The tape is sharply pulled off at right angle to the surface being tested, per ASTM D 3359. Three duplicate tests are conducted. No loss of adhesion of film to metal, no blistering and no significant visual change in appearance when examined by the unaided eye.

8. **Corrosion Resistance**

Humidity Procedure: Samples are exposed in a controlled heat and humidity chamber for 1,500 hours at 100°F and 100% RH with chamber operated in accordance with ASTM D 2247. Three duplicate tests are conducted. No formation of blisters to an extent greater than "Few" of Size No. 8 as depicted in Figure No. 4 of ASTM D 714.

Salt Spray Procedure: Film was scored sufficiently deep to expose base metal using a sharp knife. The sample was exposed for 1,500 hours according to ASTM B117 using a 5% salt solution. Samples were removed and wiped dry. Tape (Permacel 99, or equivalent 3/4" wide) was placed over scored area by pressing down firmly against coating to eliminate voids and air pockets. The tape is then sharply pulled off at right angle to the plane of surface being tested. Three duplicate tests are conducted. Minimum rating of seven for scribed areas and eight for blistered areas.

Outdoor Weathering: Six specimens were subcontracted to South Florida Test Services, Inc. to perform outdoor weathering exposure. The test specimens were subjected to 12 months of direct exposure in South Florida at a 45° angle rack at as required by AAMA 2603. The specimens were evaluated by Architectural Testing, Inc. upon completion of exposure and return of the specimen.

Test Results: Individual test results are reported in the following table.

Test	Results	Requirements / Comments
Color Uniformity	Pass	Visually uniform
Specular Gloss	Pass 19.6 Average (grain pattern)	Low Gloss Range Target Range 19.9 or less
Dry Film Hardness	Pass	No rupture of film
Dry Film Adhesion	Pass 100% Adhesion	No film removal
Wet Film Adhesion	Pass 100% Adhesion	No film removal
Impact Resistance	Pass	No film removal
Muriatic Acid Resistance	Pass	No blistering or visual change
Mortar Resistance	Pass	No loss of adhesion or visual change
Detergent Resistance	Pass	No loss of adhesion, blistering or visual change
Humidity Resistance	Pass No blistering	No blistering greater than Size 8 and "Few"
Salt Spray Resistance	Pass No Creep or Blistering	Minimum rating of 7 on scribe, and 8 within the test specimen field
Outdoor Weathering	Pass No Checking or Crazing	No loss of adhesion, slight fading

For ARCHITECTURAL TESTING, INC.:

Digitally Signed by: Joseph M. Brickner
Joseph M. Brickner
Senior Technician - Component/Materials Testing

Digitally Signed by: Gary Hartman
Gary Hartman, P.E.
Director - Component/Materials Testing

JMB:jmb/nlb

Attachments (pages)
Appendix A - Photographs (2)

Architectural Testing

55329.02-106-31
Page 5 of 5
Revision 1: 07/30/10

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	06/15/06	N/A	Original report issue
1	07/30/10	All	Change product identification to DS 403 (1803/01)

APPENDIX A

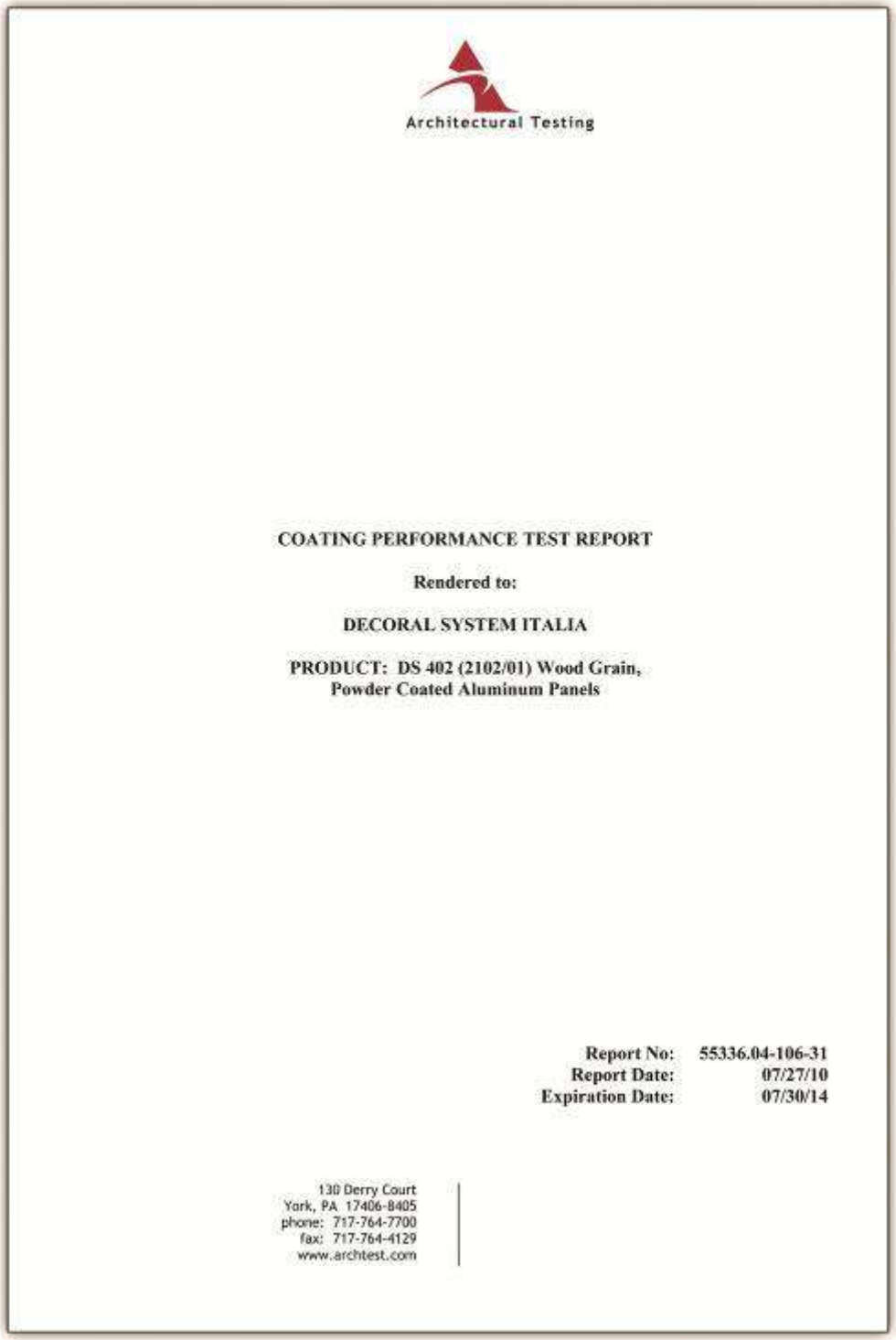
Photographs

Architectural Testing

55329.02-106-31

Photo No. 1
Adhesion Detail

Photo No. 2
Impact Detail



Architectural Testing

COATING PERFORMANCE TEST REPORT

Rendered to:

DECORAL SYSTEM ITALIA

PRODUCT: DS 402 (2102/01) Wood Grain,
Powder Coated Aluminum Panels

Report No: 55336.04-106-31
Report Date: 07/27/10
Expiration Date: 07/30/14

130 Derry Court
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phone: 717-764-7700
fax: 717-764-4129
www.archtest.com

Architectural Testing

COATING PERFORMANCE TEST REPORT

Rendered to:

DECORAL SYSTEM ITALIA
Viale del Lavoro, 5
37040 Arcole (Verona), Italy

Report No:	55336.04-106-31
Test Date:	02/09/05
Through:	07/27/10
Report Date:	07/27/10
Expiration Date:	07/27/14

Product: DS 402 (2102/01) Wood Grain, Powder Coated Aluminum Panels

Project Summary: Architectural Testing, Inc. was contracted by Decoral System Italia to conduct testing on coated aluminum panels with overall dimensions of 6" long by 3" wide, supplied by Decoral System Italia. The coated aluminum panels were visually inspected before testing for surface flaws. The panels supplied did not meet the AAMA 2604-02 performance requirements for post-weathering gloss retention.

Test Procedure: The following list of tests were performed in accordance with AAMA 2604-02, *Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.*

1. **Color Uniformity**

   Procedure: Extrusions were selected randomly and visually inspected under a uniform light source. Color must be consistent within a specified range. (This test was performed to evaluate the consistency of coating coloring between pieces).

2. **Specular Gloss**

   Procedure: This procedure was performed in accordance with ASTM-D523, using a 60° Gloss Meter. Gloss values must be within ±5 of a specified value except for the High Gloss Range, which must be a minimum of 80. Three duplicate tests are conducted.

3. **Dry Film Hardness**

   Procedure: An Eagle Turquoise Pencil, grade "F" minimum hardness is stripped leaving full diameter of lead exposed to length of 1/4" to 3/8" maximum. The end of the pencil is flattened to 90° of the pencil axis using fine grade emery paper. The pencil is held at 45° to film surface and then pushed forward 1/4" using as much downward pressure as can be applied without breaking lead, reference specification ASTM D 3363. Three duplicate tests are conducted. No film rupture is allowed.

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Test Procedure: (Continued)

4. **Film Adhesion**

Dry Procedure: Eleven parallel cuts are made 1/16" apart through the film. Eleven similar cuts are made at 90° to and crossing the first eleven cuts. Permacel 99 or equivalent tape 3/4" wide is applied over the area of the cuts by pressing down firmly against coating to eliminate voids and air pockets. The tape is then sharply pulled off at a right angle to the plane of the surface being tested. Three duplicate tests are conducted. Test pieces are kept at room temperature, (approximately 74°F).

Wet Procedure: The procedure is the same as above except that the aluminum panels are immersed in distilled water at 100°F for 24 hours. Samples are then removed and wiped dry. The test must be performed within five minutes after removal from water bath. Three duplicate tests are conducted. No removal of film under tape within or outside of crosshatched area or blistering anywhere on wet samples. Number of squares affected shall be reported as the failure percentage.

Boiling Water Procedure: The procedure is the same as above except that the aluminum panels are immersed in boiling distilled water at 100°C for 20 minutes. Samples are then removed and wiped dry. The test must be performed within five minutes after removal from water bath. Three duplicate tests are conducted. No removal of film under tape within or outside of crosshatched area or blistering anywhere on wet samples. Number of squares affected shall be reported as the failure percentage.

5. **Impact Resistance**

Procedure: A 5/8" diameter round nosed impactor is used to perform the impact test. The impact load is applied directly to coated surface using a Gardner Variable Impact Tester (160 inch-pound range) of sufficient force to deform test sample a minimum of 0.10". Permacel 99 or equivalent tape 3/4" wide is applied over deformed area and firmly pressed against the surface to alleviate voids and air pockets. The tape is sharply pulled off at a right angle to the plane of the surface being tested. Three duplicate tests are conducted. Test pieces are kept at room temperature, (approximately 74°F).

6. **Abrasion Resistance**

Procedure: This procedure was performed in accordance with the falling sand test method in ASTM D 968. The Abrasion Coefficient shall be calculated as follows: Liters of sand used to wear through / thickness of coating in mils = Liters per Mil. Three duplicate tests are conducted. The abrasion coefficient value of the coating shall be 20 minimum.

Test Method: (Continued)

7. **Chemical Resistance**

Muriatic Acid Procedure: Ten drops of 10% (by volume) muriatic solution (37% commercial grade hydrochloric acid) in tap water is applied to the surface to be tested and covered with a watch glass to prevent evaporation. The acid solution and test are conducted at 74ºF. After15 minutes of exposure, the sample was rinsed with running tap water. Three duplicate tests are conducted. No blistering and no visual change in appearance are allowed when examined by the unaided eye.

Mortar Procedure: Mortar is prepared by mixing 75 grams of building lime and 225 grams of dry sand, both passing through 10 mesh wire screen and sufficient water, approximately 100 grams, to make a soft paste. The mortar is immediately applied to an area 2" square and 1/2" thick onto the surface of the aluminum extrusions at two separate locations. The test sections are then immediately exposed for 24 hours to 100% relative humidity at 100ºF. Three duplicate tests are conducted. The mortar shall dislodge easily and residue must be removable with 10% muriatic acid solution.

Nitric Acid Procedure: An 8 ounce wide mouth bottle is filled half full of 70% ACS reagent grade Nitric Acid. A test panel is placed painted side down over the mouth of the bottle for 30 minutes. The panels are then rinsed, wiped dry and read for color change after one hour. Three duplicate tests are conducted. No more than 5 ΔE units (Hunter) of color change when calculated in accordance with ASTM D 2244 when comparing acid exposed surfaces to unexposed surfaces.

Detergent Resistance Procedure: A 3% (by weight) solution was prepared of detergent and distilled water. Three test samples were then immersed in the solution at 100ºF for 72 hours. Samples were removed and wiped dry. Tape (Permacel 99, or equivalent 3/4" wide) was immediately applied by pressing down firmly against the coating to alleviate voids and air pockets. The tape was placed longitudinally along the entire length of the test samples. Visibly blistered areas were taped and rated. The tape is sharply pulled off at right angle to the surface being tested, per ASTM D 3359. Three duplicate tests are conducted. No loss of adhesion of film to metal, no blistering and no significant visual change in appearance when examined by the unaided eye.

Window Cleaner Resistance Procedure: An all purpose glass cleaner solution was prepared according to the specification. Ten drops of the solution were applied to each test panel and then covered with a watch glass for 24 hours. Samples were then rinsed, wiped dry and allowed to sit for four hours. The test panels are then evaluated per the dry adhesion method as outlined above. Three duplicate tests are conducted.

Architectural Testing

Test Method: (Continued)

8. **Corrosion Resistance**

Humidity Procedure: Samples are exposed in a controlled heat and humidity chamber for 3,000 hours at 100°F and 100% RH with chamber operated in accordance with ASTM D 2247. Three duplicate tests are conducted. No formation of blisters to an extent greater than "Few" of Size No. 8 as depicted in Figure No. 4 of ASTM D 714.

Salt Spray Procedure: Film was scored sufficiently deep to expose base metal using a sharp knife. The sample was exposed for 3,000 hours according to ASTM B117 using a 5% salt solution. Samples were removed and wiped dry. Tape (Permacel 99, or equivalent 3/4" wide) was placed over scored area by pressing down firmly against coating to eliminate voids and air pockets. The tape is then sharply pulled off at right angle to the plane of surface being tested. Three duplicate tests are conducted. Minimum rating of seven for scribed areas and eight for blistered areas.

Outdoor Weathering: Six specimens were subcontracted to South Florida Test Services, Inc. to perform outdoor weathering exposure. The test specimens were subjected to 60 months of direct exposure in South Florida at a 45° angle rack at as required by AAMA 2603. The specimens were evaluated by Architectural Testing, Inc. upon completion of exposure and return of the specimen.

Test Results: Individual test results are reported in the following table.

Test	Results	Requirements / Comments
Color Uniformity	Pass	Visually uniform
Specular Gloss	Pass 21.7 Average (grain pattern)	Medium Gloss Range Target Range 20-79.9
Dry Film Hardness	Pass	No rupture of film
Dry Film Adhesion	Pass 100% Adhesion	No film removal
Wet Film Adhesion	Pass 100% Adhesion	No film removal
Impact Resistance	Pass	No film removal
Abrasion Resistance	Pass	Abrasion Coefficient Value > 20
Muriatic Acid Resistance	Pass	No blistering or visual change
Mortar Resistance	Pass	No loss of adhesion or visual change
Nitric Acid Resistance	Pass 1.012 ΔE Average	No more than 5 ΔE units (Hunter) of color change
Detergent Resistance	Pass	No loss of adhesion, blistering or visual change
Window Cleaner Resistance	Pass	No loss of adhesion, blistering or visual change
Humidity Resistance	Pass	No blistering greater than Size 8 and "Few"
Salt Spray Resistance	Pass	Minimum rating of 7 on scribe, and 8 within the test specimen field
Outdoor Weathering (Five years)		
Color Retention	Pass 4.02 ΔE units	No more than 5 ΔE units (Hunter) of color change
Chalk Resistance	Pass No. 10 Rating	Not more than a No. 8 rating per ASTM D 4214
Gloss Retention	**Fail** 2.7 Average 12% Retention	Minimum of 30% gloss retention at 60°
Resistance to Erosion	Pass 2.3 % Loss	Not more than 10% film thickness loss

Architectural Testing

Data sheets, representative samples of test specimens, a copy of this report, or other pertinent project documentation will be retained by Architectural Testing, Inc. for a period of four years from the original test date. At the end of this retention period such materials shall be discarded without notice and the service life of this report by Architectural Testing will expire. Results obtained are tested values and were secured by using the designated tested methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to specimens tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.:

Digitally Signed by: Joseph M. Brickner

Joseph M. Brickner - Laboratory Supervisor
Component/Materials Testing

Digitally Signed by: Gary Hartman

Gary Hartman, P.E. - Director
Component/Materials Testing

JMB:jmb/nlb

Attachments (pages)
Appendix A - Photographs (3)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	07/30/10	N/A	Original report issue

Architectural Testing

55336.04-106-31

APPENDIX A

Photographs

Architectural Testing

55336.04-106-31

Photo No. 1
Adhesion Detail

Architectural Testing

55336.04-106-31

Photo No. 2
Impact Detail

Photo No. 3
60 Month Weathering Sample - South Florida Exposure

Qualitydecoral® Certification

Silver and Gold

QUALITYDECORAL® is a **self-certification** which confirms for **patterns** (**Decoral System® powder coatings + Decoral System® sublimatic films)** a **VERY HIGH RESISTANCE** to weather conditions and includes:

Finishings:

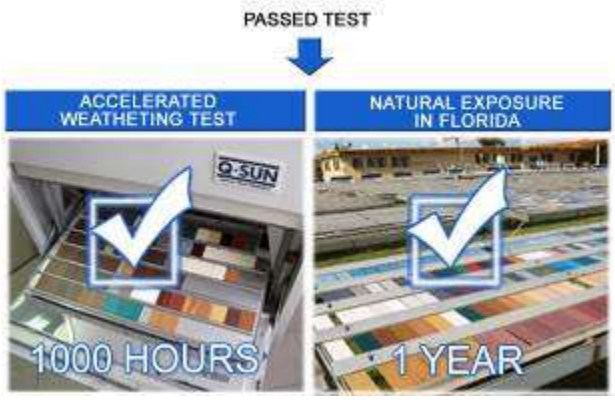
QUALITYDECORAL ★ SILVER ★

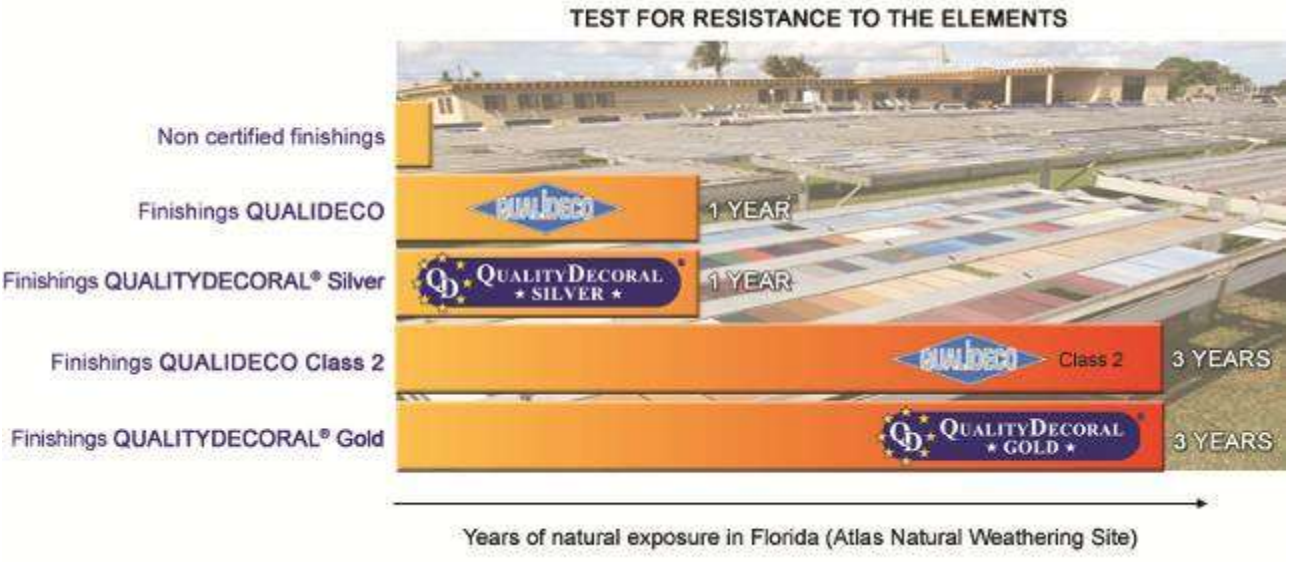
(specific combinations of Decoral System®'s powder coatings with **Decoral System®**'s transfer films)

Finishings:

QUALITYDECORAL ★ GOLD ★

(specific combinations of Super-durable Decoral System®'s powder coatings with Hyper-durable **Decoral System®**'s transfer films)





QUALITYDECORAL® SILVER

Qualitydecoral® Silver certifies the resistance of long lasting patterns that are considered fit for external use.

Tests required for certification

The decorations are exposed to intense light radiation and to severe atmospheric conditions for long periods.

The machines for accelerated aging tests at the **Decoral® LAB** (QSun3000 and Solarbox) simulate a long period exposure in standard atmospheric conditions.

Qualitydecoral® Silver certificate also requires to pass the test of 1 year exposure in Florida, where environmental and atmospheric conditions are more aggressive than elsewhere.

Tests done on patterns after the exposure

Two important aspects are checked after the exposure tests, resuming the quality of a pattern:

Gloss %: it measures the percentage of the remaining brightness

ΔE: color variation, the change of colour shade.

Qualitydecoral® Certification

Silver

Quality Certificate

If the pattern passes the test, which means if the parameters are under certain limits after both exposures and after a visual evaluation from the technical staff based on the grey scale, the **Qualitydecoral® Silver certificate is issued.**

An example of **QualityDecoral® Silver certificate** (pattern with high resistance to the climate) is shown above.

QUALITYDECORAL® GOLD

Qualitydecoral® Gold certifies the resistance of long lasting patterns that are considered fit for external use under very severe climate.

Tests required for certification

The decorations are exposed to an intense light radiation and to severe atmospheric conditions for long periods.

The machines for accelerated aging tests at the **Decoral® LAB** (QSun3000 and Solarbox) simulate a long period exposure in standard atmospheric conditions.

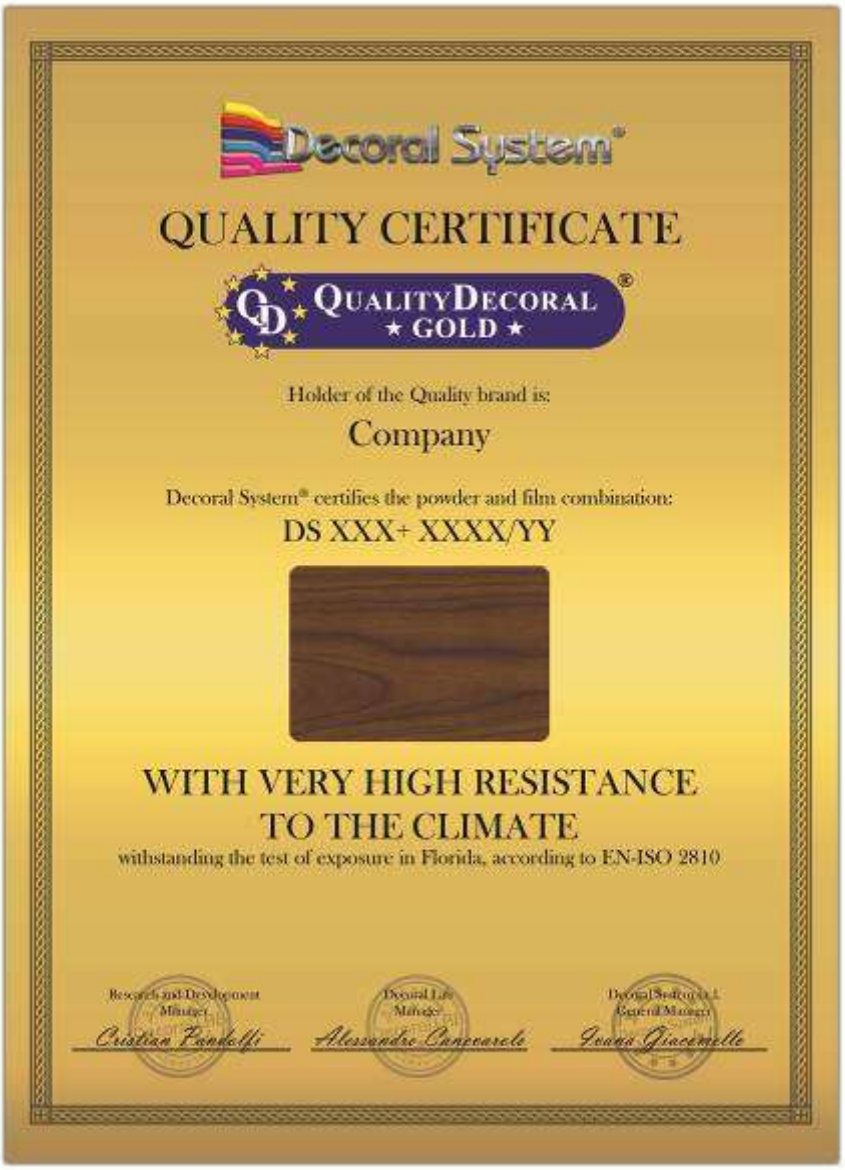
Qualitydecoral® Gold certificate also requires to pass the test of 3 years exposure in Florida, where environmental and atmospheric conditions are more aggressive than elsewhere.

Tests done on patterns after the exposure

Two important aspects are checked after the exposure tests, resuming the quality of a pattern:

Gloss %: it measures the percentage of the remaining brightness

ΔE: color variation, the change of colour shade.



Quality Certificate

If the pattern passes the test, which means if the parameters are under certain limits after both exposures and after a visual evaluation from the technical staff based on the grey scale, the **Qualitydecoral® Gold certificate is issued.**

An example of **QualityDecoral® Gold certificate** (pattern with high resistance to the climate) is shown above.

Patents

Decoral® products are a huge value for our company, and for this reason **Decoral**® makes sure to preserve their uniqueness with many registered patents both in Italy and abroad.

- 19 Italian patents;

- 8 European patents;

- 2 PCT patents

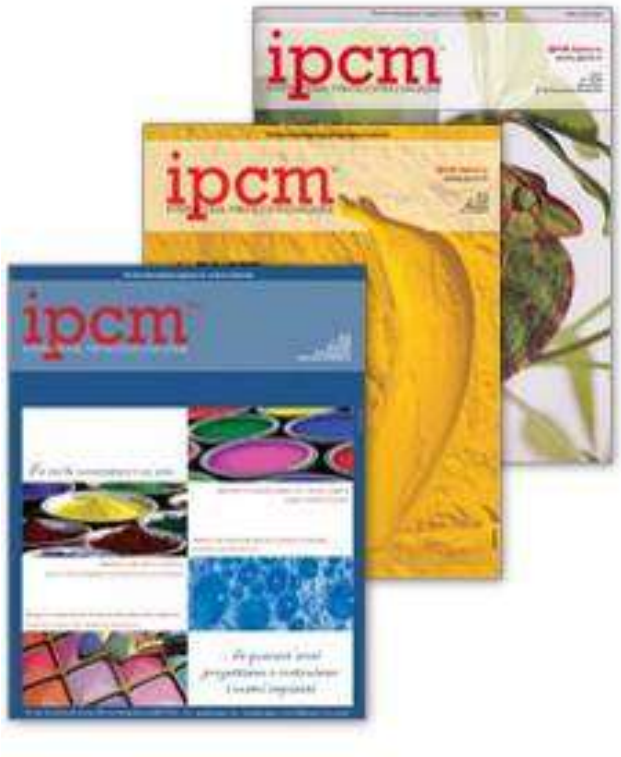
- 45 national patents: Australia (1), Bahrain (1), Canada (12), U.K. (1), France (3), Germany (3), Greece (3), Mexico (1), Poland (1), Slovenia (1), Spain (3) and USA (15).

“IPCM” MAGAZINE PRESENTS DECORAL SYSTEM® FINISHES CERTIFIED QUALITYDECORAL® GOLD

IPCM magazine presents **Decoral System®** finishes **certificated QUALITYDECORAL® GOLD.**

“Use of long-lasting paint coats and hyper-durable films for an amazing step forward to ecology”

The high durability of these finishes has a great advantage on weather sustainability, because it greatly increases the life of the pattern, thus reducing the maintenance costs.



www.ipcm.it

USING SUPER DURABLE POWDER COATINGS AND HYPER-DURABLE FILMS FOR AN INCREDIBLE STEP FORWARD TOWARDS ECOLOGY.

Impiego di prodotti vernicianti super-durabili e film hyper-durabili per un incredibile passo avanti verso l'ecologia.

Giancarlo Fenzi,
Cristian Pandolfi,
Alessandro Canevarolo
Decoral System®,
Arcole (VR), Italy
alessandro.canevarolo@decoral-system.com

The general and increasing need for products' durability pushed Decoral®'s technology frontiers unimaginable until today. New resins, new additives and new cromophores allowed designing products showing an increased durability compared to standards reached up to now. The Qualitydecoral® Gold series is born. This endurance, besides allowing to apply this famous technology to fields unexplored up to now, considerably increases objects' life.

Market and technological developments

Decoral System®, since 90's leader in plants' production, raw materials manufacturing and in managing the know-how concerning sublimation technology, recently developed and launched onto the market a new series of powder coating and a new series of sublimation films expressly formulated for this process. Class 2 powder coatings (DS 04XX S and DS 07XX S series) involve using polyurethane resin highly resistant to degradation and an innovative combination of UV absorbers; all of this to increase light endurance (especially towards short

La generale e crescente necessità di durabilità dei prodotti ha spinto la tecnologia Decoral® verso frontiere fino ad oggi inimmaginabili. Nuove resine, nuovi additivi e nuove molecole cromofore hanno permesso di sviluppare prodotti che mostrano una durabilità aumentata rispetto agli standard sino ad oggi raggiunti. È nata la serie Qualitydecoral® Gold. Tale resistenza, oltre a permettere l'applicazione della famosa tecnologia ad ambiti fino ad oggi inesplorati, aumenta sensibilmente la vita dei manufatti.

Mercato e Sviluppi tecnologici

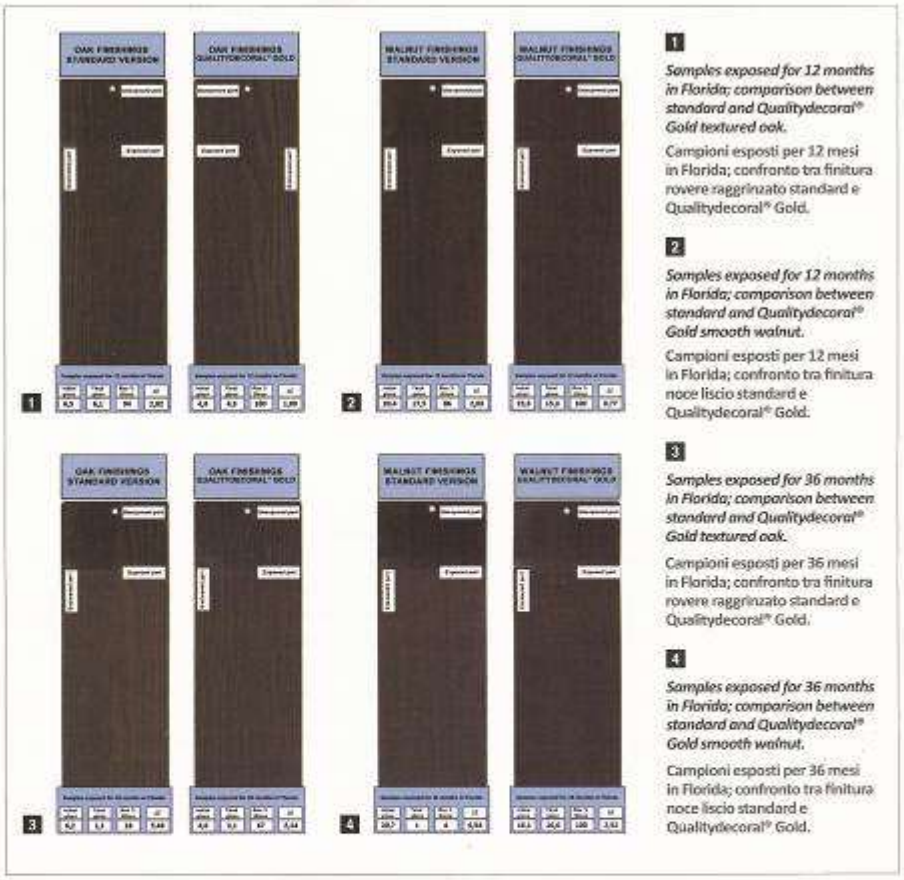
Decoral System®, fin dagli anni '90 *leader* nella messa a punto di impianti, nella preparazione di materie prime e nella gestione del *know how* legato alla tecnologia della sublimazione, ha recentemente sviluppato ed immesso sul mercato una nuova serie di prodotti vernicianti ed una nuova serie di film sublimatici espressamente formulati per tale processo. I prodotti vernicianti di classe 2 (serie DS 04XX S e DS 07XX S) prevedono l'impiego di resine di natura poliuretanica con alta resistenza al degrado, e l'utilizzo di una innovativa combinazione di assorbitori UV; il tutto finalizzato ad innalzare la

wavelengths) and to elements resistance (heat and humidity), which are the main responsible for coating products' degradation. For hyper-durable sublimation films (8XXXX/YY L4 series), the innovation is connected to the use of high resistance cromophores.
The combined use of these innovative raw materials allows reaching a higher durability against the elements, which would be unreachable with standard raw materials, normally used in the colour sublimation process.

Qualitydecoral® Gold vs Standard
Natural exposure tests, putting samples through southern Florida's humid, hot climate and high UV radiation, allow R&D labs to reliably foresee manufacts' durability. In particular, the new series' products show incredibly higher resistances than standard products. The pictures from 1 to 4 show the high durability of manufacts prepared with super-durable powder coatings and hyper-durable transfer films, especially after long exposure periods. Qualitydecoral® Gold samples, in line with standards samples after a year's exposure, explicit all their endurance to the passage of time. Indeed, comparing the images of samples exposed for three years, you can see the nearly nonexistent degradation of the high durability series (samples on the right), while normal finishings show a degradation that, though staying in the standards accepted by the market, bears the marks left by time. We can also have a numerical evidence of Qualitydecoral® Gold products high resistance.
*The main parameters, normally monitored to evaluate the degradation of decorated surfaces, are colour variation (ΔE) and residual gloss percentage (res%). After three years' exposure, the smooth walnut superdurable sample's ΔE is extremely low and the colour variation is 2,52, while the sheet prepared with standard products was subject to a 6,54 degradation (**Fig. 4**). Qualitydecoral® Gold sample shows a great stability also in terms of residual gloss (res% 100); unaltered gloss. On the other hand, standard raw materials show an higher degradation, with a residual gloss percentage of 4%. It is important to consider that samples were run through a test of thrice the duration imposed by Qualideco specifications for standard products. Basing on this data, we can state that new series' products have a durability three times higher than decorations prepared with standard raw materials.*

resistenza alla luce (specialmente verso le corte lunghezze d'onda) ed agli agenti atmosferici (calore ed umidità), principali responsabili del degrado dei prodotti vernicianti. Per i film sublimatici hyper-durabili (serie 8XXXX/YY L4) l'innovazione è legata all'impiego di cromofori ad elevata resistenza. L'uso combinato di queste innovative materie prime permette di raggiungere una maggiore durabilità verso gli agenti atmosferici altrimenti non raggiungibile con le comuni materie prime normalmente utilizzate nel processo di sublicromia (prodotti *standard*).

Qualitydecoral® Gold vs Standard
Test di esposizione naturale che sottopongono i campioni al clima caldo, umido ed all'alto irraggiamento UV del sud della Florida permettono ai laboratori R&D di prevedere fedelmente la durabilità dei manufatti. Nello specifico, i prodotti della nuova serie mostrano resistenze incredibilmente superiori, quando confrontati con i prodotti standard. Le immagini da 1 a 4 evidenziano l'elevata durabilità dei manufatti ottenuti con prodotti vernicianti super-durabili e con film sublimatici hyper-durabili, soprattutto ai lunghi tempi di esposizione. I campioni Qualitydecoral® Gold che risultano allineati ai campioni *standard* dopo un anno di esposizione esplicitano tutta la resistenza al passare del tempo. Infatti, dal confronto delle immagini dei campioni esposti per tre anni è possibile notare il degrado, praticamente nullo, delle serie ad alta durabilità (campioni a destra), mentre le normali finiture presentano un degrado che pur restando nella normalità, accettata dal mercato, mostra i segni del tempo.
Anche dal punto di vista numerico è possibile avere un riscontro sulla elevata resistenza dei prodotti Qualitydecoral® Gold. I parametri fondamentali, normalmente monitorati per valutare il degrado delle superfici nobilitate, sono la variazione del colore (ΔE) ed il residuo percentuale di brillantezza (res%). Dopo tre anni di esposizione il ΔE del campione noce liscio superdurabile è estremamente contenuto, variazione colore = 2,52, mentre il pannello preparato con i prodotti *standard* ha subito un degrado pari a 6,54 (**fig. 4**). Anche in termini di brillantezza residua la stabilità del campione Qualitydecoral® Gold mostra notevoli risultati (res% 100); brillantezza inalterata. Al contrario le materie prime standard risultano maggiormente degradate, con una brillantezza residua percentuale del 4%. Importante considerare che i campioni sono stati sottoposti ad un *test* di durata tripla rispetto quella imposta dal capitolato Qualideco per prodotti standard, internazionalmente riconosciuto.
Sulla base di questi dati è possibile affermare che prodotti della nuova serie hanno una durabilità tripla rispetto al decorato preparato con le materie prime *standard*.



1

Samples exposed for 12 months in Florida; comparison between standard and Qualitydecoral® Gold textured oak.

Campioni esposti per 12 mesi in Florida; confronto tra finitura rovere raggrinzato standard e Qualitydecoral® Gold.

2

Samples exposed for 12 months in Florida; comparison between standard and Qualitydecoral® Gold smooth walnut.

Campioni esposti per 12 mesi in Florida; confronto tra finitura noce liscio standard e Qualitydecoral® Gold.

3

Samples exposed for 36 months in Florida; comparison between standard and Qualitydecoral® Gold textured oak.

Campioni esposti per 36 mesi in Florida; confronto tra finitura rovere raggrinzato standard e Qualitydecoral® Gold.

4

Samples exposed for 36 months in Florida; comparison between standard and Qualitydecoral® Gold smooth walnut.

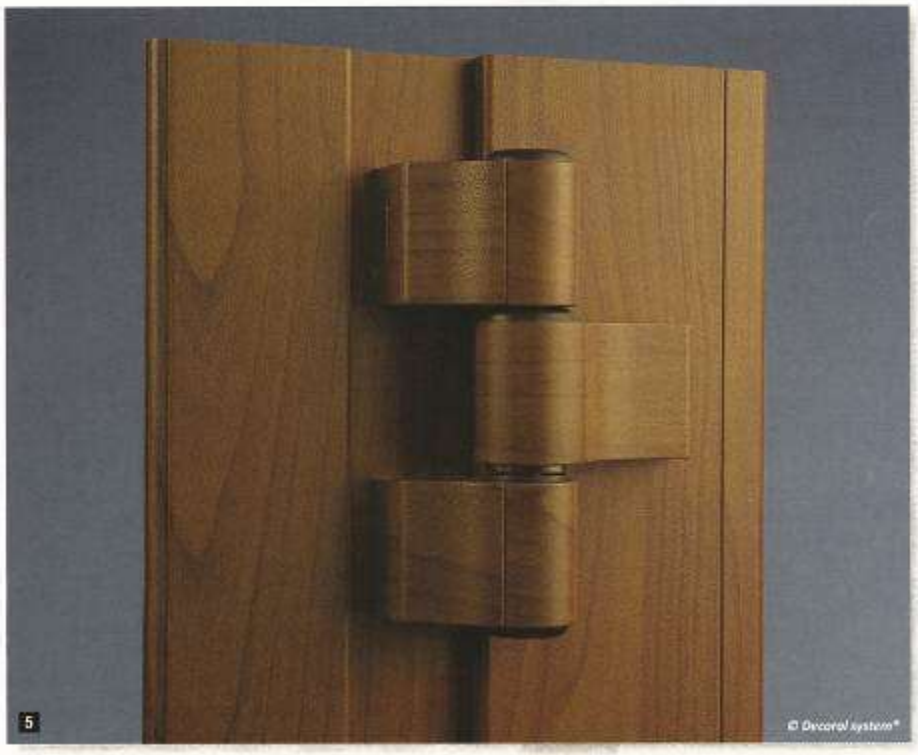
Campioni esposti per 36 mesi in Florida; confronto tra finitura noce liscio standard e Qualitydecoral® Gold.

Wood effect long life and low environmental impact

*The technological improvement concerning finishings' durability adds up to benefits to the efficiency of aluminium doors and windows, such as the high thermal efficiency, the resistance to wear and tear by the elements and the high noise absorption. Long lasting surfaces also considerably reduce the need for restoration of manufacts, limiting the environmental impact linked to the worn-out recycling process and to the production of new materials. Moreover, we should mention the low impact that the "wood effect" aluminium world has on deforestation and generally on nature (**Fig. 5**). Decoral System®, market leader in*

La lunga vita dell'effetto legno ed il ridotto impatto ambientale

Il miglioramento tecnologico legato alla durabilità delle finiture si va a sommare ai benefici strettamente correlati all'efficienza della serramentistica in alluminio; l'elevata efficienza termica, la resistenza agli agenti atmosferici e l'elevato assorbimento del rumore. La lunga durata delle superfici invece riduce notevolmente la necessità di ripristino dei manufatti, limitando l'impatto ambientale connesso ai processi di riciclaggio dell'esausto ed alla produzione del nuovo. Come ulteriore beneficio deve essere citato il ridotto impatto che il mondo dell'alluminio "effetto legno" ha verso il disboscamento e più in generale verso la natura (**fig. 5**).
Decoral System, *leader* nel mercato della produzione di ma-



the production of raw materials for decoration, produces every year powder coatings and transfer films to decorate doors and windows for about 200'000 flats, housing units which could lodge about 400'000 people. To produce as many doors and windows we would use about 60'000 m³ of wood, for which we should deforest many hectares of woods. Moreover, these doors and windows would have a lower durability and need a continuous maintenance, increasing the environmental impact.

terie prime per la decorazione, mette in commercio ogni anno prodotti vernicianti e film sublimatici per decorare infissi per circa 200'000 appartamenti, unità abitative utili ad ospitare una città di circa 400'000 abitanti. Per la produzione di altrettanti infissi in legno servirebbero circa 60'000 m³ di materiale ligneo, per le quali si renderebbe necessario disboscare numerosi ettari di foreste o boschi. Inoltre questi infissi presentano una durabilità inferiore e necessitano di una continua manutenzione aumentando l'impatto con l'ambiente.

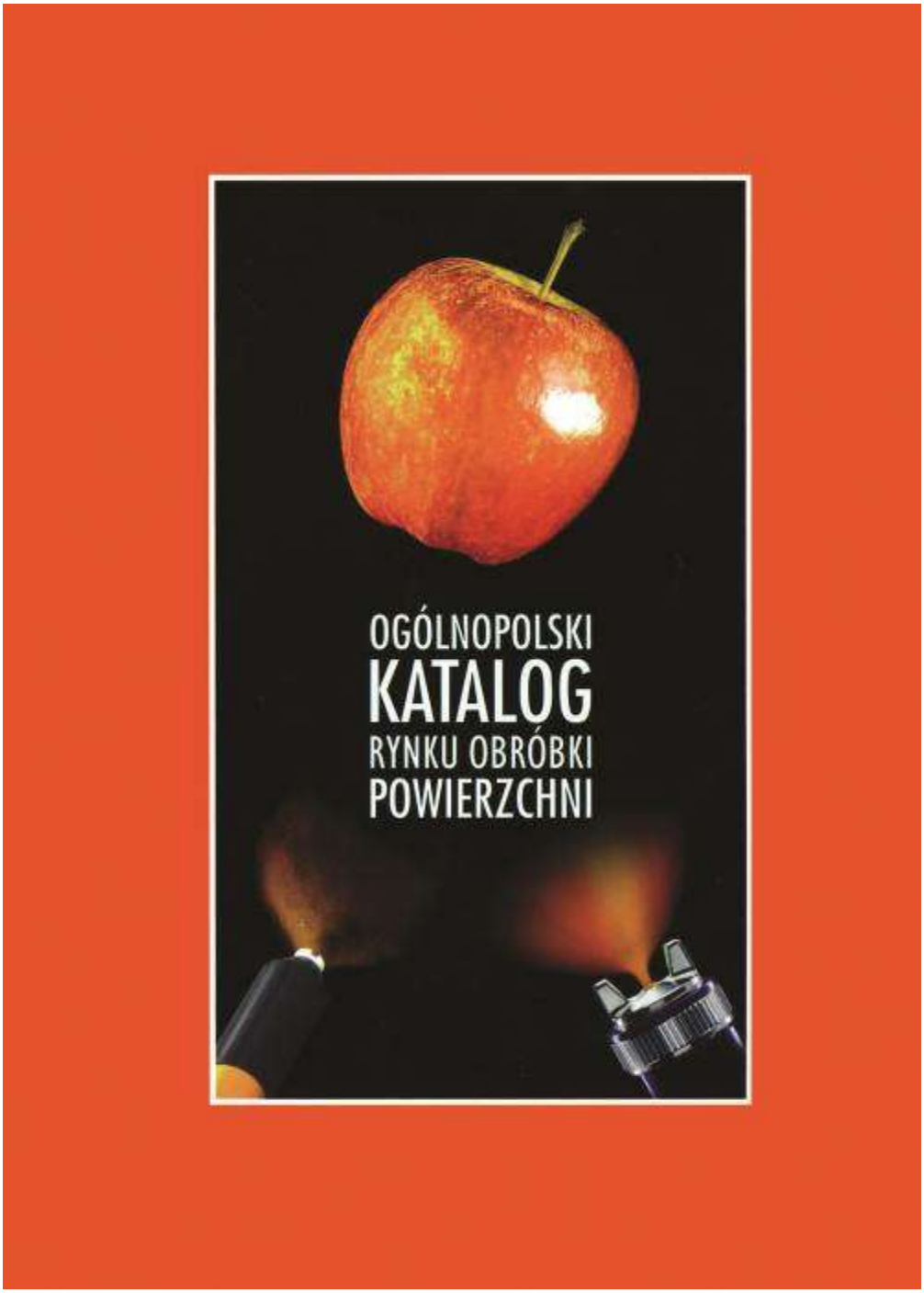
Conclusions

The encouraging results we got up to now allow us to connect the new formulations to the higher performances of Qualitydecoral® Gold decorated finishings. Choosing DS 04XX S and DS 07XX S series powder coatings and hyper-durable sublimation films (8XXXX/YY L4 series) we can get decorated surfaces with a very high resistance to the elements. All of this leads to an incredible durability and consequently to a very low environmental impact. ■

Conclusioni

Gli incoraggianti risultati fin qui ottenuti permettono di associare alle nuove esperienze formulative le maggiori performance delle finiture decorate Qualitydecoral® Gold. Passando ai prodotti vernicianti delle serie DS 04XX S e DS 07XX S ed ai film sublimatici hyper-durabili (serie 8XXXX/YY L4) si possono ottenere superfici decorate caratterizzate da elevatissima resistenza verso gli agenti atmosferici. Il tutto per una incredibile durabilità ed un conseguente ridotto impatto ambientale. ■

“OGOLNOPOLSKI KATALOG RYNKU OBROBKI POWEIERZCHNI” PUBLISHES AN ARTICLE ON THE QUALITY OF DECORAL SYSTEM® FINISHES CERTIFIED QUALITYDECORAL® GOLD.



Superodporne farby proszkowe w połączeniu z wysokiej jakości foliami dekoracyjnymi w zgodzie z ekologią

Qualitydecoral®Gold Zwycięski wybór

Rosnące wymagania w odniesieniu do wytrzymałości produktów skłaniają technologię Decoral® do rozwoju. Nowe żywice, dodatki do farb oraz barwniki pozwalają na tworzenie produktów charakteryzujących się wysoką wytrzymałością. W tym świetle narodziła się nowa technologia Qualitydecoral®Gold. Otwiera ona nowe pola aplikacji, znacznie wydłużając żywotność powłok i obiektów nimi pokrytych. To wszystko dla dobra otaczającego nas środowiska.

Rozwój rynku i technologii

Technologia Decoral System® od początku lat 90. XX wieku dominuje w wielkoskalowej produkcji, tworzeniu komponentów dla budownictwa, jak i rozwijaniu know-how w zakresie zjawiska sublimacji. W ostatnim czasie wdrożono nowy rodzaj farb proszkowych oraz nową linię powłok sublimacyjnych. Klasa 2 farb proszkowych (DS 04XX S oraz DS07XX S) zbudowana jest na bazie żywic poliuretanowych bardzo odpornych na czynniki niszczące, jak również zawiera innowacyjne mieszaniny absorberów UV. Zwiększa to odporność na światło (głównie fale krótkie), jak i oddziaływanie ciepła oraz wilgoci, które to czynniki w głównej mierze odpowiadają za degradację powłok. W odniesieniu zaś do folii sublimacyjnych ich wysoka jakość zawdzięczana jest dzięki użyciu bardzo odpornych barwników.

Powyższa kombinacja składników pozwala na osiągnięcie niebywałej odporności polakierowanych detali, która to byłaby niemożliwa do osiągnięcia przy zastosowaniu standardowych komponentów używanych do procesu sublimacji kolorów.

Qualitydecoral®Gold kontra standardowe rozwiązania

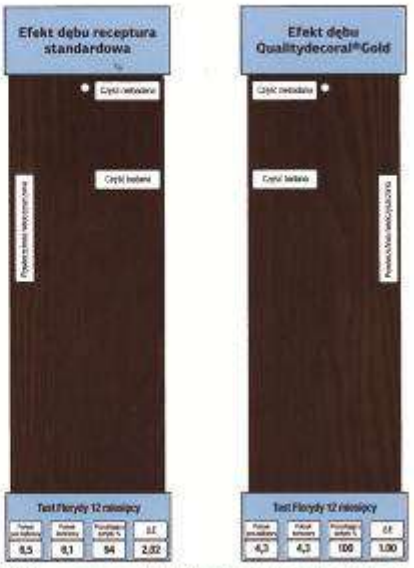
Najpewniejszym testem pozwalającym technologom laboratoryjnym sprawdzenie jakości produktu jest naturalny test klimatyczny na południu Florydy – tzn. w warunkach dużej wilgotności, wysokich temperatur i znacznej radiacji UV. Wobec wymienionych parametrów nowa seria produktów odznacza się znacznie wyższymi parametrami w stosunku do standardowych rozwiązań. Zdjęcia obok pokazują wysoką odporność powłok proszkowych, jak i folii dekoracyjnych na długie oddziaływanie czynników zewnętrznych. Qualitydecoral®Gold w zestawieniu ze standar-

dowymi próbkami po rocznym okresie badania uwidacznia wszystkie swoje zalety. Szczególnie jest to widoczne po zestawieniu prób trzyletnich, gdzie seria superodporna niemalże nie prezentuje degradacji (próbki po prawej), zaś receptury standardowe uległy znacznemu zniszczeniu.

Wyższość nowego produktu możemy również potwierdzić danymi numerycznymi. Głównymi parametrami, dzięki którym monitorujemy postęp starzenia się powłoki, są odchyłka koloru (ΔE), jak i utrata połysku (stopień utraty %). Po trzech latach trwania testu gładki kolor orzech w technologii superdurable zanotował niewielką zmianę koloru, tzn. ΔE=2,52, kiedy to w technologii standardowej parametr ten osiągnął wartość aż 6,54. Próbki Qualitydecoral®Gold charakteryzowały się również stabilnością parametru utraty połysku. Po okresie prób połysk pozostał bez zmian, kiedy to w przypadku standardowych rozwiązań utrzymano jedynie 4% wyjściowego połysku. Ważne jest, aby zaznaczyć, iż wszystkie próbki poddawano badaniom według wytycznych Qualideco dla standardowych produktów. Bazując na otrzymanych rezultatach możemy stwierdzić, iż nowa technologia superdurable posiada trzykrotnie lepszą wytrzymałość od produktów stworzonych przy użyciu standardowych składników.

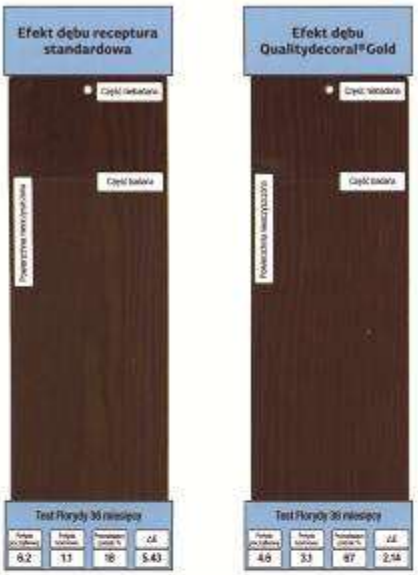
Efekt słojów drewna – wytrzymałość i pozytywny wpływ na środowisko

Technologiczny przełom w odniesieniu do wytrzymałości powłok przyniósł korzyści płynące z lepszej wydajności montowanych drzwi, jak i okien a polegające na: wzroście efektywności cieplnej, zwiększonej odporności na zużycie, jak i polepszonej absorpcji hałasu. Dłuższy czas odporności oznacza również brak

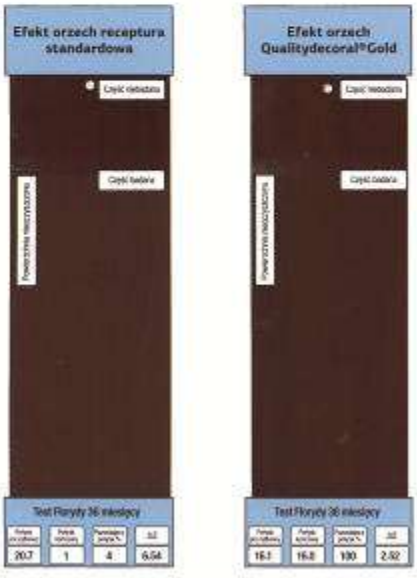


Próbka wystawiona na test 12 miesięcy testu Florydy; porównanie pomiędzy standardem a Qualitydecoral®Gold dąb efekt struktury.

Próbka wystawiona na test 12 miesięcy testu Florydy; porównanie pomiędzy standardem a Qualitydecoral®Gold orzech faza gładka.



Próbka wystawiona na test 36 miesięcy testu Florydy, porównanie pomiędzy standardem a Qualitydecoral®Gold dąb efekt struktury.



Próbka wystawiona na test 36 miesięcy testu Florydy, porównanie pomiędzy standardem a Qualitydecoral®Gold orzech farba gładka.

konieczności częstych wymian stolarki, co bezpośrednio wpływa na zmniejszony recykling, jak i konieczność zwiększania produkcji źródłowej. Co więcej, „drewnopodobne powłoki" na aluminium przyczyniają się do zmniejszenia procesu wylesiania naszej planety. Decoral System®, lider rynku materiałów dla powłok dekoracyjnych, co roku wytwarza farby proszkowe, jak i folie dekoracyjne mogące pokryć okna i drzwi w około 200 000 mieszkaniach, w których to mogłoby zamieszkać 400 000 ludzi. Do wyprodukowania takiej liczby drzwi i okien potrzeba by było zużyć ponad 60 000 m³ drewna. Ponadto, okna drewniane są mniej odporne na zniszczenia niż aluminiowe, co wymagałoby ich częstszych wymian, a to bezpośrednio przekładałoby się na zasoby naszego środowiska.

Podsumowanie

Pozytywne wyniki testów uprawniają nas do kontynuowania nowoczesnych receptur systemu Qualitydecoral®Gold. Wybierając serie farb proszkowych DS 04XX S lub DS07XX S oraz superodpornych powłoki dekoracyjne (8XXXX/YY L4), uzyskujemy powierzchnię dekoracyjną zwiększającą wytrzymałość elementu na zniszczenie. To wszystko prowadzi do niebywałej jakości w zgodzie ze środowiskiem naturalnym. ■

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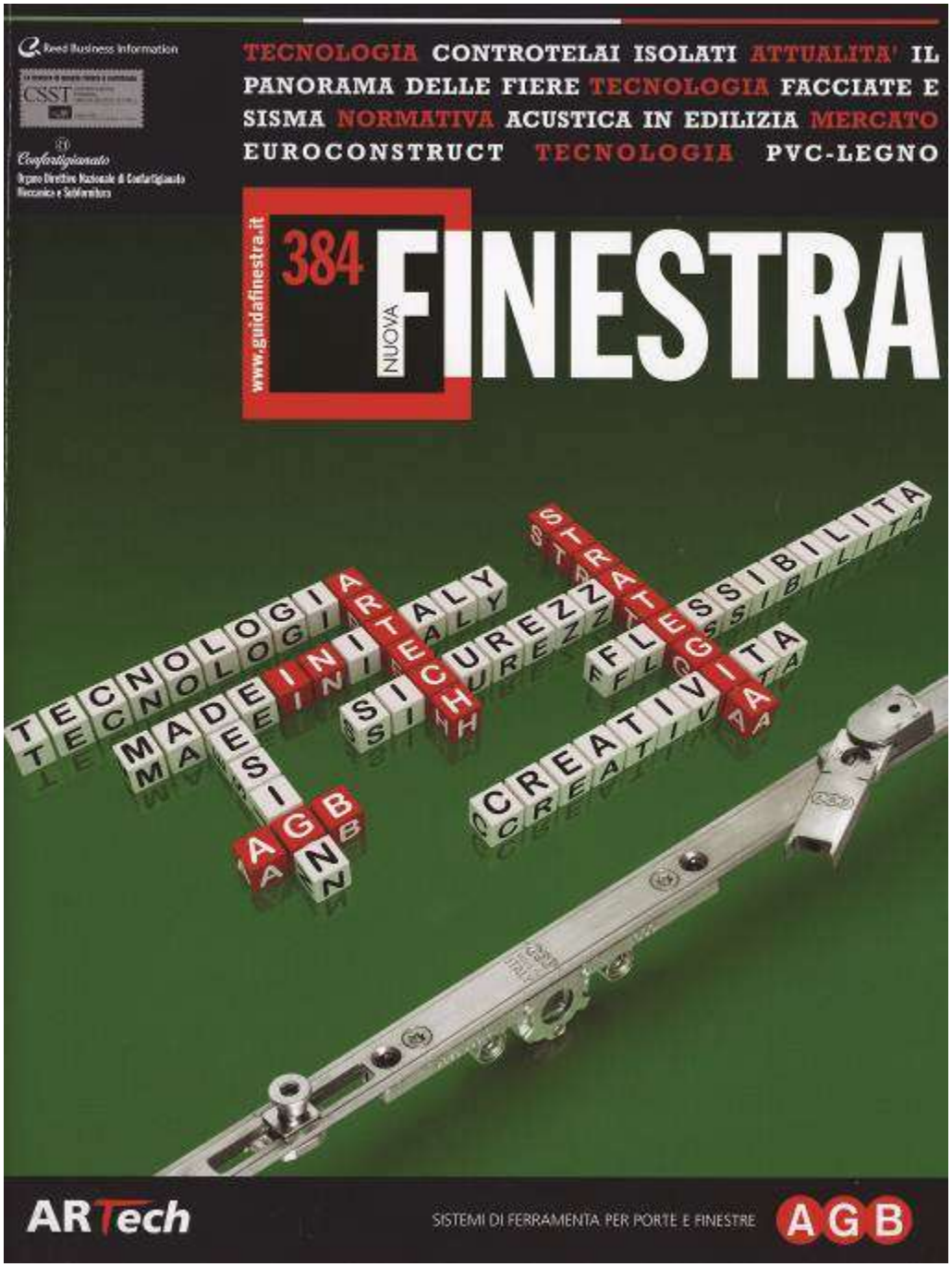
“NUOVA FINESTRA” MAGAZINE PRESENTS DECORAL SYSTEM® FINISHES RESISTANT TO EXTREME WEATHER CONDITIONS



Innovando le finiture

in aree geografiche dove i sublimati non erano fino ad ora impiegati a causa delle condizioni climatiche avverse.

Sempre nel campo dei trattamenti superficiali tramite sublimazione **Viv Decoral**, azienda del gruppo Decoral System, ha presentato la serie Quality Decoral Gold. Elemento caratterizzante di queste finiture effetto legno è infatti proprio l'elevata durabilità agli agenti atmosferici. Grazie all'impiego di vernici superdurable e film sublimatici hyperdurable queste finiture sono certificate Qualitydecoral Gold, un'omologazione che prevede il superamento di test molto severi come l'invecchiamento accelerato per 2500 ore e l'esposizione naturale in Florida per ben tre anni. Grazie a questa linea di finiture superficiali Viv Decoral intende permette l'impiego di decorazioni effetto legno anche

PRESENTATION OF FINISHES DECORAL SYSTEM® CERTIFIED QUALITYDECORAL® GOLD AT "ALUMINIUM TWO THOUSAND" (8th WORLD CONGRESS).

Coating

AESTHETIC SURFACE TREATMENTS WITH HIGH DURABILITY. USING SUPER DURABLE POWDER COATINGS AND HYPER-DURABLE FILMS FOR AN INCREDIBLE STEP FORWARD TOWARDS ECOLOGY.

ALESSANDRO CANEVAROLO *(speaker)*
Decoral System
Italy

G. FENZI, C. PANDOLFI
Decoral System

Abstract

The general and increasing need for products' durability pushed Decoral®'s technology frontiers unimaginable until today. New resins, new additives and new cromophores allowed designing products showing an increased durability compared to standards reached up to now. The Qualitydecoral® Gold series is born. This endurance, besides allowing to apply this famous technology to fields unexplored up to now, considerably increases objects' life. Everything to Nature's advantage!

Notes

PRESENTATION OF DECORAL® TECHNOLOGY

LA PAROLA AI SOCI

THE WORD TO THE MEMBERS

A cura di Giancarlo Fenzi, Cristian Pandolfi, Alessandro Canevarolo (Decoral System)
Edit by Giancarlo Fenzi, Cristian Pandolfi, Alessandro Canevarolo (Decoral System)

I testi delle relazioni e delle comunicazioni che seguono riguardano comunicati, argomenti e temi sviluppati da ditte associate e rappresentano la posizione delle stesse.

The witness of the relations and the communications that follow egard communicated, argumentsand topicsdeveloped from associate companies and they represent the position of the same ones.

TECNOLOGIA DECORAL® NELLA NOBILITAZIONE DEI METALLI - EFFETTO LEGNO SUPERDURABILE
METAL DECORATION BY DECORAL® TECHNOLOGY - SUPERDURABLE WOODGRAIN

Riassunto

La nobilitazione superficiale dei metalli, ottenuta mediante il processo di sublimazione su substrati verniciati a polvere con prodotti poliuretanici, permette di ottenere eccellenti risultati in termini di resistenza agli agenti atmosferici. Ma i recenti sviluppi in relazione a tali prodotti vernicianti hanno permesso di abbattere i vecchi limiti fino ad ora considerati insuperabili. Le vernici in polvere poliuretanica Decoral System della serie "superdurabile" permettono di ottenere finiture ad elevata resistenza aprendo nuove frontiere applicative a questa famosa tecnologia decorativa.

Mercato e sviluppi tecnologici

La crescente domanda dell'effetto legno, o più in generale di decorazione intesa come nobilitazione superficiale dei metalli, ottenuta mediante processo di sublimazione ha imposto notevoli sforzi alle aziende impegnate nella gestione del processo e nella produzione delle materie prime impiegate.

Decoral System, da anni leader nella messa punto di impianti, nella preparazione di materie prime e nella gestione del knowhow legato a tale tecnologia, ha recentemente sviluppato ed immesso sul mercato internazionale una nuova serie di prodotti vernicianti espressamente formulati per il processo di sublicromia.

I prodotti delle serie superdurabile (DS 04XX S e DS 07XX S) permettono di raggiungere una maggiore durabilità verso gli agenti atmosferici, non raggiungibile con i prodotti vernicianti delle normali serie.

Sublimazione, processo fisico di trasferimento

Il processo di sublimazione, conosciuto anche come trasferimento termico, adottato da Decoral System fin dagli anni '90, prevede l'impiego di speciali prodotti vernicianti di natura poliuretanica che mostrano una elevata affinità verso gli inchiostri sublimatici; inchiostri caratterizzati dalla presenza, nella formulazione, di speciali coloranti della classe dei dispersi; che, ad una data temperatura (ca 200°C), passano direttamente dallo stato solido allo stato gassoso. Solo in un secondo momento durante il processo di raffreddamento questi rimangono solubilizzati, dopo essere tornati allo stato solido, all'interno dello strato di prodotto verniciante. (Fig. 1)

Sublimazione, ambiti applicativi

I principali vantaggi della tecnologia di sublimazione della Decoral System sono legati all'alta definizione delle decorazioni

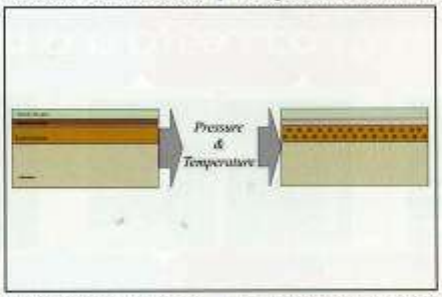


Fig. 1 Schematizzazione del processo di sublimazione, trasferimento degli inchiostri sublimatici nello strato di prodotto verniciante precedentemente applicato

Abstract

The finishing of metals, obtained by sublimation on polyurethane powder coated substrates has achieved excellent results in terms of outdoor resistance.

Nonetheless recent developments in coating technology have dramatically pushed the old achieved performance levels up. The polyurethane powder coatings of superdurable series by Decoral System® have opened new fronteers of higher performance for this popular decoration technology.

Market and Technological Developments The increasing demand of woodgrain finishings, or, generally speaking, decoration finishings on metals by heat-transfer process has imposed significant efforts to companies involved in this business: from decoration process management to raw materials' manufacturing. Decoral System®, market leading company as far as supply of turn-key plants, raw materials and know-how for this technology is concerned, has recently developed and marketed a new series of powder coatings specifically designed for heat-transfer technology. Superdurable Series (DS 04XXS and DS 07XXS) achieves a significant improval in outdoor durability performance, unattainable to standard powder coatings.

Sublimation as physical transfer process

The process of sublimation, also known as thermal transfer, which was adopted by Decoral System® since Nineties requires the use of special polyurethane powder coatings showing a high compatibility with sublimation inks; on the other hand sublimatic inks are characterized by the presence, when formulating, of a special class of dispersed dyes, capable, at a given temperature (about 200°C), of moving directly from solid to gaseous state.

Only later, after cooling and returning to the solid state, they will remain in solution, in the coating strate. (Picture 1).

Heat-transfer, fields of application

The main advantages of Decoral System® heat-transfer technology consists of the high definition of the output, its versatility on pro-

Fig. 1 Process of sublimation, ink transfer in the pre-coated layer of coating

ottenute, alla sua applicabilità a varie tipologie di estrusi: profili, laminati e oggetti tridimensionali, e a tutti i settori dove i supporti si possano verniciare e successivamente decorare tramite sublimazione con inchiostri sublimatici. Si possono anche riprodurre immagini personalizzate.
La manutenzione delle superfici decorate risulta assolutamente semplice e rapida. Condizione fondamentale è la resistenza senza deformazione dei materiali di supporto alle temperature del processo di sublimazione (circa 200°C per 10 minuti).

I prodotti vernicianti poliuretanici in versione superdurabile Decoral System ha da alcuni anni sviluppato un prodotto verniciante superdurabile che conferisce al prodotto finito (superfici decorate) maggiori prestazioni. La speciale formulazione, di questi prodotti vernicianti, prevede l'impiego di resine di natura poliuretanica con alta resistenza al degrado, e l'utilizzo di una innovativa combinazione di assorbitori UV; il tutto determina l'elevata resistenza alla luce (specialmente le corte lunghezze d'onda) ed agli agenti atmosferici (calore ed umidità) principali responsabili del degrado dei prodotti vernicianti.

Come viene valutata la resistenza
Per valutare la resistenza delle finiture nei laboratori vengono prevalentemente utilizzate due tipologie di test:
- L'invecchiamento accelerato
- Le esposizioni naturali.

Nel primo caso si tratta di test controllati e ripetibili che ricreano e simulano fedelmente alcuni dei fattori delle esposizioni naturali.
Nel secondo caso si tratta di test non prevedibili (influenzati dall'andamento del clima) che vengono normalmente utilizzati per verificare e confermare i risultati riscontrati con gli invecchiamenti artificiali. Nei laboratori R&D vengono abitualmente condotti centinaia di test di questo tipo per valutare/controllare le varie produzioni ed i prodotti in fase di sviluppo.

Invecchiamento accelerato
Tutti i campioni vengono sottoposti all'irraggiamento di lampade allo xenon ed a cicli umido/secco mediante speciali apparecchiature (Q-Sun, SolarBox), vedi figura 2. Tali apparecchiature vengono utilizzate in conformità agli standard internazionali imposti dalla norma ISO 11341 rispettando le seguenti impostazioni:
- intensità luminosa, 550±20W/m2 (290-800 nm)
- temperatura del pannello

cessable shapes (it can be applied to various types of extruded products, i.e. profiles, laminates and solid objects), materials and fields (provided that shapes can be powder coated and then decorated). Tailor-made pictures and patterns can be obtained.
The maintenance of decorated surfaces is absolutely simple and quick. The most basic condition to apply heat-transfer process is resistance without deformation to the process of sublimation temperature (about 200°C for 10 minutes).

The superdurable polyurethane powder coatings
Decoral System® has developed a powder coating which gives the finished product improved outdoor performances. The special formulation of these coatings, requiring special palyurethane resins with high resistance properties to degradation and an innovative combination of UV absorbers, holds for a high resistance to light (especially as far as short wavelengths are concerned) and weather conditions (heat and humidity), which are the most significant agents of degradation.

How to measure outdoor performance
To evaluate the resistance of the finishes two types of tests are used:
- Accelerated Weathering Test
- Natural Exposure Test.
In the first case, tests are conducted in lab, it means they are controlled and repeatable.
They are meant to accurately simulate and recreate some of the factors of a natural exposure. In the second case, tests are conducted in a real environment: it means they are not predictable (i.e. affected by the real climate) and their purpose is to control and confirm the results of Accelerated Weathering Tests. In Decoral® R&D laboratories are routinely conducted hundreds of tests of this type to assess/monitor reliability of current and under development finishings.

Accelerated Weathering Test
All samples are exposed to radiation of Xenon lamps and to wet/dry cycles by special equipment (Q-Sun, SOLARBOX), see Picture 2. Such equipment is used in accordance with international standards imposed by norm ISO 11341, i.e. complying with the following settings:
- light intensity, 550 ± 20 W / m 2 (290-800 nm)

Fig. 2 Apparecchiature per l'invecchiamento accelerato | ***Fig. 2 Equipment for the Accelerated Weathering Test***

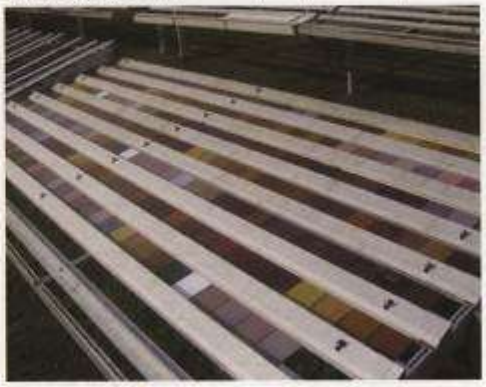


Fig. 3 Esposizione naturale, campioni esposti all'AWSG in Florida | ***Fig. 3 Florida Natural Exposure, test samples***

nero, 65 ± 5°C
- ciclo umido 18 minuti
- ciclo secco 102 minuti
Alla fine dei test, che normalmente hanno una durata minima di 1000 ore, viene valutata la variazione di brillantezza (EN ISO 2813, con angolo di incidenza 60°) ed il cambiamento di colore ΔE con metodo CIELAB (ISO 7724/3) rispetto ai valori di partenza. Questo permette di stabilire, in maniera parametrizzata l'invecchiamento delle varie superfici testate. La corretta conduzione dei test viene verificata attraverso l'utilizzo di campioni in bianco; ad invecchiamento noto.

Esposizione naturale
Le esposizioni naturali vengono invece condotte in Florida presso il sito espositivo della Atlas Weathering Service; il sud della Florida fornisce infatti un clima caldo umido e ad alto irraggiamento UV.
Invecchiamento naturale: tutti i campioni vengono sottoposti all'irraggiamento naturale in Florida (vedi figura 2). L'esposizione viene effettuata, in conformità allo standard internazionale descritto nella ISO 2810, rispettando le seguenti specifiche:
- esposizione del pannello in direzione sud
- angolo di inclinazione del pannello 5°
- pannello scoperto sul retro

Al termine del periodo di esposizione, pari a 12 mesi, viene valutata la variazione di brillantezza (EN ISO 2813, con angolo di incidenza 60°) ed il cambiamento di colore ΔE con metodo CIELAB (ISO 7724/3) rispetto ai valori di partenza. Anche l'esposizione naturale viene monitorata attraverso l'invio di campioni in bianco ad invecchiamento noto.

Preparazione superfici campione da testare
Tutti i campioni, successivamente sottoposti ad invecchiamento accelerato e ad esposizione naturale in Florida sono stati preparati come segue:
- Applicazione del prodotto verniciante in polvere, condotta rispettando i parametri imposti dalle schede tecniche, delle specifiche serie, sia in termini di temperatura che di tempo di permanenza (20'@200°C)
- La sublimazione è stata condotta rispettando i parametri descritti dalle schede tecniche in relazione alla temperatura minima che il metallo deve raggiungere (200°C)

Campioni preparati
Sono state preparate due serie di campioni, una con prodotti vernicianti superdurabili (Serie DS 07XX S; comprendente i campioni A1, B1, , N1) ed un'altra con prodotti vernicianti della serie standard (Serie DS 7XX;

- black panel temperature, 65 ± 5 ° C
- wet cycle 18 minutes
- dry cycle 102 minutes.
At the end of the test, whose minimum duration is 1000 hours, Residual Gloss (EN ISO 2813, with an angle of incidence 60°) and Color Variation ΔE (CIELAB method - ISO 7724 / 3) are measured comparing pre-test values. In this way it is possible to evaluate the aging of surfaces using standard indexes. The accuracy of the test is verified through the use of samples in white, whose aging behaviour is known.

Natural Exposure Test
Natural Exposure Tests are conducted in Atlas Weathering Service Sites in Florida (Picture 3).
South Florida climate indeed is hot, wet and higly exposed to UV-rays.
All samples are subjected to natural irradiation in Florida according to the international standard ISO 2810, i.e. complying with the following specifications:
- facing south
- tilt angle 5° from the horizontal
- open backing.
After 12 months exposure period, residual gloss (EN ISO 2813, with an angle of incidence 60°) and color variation ΔE (CIELAB method - ISO 7724 / 3) are measured comparing pre-test values. Even the Natural Exposure Test accuracy is verified by through the use of samples in white, whose aging behaviour is known.

Preparing Sample Surfaces for Testing
All samples subsequently subjected to AWT or NET are prepared as follows:
- application of powder coating, corried out in compliance with the parameters set by TDS both in terms of temperature and time (20'@ 200°C)
- heat-transfer process was conducted in compliance with the parameters described in TDS, in terms of minimum temperature that the metal must reach (200°C).

Sample Preparation
For the Comparative Test on Superdurable Products Two sets of samples were prepared, one using superdurable powder coatings, (Series DS 07XXS, including the samples A1, B1, ..., N1) and one using standard series coating 5

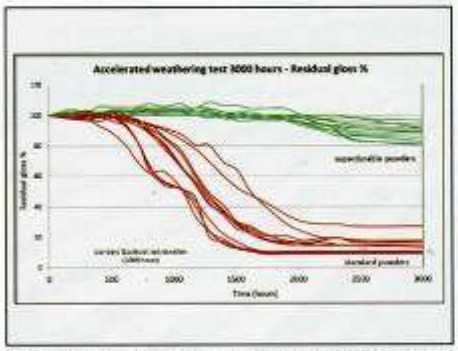


Fig. 4 Andamento del residuo % di brillantezza misurato durante l'avanzamento dei test

Fig. 4 Residual gloss behaviour graph

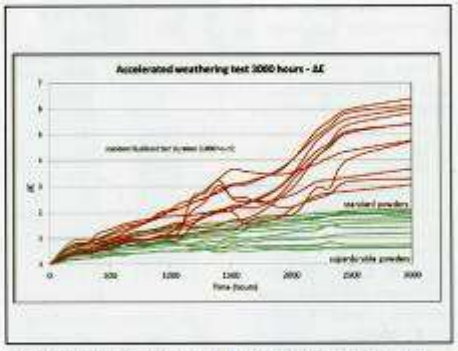


Fig. 5 Andamento del ΔE misurato durante l'avanzamento dei test

Fig. 5 Colour variation graph

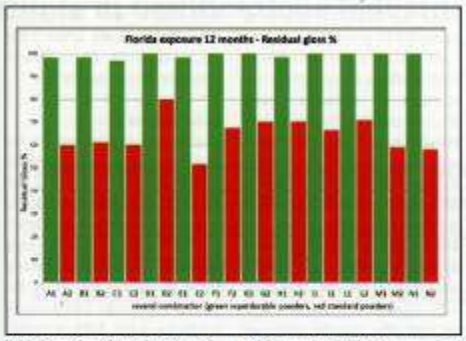


Fig. 6 Esposizione in Florida 12 mesi, confronto tra i valori di brillantezza residua%, in verde campioni della serie superdurabili

Fig. 6 12 months NET in Florida, comparison between the values of percentage of residual gloss, green samples representing superdurable products

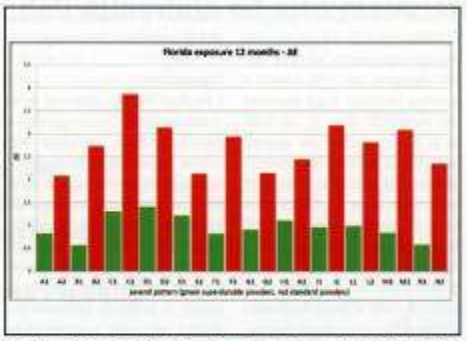


Fig. 7 Esposizione in Florida 12 mesi, confronto tra i valori di ΔE misurato in verde campioni della serie superdurabile

Fig. 7 12 months NET in Florida: comparison between the values of measured ΔE, green samples representing superdurable products

comprendente i campioni A2, B2, N2). Combinando varie tonalità del prodotto verniciante e differenti codici di film sublimatici le finiture testate risultavano rappresentative di una completa gamma di "nobilitazioni effetto legno".

Superdurabile vs Standard

Come precedentemente descritto le due serie di prodotti sono stati testati in maniera comparativa all'invecchiamento artificiale per un totale di 3000 ore (3 volte il tempo minimo richiesto dai capitolati internazionali, 1000 ore) ed all'invecchiamento ottenuto mediante esposizione naturale in Florida per 12 mesi.

Andamento campioni sottoposti all'invecchiamento accelerato

La misura della brillantezza residua, effettuata sui campioni sottoposti ad invecchiamento accelerato ogni 100 ore, evidenziano come il valore sia nettamente più stabile nei campioni preparati con prodotto verniciante della serie superdurabile.

Dopo 3000 ore, per tutti i campioni superdurabili testati il valore di brillantezza residua percentuale è ancora maggiore dell'80%. I campioni preparati con il prodotto verniciante standard, pur soddisfacendo i requisiti minimi dei capitolati internazionali (gloss residuo maggiore del 50%), dopo un migliaio di ore cominciano una significante perdita di brillantezza superficiale; dovuta all'innesco ed alla propagazione di reazioni radicaliche iniziate dagli UV con cui vengono irraggiati i campioni.

Si noti la netta separazione delle due tipologie di prodotti, nella figura 4., l'andamento dei campioni contrassegnati con il colore verde mostrano un degrado ridotto (brillantezza residua prossima al 100%).

Anche in termini di variazione del colore tutti i campioni preparati con prodotti vernicianti della serie DS 07XX S mostrano una maggiore stabilità all'irraggiamento mediante lampade allo xenon. Nessuno dei campioni in verde, nella figura 5, raggiunge valori di ΔE superiori a 2. I prodotti standard presentano valori di ΔE maggiori e variabili in funzione del tipo di finitura.

Andamento campioni esposti per 12 mesi in florida.

Al rientro dopo 12 mesi di esposizione in Florida i campioni, lavati e sottoposti a misurazione strumentale, hanno messo in evidenza quanto segue:

- nelle finiture preparate con prodotti vernicianti della serie superdurabile la brillantezza rimane pressoché inalterata, residuo vicino al 100% (figura 6, campioni in verde)
- nelle finiture preparate con

(DS 7XX series, including the samples A2, B2 , ..., N2). Different shades of coating and different codes of heat-transfer film finishes were combined in order to obtain a significant and representative range of woodgrain finishings.

Superdurable vs Standard

As previously described, the two sets of products have been tested through a comparative AWT of 3000 hours (3 times the minimum time value required by the most renowned international Specifications, 1000 hours) and to a comparative NET in Florida for 12 months.

Comparative Performance of samples subjected to AWT *The measurement of residual gloss, carried out on samples subjected to AWT after every 100 hours, shows that the value is significantly more stable in the samples prepared with the coating of Superdurable Series.*

After 3000 hours, on all superdurable tested samples, the value of residual gloss percentage is even higher than 80%.

Standard Coating Samples, although meeting the minimum requirements of the international specifications (>50% residual gloss), after a thousand hours, show a significant loss of surface gloss, due to the initiation and propagation of radical reactions, started by UV irradiated on the samples. Note the sharp behavioud difference of the two sets of products, in Picture 4. Samples marked with green colour show a small degradation (residual gloss close to 100%).

In terms of color variation, all samples prepared with coatings Series DS 07XXS show a greater stability to irradiation by xenon lamps. None of the samples in green in Picture 5, exceeds 2 ΔE value Standard products show higher values of ΔE, whose variation depends also on the specific type of finishing.

Comparative Performance of samples subjected to NET

Coming back after 12 months exposure in Florida, samples were washed, subjected to instrumental measurements and showed the following behaviour:

- on finishes made with superdurable powder coatings, gloss values are virtually the same, staying

INTERNATIONAL PRIZE METEF 2012

"First prize goes to **Decoral System®.**

The company owns one of the first patents for decorative technique of wood effect aluminium. Since the 90's it has been the leader in producing plants and raw materials linked to the particular technique of heat transfer, developing and launching in the market a new kind of products related to this particular finish.

They are a new generation of Powders and heat transfer film specially studied for better performance in terms of durability.

The high durability of these finishes has a great advantage on environmental sustainability, because it greatly increases the life of the products, thus reducing the maintenance costs.

Before going on the market, the decorated products with this new kind of finish severely tested with accelerated ageing process tests and with long periods of natural exposure in Florida."

metef 2012

CREATIVITY AND INNOVATION PRIZE (1998)

MERLI NATIONAL PRIZE(2008)

MOVIMENTO AZZURRO

ASSOCIAZIONE DI PROTEZIONE AMBIENTALE
Riconosciuta dallo Stato ai sensi della Legge n. 349/86
O.N.L.U.S.

PREMIO NAZIONALE PER L'AMBIENTE
GIANFRANCO MERLI

assegnato a

Decoral System

con la seguente motivazione

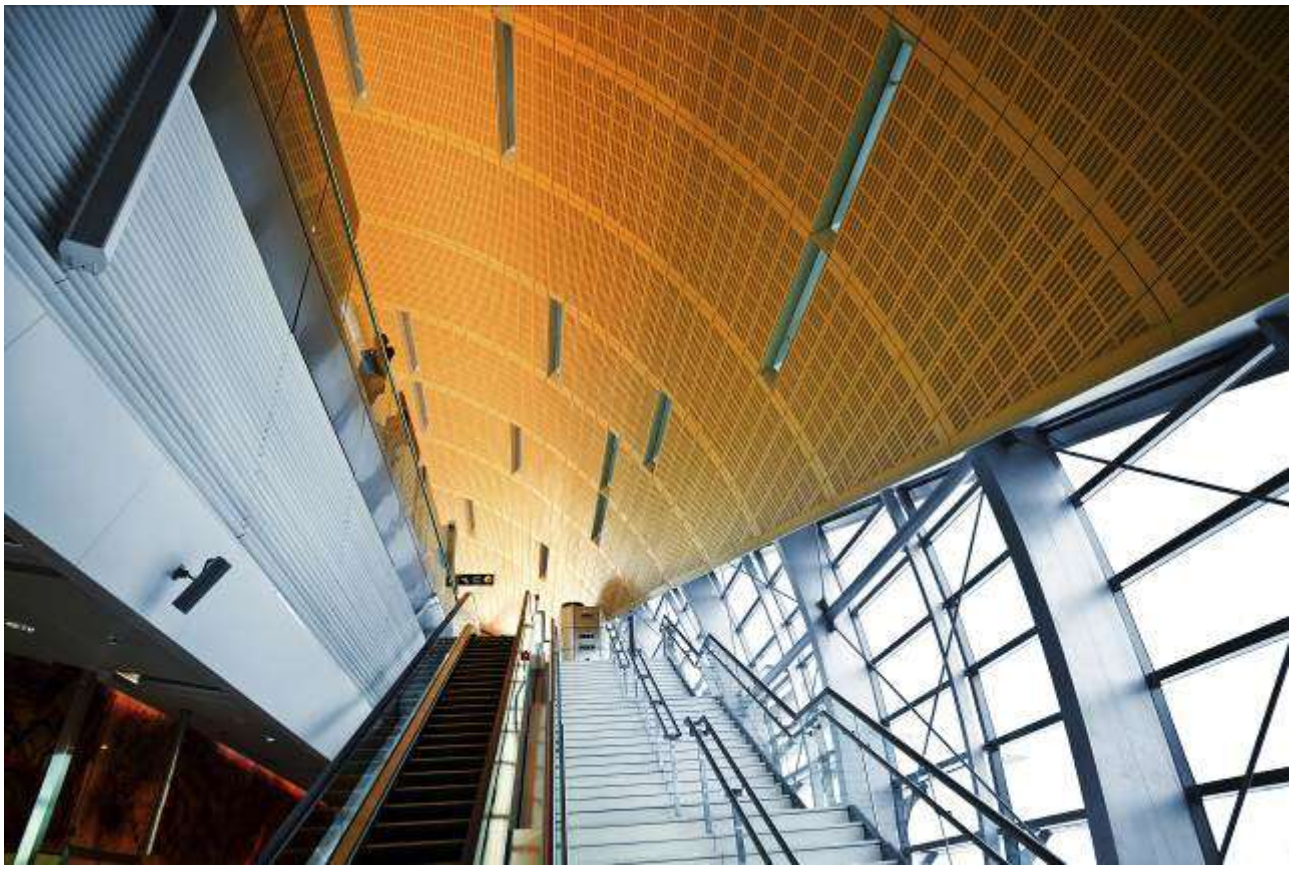
Per la realizzazione di prodotti largamente utilizzati in edilizia e in arredamento, atti a sostituire l'uso del legno e le relative periodiche manutenzioni poiché gli elaborati Decoral System non né richiedono, come risulta dai certificati di qualità emessi da qualificati laboratori scientifici. Tale brevetto che si annovera tra le innovazioni tecnologiche più avanzate, dal punto di vista strettamente ecologico permette la riduzione dell'uso del legno per impieghi industriali e quindi un minore abbattimento delle essenze.

il segretario generale
Dante Fasciolo

il presidente nazionale
Rocco Chiriaco

Il premio nazionale per l'ambiente Gianfranco Merli è promosso dal Movimento Azzurro in collaborazione con Fondazione Europea di Educazione Ambientale - Bandiere Blu-Italia, Libertas, Associazione Mare e Marinai.

Roma, 1 marzo 2007
Istituto Luigi Sturzo



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