



Seminar - PCMs4Buildings

PCMs: Thermophysical characterization and buildings' applications

Thermal regulation of photovoltaic modules using thermal energy storage units with PCMs

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Framework

High operating temperatures reduce the performance of commercial polycrystalline silicon photovoltaic (PV) devices by reducing the efficiency of solar to electrical energy conversion in the PV cells.

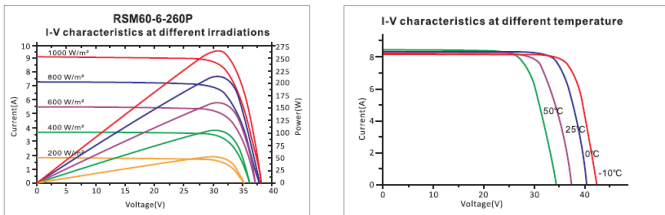
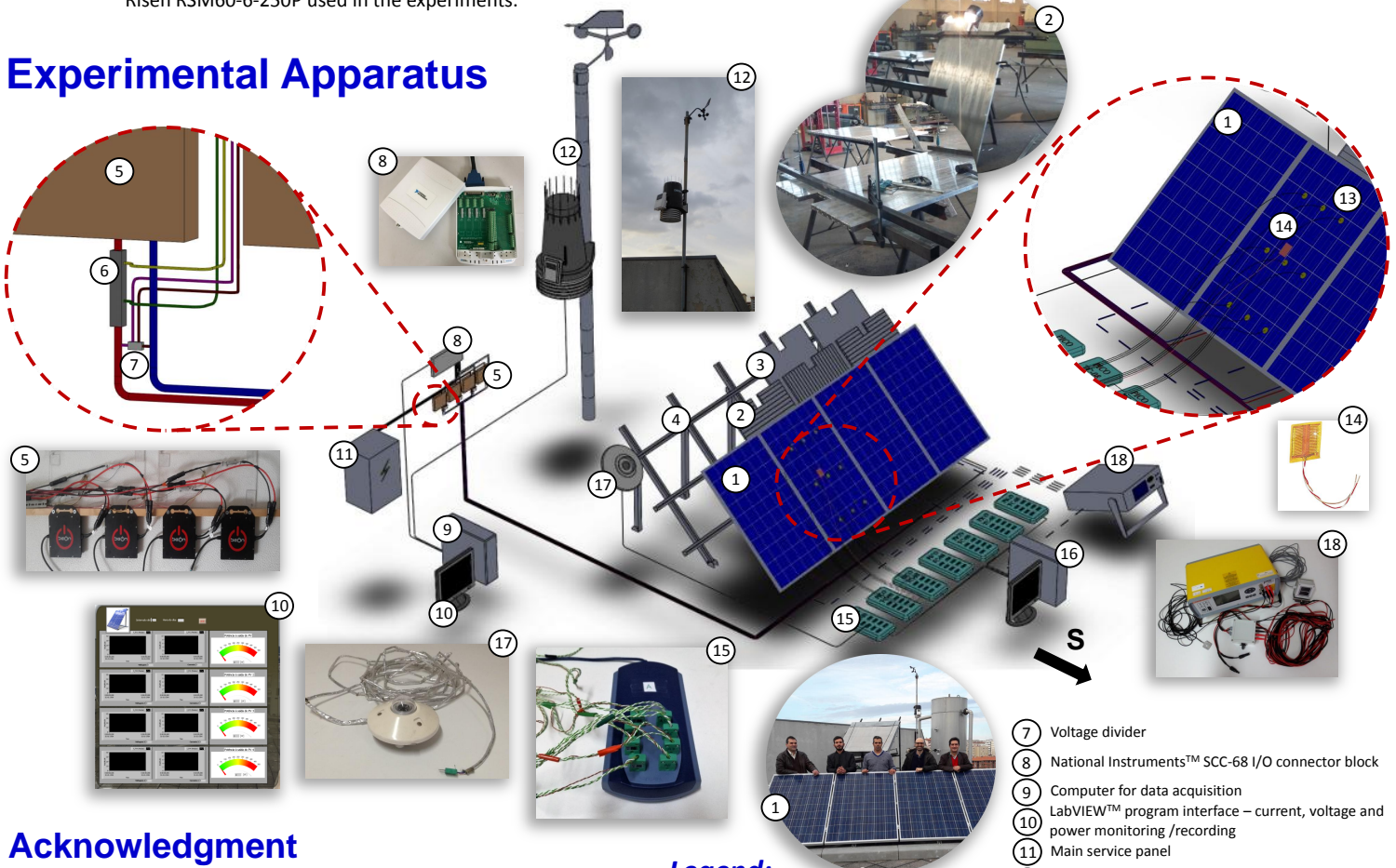


Figure 1 – Key features of the high performance polycrystalline module Risen RSM60-6-250P used in the experiments.

Major Goals

- To develop a real-scale experimental apparatus to evaluate the performance improvement of PV/PCM systems incorporating thermal energy storage (TES) units filled with free-form PCMs. The TES units are intended to control the temperature rise in the PV cells;
- To carry out an experimental parametric study to evaluate the influence of different configurations of the TES unit (horizontally and vertically oriented cavities) and the impact of different phase-change temperature ranges of the PCM – the PCMs RT22HC, RT25HC and RT28HC from RUBITHERM® will be used;
- To provide reliable experimental results for numerical validation purposes.

Experimental Apparatus



Acknowledgment

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Legend:

- 1 Risen RSM60-6-250P PV modules
- 2 Mobile TES units filled with PCMs
- 3 Mobile heat dissipation module
- 4 Support system
- 5 DC/AC microinverter BeOn
- 6 Shunt resistor
- 7 Voltage divider
- 8 National Instruments™ SCC-68 I/O connector block
- 9 Computer for data acquisition LabVIEW™ program interface – current, voltage and power monitoring /recording
- 10 Main service panel
- 11 Davis Instruments Vantage Pro2™ weather station
- 12 Thermocouples (K-type)
- 13 OMEGA™ flexible heat flux sensor HFS-4
- 14 Pico® USB TC-08 thermocouple data logger
- 15 PicoLog® data acquisition program
- 16 Kipp&Zonen CM11 pyranometer
- 17 PVPMT2540C mobile peak power and I-V-curve measurement device for PV modules

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