Example name: Citrin Solar

Template completed by:
Spanish BISTS Network
stefan.remke@solcess.com

For installations

BISTS Location:
Böhmerwaldstr. 32, 85368 Moosburg, Germany
11°56’38,94” E, 48°28’57,13” N
Climate Type:
Cfb
Building Use:
Commercial, Manufacturing facility for solar collectors

Level of BISTS integration
Rush: level 3
Reijenga: 2/3
x New Build
O Refurbishment
O Other: ……………………

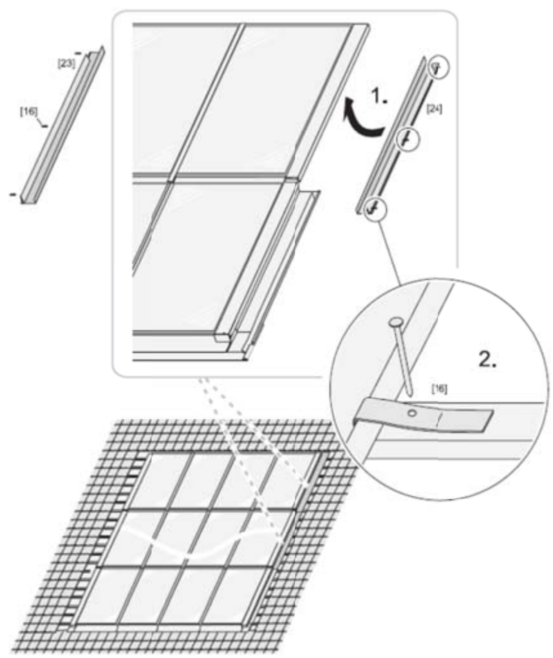
Type of BISTS:

Active

Function(s):
O Air heating
x Water heating
O Combi-system
O Cooling/ventilation/shading
O PV/T
O linked to another system (e.g., heat pump)
O Other: ……………………….

Building element:

x Facade
x Roof
O Other: ……………………..



BISTS characteristics:

The collector system is a commercial product for roof application. In this example it was used as a demonstration in a facade application. The installation consists of a 70 collectors with 1.849m² (absorber) each = 129.43m². The facade is oriented 17.5° W.

Stage of Development:		**Responsible:**
O	Idea/Patent	…………………………………..
O	Prototype	…………………………………..
x	Demonstration	Citrin Solar GmbH (for facade application)
x	Integral building element	Citrin Solar GmbH ..…………..
x	Commercially available	Citrin Solar GmbH (for roof application)

BISTS description and context

The BISTS is a collector field of CS 300 M modules from Citrin Solar GmbH Moosburg/Germany. The aim of the installation is to provide solar energy for the 3,000m^2 floor heating of the building. The solar energy that comes from the facade and an additional on-roof collector field of 66.5 m^2 (absorber) @∠60°, 17.5°W is stored in a 17,000 l tank. The facade was chosen for collector installation in order to maximize winter yield and avoid overheating in summer. The floor heating is covered with a thick concrete layer of the floor plate which serves as an additional energy storage. Auxiliary heat is provided by a 200 kW wood chip boiler.

The installation is prepared to deliver heat to adjacent buildings.

System viability

Máximum Energy consumption of the building according to German EnEV: 774,529 kWh/a
Real Energy consumption (2010): 275,166 kWh/a

Solar Energy (2010): 70.000 kWh/a
Auxiliary Energy (2010): 205,166 kWh/a

Module price: 320 EUR/m^2
Frame and accessories: 106 EUR/m^2 (roof) 76 EUR/m^2 (Facade)

Modelling and simulation tools developed/used

Simulation with Polysun Designer. Results available from Citrin Solar.

BISTS Performance data

Based on:
O Estimation
O Detailed simulation
O Measurement/testing
x Long-term monitoring

Performance parameters

For separate collectors:
performance rating coefficients -

Reference area: Absorber
η_0 – 0.789
a_1 – 4.19 W/m²K
a_2 – 0.0099 W/m²K²
K_{50} – 0.93

Casing material: Aluminum
Insulation material: Mineral wool
Insulation thickness: 30mm

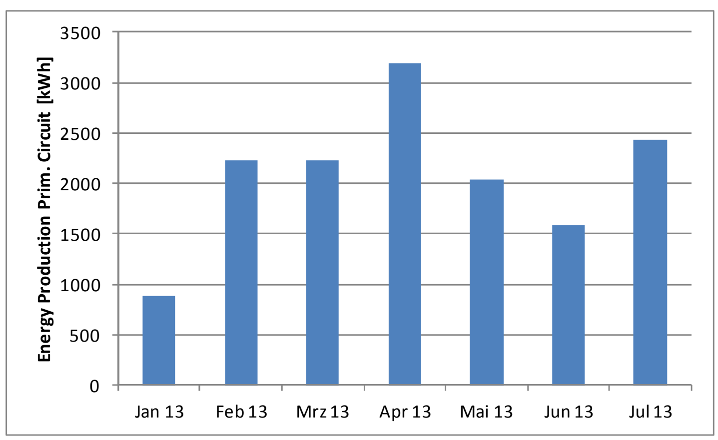
Solar Keymark No. 011-7S425 F

Total Solar Energy production (facade + on roof):
70.000 kWh/a (=357kWh/m²/a)

Detailed monitoring data since 2010/11 with a 4min interval available from Citrin Solar on:

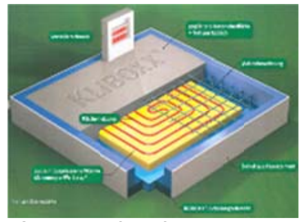
On Roof field, primary + secondary circuit, Temp. (T), Energies (E)
Facade, primary + secondary circuit, T, E
Heating circuits, T, E
Boiler, T, E
Room heating zones, T, E
Storage tank, T
Discharge, , T, E
Whether data
Direct heating adjacent building, , T, E
heating adjacent building from buffer, , T, E
DHW, , T, E

Example: Energy production Facade collectors



Additional information:





Floor heating under construction / Solar storage tank 17.000 l / Structure of the floor plate

Sources and references:

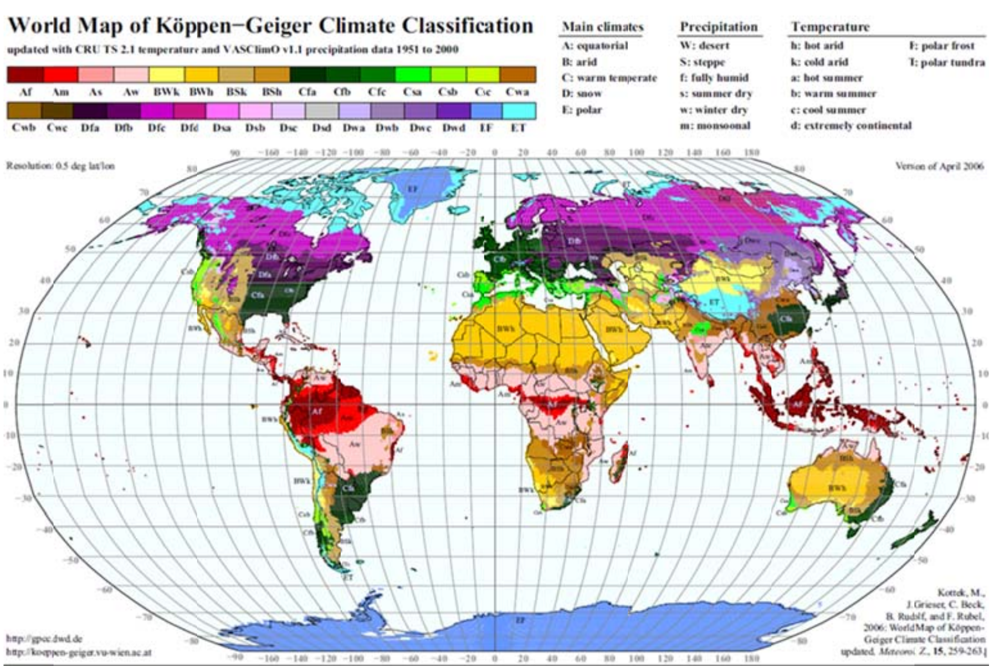
Photos: Citrin Solar GmbH
Performance Data: EN 12975-2:2006 Test Report No. C978PEN, SPF, Rapperswill

INSTRUCTIONS

Please fill in as much information as possible.
Tick where appropriate.
Text in red is suggested guidance. Insert information in provided space, removing red text as appropriate
If possible, use metric values.
If necessary, supply additional information on separate sheets

<u>Reference listing</u>

Köppen climate classification



(Kottek, M., J. Grieser, C. Beck, B. Rudolf, and F. Rubel, 2006: World Map of Köppen-Geiger Climate Classification updated. Meteorol. Z., 15, 259-263.)

Reijenga classification
The integration of PV systems in architecture can be divided into five categories:

1. Applied invisibly
2. Added to the design
3. Adding to the architectural image
4. Determining architectural image
5. Leading to new architectural concepts.

(Reijenga, TH and Kaan, HF. (2011) PV in Architecture, in Handbook of Photovoltaic Science and Engineering, Second Edition (eds A. Luque and S. Hegedus), John Wiley & Sons Ltd, Chichester, UK)

Rush classification
The architectural/visual expression of building services systems are identified as:

Level 1. Not visible, no change
Level 2. Visible, no change
Level 3. Visible, surface change
Level 4. Visible, with size or shape change
Level 5. Visible, with location or orientation change

(Rush, RD. (1986) The Building systems integration handbook Wiley, New York, USA)

Collector test standards

BS EN 12975-2 2006 'Thermal solar systems and components solar collectors - Part 2 test methods'
ASHRAE Standard 93-2010 'Methods of Testing to Determine the Thermal Performance of Solar Collectors'
ASHRAE Standard 95-1987 'Methods of Testing to Determine the Thermal Performance of Solar Domestic Water Heating Systems'