

Report TAG3-UA-1212-E07

Testing of the transmission and the g-value of a polycarbonate multiwall panel AKYVER 16/7 IR Control Grey

for:

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The results in this report refer to the tested samples. Fraunhofer ISE did not have any influence on the selection of samples.

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1 Description of samples

The following sample was supplied for testing by the client, Kaysersberg Plastics, Kaysersberg:

AKYVER 16/7 IR Control Grey

7-layer grey polycarbonate multiwall panel with external IR-protective layer

Area (external dimensions): 1000 mm x 1005 mm

Total thickness: 16 mm

Date of delivery: 19th October, 2012

Fraunhofer ISE sample ID: KS308002

2 Description of measurement methods

The TestLab Solar Façades has been accredited for testing windows, façades and other products according to DIN EN ISO/IEC 17025:2005 since 2006. The accreditation encompasses the determination of the g value (total solar energy transmittance), transmittance, reflectance and U value by measurement and calculation. The flexible accreditation also includes procedures developed at Fraunhofer ISE which go beyond the state of the art documented in standards. The DAkkS registration number for the accreditation is D-PL-11 140-03-01.

2.1 Description of spectral transmittance measurements for multiwall polycarbonate sample

The spectral normal-hemispherical transmittance of the multiwall polycarbonate panels was measured for near-normal incidence over the spectral range from app. 370 nm to app. 1980 nm with a Tec5 diode array spectrometer and an integrating sphere. The integrating sphere has a diameter of 650 mm and is coated with PTFE.

The spectral normal-hemispherical transmittance of all samples was also measured using a Perkin-Elmer Lambda-900 spectrometer and a 220 mm integrating sphere also coated with PTFE. These spectra were used to complete the spectra described above to cover the range from 280 nm to 2500 nm.

The angle of incidence was 0 ° for the transmittance measurements.

The samples were mounted with the outside layer oriented toward the lamp.

2.2 Description of the calculation procedure

The light and (solar) energy values for the samples were calculated according to EN 410 on the basis of the measured normal-hemispherical transmittance using an EXCEL table which has been validated in house.

2.3 Description of the total solar energy transmittance measurement

The total solar energy transmittance g (solar factor) was determined for the sample with the calorimetric measurement facility GKAL3 with a solar simulator (see Figure 1). The sample was mounted with air-tight sealing material in front of the absorber of the calorimeter. Lateral heat losses were minimised with an insulating frame of polystyrene. The sample was mounted with the partitions oriented vertically.

With a cross-flow ventilator, wind conditions were established on the outer surface of the sample with a wind speed of 3-4 m/s. This corresponds to an external heat coefficient of $h_e = 25 \pm 3 \text{ W/(m}^2\text{K)}$, according to the standard conditions of DIN EN 410.

The distance between the inner surface of the sample and the absorber was chosen such that the internal heat transfer coefficient was $h_i = 7.7 \pm 1 \text{ W/m}^2\text{K}$. This corresponds to the standard conditions according to DIN EN 410.

The absorber surface temperature (internal temperature for the measurement) and the air temperature in the measurement chamber (external temperature) was about 25 °C.

The measurement was done with normally incident radiation (angle of incidence 0°). The irradiance level on the sample was about 530 W/m².

Depending on the position of the lamps, the light from our solar simulator has a divergence of 3°-12°. The lamps were set up such that the resulting divergence was as small as possible in the plane in which the tested sample in question would react sensitively to divergent radiation. In the case of venetian blinds, for example, this is the direction perpendicular to the plane which is defined by the incident radiation direction and the axis of the slats.

The spectrum of the incident light – generated by the solar simulator with HMI 4000 lamps – is practically identical to the standard spectrum specified in EN 410. However, the slight mismatch between the two spectra results in a small difference in the solar transmittance of the sample. The measured g value was corrected spectrally by adding this difference in transmittance to the g value (based on the assumption of a small secondary heat gain value).

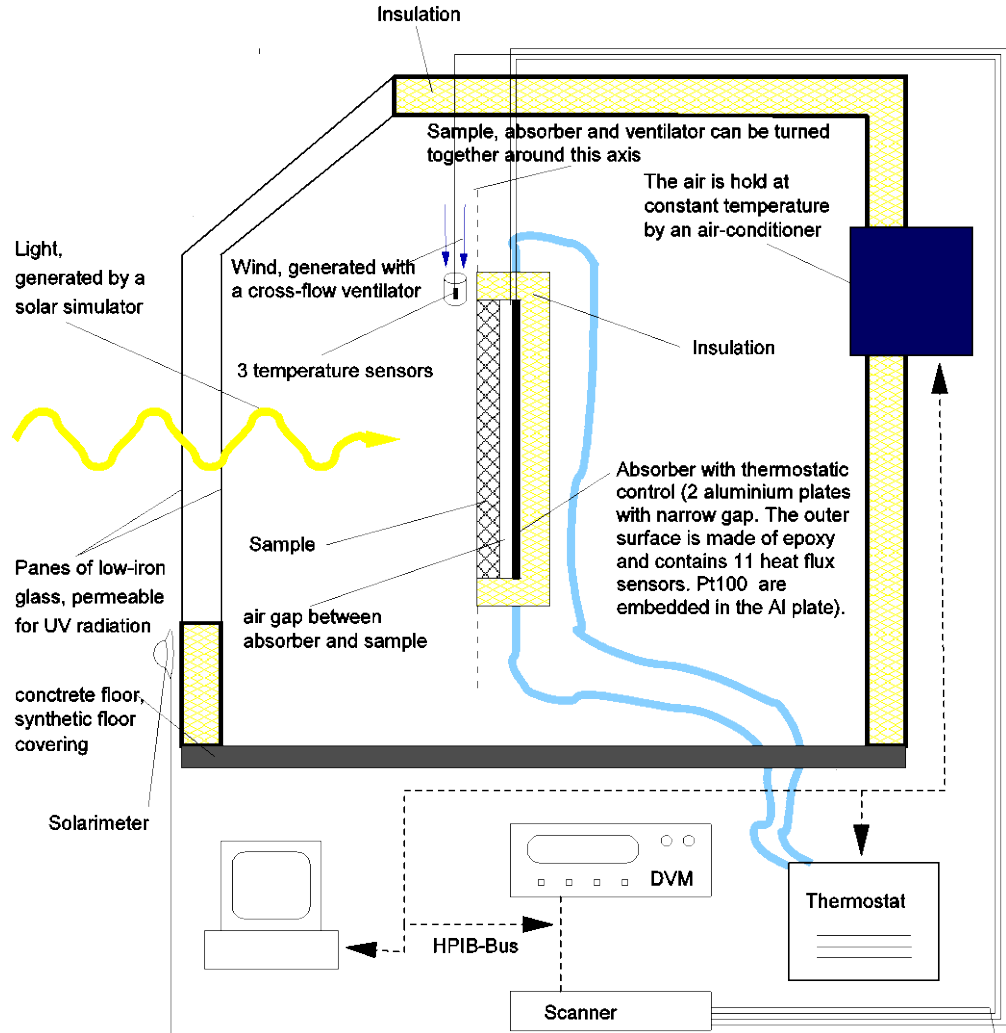


Figure 1

Cross-section through the measurement chamber and the calorimeter.

3 Results

3.1 Results of the transmission measurement

Table 1 Results for normal-hemispherical transmittance according to EN 410. The results apply for normally incident radiation. Three decimal places are used only to indicate small differences between similar values. Only two decimal places are significant.
Sample: Multiwall panel AKYVER 16/7 IR Control Grey (Fraunhofer ISE sample ID: KS308002).
Date of measurements: 25th – 30th October, 2012.

sample ID	normal-hemispherical transmittance according to EN 410 [-]	
	light	direct (solar) radiation
KS308002	0.231	0.247

The total measurement uncertainty for the transmittance measurements without consideration of uncertainty in the wavelength calibration is an absolute value of 0.01. The spectra of these samples is such that we do not expect the measurement uncertainty to be significantly increased if the wavelength calibration is taken into account.

3.2 Spectrum

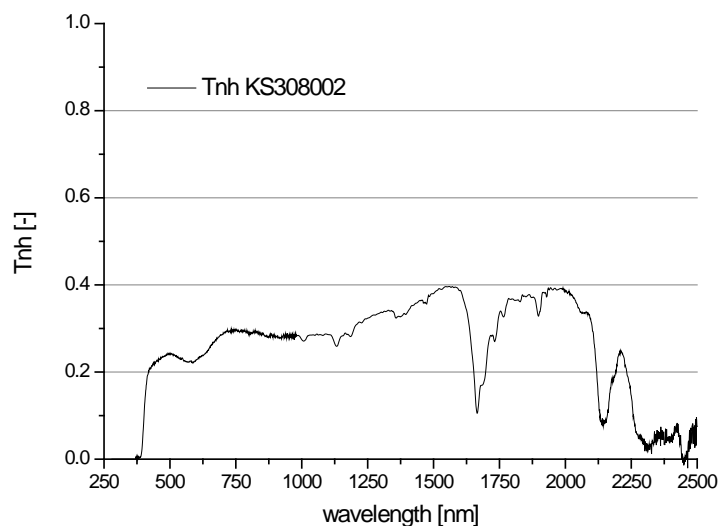


Figure 2 Normal-hemispherical transmittance spectrum of the sample KS308002.

3.3 Results of the g-value measurement

Table 2 Measurement results of the g-value test of the multiwall panel AKYVER 16/7 IR Control Grey
(Fraunhofer ISE sample ID: KS308002).
Date of measurements: 19th – 21st November, 2012.

angle of incidence	irradiance level on the sample	internal temperature	external temperature	g value
0°	ca. 530 W/m ²	25 °C	26 °C	0.36 ± 0.03