PV Fact Sheet

08 | Weather- and UV-resistant markers for PV installations

What is important when it comes to mandatory markers and stickers for the PV system?

Photovoltaic installations today are designed for a lifetime of more than 30 years. PV modules, which today have a warranty of up to 25 years, show strong robustness over time. This means that any additional components must also be highly robust. This white paper evaluates the lifetime of markers and stickers used in PV installations following IEC 62548:2016, which describes the need for UV-resistant marking in PV installations.

UV resistance according to ISO 4892-2

The irradiation energy generated by the sun varies depending on the location on the earth and the season of the year. For example, the amount of irradiation is in Central Europe 1.000 kWh/m²a (per square meter per year) and about 2.350 kWh/m²a for the Sahara.

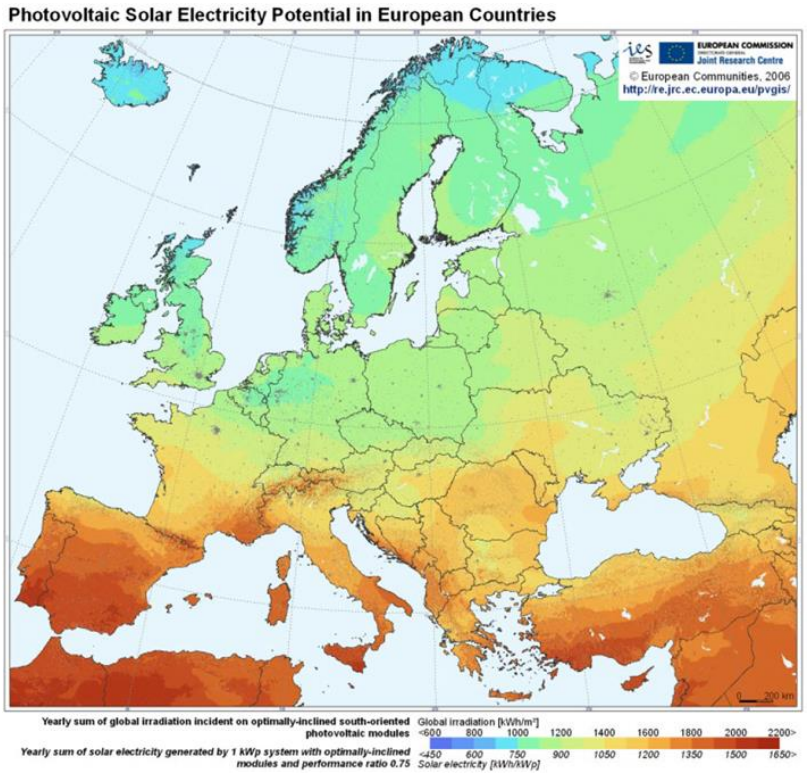

Figure 1: Potential of solar irradiation in Europe

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To evaluate the robustness of markers and stickers, ISO 4892-2 contains a test procedure with the following parameters: Irradiance 0.35 W/m² at 340 nm wavelength over 1000 h; with cycles of 102 minutes light on and 18 minutes light on with water spray. This equals a total irradiation of 350 W/m². The test utilises 100% UV irradiation. The irradiation of the sun itself only contains less than 10% UV irradiation.

Knowing the irradiation values in each location and knowing the total irradiation of 350 W/m² of the ISO 4892-2 test, we can now calculate the expected lifetime for specific locations.

Region	**Sun Irradiation**	**Calculated Lifetime**
Central EU	1 kWh/m²a => 11.4 W/m² (UV)	30 years
South EU	2 kWh/m²a => 23.0 W/m² (UV)	15 years
Sahara	2.5 kWh/m² => 28.5 W/m² (UV)	12 years

Testing at Weidmüller

Weidmüller follows the test procedures defined in ISO 4892-2:2013-03. Considering that the lifetime expectation of PV installations is more than 30 years today, Weidmüller increased the test time from 1000 h to 5000 h. This leads to the following calculated lifetimes.

Region	**Sun Irradiation**	**Calculated Lifetime**
Central EU	1 kWh/m²a => 11.4 W/m² (UV)	150 years
South EU	2 kWh/m²a => 23.0 W/m² (UV)	75 years
Sahara	2.5 kWh/m² => 28.5 W/m² (UV)	60 years

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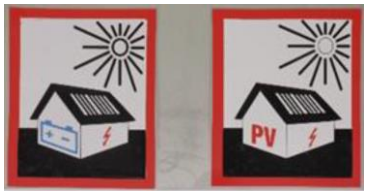
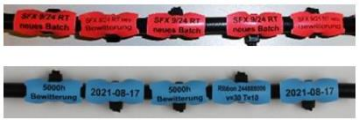
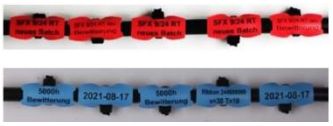
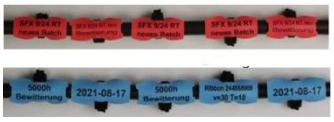
After all the theory, let's look at the results after 3000 and 5000 hours of testing for a few articles.

Article	Original	After 3000 hours	After 5000 hours
TABPACK PV 90/100 WFF 2817460000			
THM PV 89/60 B/DR RT with imprint 2817450000			
THM PV EL 90 GE 30M with imprint 2817440000			
SFX-VT 9/24 MM RT and BL with imprint 2799310000 2799320000			

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The test results show that, even after 5000 hours, all products are still legible. The yellow colour of the THM PV EL 90 GE 30M absorbs more UV radiation; therefore, the sticker is more strongly affected by the water and UV irradiation.

The result: after a theoretical lifetime of 60 years in Sahara - thus more than a lifetime of a PV installation - the markers still exist and can be read.

One final question might arise: What about the adhesive power of the markers? This is determined by the shear strength, the peel strength and the starting adhesion and is designed and tested by Weidmüller for the respective area of application. You'll find detailed information in the respective data sheet.

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