TwinSolar®: PV- and Thermo- Solarmodul in ONE

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The TwinSolar® Technology allows upgrading any PV-module with a thermal collector

1) General Information

PV -Front Site

Thermo-Back Side

The TwinSolar™ is a standardized PV Hybrid-Module, using serial solar panels proven in many years of operation. The PV-panels are extended whit a thermal collector, placed on the back side of the panel – see pictures left. The Twinsolar - in operation since 5 years - is simple, robust and economical.

The main Twinsolar™ APPLICATION is the realization of electrically AND thermal energy plants:

- for PV-production of electrically energy using the PV-panel;
- for production of thermal energy necessary for tap-water during summer and heating during winter, using the thermal panel-part.

The DOUBLE USE of your roof surface allows:

- INCREASING of the energy production from the roof surface and
- MAXIMAZING of the benefits from the PV installation;
- REDUCING of the specifically COSTS during the installation, operation and service of the plant.

The COST-EFFICEINCY Twinsolar™ is based on:

- REDUCING of the installation time, this time is only 20% higher as the installation of PV-panels, because of the one connector technique of the hydraulic part of the Twinsolar™
- the efficiency of the PV-part of the panel during the summer season increases up to 20% because of the “cooling” of the solar panels circulation of the cooling liquid.

2) Technical Characteristics of TwinSolar® PVT-22-2.0

Technical Characteristics	
Cell	Polycrystalline Si solar cells
No. of Cells & Connections	60 in series with bypass diodes
Dimensions (LxWxH)	1640 x 994 x 46 mm
Weight (PV + Thermal)	21 kg + 8 kg
Type of Output Terminal	Lead Wire with MC Connector
Cooling water connection	G ¼

Ambient Conditions	
Parameter	Rating
Operating Temp.	-30 … +85 °C
Storage Temp.	-40 … +85 °C
Storage Humidity	up to 90 %

Electrical Characteristics PV		
Parameter	Symbol	Typical
Open Circuit Voltage	V_{oc}	36.8 V
Maximum Power Voltage	V_{mp}	29.4 V
Short Circuit Current	I_{sc}	8 A
Maximum Power Current	I_{mp}	7.5 A
Nominal Power	P_m	220 W (± 3%)
Module Efficiency	η_m	13.5 %
Maximum System Voltage	V_{max}	1000 V

Temperature Coefficients PV	
α P_m T-coef. Power	- 0.43 $^{\%}/_{°C}$
α I_{sc} T-coef. Current	+ 0.05 $^{\%}/_{°C}$
α V_{oc} T-coef. Voltage	- 0.35 $^{\%}/_{°C}$

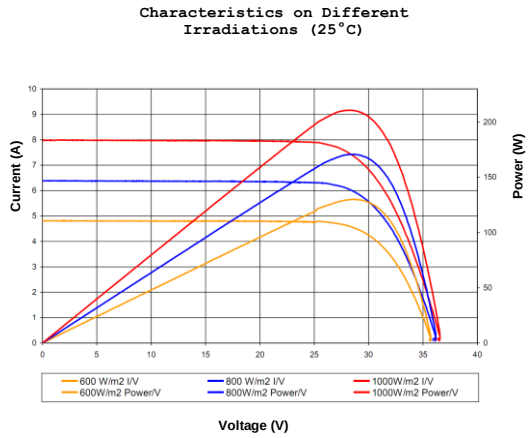
Thermal Characteristics Th-Part*			
Parameter	Symbol	1 module	5 modules in series
Thermal Power*	**P_{th}**	**600 W ***	**3000 W ***
Dyn. Pressure	P_r	0.15 bar at 1.2 $^{ltr}/_{min}$	0.8 bar at 1.2 $^{ltr}/_{min}$
Test-Pressure	P_t	10 bar	
Flow-rate range	V_F	0.1 $^{ltr}/_{min}$ to 2 $^{ltr}/_{min}$	
Cooling Liquid Water / Glycol	Cl	60 % / 40 % (-30 °C)	

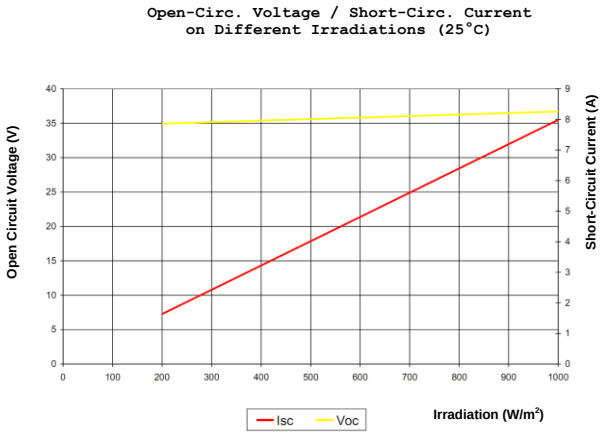
*Data Sheet Conditions::

Ambient Temperature Ta = 25°C; solar Irradiation = 1 kW/m^2 AM 1.5, wind speed 3m/s, gape between the ptched roof and panel = 10 cm; Temperature Difference Td between ambient Temperature Ta and cooling liquid Temperature Tc is equal to Td = 5°C

2.1. PV-Characteristics TwinSolar® PVT-22-2

The characteristics of the PV-Part is equivalent whit the parameters of the source PV-panel. The integration of the thermal part INCREASES the power output of the PV-panel during high environment temperatures Ta and activated thermal part up to 20%. The lifetime of the PV-panel INCREASES, because of the reduction of the medium temperature Tm of the panel during operation.





2.2. Thermal Characteristics of TwinSolar® PVT-22-2.

The thermal output power of the panel decreases if the cooling medium T° (Tc) get hotter and the difference Td between medium temperature Tc and ambient temperature Ta increases: Td = Tc – Ta.

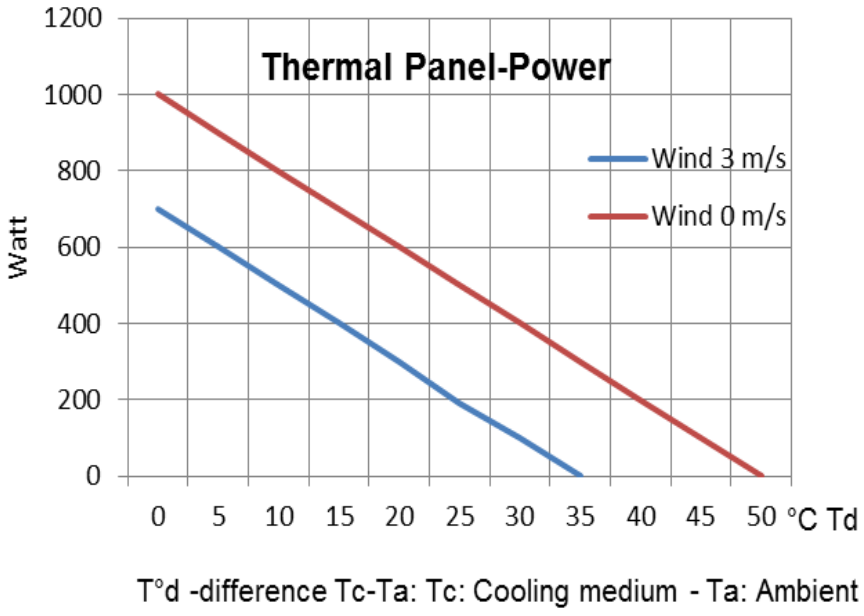


Fig.: Panel Power

2.3. Calculation of the thermal power output (example)

The Calculation of the thermal power uses the Table “Panel-Power” (see page 3).

Conditions for the Calculations:
Ta ambient Ta = 30°C Irradiation = 1000 W/m^2 Wind = 0 m/s
5xTwinsolar Panel serial connected to a string.

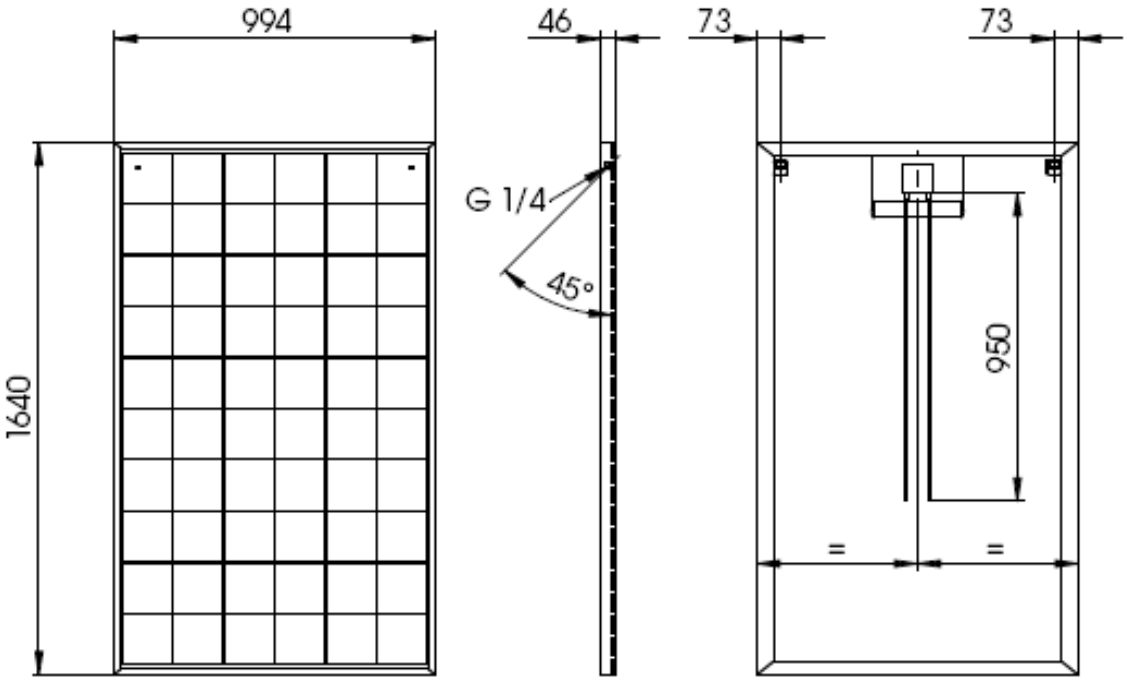
a) Input T°: first Panel Tc1 = 30°C
   Td1 = Tc1(30°C) – Ta(30°C) = 0°C
   from Fig. “Panel Power”: Panel Power1 Pp1 = 1000W

b) Output T°: last Panel Tc5 = 55°C
   Td = Tc5(55°C)- Ta(30°C)=25°C
   from Fig. “Panel Power”: Panel Power Pp5 = 400W

c) Medium panel power: Ptm = 0.5*(400W+1000W)= 700W

d) RESULT: Thermal string power**:** Pths = 5*Ptm = 3500 W

3) TwinSolar® PVT-22-2.0 Dimensions (all dimensions in mm)



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