Decoral LAB
Research and Development

Accelerated Weathering Test
Natural Exposure Test

WENGHÈ EFFECT

MRK 010-0722

TEST DI INVECCHIAMENTO ACCELERATO:

Invecchiamento accelerato

Tutti i campioni vengono sottoposti all'irraggiamento di lampade allo xenon ed a cicli umido/secco mediante speciali apparecchiature (Q-Sun, SolarBox). Tali apparecchiature vengono utilizzate in conformità agli standard internazionali imposti dalla norma ISO 16474-2 rispettando le seguenti impostazioni:

- intensità luminosa, 550±20W/m^2 (290-800 nm)
- temperatura del pannello 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 (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.

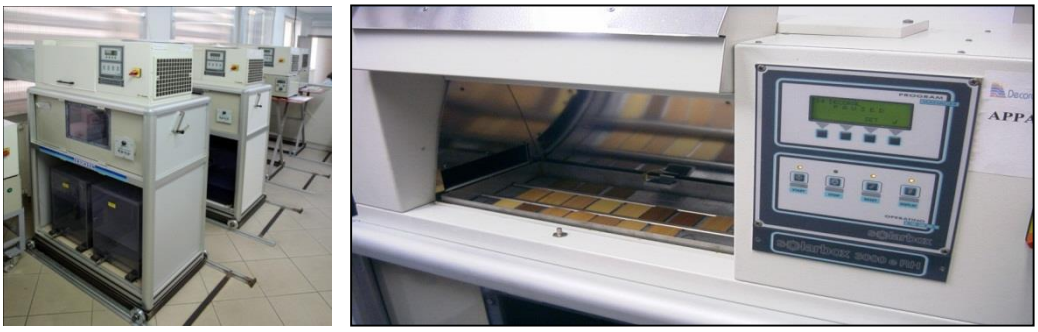


Figure: apparecchiature per l'invecchiamento accelerato.
Pictures: equipment for the Accelerated Weathering Test

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 16474-2, i.e. complying with the following settings:

- 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 aging of surfaces using standard indexes. The accuracy of the test is verified through the use of samples in white, whose aging behaviour is know.

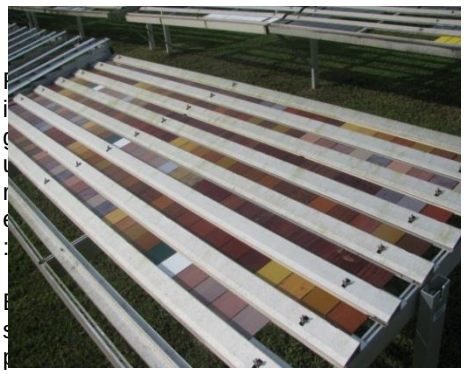
ESPOSIZIONE NATURALE IN FLORIDA:

Esposizione naturale

Le esposizioni naturali vengono 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. 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 (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.



osizione naturale, campioni esposti all'AWSG in Florida

Pictures: Florida Natural Exposure, test samples

Natural Exposure Test

Natural Exposure Tests are conducted in Atlas Weathering Service Sites – Florida. 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 colour 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.

ID Test Report	PROD. VERNIC	COD. FILM	PROG. N°	IMMAGINI
TR-IA-15-2012	DS 775	2502/12	15	
TR-IA-266-2012	DS 775	2532/04	266	
TR-IA-170-2014	DS-0753S	2513/06	170	
TR-IA-139-2011	DS 475	1505/01	139	
TR-IA-92-2014	DS-0753S	2516/02	92	
TR-NE-191-2012	DS-0733S	2516/02	191	

Test Report: Accelerated Weathering Test

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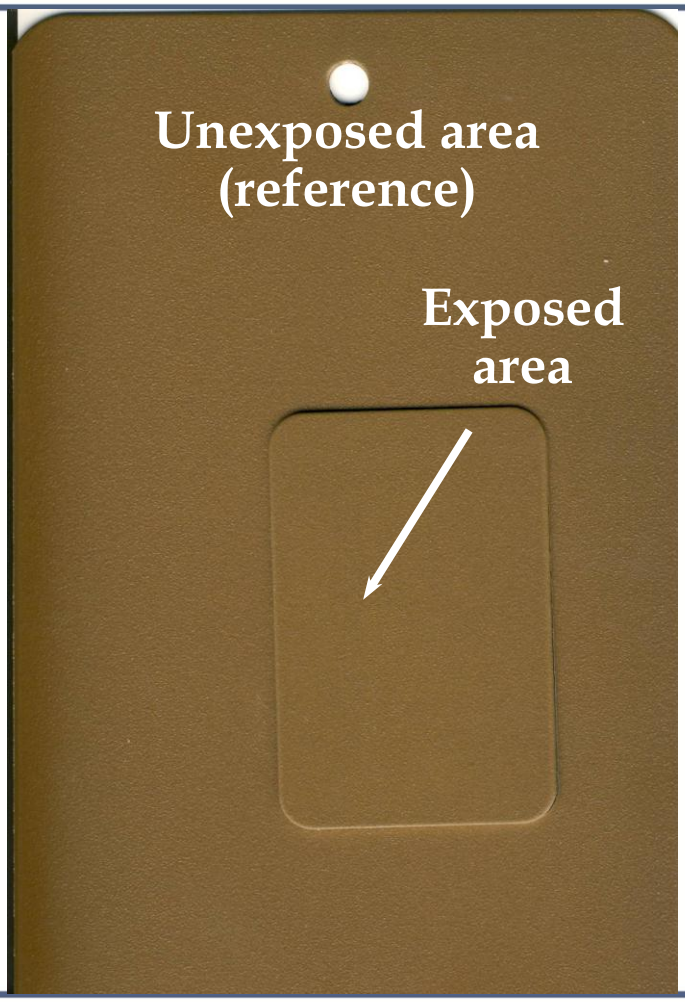
Laboratory Test

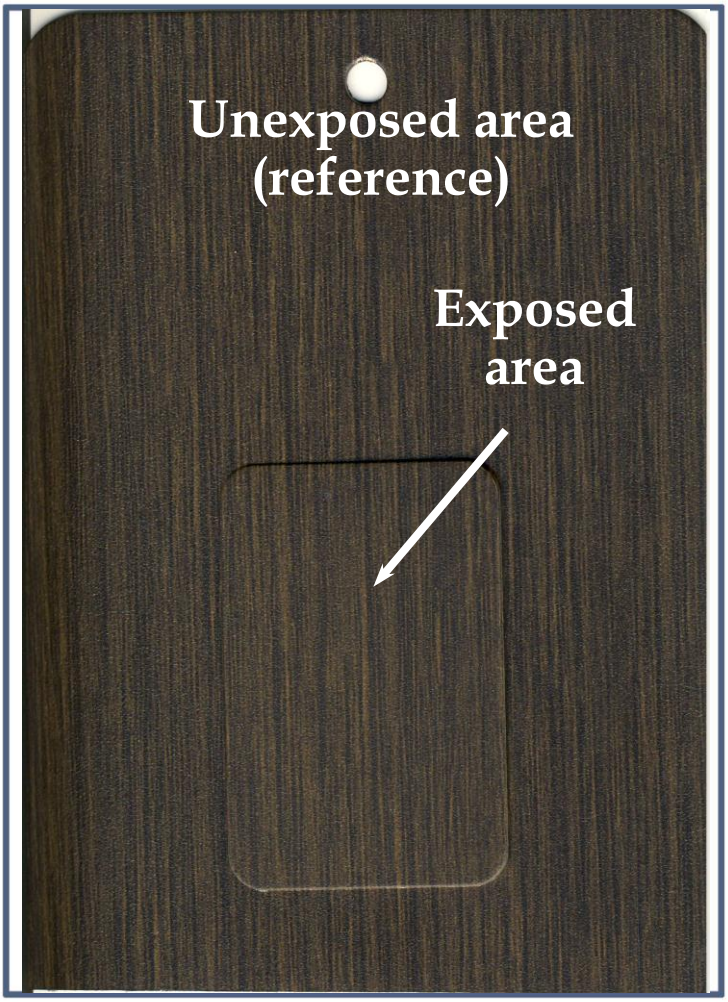
No. 274

Device: QSun 3000

Total duration: 957h



LAB. ID NUMBER: 24054
POWDER COATING: DS 775
HEAT TRANSFER FILM: --
colour variation (ΔE): **0,36**
residual gloss: **100%**



LAB. ID NUMBER: 24050
POWDER COATING: DS 775
HEAT TRANSFER FILM: 2502/12
colour variation (ΔE): **1**
residual gloss: **95%**

Technical Remarks

Excellent residual gloss and very low colour variation (ΔE), after 957 hours.

Technical Opinion:

Suitable for OUTDOOR USE

Test was carried on samples prepared according to technical specifications supplied by raw materials manufacturers. However, the resistance against accelerated weathering test is only one of the conditions necessary for the evaluation of the resistance of the finished product. For a final assessment see further analysis on natural exposure in Florida.

Test Report: Accelerated Weathering Test

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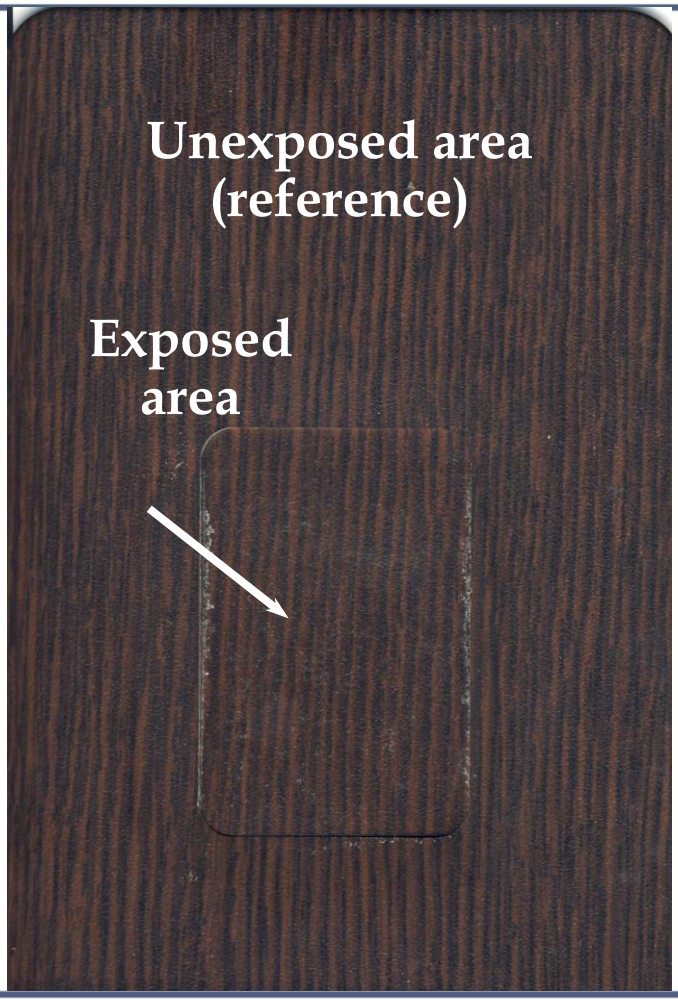
Laboratory Test

No. 414

Device: QSun 3000

Total duration: 1269h



LAB. ID NUMBER: 34954
POWDER COATING: DS-0753S
HEAT TRANSFER FILM: 2516/02
colour variation (ΔE): **1,11**
residual gloss: **97%**

Technical Remarks

Excellent residual gloss and low colour variation (ΔE), after 1264 hours.

Technical Opinion:

Suitable for OUTDOOR USE

Test was carried on samples prepared according to technical specifications supplied by raw materials manufacturers. However, the resistance against accelerated weathering test is only one of the conditions necessary for the evaluation of the resistance of the finished product. For a final assessment see further analysis on natural exposure in Florida.

Test Report: Accelerated Weathering Test

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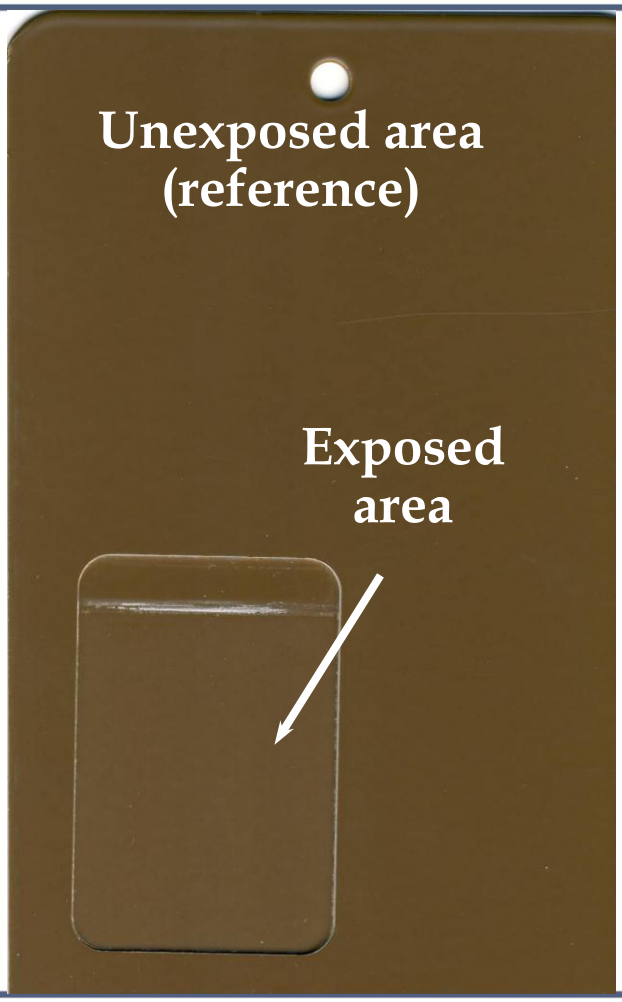
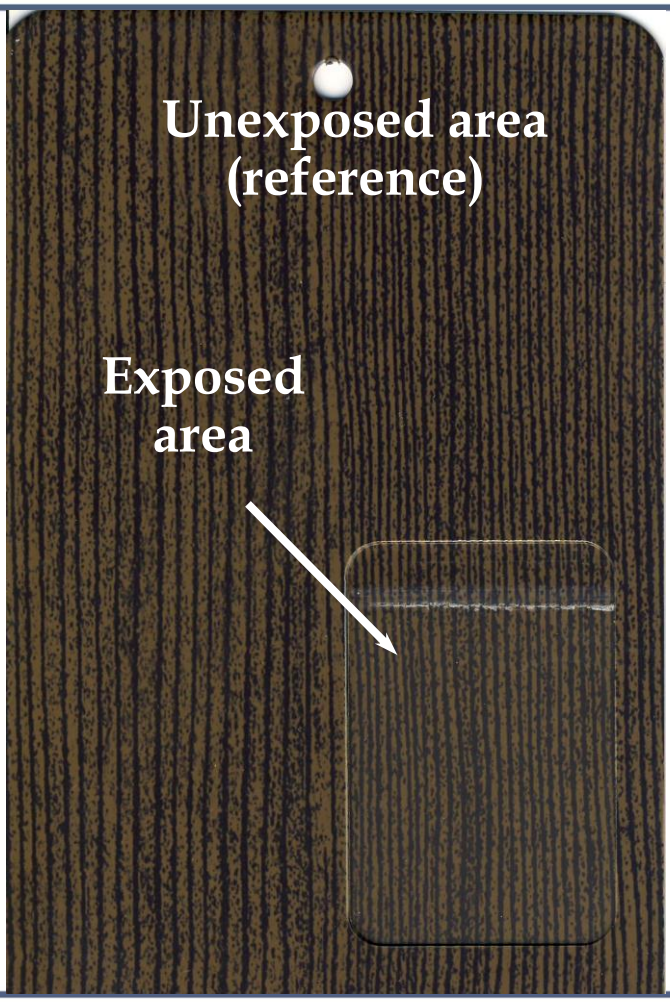
Laboratory Test

No. 214

Device: Solar 3000e

Total duration: 804h





LAB. ID NUMBER: 22162
POWDER COATING: DS 475
HEAT TRANSFER FILM: --
colour variation (ΔE): **0,21**
residual gloss: **78%**

LAB. ID NUMBER: 22163
POWDER COATING: DS 475
HEAT TRANSFER FILM: 1505/01
colour variation (ΔE): **1**
residual gloss: **80%**

Technical Remarks

Excellent residual gloss and very low colour variation (ΔE), after 804 hours.

Technical Opinion:

Suitable for OUTDOOR USE

Test was carried on samples prepared according to technical specifications supplied by raw materials manufacturers. However, the resistance against accelerated weathering test is only one of the conditions necessary for the evaluation of the resistance of the finished product. For a final assessment see further analysis on natural exposure in Florida.

Test Report: Accelerated Weathering Test

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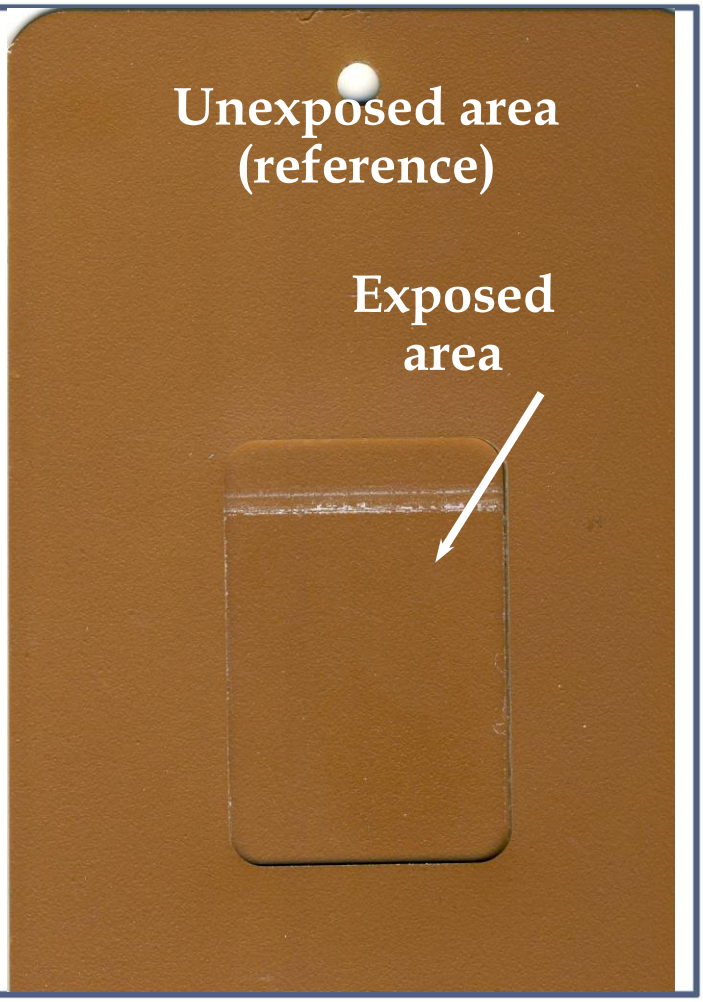
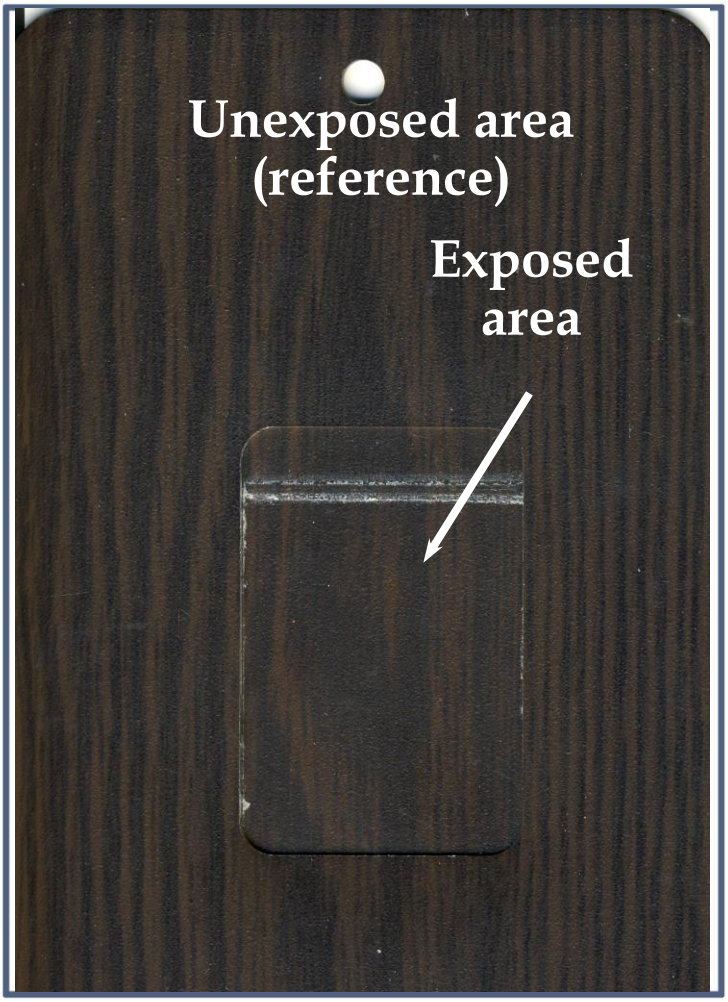
Laboratory Test

No. 423

Device: Solar 3000RHN

Total duration: 1138h





LAB. ID NUMBER: 35591
POWDER COATING: DS-0753S
HEAT TRANSFER FILM: --
Colour Variation(ΔE): **1,01**
residual gloss: **99%**

LAB. ID NUMBER: 35590
POWDER COATING: DS-0753S
HEAT TRANSFER FILM: 2513/06
Colour Variation(ΔE): **1,02**
residual gloss: **100%**

Technical Remarks

Excellent residual gloss and low colour variation (ΔE) after 1138 hours.

Technical Opinion:

Suitable for OUTDOOR USE

Test was carried on samples prepared according to technical specifications supplied by raw materials manufacturers. However, the resistance against accelerated weathering test is only one of the conditions necessary for the evaluation of the resistance of the finished product. For a final assessment see further analysis on natural exposure in Florida.

Test Report: Accelerated Weathering Test

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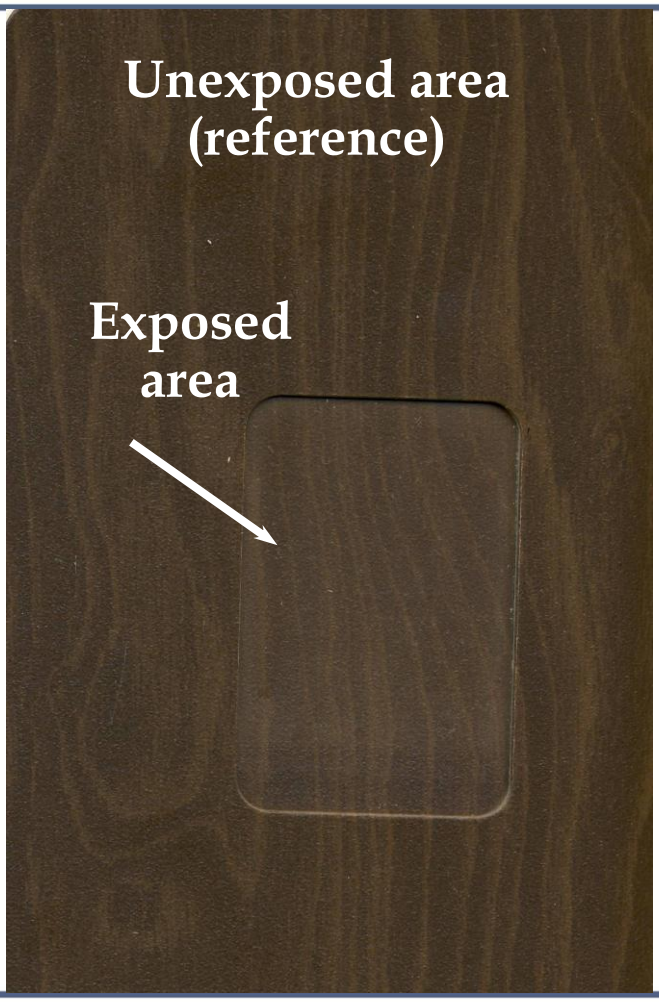
Laboratory Test

No. 327

Device: QSun 3000

Total duration: 1263h



LAB. ID NUMBER: 25822
POWDER COATING: DS 775
HEAT TRANSFER FILM: 2532/04
colour variation (ΔE): **1,8**
residual gloss: **55%**

Technical Remarks

Sufficient residual gloss and very low colour variation (ΔE), after 1263 hours on decorated sample.

Technical Opinion:

Suitable for OUTDOOR USE

Test was carried on samples prepared according to technical specifications supplied by raw materials manufacturers. However, the resistance against accelerated weathering test is only one of the conditions necessary for the evaluation of the resistance of the finished product. For a final assessment see further analysis on natural exposure in Florida.

Test Report: Florida Natural Exposure

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Florida Test

Total duration: 12 months

EXPOSURE PERIOD:

FROM: **18/08/2011**

TO: **30/08/2012**

LAB. ID NUMBER: 24828
POWDER COATING: DS-0733S
HEAT TRANSFER FILM: 2516/02L
colour variation (ΔE): **0,69**
residual gloss: **90%**

Technical Remarks

Excellent residual gloss and very low colour variation (ΔE)

Technical Opinion:

Suitable for OUTDOOR USE

Test was carried on samples prepared according to technical specifications supplied by raw materials manufacturers.

QUALIDECO REQUIREMENTS
The residual gloss must be at least 50% of the original gloss. The final evaluation will be based on visual inspection with the naked eye, with a maximum value of 4 on the grey scale (ISO 105-A02).