

Solar UV radiation test

Customer:

ENSTO

Ensto Building Systems Finland Oy
Porvoo

Target:



Fig. 1. DUT. Cubo S, O, D and Polybox enclosures

- a.** SPCP101006G 100x100x60mm plain sides, cover opaque PC, base opaque PC+10% glass fiber
- b.** SPCP131308T 125x125x75mm plain sides, cover transparent PC, base opaque PC+10% glass fiber
- c.** SPCP182510HG 175x250x100mm plain sides, cover opaque PC, base PC+10% glass fiber
- d.** OPCP203013G 200x300x130mm plain sides, cover opaque PC, base PC+10% glass fiber
- e.** OPCP203013G 200x300x130mm plain sides, cover opaque PC, base PC+10% glass fiber PAINTED with UV protected coating
- f.** DPCP121209G 120x122x86mm plain sides, cover and base opaque PC
- g.** UPCG100806HNLFF 276x257x185mm (10x8x6inch) plain sides, flange mounting, hinged, plastic snap latch, cover and base opaque PC
- h.** UPCT121006HML 326x306x185mm (12x10x6inch) plain sides, mounting lugs, hinged, stainless steel latch, cover transparent PC and base opaque PC

4 pcs per each, two (2) samples for 1000h exposure and two (2) for 2000h exposure.

Testing Time:

21.12.2020 – 18.3.2021

Purpose of the Test:

To test how the samples under test withstand an exposure to solar radiation, heat and high humidity.

Test Method:

Exposure:

Solar radiation exposure 2000h
Continuous irradiation
UV intensity 60 W/m²
Spray cycle 18min in every 120min
Tamb +38 °C
RH50%
Sample rotation, weekly
Test conditions are derived from the ISO 4892-1 and 4892-2 (2013), Method A, cycle 4

Measurements:

Colour DE in every 500 exposure hours

Mechanical tests:

Tensile strength, Charpy impact, flexural modulus

Feasibility of the Test Method:

The test method is not assessed in this context, but it is according to customer requirements.

Performed Actions:

Schematic diagram of test arrangement. The black arrows from the artificial sun shows the direction of the solar radiation.

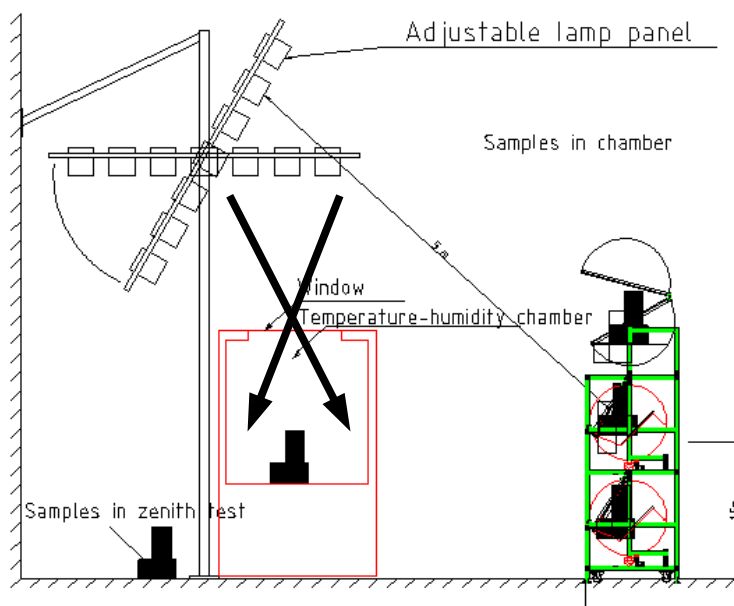


Fig. 2. Schematic diagram of the test arrangement

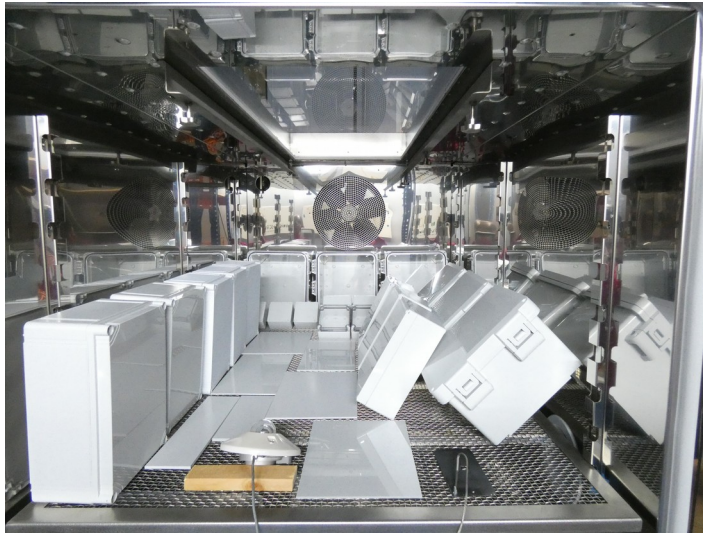


Fig. 3. Test set-up. DUT.

The maximum values of the total solar irradiation (UV+VIS+IR) is measured to be 1100W/m². The UV part of the radiation is 5.5% thus the UV radiation intensity is 61 W/m² ± 5 W/m². (Fig. 5) The sample rotation performed weekly. Reverse osmosis water was used to perform spray cycle.

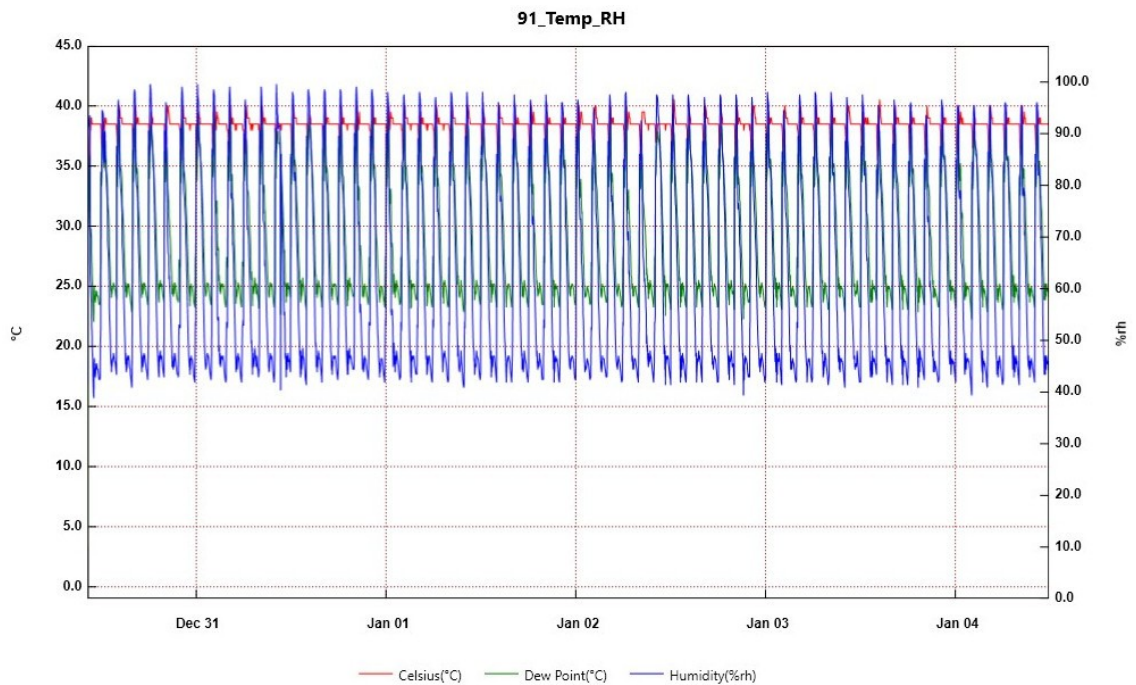


Fig. 4. Measured exposure condition.

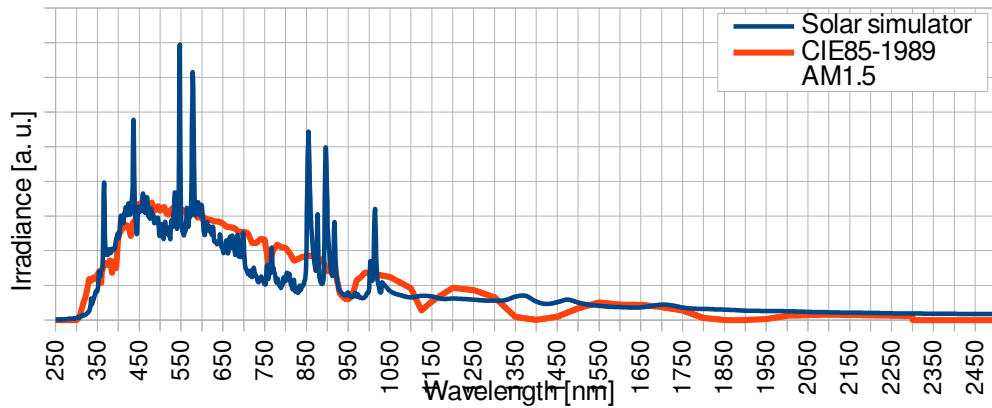


Fig. 5. The spectrum of SSF42-Artificial-Sun (blue).

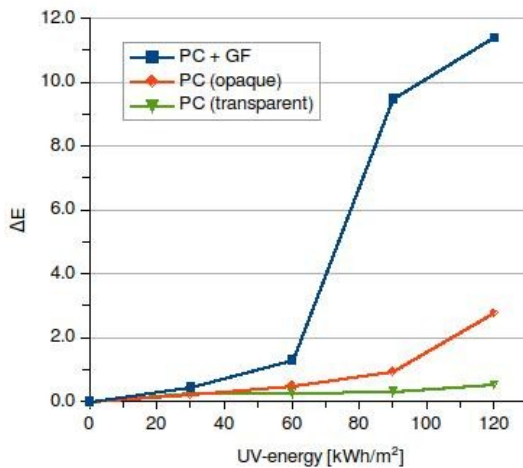


Fig. 6. Colour change during testing. X-axis value 60 kWh/m² corresponds 1000 exposure hours and 120 corresponds 2000 exposure hours. Under ideal viewing conditions a DE value of 1 represents a just perceptible colour difference to the human eye. However, the human eye sees differently colour differences in different colours. The differences in darker colours are more perceptible to the eye. The colour of transparent sample (PC transparent) was measured on white paper placed under the sample.



Fig. 7. The sample code (e.g. G) and exposure hours (e.g. 1000h) behind the samples at the top.

Used Equipment:

SSF42-2004-Artificial-Sun: No. 20
Solar Tester: No. 80
Solar irradiation: No. 25_Precision pyranometer, calibrated 21.5.2019. Calibration is valid.
Temperature: No. 91_Datalogger, calibrated 4.2.2021. Calibration is valid.
Relative humidity: No. 91_Datalogger, calibrated 4.2.2021. Calibration is valid.
Colour: No. 70, calibration is made before every measurement session. Calibration is valid.

Analysis:

The mechanical tests – tensile strength (ref. EN ISO 527-2), charpy impact (ref. EN ISO 179-1) and flexural modulus (ref. EN ISO 178) – have been performed by Eurofins Expert Services Oy. Report no EUFI29-21001051-T2 dated 1st June, 2021.

Conclusions:

The samples **passed** the tests. The yellowing of PC+GF material can be seen with the naked eye. The visual appearance of the other materials remained almost unchanged.

Remarks:

Information on the test samples and mechanical test results has been obtained from the customer.

Signatures:

Littoinen, Finland

3rd June 2021

Hannu Suokivi

[Solar Simulator Finland](http://www.solarsimulator.com)

