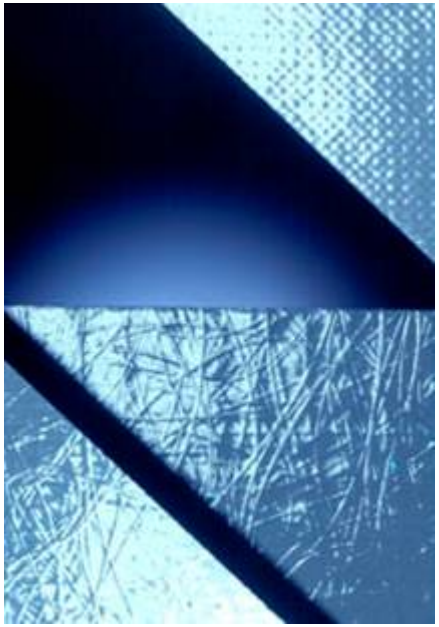


Quality and Consistency

Quality and Consistency



Raw Material Control

- 100% of all resins
- Partial control of glass mats



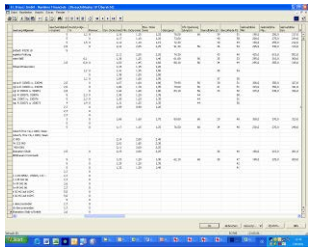
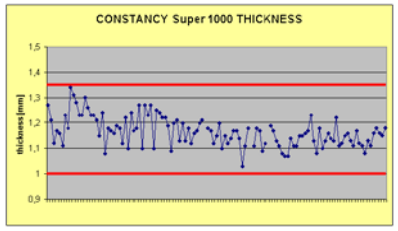
Process control and final control

- 100% process control
- Final control:
  - Every second coil: barcol hardness, thickness, delamination, transparent
  - 2 times per shift: surface tension, gel coat thickness
  - 3 times per shift: pinholes

Laboratory

- Approx. 1% of the production
- Tensile and bending strength
- Residual styrene
- Gloss
- Yellowing
- Long term surface tension
- IR-test
- Barcol hardness
- Glass content
- Surface tension, dyne level
- Long term temperature tests
- Bending radius

Feedback and Statistic

Quality System

ZERTIFIKAT ◆ CERTIFICATE ◆ 證書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

TÜV SÜD Management Service

CERTIFICATE

The Certification Body
of TÜV SÜD Management Service GmbH
certifies that

LAMILUX

Heinrich Strunz GmbH
Lamilux Sicherheitstechnik GmbH
Zehstraße 2, D-95111 Rehau

has established and applies
a Quality Management System for

development, production, distribution, installation and maintenance of individual rooflights, continuous rooflight systems, constructive glass design, smoke and heat exhaust ventilation systems (SHEVS), window wall systems, LAMILUXplan, products of glass fibre reinforced plastic business area of timber construction development, production and distribution of ecological framehouses, carpenter's work and other wood works; LAMILUX Sicherheitstechnik GmbH Installation and maintenance of individual rooflights, continuous rooflight systems, constructive glass design, smoke and heat exhaust ventilation systems (SHEVS), window wall systems, LAMILUX control system

An audit was performed, Report No. **70025028**
Proof has been furnished that the requirements
according to

ISO 9001: 2000

are fulfilled. The certificate is valid until **2009-07-31**
Certificate Registration No. **12 100 16167 TMS**

TÜV SÜD

Munich, 2006-10-04

IAF

GMS-TGA-ZM-07-92

TÜV SÜD Management Service GmbH • Zertifizierstelle • Ridlerstraße 65 • 80339 München • Germany

- Raw material control
- Processing control
- Goods final inspections
- Product testing

- Continuous product development

Continuous Material Control

- Raw material control
  - Styrene content and chemical resistance

- Raw material control
  - Reactivity of resins

Continuous Raw Material Control

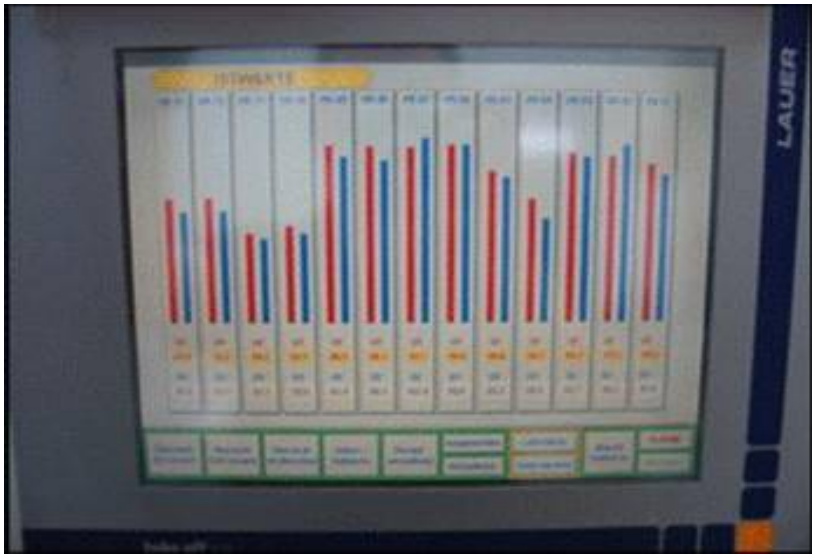
- Raw material control
  - Viscosity

- Raw material control
  - Refraction index of resin

- Raw material control
  - Open time of resin

Continuous Process Control

- Process control
  - Automatic production control secured by different measuring tools



Goods Final Inspection

- Thickness and Gelcoat thickness
- Weight
- Bending and tensile strength

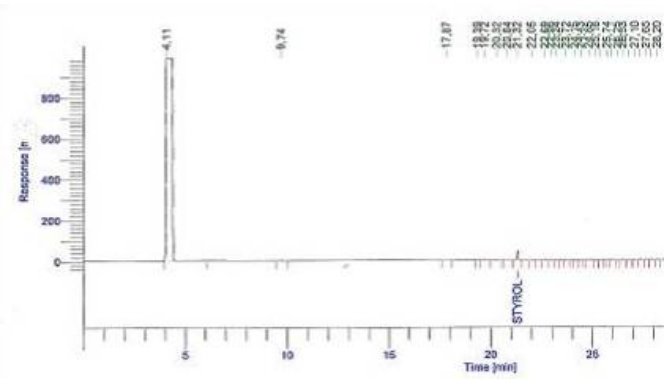
Goods Final Inspection

- Bending test
  - Bending radius

- Glass content

Goods Final Inspection

- Gaschromatography – Residual styrene content

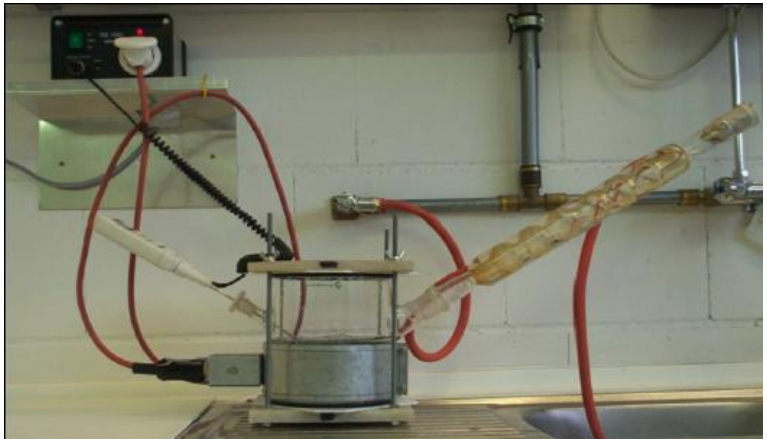


Reststyrol - Analyse

Komponente Name	Zeit [min]	Fläche [uV*sec]	Norm. Fläche [%]	BL	Raw Amount	Adjusted Amount
Styrol	21,322	156102,84	100,00	BB	0,1130	0,0568
		156102,84	100,00		0,1130	0,0568

Goods Final Inspection

- Cooking test



- B2 - test

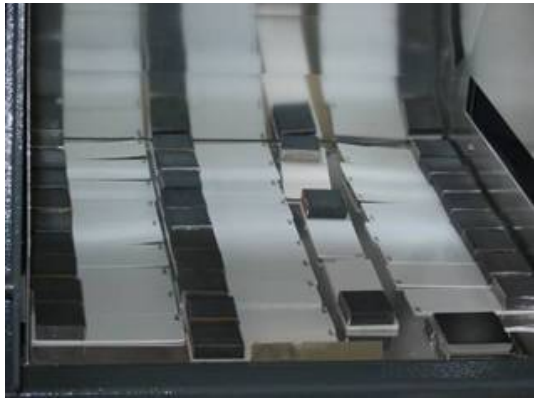
Continuous Product Testing

- Heat-cold bending test
  - 8 hours at 80°C
  - 16 hours at -30°C

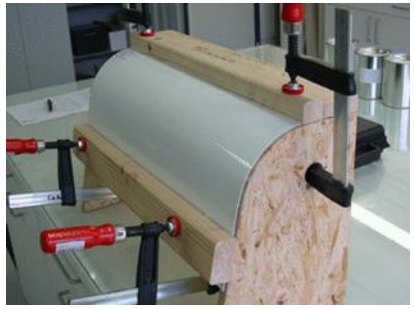
- Heat-cold test
  - 8 hours at 80°C
  - 16 hours at -30°C

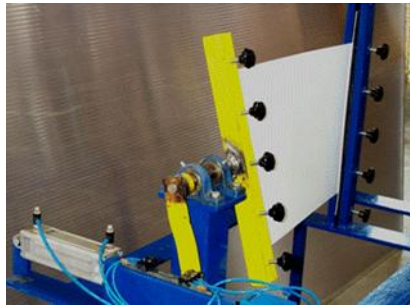
Continuous Product Testing

- Light stability and sun test



- Testing of real bending applications
- Torsion testing



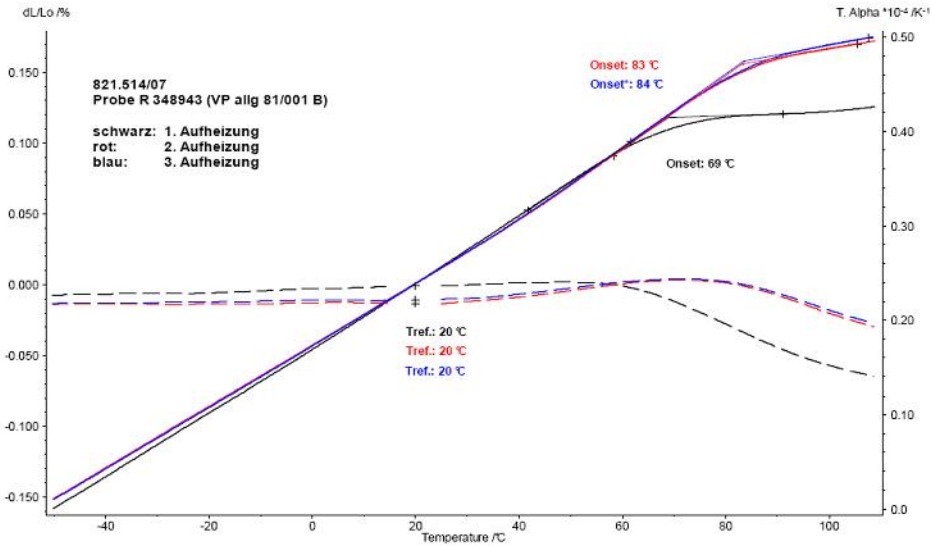


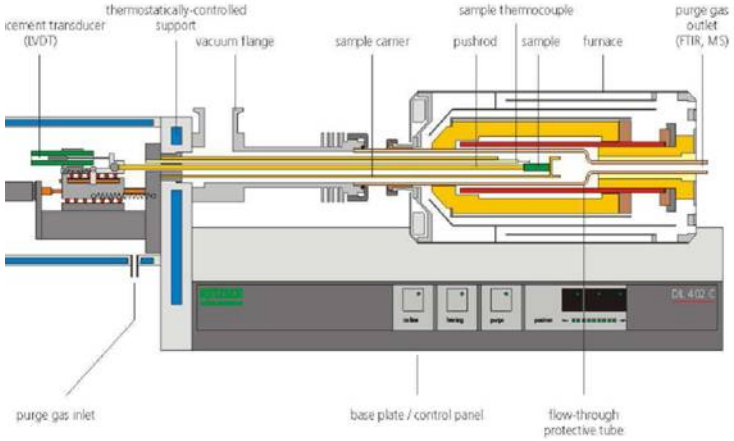
Continuous Product Testing

- Thermal expansion at 50°C of material at 6 meter length

Continuous Product Testing

- Thermal expansion measured with Dilatometer





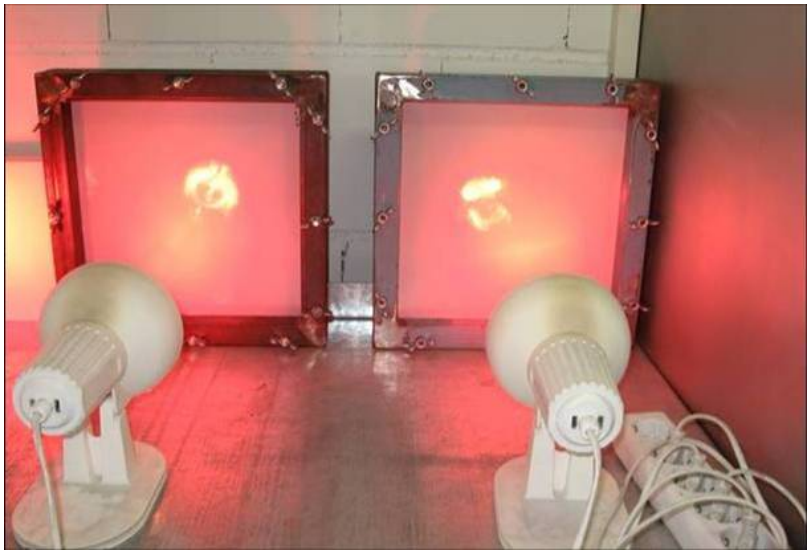
Continuous Product Testing

- Halogen radiation at 80 °C

Continuous Product Testing

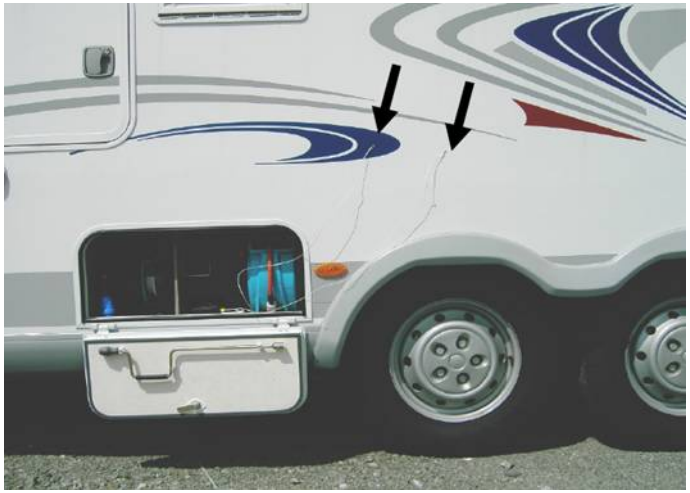
- Heat test

- Infrared test



Thermography of different colours

- White area 50°C
- Grey area 54°C
- Black area 80°C
- Rearside of sandwich panel 40°C
- Outside temperature 30°C

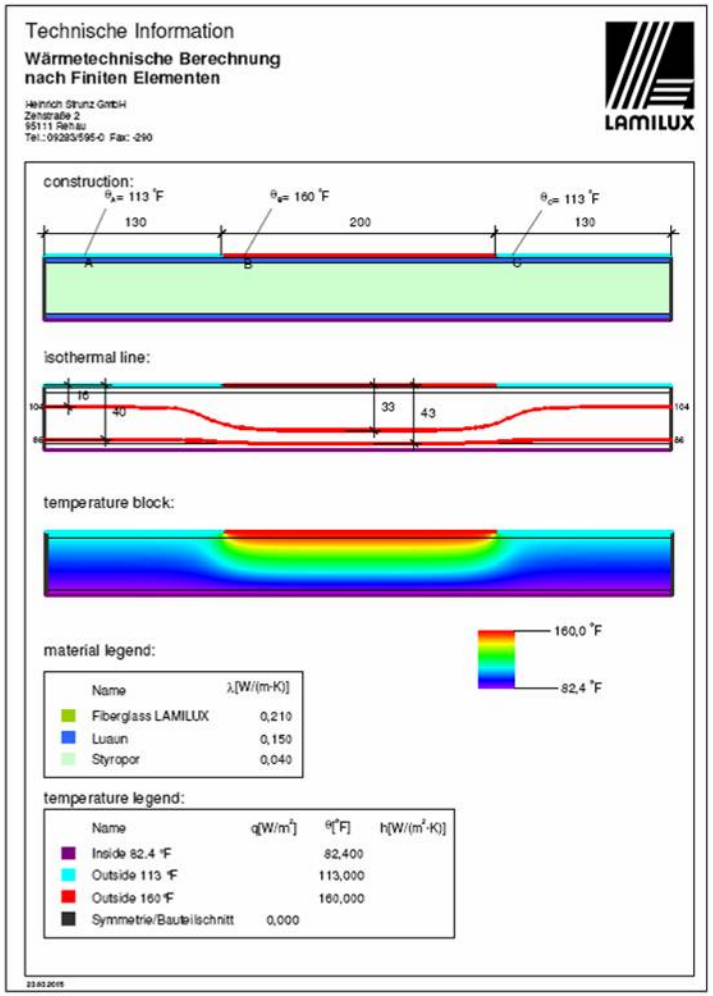


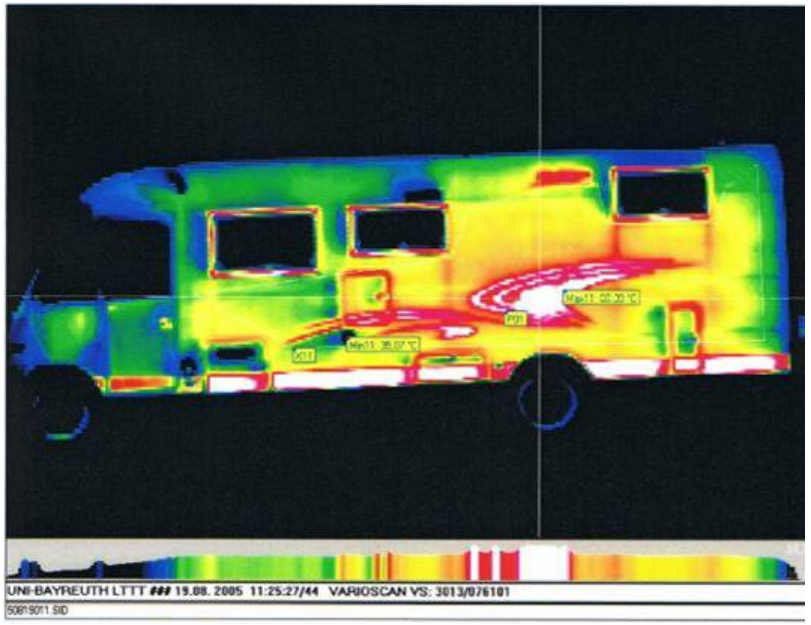
$$\Delta l = \alpha \times l_o \times \Delta T$$

$$\Delta l_{50°C} = 35 \times 10^{-6}\ K^{-1} \times 6000\ mm \times 20\ K = 4.2\ mm$$

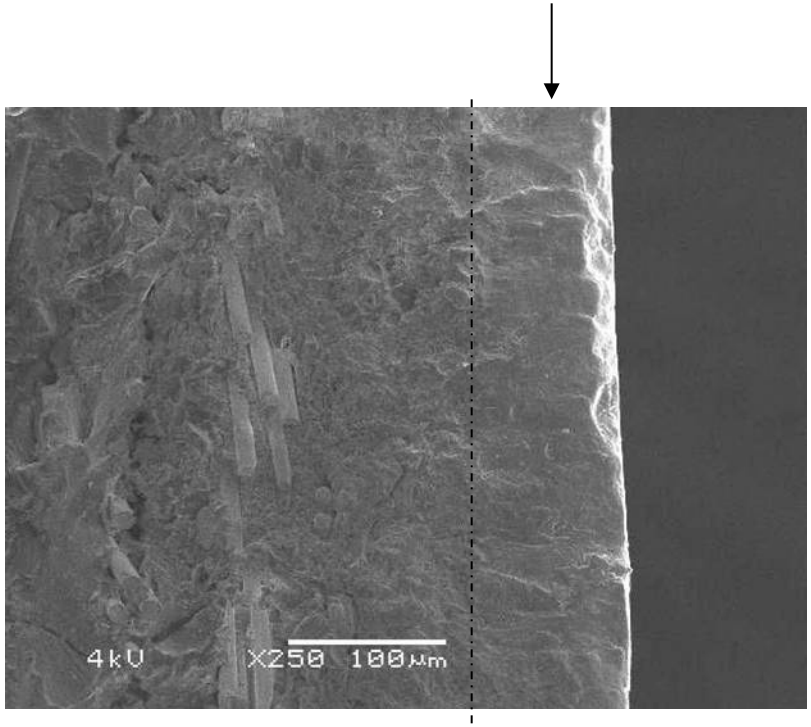
$$\Delta l_{80°C} = 35 \times 10^{-6}\ K^{-1} \times 6000\ mm \times 50\ K = 10.5\ mm$$

Thermography of a side wall





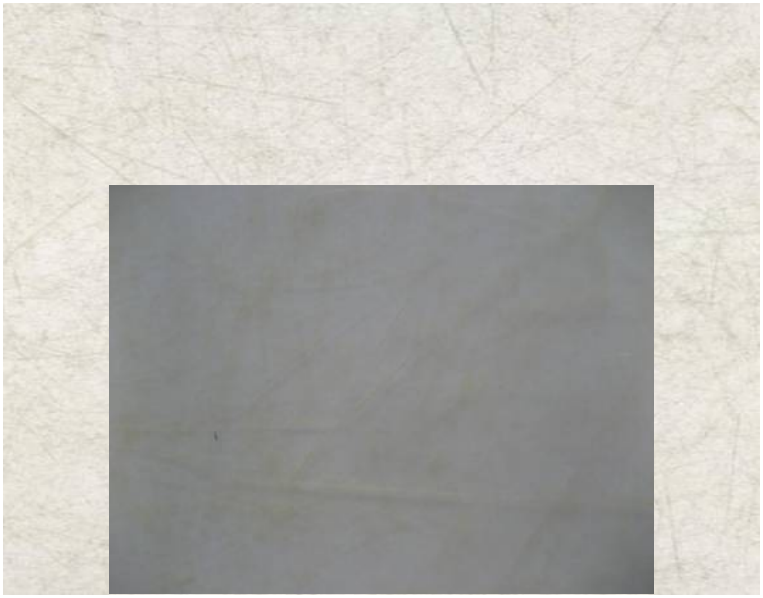
Gel coat as UV protective coating



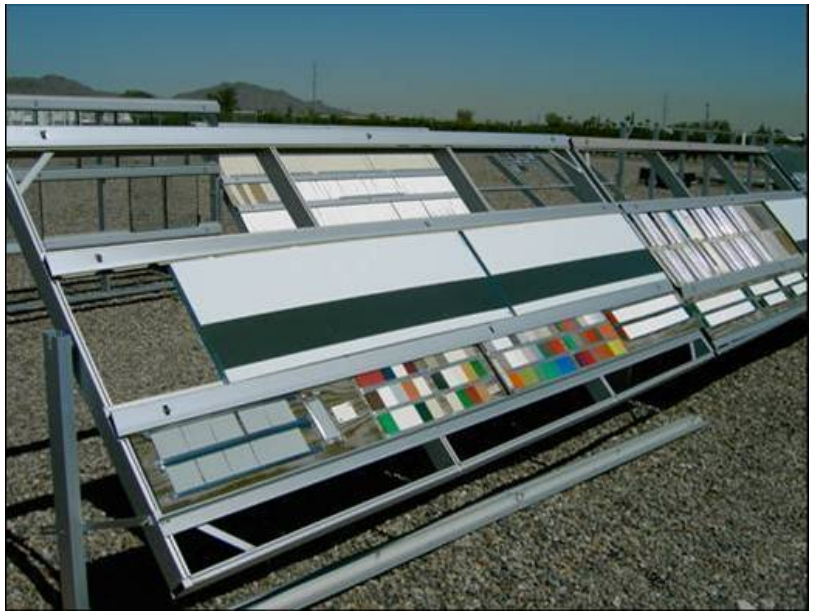
Contrast without / with gel coat

- Without gel coat

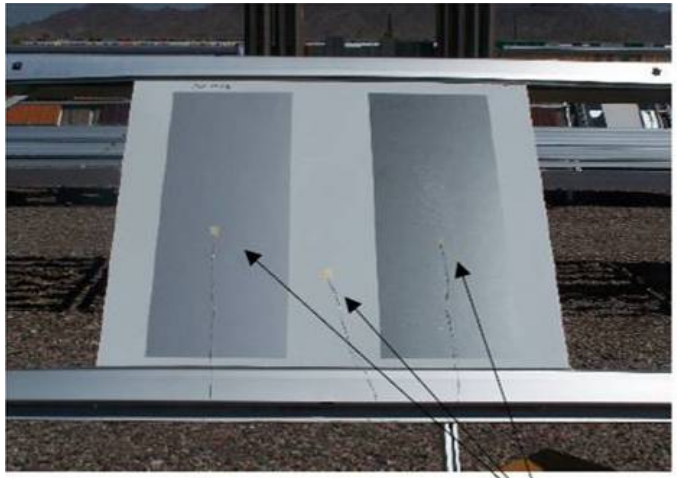
- With gel coat



Outdoor Weathering Tests in Arizona

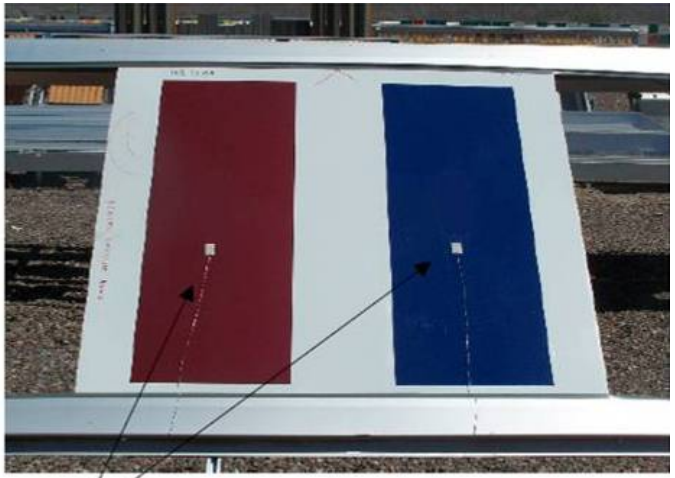


Continuous surface-temperature tests in Arizona

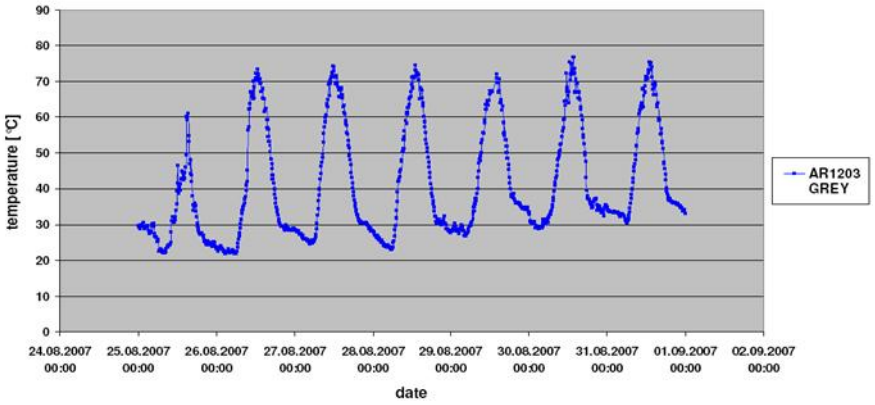


Sample AR 1203

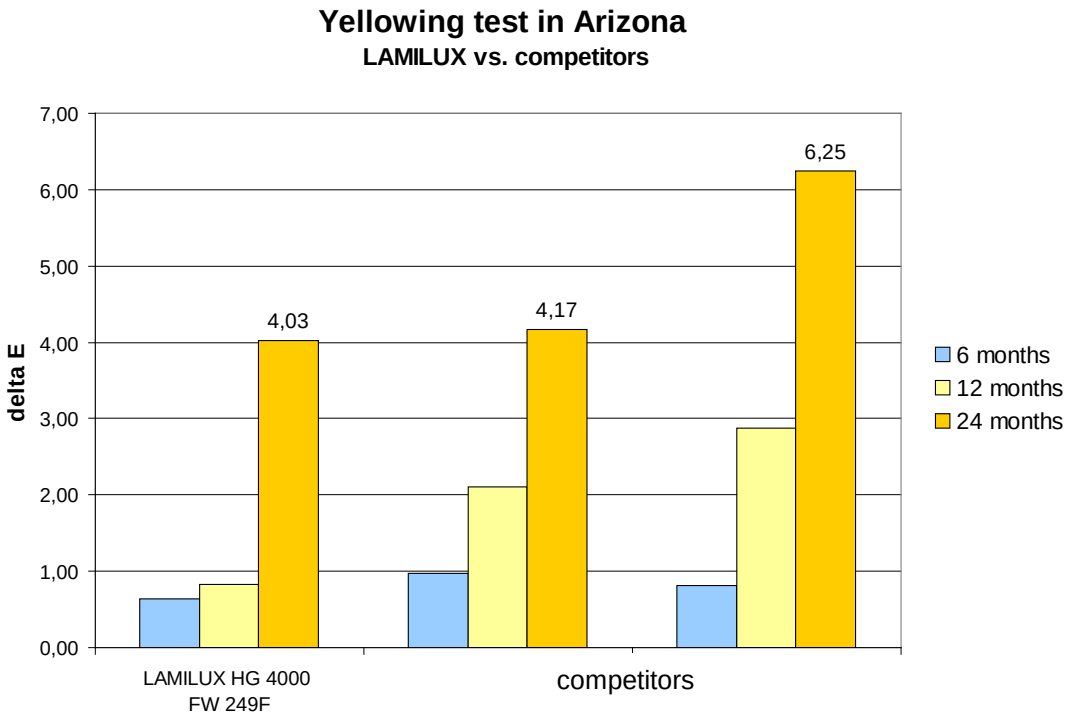
Thermocouples



Sample AR 1204

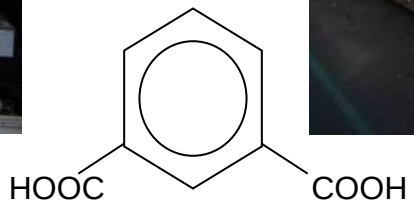


Continuous yellowing tests in Arizona



UV resistance

- LAMILUXplan glass fibre reinforced composite is coated with a gel coat resin based on isophtalic-acid



- LAMILUXplan glass fibre reinforced composites are used for RV-sidewall in USA (Florida, Arizona, California) for more than 10 years without any claims