



USE CASE

Mini Cube: ideal for testing photovoltaic modules

Can your module withstand thermal and moisture-related stress?



terraXcube





terraXcube is Eurac Research’s extreme climate simulation center at the NOI Techpark in Bolzano, South Tyrol, Italy. Within its chambers, even the most extreme environmental conditions on our planet can be created. By combining hypobaric and altitude technology with state-of-the-art environmental simulation, we aim to investigate the effects of extreme climate conditions on humans, ecological processes and industrial products. The climate chambers differ in size and equipment and can accommodate people, plants and other living organisms for up to extended periods and have the space to accommodate large machines and products. Each day our team breaks new ground with scientists and industry partners and prepares the path to gain discoveries.

A photovoltaic module is a complex product and consists of several components: photovoltaic cells, glass, wires, frames and metal strings, boxes and plastic sheets, each with different coefficients of thermal expansion. In the Mini Cube, you can expose your photovoltaic module to both repeated or sudden temperature and humidity changes to test ability to withstand thermal stress and penetration of moisture over time. It is possible to test up to ten photovoltaic modules according to the IEC 61215:2021 standard. The test includes a visual and performance check of the photovoltaic modules which is carried out after predetermined cycle intervals or at the end of the cycle series. Checks can be carried out to ascertain whether the front glass has become delaminated or if the junction box is unglued or the frame is deformed.

The electrical performance of a photovoltaic module can be tested in our Mini Cube under simulated icy winter temperatures. In a photovoltaic system, the inverter converts the direct current into an alternating current. When designing the system, it is important to choose the right inverter so that it can withstand the voltage and current peaks generated by the photovoltaic modules in all seasons, especially in winter when low temperatures cause the modules to work at higher voltages. With a power test, it is possible to determine the actual voltage generated at extreme sub-zero temperatures. In the Mini Cube the modules are brought to a predefined stable minimum temperature for a few hours. Each one is then taken to the accredited “Solare PV” laboratory where the characteristic curves are measured and from which the open circuit voltage and the voltage at the maximum power point are extrapolated.

In the “Solare PV” laboratory, electroluminescence tests can also be performed upon request to detect module damage that cannot be seen with the naked eye, such as cell fractures or interruptions in metal conduction strings.

The test in a nutshell:

			
Temperature range	Humidity	Test duration (days/months)	Test development

Measures:

The Mini Cube is located in the laboratories of Eurac Research’s Institute for Renewable Energy in the NOI Techpark. The internal dimensions are: 1.30 m x 1.52 m x 2.20 m (L x W x H). Objects up to a total weight of 300 kg can be tested. The temperature range inside the Mini Cube is -40°C and +90°C (± 1°C in time ± 2°C in space) according to IEC 60068-3-5:2018.

Accredited tests:

Tests accredited by [Accredia](#) according to the following standards:
 CEI EN 60068-2-1:2007, IEC 60068-2-1:2007
 Environmental testing - Cold
 CEI EN 60068-2-2:2008, IEC 60068-2-2:2007
 Environmental testing - Dry heat



LAB N° 1785L



Technical data:

Temperature: -40...+90°C
 Temperature rate of change: 1.7°C/min (-40...+85°C),
 1.7°C/min (+85...-0°C), 1°C/min (+0...-40°C)
 Relative humidity: 20...95%
 Dew Point Range for Continuous Tests: +2...+89°C

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