Climatic Loads for Thermal Flat Plate Collectors

INFO SHEET No. 01

Description	This info sheet presents a selection of climatic loads for thermal flat plate collectors for different climatic regions as measured in the framework of the projects *Speed*Coll (2011-2015) and *Speed*Coll2 (2016-ongoing).
Publication date	October 2017
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Funding	German Federal Ministry for Economic Affairs and Energy BMWi (Fkz.: 0325865 A+B)
Download & further information	www.speedcoll2.de

Outdoor Exposition Sites

For a thorough investigation of the weather resistance of solar thermal materials and the analysis of micro and macro climatic degradation factors, profound knowledge of realistic outdoor conditions is needed. In *Speed*Coll and *Speed*Coll2, outdoor data are measured around the world in the Negev desert (arid) in Israel, on Gran Canaria (maritime), on the Zugspitze in the German Alps (alpine), in Kochi, India (tropical) and in Freiburg and Stuttgart – two reference test sites for moderate climate in Germany.

Figure 1: Geographical location of the outdoor exposition sites within the *Speed*Coll projects

Next to meteorological data like temperature, solar irradiation or relative humidity that are recorded every minute, wind and snow loads, stress through soiling or atmospheric corrosion and collector specific data are in the centre of our investigation. In addition, we also measure temperatures on the absorber surface or in defined spots in the adhesive joints of *Speed*Coll's collector samples.

This kind of data acquisition allows the detection of weak spots and the development of qualification procedures for solar collectors for the respective climatic conditions.

The left histogram in figure 2 shows the frequency distributions of the ambient temperatures for one year of exposition at the test sites of the project. The highest temperature is shown for the Negev desert in Israel (see blue line).

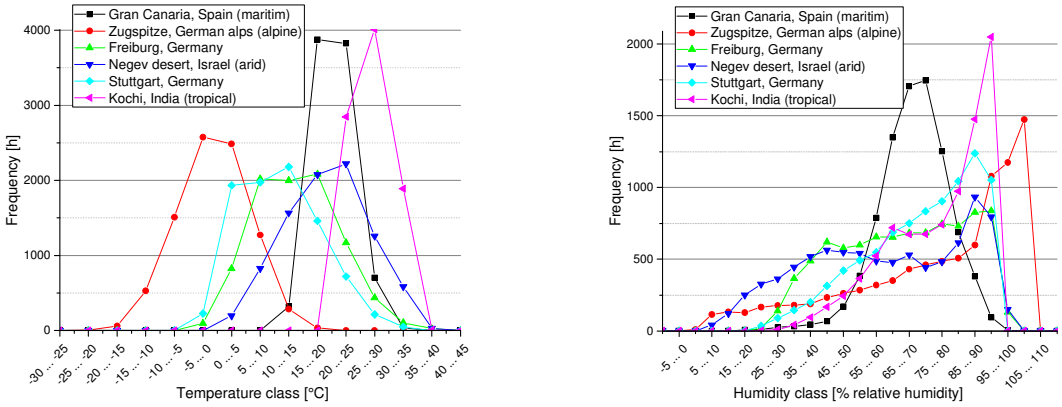

Figure 2: Meteorological parameters: frequency distributions of the ambient temperature (left) and relative humidity (right) at the different exposure sites

The frequency distributions of the relative humidity (RH) show significant differences between the individual test sites. Significantly high values were detected at the Zugspitze in the German Alps and in Kochi in India. Lower values were shown in the Negev desert in Israel. Gran Canaria, the Spanish island with maritime climate, registered the highest frequency for RH values around 70%. Freiburg and Stuttgart, the reference climates for Central Europe, show similar histograms for RH.

Stress Profiles for Flat Plate Collectors

The acquired data were used as a basis for the definition of stress profiles, typically rendered as multidimensional frequency distributions. Stress profiles allow conclusions about the effects of combined stress factors such as UV irradiance, relative humidity, temperature or corrosiveness on the tested samples for the definition of adequate accelerated tests in the laboratory. Figure 3 shows frequency distributions of temperatures used for time transformation functions as a basis for accelerated indoor tests.

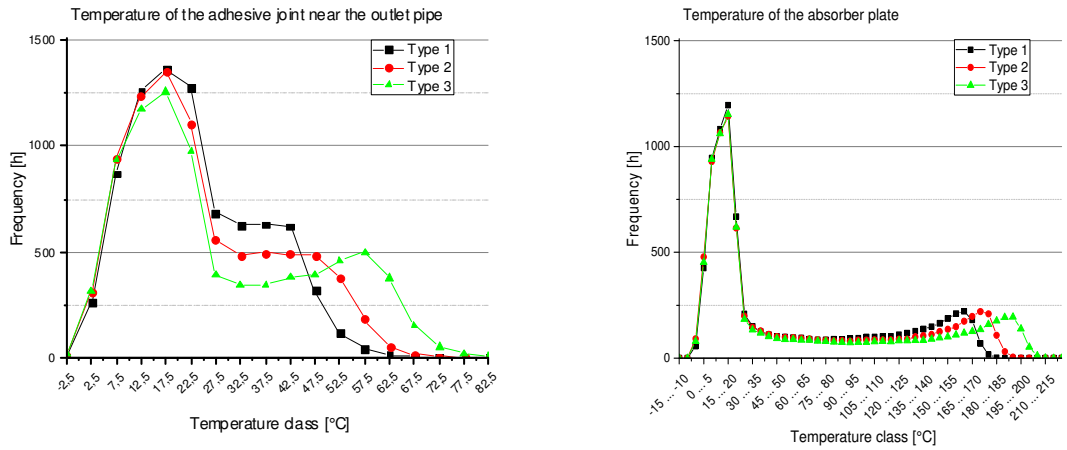

Figure 3: Frequency distributions of the temperatures of the adhesive joints (left) and absorber plates (right) at the Negev desert exposure site for three different collector types (manufacturers)