



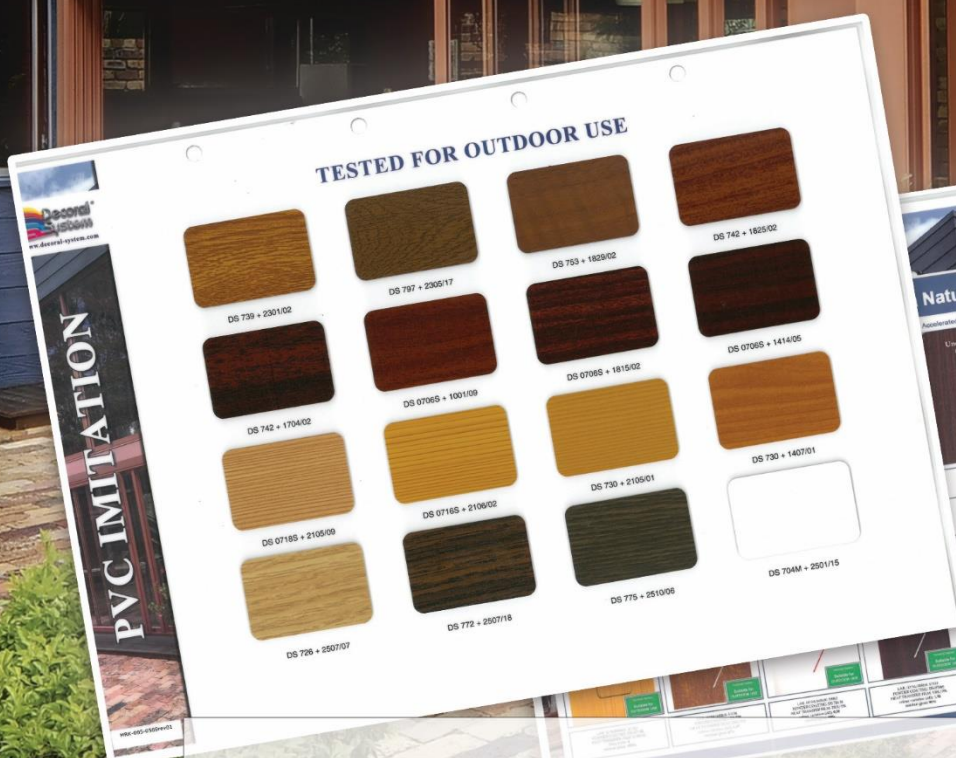
Decoral LAB
Research and Development



Accelerated Weathering Test Natural Exposure Test



MRK 010-0569



PVC PER ESTERNO

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, $550 \pm 20 \text{ W/m}^2$ (290-800 nm)
- temperatura del pannello nero, $65 \pm 5^\circ\text{C}$
- 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 11664/4) 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, $550 \pm 20 \text{ W / m}^2$ (290-800 nm)
- black panel temperature, $65 \pm 5^\circ\text{C}$
- 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 11664/4) 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.

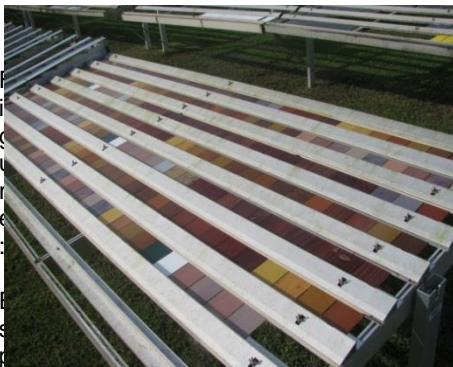
ESPOSIZIONE NATURALE IN FLORIDA:

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.



Esposizione 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 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 by through the use of samples in white, whose aging behaviour is known.

ID Test Report	PROD. VERNIC	COD. FILM	PROG. N°	IMMAGINI
TR-NE-02-2011	DS 739	2301/02	2	
TR-NE-71-2014	DS 797	2305/17	71	
TR-IA-66-2013	DS 753	1829/02	66	
TR-IA-72-2011	DS 742	1825/02	72	
TR-NE-98-2014	DS 742	1704/02	98	
TR-NE-23-2011	DS-0706S	1001/09	23	
TR-NE-23-2013	DS-0706S	1815/02	23	
TR-IA-140-2011	DS-0706S	1414/05	140	
TR-NE-174-2014	DS-0718S	2105/09	174	
TR-NE-139-2015	DS-0716S	2106/02	139	
TR-IA-67-2013	DS 730	2105/01	67	
TR-IA-68-2013	DS 730	1407/01	68	

TR-IA-02a-2011	DS 726	2507/07	2	
TR-IA-87-2012	DS 772	2507/18	87	
TR-IA-170-2012	DS775	2510/06	170	
TR-NE-08-2012	DS704M	2501/15	8	



Laboratory
Test

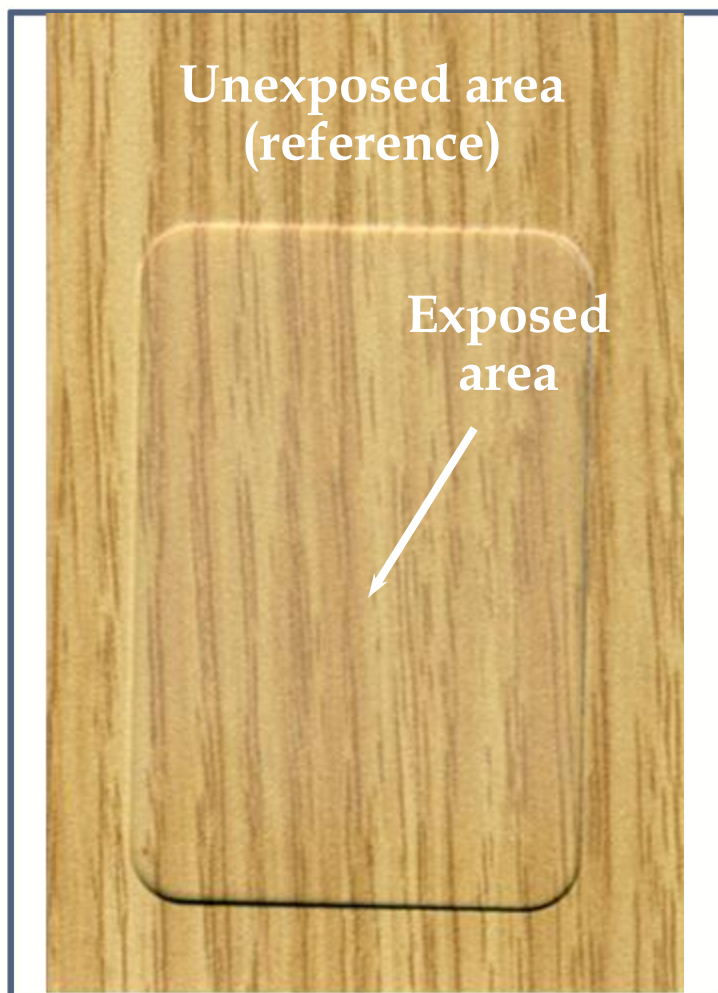
No. 294



Device:
Qsun 3000



Total duration:
953h



LAB. ID NUMBER: 24264
POWDER COATING: DS 726
HEAT TRANSFER FILM: 2507/07L
colour variation (ΔE): **2,3**
residual gloss: **81%**

Technical Remarks

Excellent residual gloss and very low colour variation (ΔE), after 953 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.



Laboratory
Test

No. 361



Device:
Solra 3000RH



Total duration:
1272h



LAB. ID NUMBER: 29120
POWDER COATING: DS 753
HEAT TRANSFER FILM: 1829/02
Colour variation(ΔE): **1,16**
residual gloss: **76%**

Technical Remarks

Excellent residual gloss and very low colour variation (ΔE), after 1272 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.



Laboratory
Test

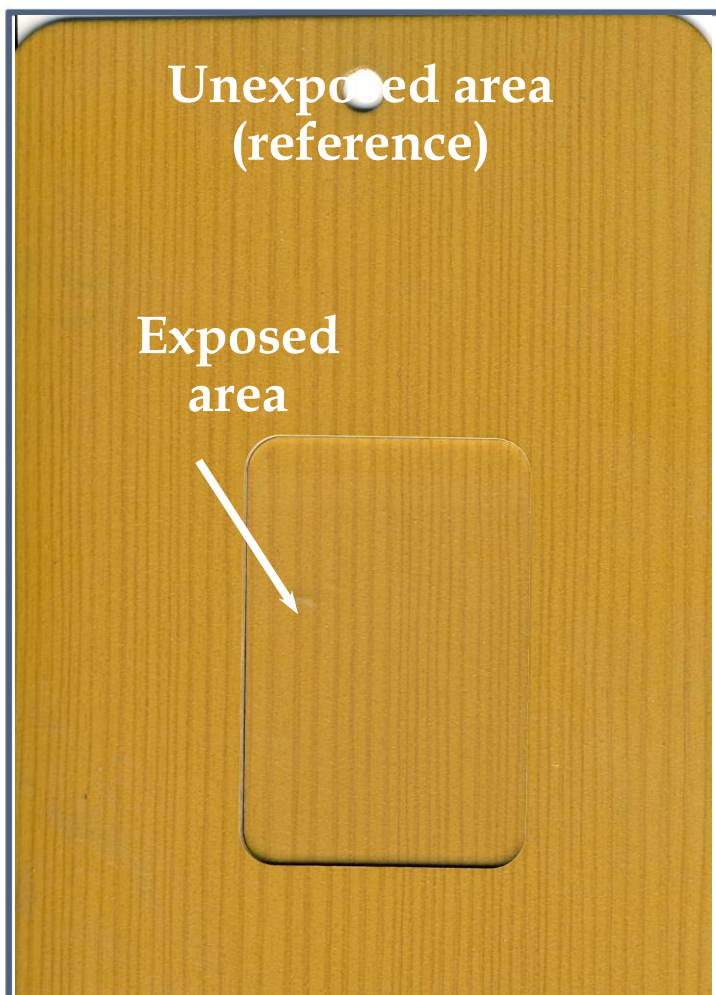
No. 361



Device:
Solra 3000RH



Total duration:
1272h



LAB. ID NUMBER: 29116
POWDER COATING: DS 730
HEAT TRANSFER FILM: 2105/01
Colour variation(ΔE): **0,36**
residual gloss: **90%**

Technical Remarks

Excellent residual gloss and very low colour variation (ΔE), after 1272 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.



Laboratory
Test

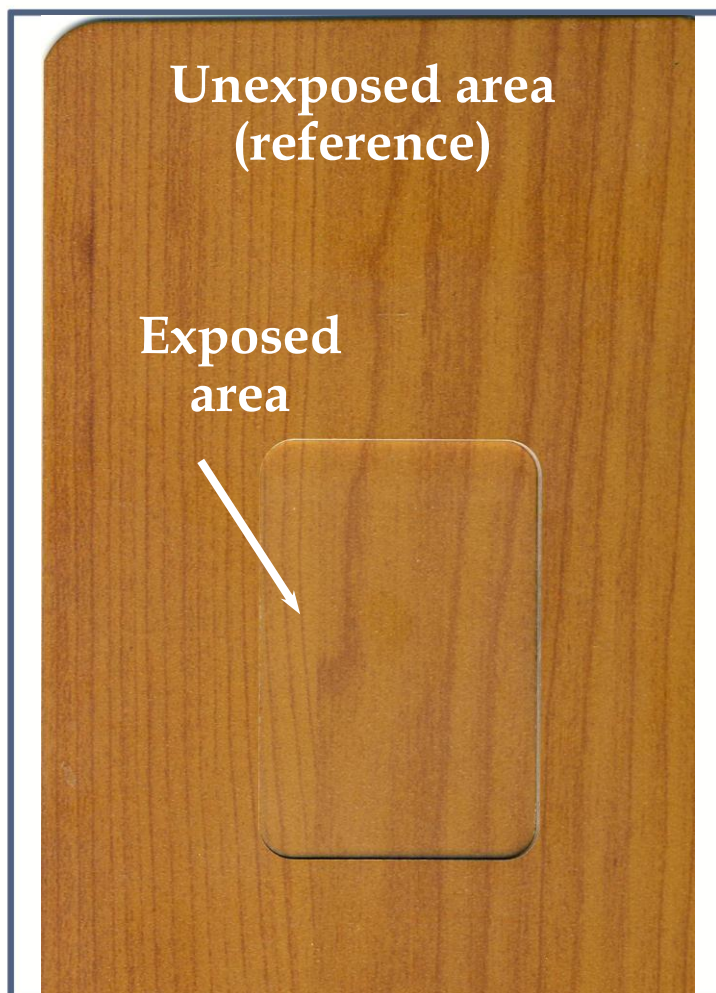
No. 361



Device:
Solra 3000RH



Total duration:
1272h



LAB. ID NUMBER: 29117
POWDER COATING: DS 730
HEAT TRANSFER FILM: 1407/01
Colour variation(ΔE): 1,2
residual gloss: 87%

Technical Remarks

Excellent residual gloss and very low colour variation (ΔE), after 1272 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.



Laboratory
Test

No. 296



Device:
QSun 3000



Total duration:
1011h

Unexposed area
(reference)

Exposed
area



LAB. ID NUMBER: 24317
POWDER COATING: DS 742
HEAT TRANSFER FILM: --
colour variation (ΔE): **0,11**
residual gloss: **98%**

Unexposed area
(reference)

Exposed
area



LAB. ID NUMBER: 24325
POWDER COATING: DS 742
HEAT TRANSFER FILM: 1825/02L
colour variation (ΔE): **0,99**
residual gloss: **95%**

Technical Remarks

Excellent residual gloss and very low colour variation (ΔE), after 1011 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.



Laboratory
Test

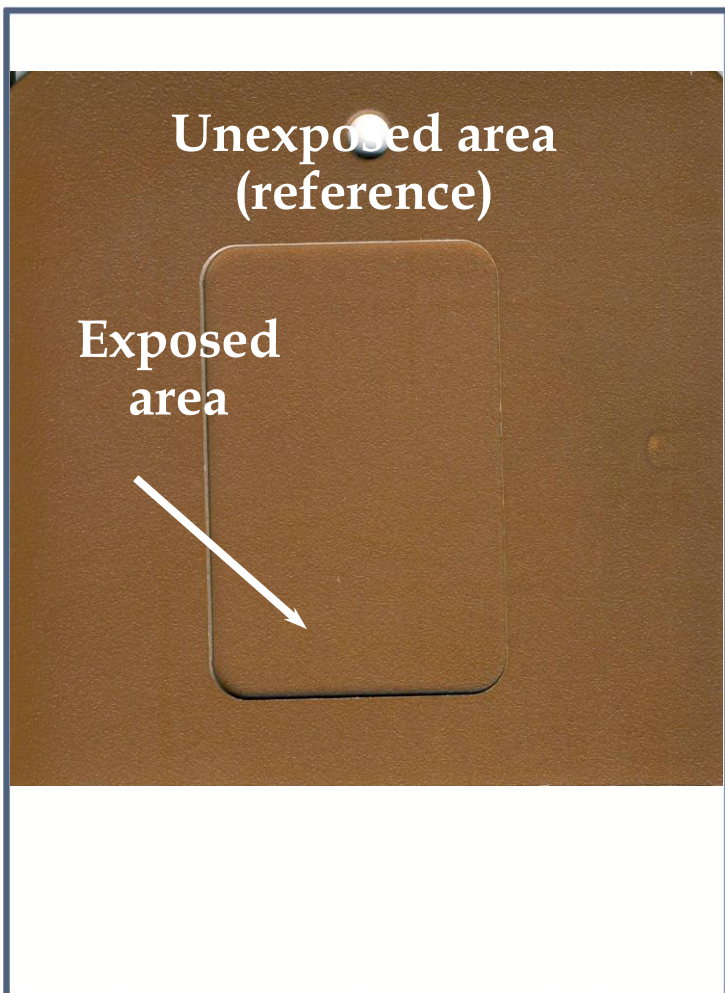
No. 288



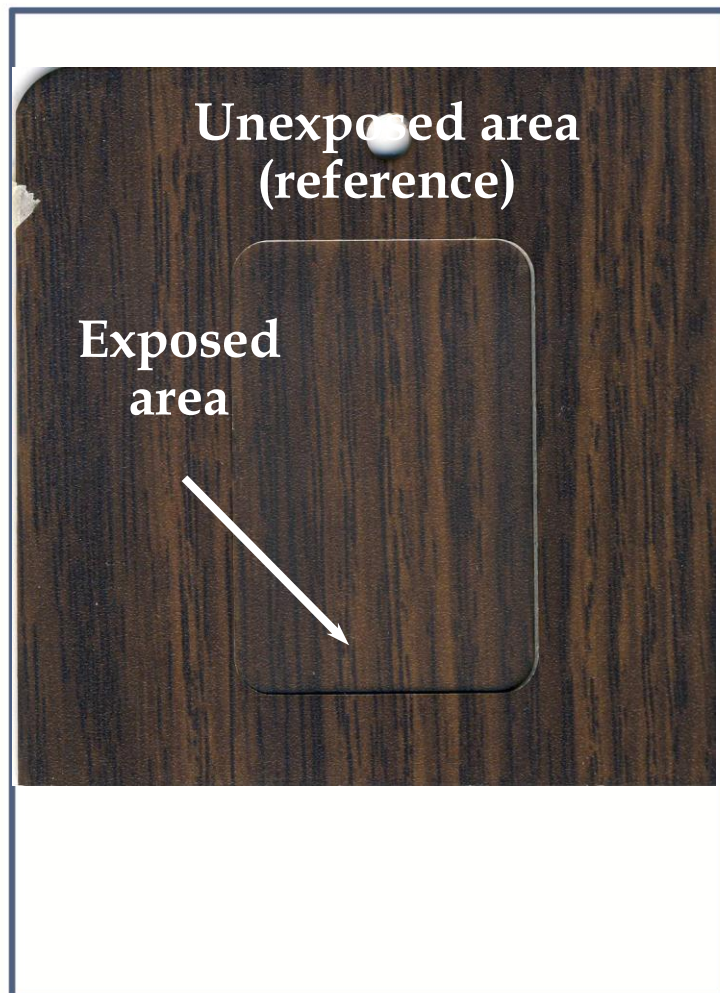
Device:
QSun 3000



Total duration:
950h



LAB. ID NUMBER: 24201
POWDER COATING: DS 772
HEAT TRANSFER FILM: --
colour variation (ΔE): 0,3
residual gloss: 92%



LAB. ID NUMBER: 24193
POWDER COATING: DS 772
HEAT TRANSFER FILM: 2507/18
colour variation (ΔE): 1,06
residual gloss: 89%

Technical Remarks

Excellent residual gloss and very low colour variation (ΔE), after 950 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.



Laboratory
Test

No. 232



Device:
QSun 3000



Total duration:
999h

Unexposed area
(reference)

Exposed
area



Unexposed area
(reference)

Exposed
area



LAB. ID NUMBER: 22765
POWDER COATING: DS-0706S
HEAT TRANSFER FILM: --
colour variation (ΔE): **0,17**
residual gloss: **104%**

LAB. ID NUMBER: 22766
POWDER COATING: DS-0706S
HEAT TRANSFER FILM: 1414/05L
colour variation (ΔE): **1,01**
residual gloss: **84%**

Technical Remarks

Excellent residual gloss and very low colour variation (ΔE), after 999 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.



Laboratory
Test

No. 322



Device:
QSun 3000



Total duration:
1102h

Unexposed area
(reference)

Exposed
area



Unexposed area
(reference)

Exposed
area



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

LAB. ID NUMBER: 26255
POWDER COATING: DS 775
HEAT TRANSFER FILM: 2510/06
colour variation (ΔE): **1,85**
residual gloss: **61%**

Technical Remarks

Good residual gloss and very low colour variation (ΔE), after 1102 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.



**Florida
Test**



**Total duration:
12 months**



EXPOSURE PERIOD:

FROM: 18/04/2009

TO: 28/04/2010

LAB. ID NUMBER: 17736
POWDER COATING: DS 739
HEAT TRANSFER FILM: 2301/02L
colour variation (ΔE): 1,37
residual gloss: 87%

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).

**Unexposed area
(reference)**

**Exposed
area**





**Florida
Test**



**Total duration:
12 months**



EXPOSURE PERIOD:

FROM: 18/08/2009

TO: 19/08/2010

LAB. ID NUMBER: 19063
POWDER COATING: DS 704 M
HEAT TRANSFER FILM: 2501/15L
colour variation (ΔE): 0,38
residual gloss: 93%

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).

**Unexposed area
(reference)**

**Exposed
area**





**Florida
Test**



**Total duration:
12 months**



EXPOSURE PERIOD:

FROM: 30/04/2009

TO: 28/04/2010

LAB. ID NUMBER: 17532
POWDER COATING: DS-0706S
HEAT TRANSFER FILM: 1001/09L
colour variation (ΔE): **1,92**
residual gloss: **96%**

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).

**Unexposed area
(reference)**

**Exposed
area**





**Florida
Test**



**Total duration:
12 months**



EXPOSURE PERIOD:

FROM: 14/01/2012

TO: 16/01/2013

LAB. ID NUMBER: 25619
POWDER COATING: DS-0706S
HEAT TRANSFER FILM: 1815/02L
colour variation (ΔE): 1,57
residual gloss: 96%

Technical Remarks

Excellent residual gloss and very low colour variation
(ΔE)

Technical Opinion:

Suitable for OUTDOOR USE

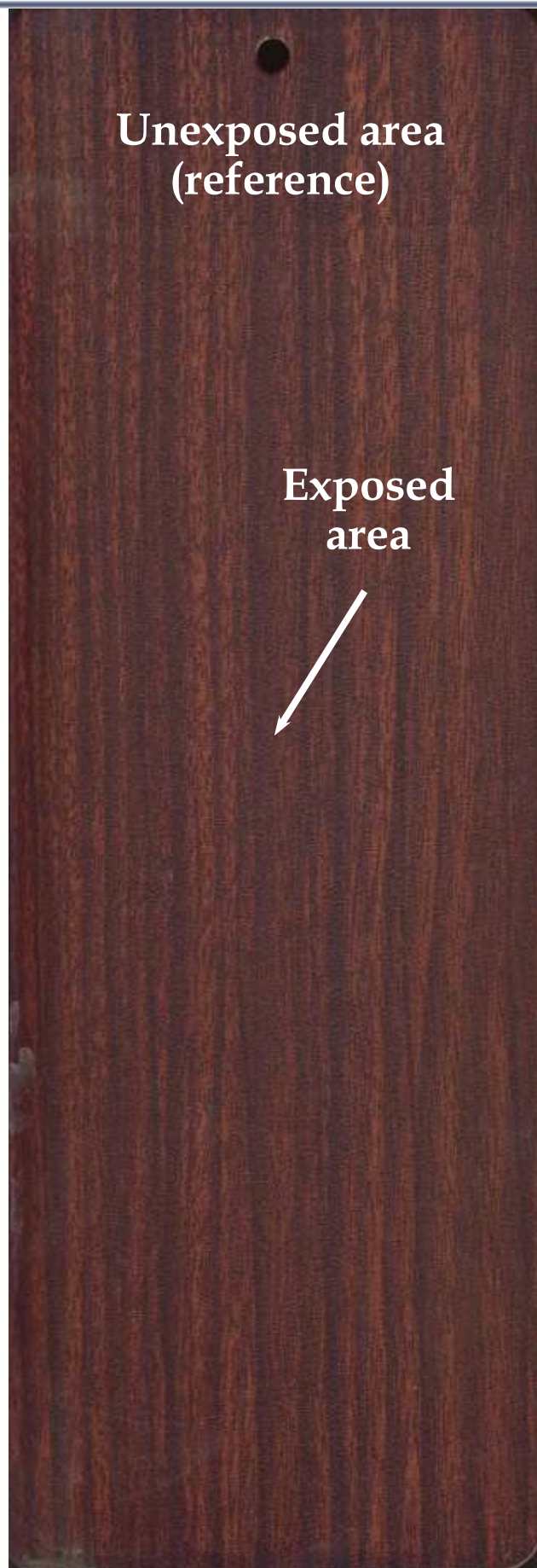
Test was carried on samples prepared according to technical specifications supplied by raw materials manufacturers.

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).

**Unexposed area
(reference)**

**Exposed
area**





**Florida
Test**



**Total duration:
12 months**



EXPOSURE PERIOD:

FROM: 14/01/2012

TO: 14/01/2013

LAB. ID NUMBER: 25674
POWDER COATING: DS 797
HEAT TRANSFER FILM: 2305/17
Colour variation (ΔE): 0,59
residual gloss: 97%

Technical Remarks

Excellent residual gloss and 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).

**Unexposed area
(reference)**

**Exposed
area**





**Florida
Test**



**Total duration:
12 months**



EXPOSURE PERIOD:

FROM: 14/01/2012

TO: 14/01/2013

LAB. ID NUMBER: 25656
POWDER COATING: DS 742
HEAT TRANSFER FILM: 1704/02
Colour variation (ΔE): **1,91**
residual gloss: **91%**

Technical Remarks

Excellent residual gloss and low colour variation (ΔE).

Technical Opinion:

Suitable for OUTDOOR USE

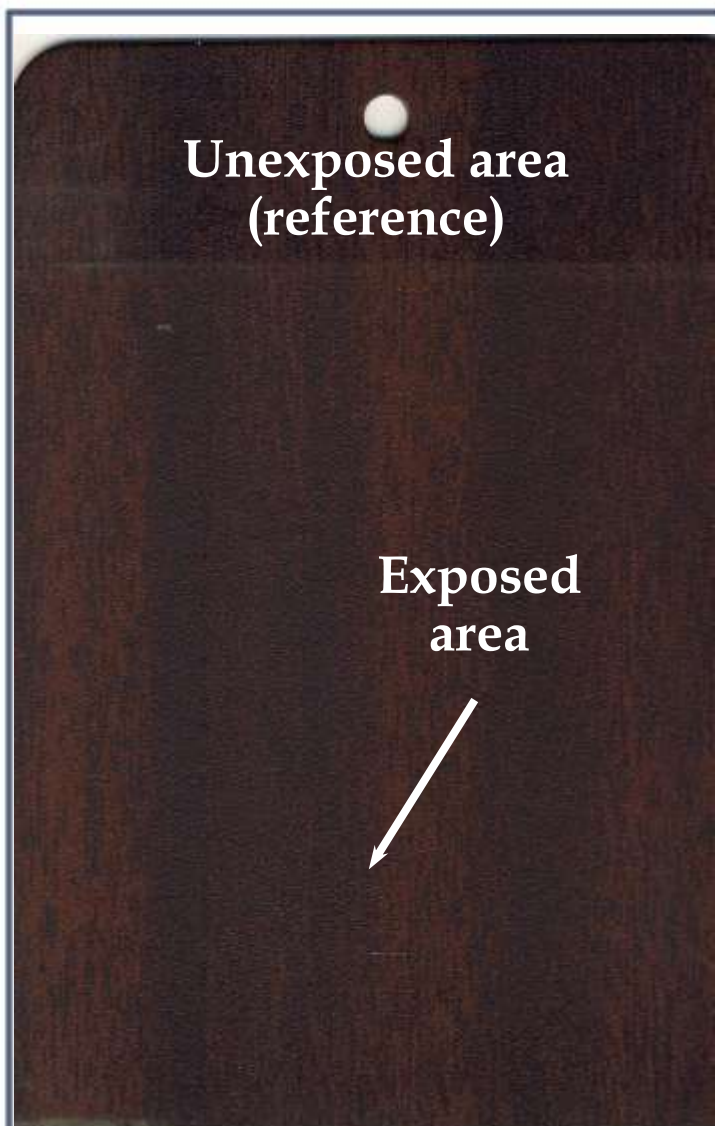
Test was carried on samples prepared according to technical specifications supplied by raw materials manufacturers.

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).

**Unexposed area
(reference)**

**Exposed
area**





**Florida
Test**



**Total duration:
12 months**



EXPOSURE PERIOD:

FROM: 23/05/2014

TO: 27/05/2015

LAB. ID NUMBER: 34046
POWDER COATING: DS-0716S
HEAT TRANSFER FILM: 2106/02
Colour variation (ΔE): 2,6
residual gloss: 97%

Technical Remarks

Excellent residual gloss and 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).

**Unexposed area
(reference)**

**Exposed
area**





**Florida
Test**



**Total duration:
12 months**



EXPOSURE PERIOD:

FROM: 20/08/2013

TO: 21/08/2014

LAB. ID NUMBER: 32027
POWDER COATING: DS-0718S
HEAT TRANSFER FILM: 2105/09
Colour variation (ΔE): **2,34**
residual gloss: 95%

Technical Remarks

Excellent residual gloss and 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).

**Unexposed area
(reference)**

**Exposed
area**

