

## **Light Fastness of Coloured Anodised Aluminium by Polychromal**

### **Test institute**

The enclosed tests were performed by the Atlas Weathering Services Group Europe of Atlas Material Testing Technology (MTT) GmbH. The European test laboratories of Atlas MTT in Duisburg (Germany) and Paris (France) were accredited to DIN EN ISO/IEC 17025:2000 by the Deutscher Akkreditierungsrat (DAR), an internationally renowned accreditation council affiliated with the Federal Institute for Materials Research and Testing of Germany.

The Atlas Weathering Services Group (AWSG) is one of the largest networks of ISO/IEC 17025 accredited accelerated weathering testing laboratories in the world. With laboratories in France, Germany and the United States, AWSG's indoor exposure laboratories offer artificial accelerated weathering tests and a variety of other environmental test programs, all designed to accurately simulate true end-use conditions and meet global weathering standards.

Both labs in Duisburg and France have proven over many years to provide reliable test results to international customers. The accreditation stresses the laboratories' obligation to identify clients' needs and ensures the test methods chosen meet those needs.

The facilities in Germany and France conduct accelerated weathering and light fastness testing. Featuring a variety of xenon, carbon-arc, fluorescent and metal halide weathering instruments, they can meet most accelerated test methods from corporate, national and international standards organizations.

### **Test method**

The test method used is defined in ISO 2135 "Anodizing of aluminium and its alloys – Accelerated test of light fastness of coloured anodic coatings using artificial light" second edition 1984-02-01.

This International Standard specifies an accelerated test method for assessing the fastness, using artificial light, of coloured anodic oxide coatings on aluminium and its alloys. The resistance of the colour in the anodised layer to the action of a standard artificial light source is determined. A Xenon lamp is used, having an emission wavelength profile close to daylight. D65 is the internationally recognized emission standard for outdoor daylight as defined in ISO 10977 (1993). Light sources conforming to the D65 emission standard should contain UV and visible spectrum, such as Xenon lamps.

Filtered (D65) Xenon discharge lamps are full-spectrum light sources and simultaneously expose in the UV, Visible and IR spectral regions. The Atlas SUNTEST meets the D65 spectral criterion with an optical filter system consisting of a coated quartz glass dish (P/N 56052388) and an UV special glass filter (P/N 56052371).

### **Evaluation**

Anodised samples are exposed to artificial light and regular observations are made of any colour change by comparison with the grey scale DIN EN ISO 20105-A02 (1994): Grey Scale for Assessing Change in Colour. This standard consists of a nine half-steps scale from 5 to 1 representing a visual difference and contrast. The grey scale has nine possible values: 5, 4-5, 4, 3-4, 3, 2-3, 2, 1-2 and 1.

Grade 5 means no visual colour change (best rating) and grade 1 means a large visual change (worst rating). For the visual inspections, the exposed part of a sample is compared with an unexposed reference sample.

The apparatus and light source were calibrated by exposing a coloured cloth sample (Blue wool) having a light fastness number of 6 on the European blue scale (ISO 105-B01). The time of exposure was determined for the Blue wool to show a colour change corresponding to grade 3 of the grey scale. This length of time was 200 hours and is defined as the exposure cycle for the apparatus.

Coloured anodised specimen of unknown light fastness were exposed under the same conditions as the Blue wool sample for 4 cycles. This resulted in a test time of 800 hours, which is generally equal to 9 months of outdoor exposure in middle Europe according to ATLAS Material Testing Technology GmbH. Visual inspections were performed after 400, 600 and 800 hours.

The light fastness number is a function of the number of exposed cycles required to produce the appropriate colour change corresponding to grade 3 of the grey scale (about 25 % loss of colour). Two of these cycles corresponds to a light fastness number of 7 and four of these cycles to a light fastness number of 8.

### Apparatus

The samples (35\*35 mm plates) were tested in a Suntest® XLS+ test instrument, with a Xenon Arc light source. An UV filter (suprax) / coated Quartz filter system was used. The irradiance was  $550 \pm 50 \text{ W/m}^2$  between 300 to 800 nm, with a continuous light cycle. The black standard temperature was  $42 \pm 3 \text{ }^\circ\text{C}$  (needs to be below  $50 \text{ }^\circ\text{C}$ ) and the dry bulb temperature was  $35 \pm 2 \text{ }^\circ\text{C}$ . The position of the exposed specimen in the apparatus were switched after each cycle, ensuring an identical distribution of light on each sample.

### Results

#### *CopyColours on CopyPhot*

All ten CopyColours were tested in CopyPhot mat. The CopyColours YW01, BE06 and BK10 were also tested in CopyPhot MillFinish (MF = satin) and in CopyPhot Glossy (HG = high gloss).

CopyColour	YW01	YW02	OE03	GN04	BE05	BE06	RD07	RD08	RD09	BK10
Mat	7-8	> 8	< 7	< 7	8	8	< 7	> 8	> 8	> 8
MF	7-8	-	-	-	-	8	-	-	-	> 8
HG	> 8	-	-	-	-	> 8	-	-	-	> 8

Table 1: light fastness numbers of CopyColours in CopyPhot mat / MF / HG.

There is no significant difference in light fastness results for mat and MillFinish. Glossy is somewhat light faster; perhaps more light is reflected here resulting in less colour degradation. Only the CopyColours OE03, GN04 and RD07 in CopyPhot mat have light fastness numbers smaller than 7.

#### *CopyColours on CopyPhot gold*

CopyColours BE06 and BK10 were tested in CopyPhot gold. The BE06 mat plate has a reduced light fastness number compared to the alu-look CopyPhot: smaller than 7 in stead of 8. For the Satin (MF) surface structure, this is

reversed: larger than 8 in stead of 8. The light fastness at 800 hours for glossy gold is the same as for glossy alu-look: both larger than 8. For BK10, mat gold differs barely from alu gold. The satin and glossy plates have light fastness numbers of 8 and greater than 8 respectively.

CopyColour	BE06	BK10
Mat Gold	< 7	> 8
MF Gold	> 8	8
HG Gold	> 8	> 8

Table 2: light fastness numbers of CopyColours in CopyPhot Gold mat / MF / HG.

#### *PoroPrints on DuraSeal*

All ten PoroPrints were tested in DuraSeal mat, some in DuraSeal MillFinish and DuraSeal Glossy. All PoroPrints in all tested surface structures of DuraSeal have light fastness numbers greater than 8.

PoroPrint	YW01	YW02	OE03	GN04	BE05	BE06	RD07	RD08	RD09	BK10
Mat	> 8	> 8	> 8	> 8	> 8	> 8	> 8	> 8	> 8	> 8
MF	> 8	-	-	-	-	> 8	-	-	-	> 8
HG	> 8	-	-	-	-	> 8	-	-	-	> 8

Table 3: light fastness numbers of PoroPrints in DuraSeal mat / MF / HG.

#### *Duracolours on DuraSeal*

Duracolours Yellow, Cyan, Magenta and Black were digitally printed in DuraSeal mat at 1440x1440 dpi with the DSE-printer using 4 colours: Cyan (C), Magenta (M), Yellow (Y) and Black (K).

DuraColour	Yellow	Cyan	Magenta	Black
mat	8	8	<7	>8

Table 4: light fastness numbers of DuraColours in DuraSeal mat.