



## **Solar energy...**

**Solar technology in endurance testing**

# Solar & Photovoltaic Systems – Environmental Testing ...

## ... we are your partner

Energy generated by the sun (solar energy) is considered forward looking and progressive.

For this reason, a large number of companies is now working in the field of manufacturing products for the use of solar energy.

The aim of environmental testing is to examine the suitability and service life of these products for their future use subject to the influence of temperature, air humidity, light, etc.

Tests tailored to this objective are used both in the framework of type approval and in quality control accompanying the production process.

Laboratory testing has to be able to provide reliable statements within a period of time which should be as short as possible.

An acceleration of the effects of the ambient influences which occur during the use of the products is required (acceleration). In this context, the reproducibility of the results achieved has the highest priority.



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# ... according to IEC 61215 and IEC 61646

Testing of photovoltaic modules is described in the following standards:

- **IEC 61215**

Terrestrial crystalline silicon photovoltaic (PV) modules, type suitability and type approval

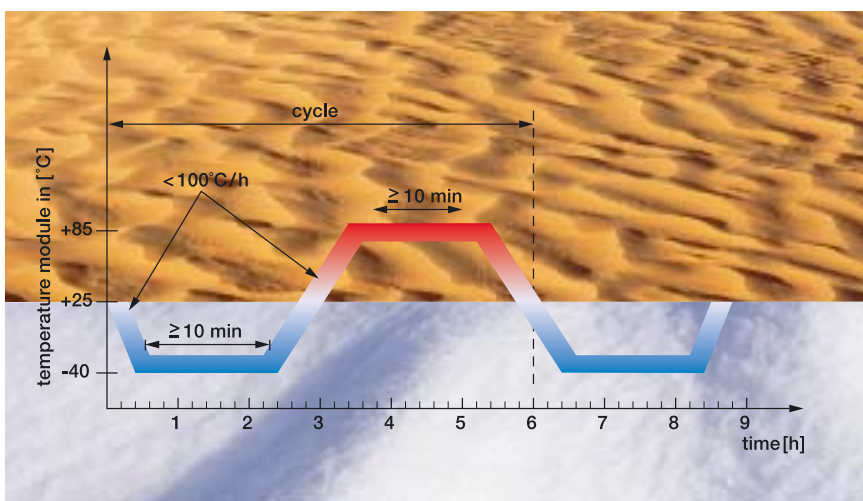
- **IEC 61646**

Terrestrial thin-film photovoltaic (PV) modules, type suitability and type approval

Both standards comprise different processes for testing of the suitability of the design; however, they have identical temperature and humidity testing procedures.

## Climatic testing for PV modules:

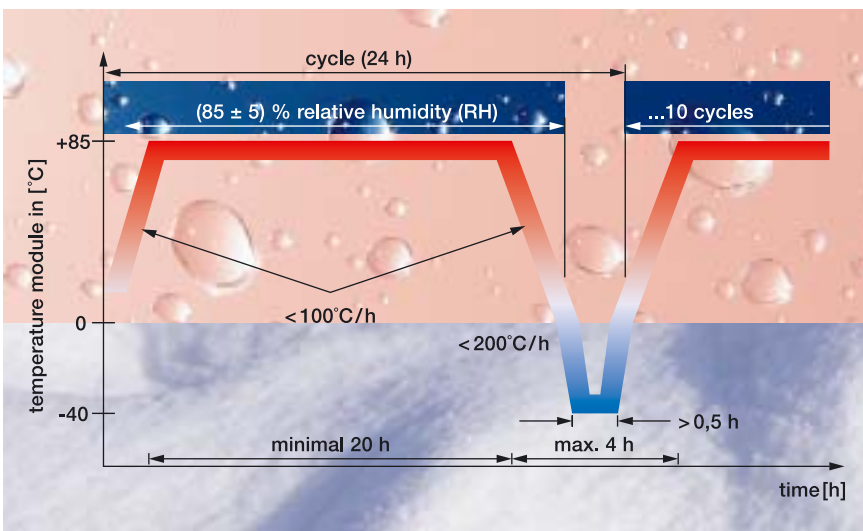
### Temperature shock cycling test (10.11)



### Solar simulation on PV modules

- Determination of the maximum output
- Determination of the temperature coefficients
- Measurement of the nominal operating cell temperature
- Performance under standard testing conditions STC\*)
- Performance at NOCT\*\*)
- Hot spot endurance test
- UV test – pre-treatment of the PV module with ultraviolet (UV) radiation before the thermal shock load and the humidity freezing testing.  
Required source of radiation: UV radiation source within the range of 280 to 385 nm and at max. 250 W/m<sup>2</sup>
- Light treatment (only under IEC 61646)  
Required source of radiation: Solar simulator with 800 to 1000 W/m<sup>2</sup>

### Humidity freezing test (10.12)



### Damp heat test (10.13)

This test is a long-term test with the following intensity:  
Test temperature: 85 °C ± 2 K  
Relative air humidity: 85 % r.h. ± 5 % r.h.  
Duration of testing: 1000 hours

Moreover, light testing with UV irradiation and solar simulation are described in these standards.

\*) Efficiencies  
Standard Test Conditions

\*\*) Nominal operating cell temperature

# Instrument Engineering Implementation ...



## Climate test chamber Type WK-2600/40

Test space volume 2.6 m<sup>3</sup>  
Test space dimensions  
W x D x H: 2000 x 1150 x 1150 mm

## Test chambers with an extra-wide test space

This series is characterized by its compact and modular design.

Several basic versions are available as temperature conditioning and climate versions with test space volumes of 2.6 and 3.4 m<sup>3</sup> and a temperature range of between -70 °C to +180 °C. Dimensions and outputs can be adjusted to the customers requirements if needed.

Test systems with a double-winged door allow easy access to many small PV modules.

The test systems comply with the mentioned standards for PV modules:

- temperature shock cycling test
- humidity freezing test
- damp heat test

In the temperature range of +10 °C to +90 °C, a relative humidity of 10 to 98 % can be achieved.

Temperature change rates from 100 °C/h to 200 °C/h can be realised.

With our control and feedback control system SIMCON/32\*-NET, the temperature of the PV modules can be measured by assigning up to 4 movable temperature sensors.

## ... with Test Chambers



### Test chambers with an extra-high test space

The test chambers with the vertical design also have a compact and modular design. There are several basic versions available.

Test chambers are available for test space volumes between 1.5 and 3.1 m<sup>3</sup> and temperature range from -70 °C to +180 °C for temperature test chambers or climate test chambers.

Tall test systems (vertical test space) are especially suitable for large PV modules.

These walk-in versions are not only compact but also enable easy handling of your PV modules.



### Climate test chamber Type WK-2200/70

Test space volume 2.2 m<sup>3</sup>  
Test space dimensions  
W x D x H: 1100 x 2150 x 950 mm

### Climate test chamber Type WK-3100/60

Test space volume 3.1 m<sup>3</sup>  
Test space dimensions  
W x D x H: 1100 x 1325 x 2100 mm





## ... with Walk-in Test Chambers



Our walk-in test chambers can be adjusted to our customers requirements highly individually in terms of their dimensions and their performance.

The large test chambers can be assembled on site made from pre-fabricated modules (test chamber), temperature conditioning, climatic equipment and control unit.

As an alternative, test chambers are available of a compact design which are manufactured as complete units, tested and commissioned, including functional testing and trial operation, within our factory.

They are delivered as one unit which is ready for connection to the media – i.e. **“ready for plug-in”**.

Walk-in test chambers can be equipped with special facilities for solar simulation testing.

### Climate test chamber Type WK-4.1’/60

Test space volume 4.1 m<sup>3</sup>  
Test space dimensions  
W x D x H: 1200 x 1500 x 2300 mm

### Climate test chamber Type WK-15’/40

Test space volume 15.0 m<sup>3</sup>  
Test space dimensions  
W x D x H: 2000 x 3100 x 2400 mm



# ... with Solar Simulation – Climate Test Chambers

## Test chambers of the SC series

### Example: SC 2000 MHG

- Test space volume 3.4 m<sup>3</sup>
- Test space dimensions W x D x H  
2000 x 1150 x 1510 mm
- Irradiation unit  
Type of irradiation 2 x 4 kW  
Metal halide global lamps
- Irradiation intensity  
800 to 1200 W/m<sup>2</sup> with reference  
to the test area, steplessly  
adjustable
- Uniformity ±5 % with reference  
to the test area
- Test area 1700 x 800 mm, at  
a distance of at least 600 mm  
below the ceiling glazing
- Spectral radiation distribution  
Global radiation 280 to  
3000 nm, recommended for  
aging tests
- Basis  
CIE Publ. No. 85 Tab. 4
- Parts  
DIN 75220 Tab. 1 Column 2/4
- Radiation modulation <1 %
- Output stability ±1 %



# Environmental Simulation Technology for Professionals. Test the best . . .



A complete product range for temperature and climate testing is available, with test space volumes of approx. 34 litres to 2160 litres and working ranges of  $-75...+180\text{ }^{\circ}\text{C}$  and 10 ... 98 % r.h. In addition, we also offer an extensive selection of proven test systems for simulating exposure to weather, temperature shock, corrosion and long-term testing for research, development, quality assurance and production.



As one of the leading manufacturers of simulation systems worldwide, Weiss Umwelttechnik offers the entire range of high-quality test equipment: from economical series devices to walk-in systems process-integrated systems built to customer specification.



A high-performance after-sales service ensures the optimal support for our customers and high operational safety of the systems. Decades of experience in the various fields of application and an intensive exchange of information with our customers throughout the world all serve to guarantee good co-operation.

If you value know-how, service and all-round safety, ask Weiss Umwelttechnik.

Further information, technical field offices in Germany, subsidiaries and agencies worldwide can be found at

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