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The National Renewable Energy Centre of Spain -CENER- is a technology centre specialized in applied research and development as well as in the promotion of renewable energies. CENER is divided into six departments: Wind Energy, Photovoltaic Solar Energy, Solar Thermal Energy, Biomass Energy, Bioclimatic Architecture and Renewable Energy Grid Integration.

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TESTING SERVICES - SOLAR DOMESTIC HOT WATER SYSTEM TESTING TO THE EN 12976 AND ISO 9459-2/5 STANDARDS

INSPECTION OF RELIABILITY AND POWER OUTPUT OF SOLAR SYSTEMS

A complete system test according to EN 12976 includes performance tests, reliability tests and document inspection.

Overheating protection according to EN 12976-2, part 5.2:
The test includes at least 4 days of operation without draw-off and 2 days in a row with total solar irradiation >20 MJ/m^2.

Pressure resistance according to EN 12976-2, part 5.3:
The storage tank and also the collector loop must withstand 1.5 times the maximal operating pressure without deformation or losses.

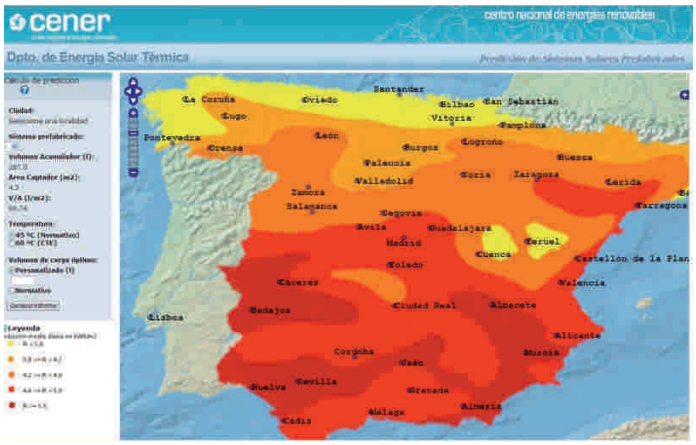
Characterization of thermal output:
The test is performed using the input-output method, or CSTG, following ISO 9459-2, or with the dynamic method, or DST, following ISO 9459-5.

Final inspection:
The test ends with detailed inspection of components and documents (freeze resistance, water contamination, reverse flow protection, safety equipment, lightning protection, labeling, and installer and user document.

THERMAL OUTPUT CHARACTERIZATION

THERMAL OUTPUT CHARACTERIZATION TEST ACCORDING TO ISO 9459-2 (CSTG)

There are three different efficiency tests: one for calculating mixing in the storage tank during draw-off, one for calculating daily system performance, and one for calculating storage tank heat losses. The solar system thermal performance test must be done on days with daily accumulated solar irradiation evenly distributed between 8 and 25 MJ/m^2 and at different internal water storage inlet temperatures.



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THERMAL OUTPUT CHARACTERIZATION TEST ACCORDING TO ISO 9459-5 (DST)

Test sequence with solar input, S-sol

This test includes a number of consecutive test days with significant solar input and consists of 2 different test sequences.

Test sequence with output at low system temperature (Test A)

With 7 draw-offs per day, the draw-off volume depends on system volume and collector area. At least 3 valid days with >12 MJ/m^2 are required.

Test sequence with output at high system temperature (Test B)

With 5 draw-offs per day, with volume depending on the draw-off temperature. At least 3 valid days with >12 or 15 MJ/m2 are required, of which 2 are consecutive.

Store-loss test sequence, S-storage

This test requires 2 consecutive draw-off days following the Test B sequence, then with the system shaded for 36 to 48 hrs until final draw-off.

Test sequence S-aux, for systems with integrated auxiliary heater

Under low solar irradiation conditions, containing 4 days with draw-off and shaded as in Test B and electrical heating at specified times.

LONG-TERM PREDICTION

After characterization of the solar system, the annual system output is calculated for different load volumes at reference locations.

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