



Accelerated Weathering Test
Natural Exposure Test



MRK-010-0975



CORTEN 1
series

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 11341 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 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 11341, 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 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.

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.

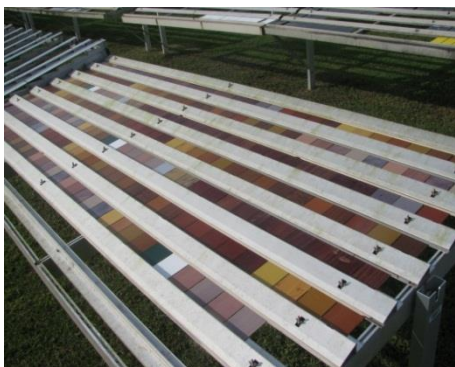





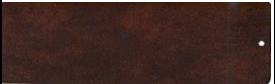








Figure: Esposizione naturale, campioni esposti all'AWSG in Florida
Pictures: Florida Natural Exposure, test samples



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-IA-71-2016	DS 742	5015/08	71	
TR-IA-76-2019	9G-242-A009	6048/02	76	
TR-NE-162-2015	9C-048-A004	5026/02	162	
TR-NE-159-2014	DS-0406S	6048/02	159	
TR-NE-24-2015	DS-0733S	6040/02	24	
TR-IA-126-2015	8G-096-A009	6048/02	126	
TR-IA-92-2019	8G-203-A009	5015/08	92	
TR-IA-90-2019	9G-243-A009	6064/02	90	
TR-IA-89-2019	9G-244-A009	5015/08	89	
TR-IA-87-2019	9G-245-A009	6048/02	87	
TR-IA-84-2019	9G-246-A009	6040/01	84	
TR-IA-83-2019	9G-247-A009	6064/02	83	

TR-IA-81-2019	9G-248-A009	6040/01	81	
TR-IA-80-2019	9G-249-A009	5015/08	80	



Laboratory
Test

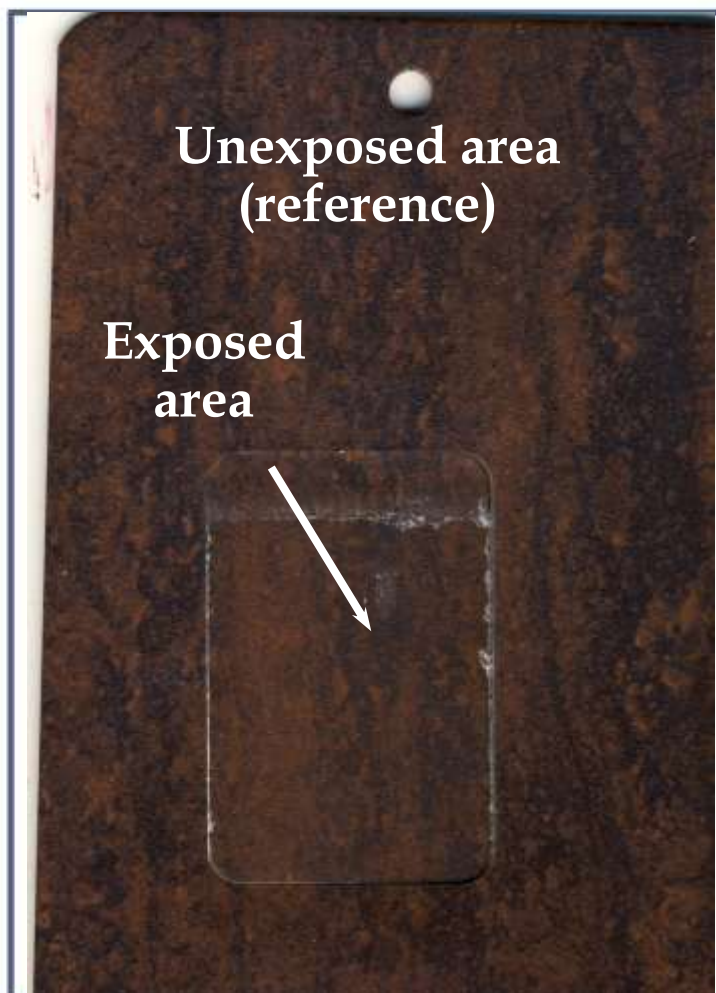
No. 466



Device:
Sol 3000e



Total duration:
1054 h



LAB. ID NUMBER: 40019
POWDER COATING: DS 742
HEAT TRANSFER FILM: 5015/08
Colour Variation (ΔE): **2,23**
residual gloss: **87%**

Technical Remarks

Excellent residual gloss and low colour variation (ΔE),
after 1054 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

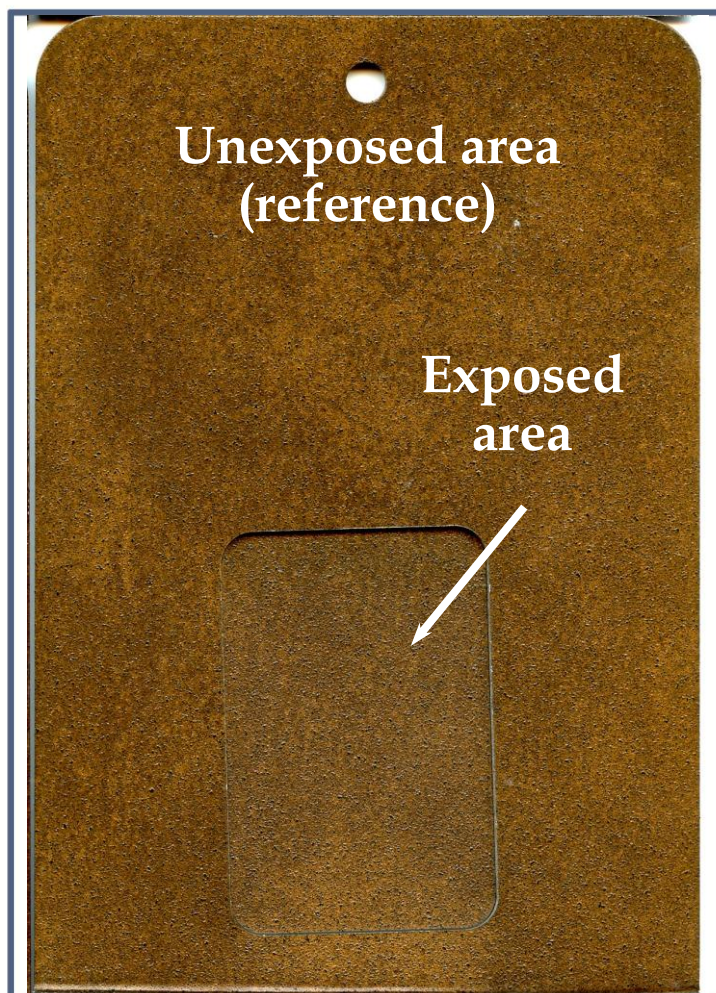
No. 536



Device:
SolarBox 3000e



Total duration:
1164 h



LAB. ID NUMBER: 44481
POWDER COATING: 9G-242-A009
HEAT TRANSFER FILM: 6048/02
Colour Variation (ΔE): **1,08**
residual gloss: **93%**

Technical Remarks

Excellent residual gloss and low colour variation (ΔE),
after 1117 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

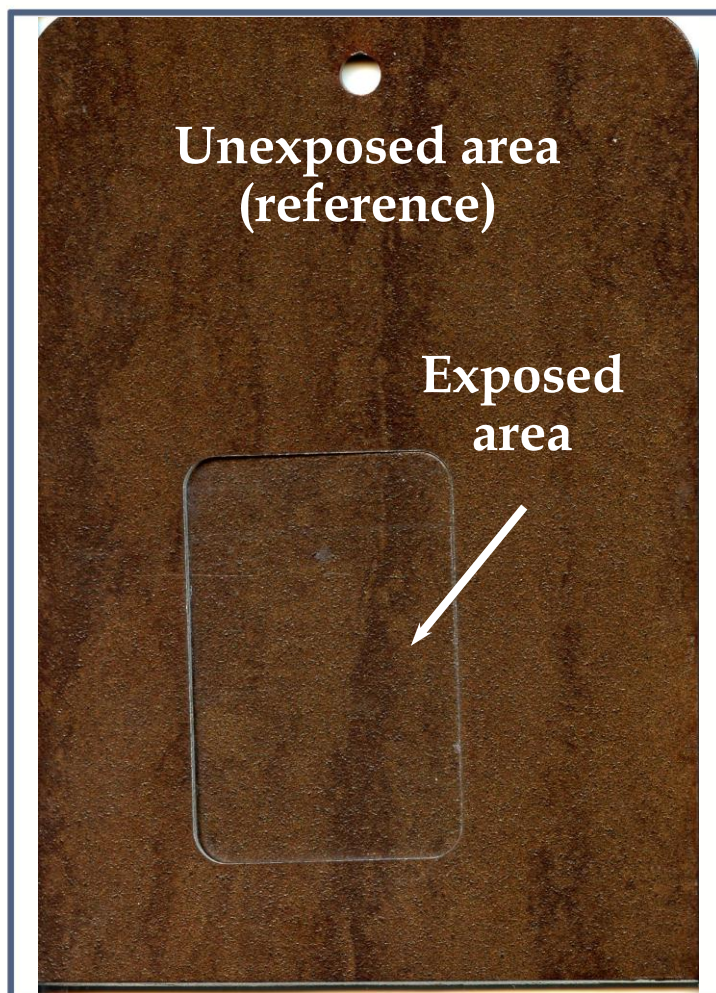
No. 534



Device:
SolarBox 3000RH



Total duration:
1302 h



LAB. ID NUMBER: 44430
POWDER COATING: 9G-249-A009
HEAT TRANSFER FILM: 5015/08
Colour Variation (ΔE): **1,03**
residual gloss: **91%**

Technical Remarks

Excellent residual gloss and low colour variation (ΔE),
after 1117 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

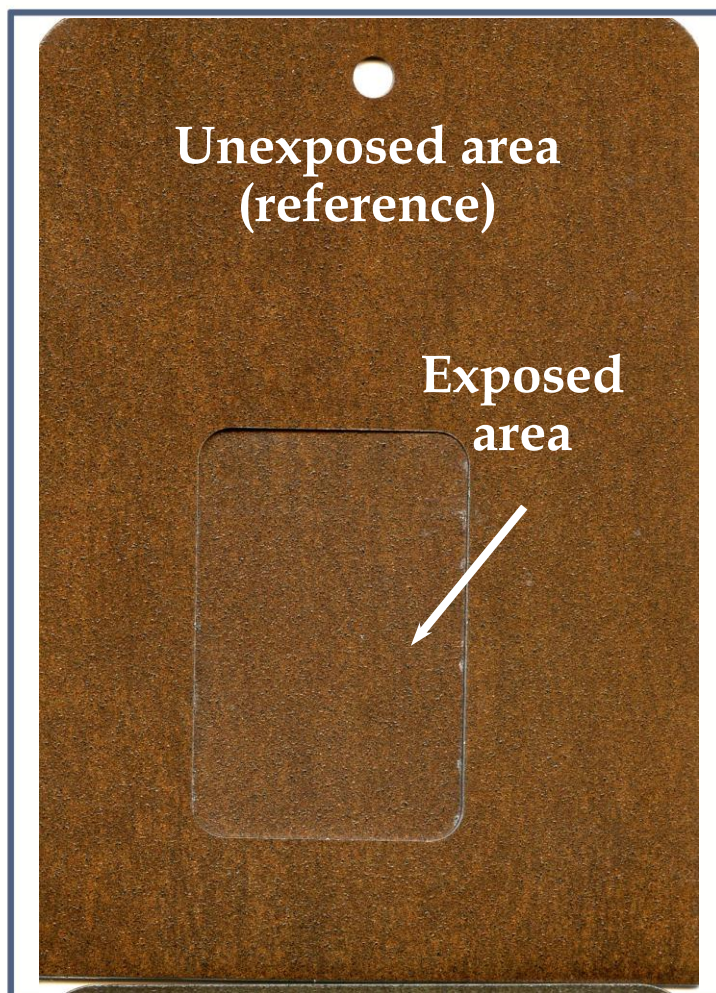
No. 534



Device:
SolarBox 3000RH



Total duration:
1302 h



LAB. ID NUMBER: 44431
POWDER COATING: 9G-248-A009
HEAT TRANSFER FILM: 6040/01
Colour Variation (ΔE): 1.3
residual gloss: 95%

Technical Remarks

Excellent residual gloss and low colour variation (ΔE),
after 1117 hours.

Technical Opinion:

**Suitable for
OUTDOOR USE**

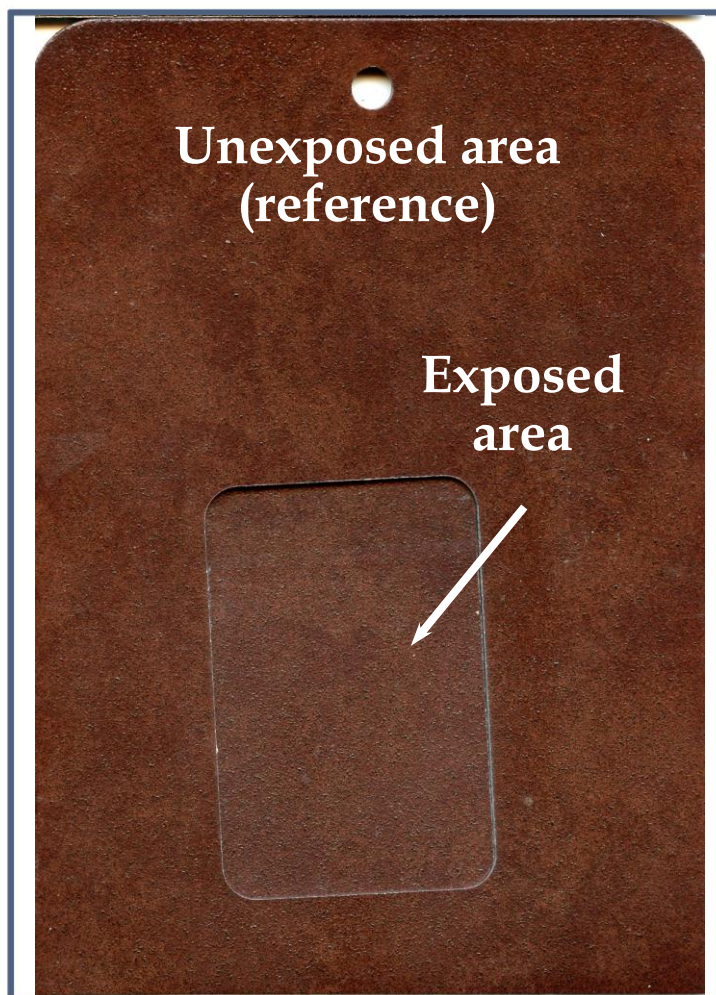
Test was carried on samples prepared according to technical specifications supplied by raw materials manufacturers. However, the resistance against accelerated weathering test is only one of the conditions necessary for the evaluation of the resistance of the finished product. For a final assessment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

 **Laboratory
Test**

No. 534

 **Device:
SolarBox 3000RH**

 **Total duration:
1302 h**



LAB. ID NUMBER: 44433
POWDER COATING: 9G-247-A009
HEAT TRANSFER FILM: 6064/02
Colour Variation (ΔE): **1,27**
residual gloss: **88%**

Technical Remarks

Excellent residual gloss and low colour variation (ΔE),
after 1117 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

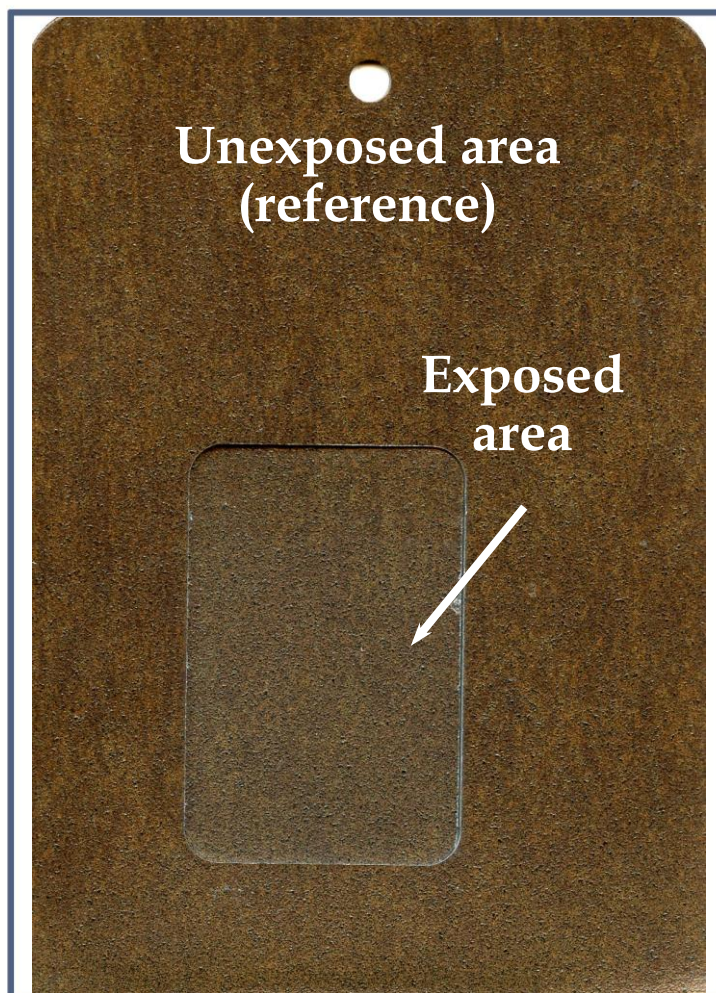
No. 534



Device:
SolarBox 3000RH



Total duration:
1302 h



LAB. ID NUMBER: 44434
POWDER COATING: 9G-246-A009
HEAT TRANSFER FILM: 6040/01
Colour Variation (ΔE): **1,47**
residual gloss: **84%**

Technical Remarks

Excellent residual gloss and low colour variation (ΔE),
after 1117 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

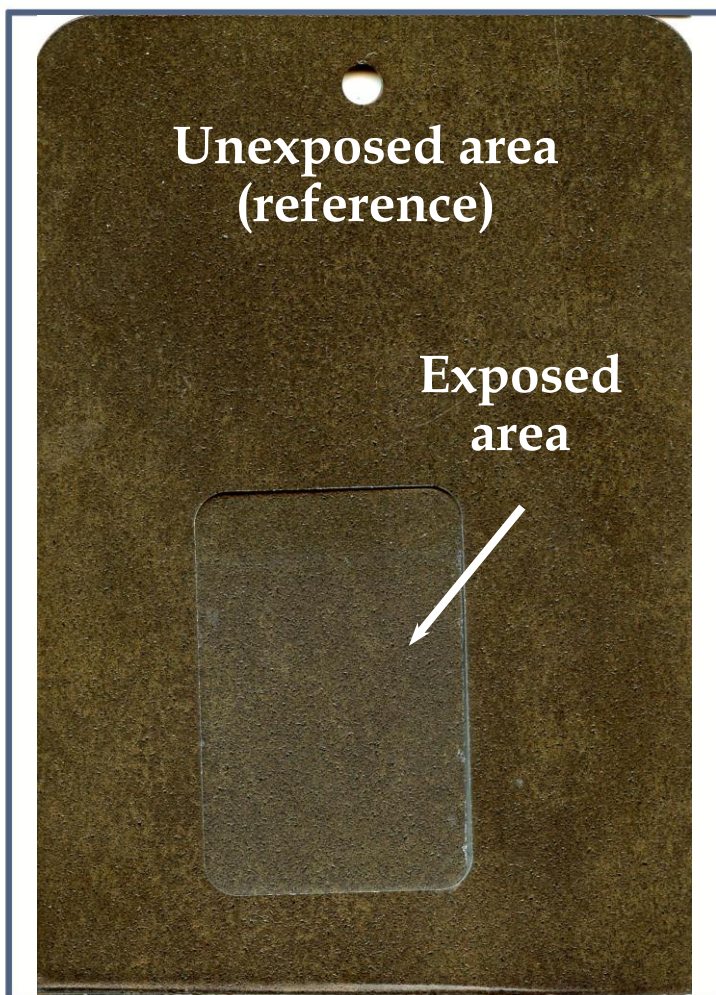
No. 534



Device:
SolarBox 3000RH



Total duration:
1302 h



LAB. ID NUMBER: 44437
POWDER COATING: 9G-245-A009
HEAT TRANSFER FILM: 6048/02
Colour Variation (ΔE): **1.80**
residual gloss: **85%**

Technical Remarks

Excellent residual gloss and low colour variation (ΔE),
after 1117 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. 534



Device:
SolarBox 3000RH



Total duration:
1302 h



LAB. ID NUMBER: 44439
POWDER COATING: 9G-244-A009
HEAT TRANSFER FILM: 5015/08
Colour Variation (ΔE): **1.18**
residual gloss: **100%**

Technical Remarks

Excellent residual gloss and low colour variation (ΔE),
after 1117 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

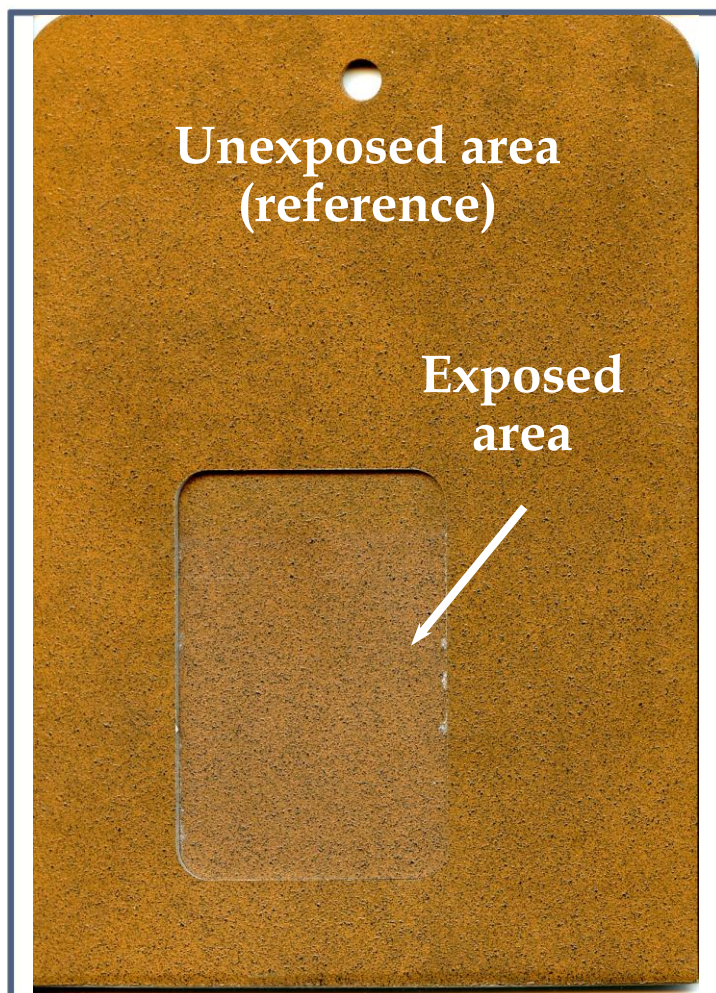
No. 534



Device:
SolarBox 3000RH



Total duration:
1302 h



LAB. ID NUMBER: 44440
POWDER COATING: 9G-243-A009
HEAT TRANSFER FILM: 6064/02
Colour Variation (ΔE): **1.90**
residual gloss: **85%**

Technical Remarks

Excellent residual gloss and low colour variation (ΔE),
after 1117 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. 534



Device:
SolarBox 3000RH



Total duration:
1302 h



LAB. ID NUMBER: 44442
POWDER COATING: 8G-203-A009
HEAT TRANSFER FILM: 5015/08
Colour Variation (ΔE): **1.45**
residual gloss: **86%**

Technical Remarks

Excellent residual gloss and low colour variation (ΔE),
after 1117 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

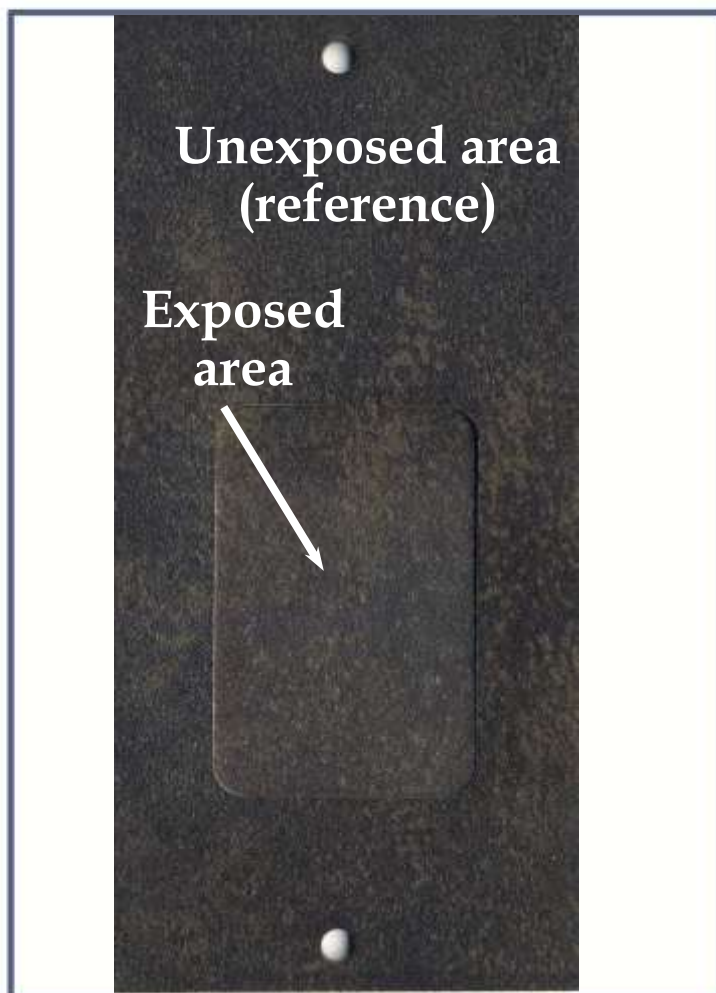
No. 446



Device:
QSun 3000



Total duration:
1345h



LAB. ID NUMBER: 36507
POWDER COATING: 8G-096-A009
HEAT TRANSFER FILM: 6048/02
Colour Variation (ΔE): **2,26**
residual gloss: **79%**

Technical Remarks

Good residual gloss and low colour variation (ΔE),
after 1345 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: 25/11/2013

TO: 25/11/2014

LAB. ID NUMBER: 32901
POWDER COATING: DS-0733S
HEAT TRANSFER FILM: 6040/02
Colour variation (ΔE): 1,21
residual gloss: 88%

Technical Remarks

Excellent residual gloss and low colour variation (ΔE).

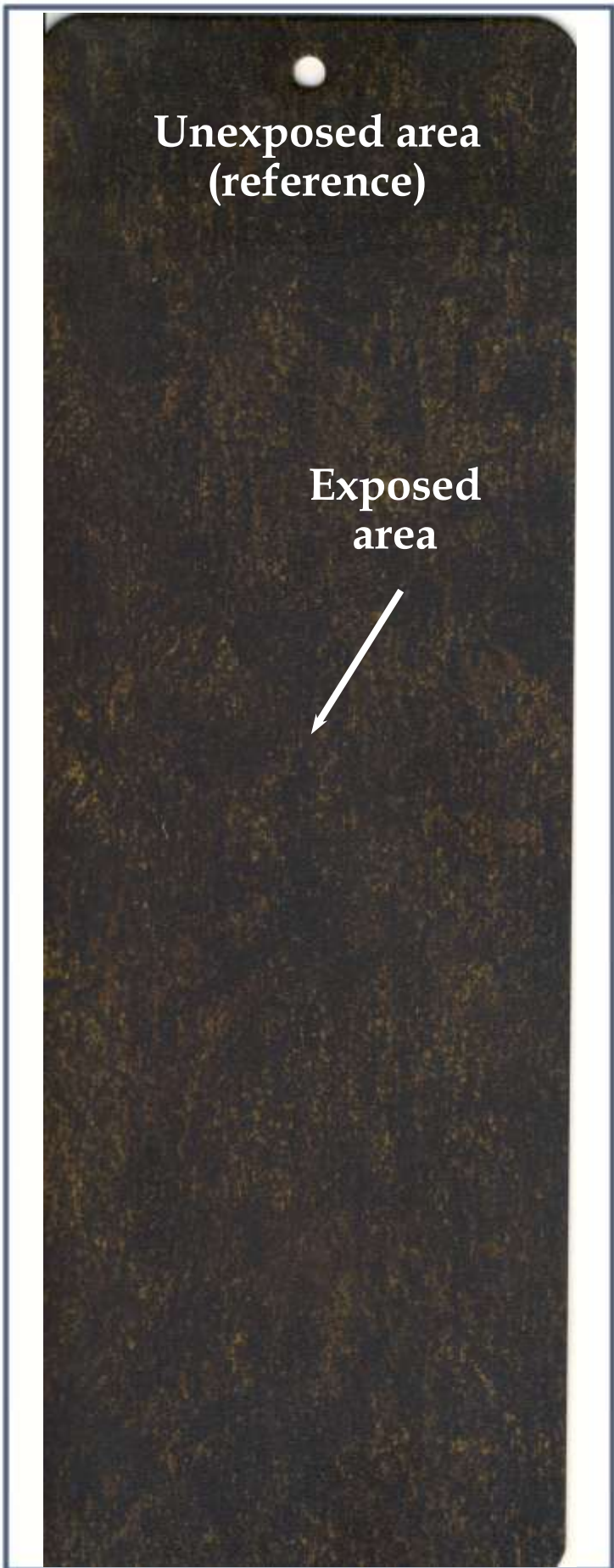
Technical Opinion:

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).





**Florida
Test**



**Total duration:
12 months**



EXPOSURE PERIOD:

FROM: 20/08/2013

TO: 21/08/2014

LAB. ID NUMBER: 32100
POWDER COATING: DS-0406S
HEAT TRANSFER FILM: 6048/02
Colour variation (ΔE): 1,2
residual gloss: 100%

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: 33989
POWDER COATING: 9C-048-A004
HEAT TRANSFER FILM: 5026/02
Grey scale: 4
residual gloss: 100%

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).

