





Certifi. EN 12975 - 2 ISO 9806 -1, ISO 9806 -2 Photovoltaic thermal hybrid solar collectors, also known as hybrid PV/T systems or PVT, is a system that converts solar radiation into thermal and electrical energy. These systems combine a photovoltaic cell, which converts electromagnetic radiation (photons) into electricity, with a solar thermal collector, which captures the remaining energy and removes waste heat from the PV module. Photovoltaic (PV) cells suffer from a drop in efficiency with the rise in temperature due to increased resistance. Such systems can be engineered to carry heat away from the PV cells thereby cooling the cells and thus improving their efficiency by lowering resistance.

The result is a cool working PV panel with higher efficiency and longer life time due to the elimination of decay of Si and the production of hot water that can be used for residential, commercial or industrial applications.

The **TESZEUS PV-T** Photovoltaic-Thermal Hybrid Solar Collector can be combined with normal thermosyphon systems or can be installed in split type installations or multi panel arrays for high electrical and thermal energy capacity demands.

#### **PV Paradox**

Photovoltaics(PV) are semi-conductors and operate in a paradox - they need sunlight to generate electricity but suffer a degradation in performance as they get hotter.



Figure Performance vs. Temperature of PV-T and PV panels of 250Watt peak output

**PV-T** stands for **Photovoltaic-Thermal**. Generates both electricity and usable thermal heat at the same time from one panel. These systems combine a photovoltaic cell, which converts electromagnetic radiation (photons) into electricity, with a solar thermal collector, which captures the remaining energy and removes waste heat from the PV module.

#### **PV-T TECHNOLOGY VS PV TECHNOLOGY**



The electricity flows into an inverter for use in the building or export to the grid as per a standard PV configuration. The temperature is regulated via a control sensor and the coolant is transferred using a pump to a heat exchanger which heats water in a storage tank for use in the DHW and heating systems.

- Dual solar collection 2 usable energy outputs with one collection system.
- Improved PV generation up to 50% more electricity than an equivalent conventional PV system with same peak output.
- Lower installation cost than an equivalent performance system comprised of a separate Solar PV and Solar thermal systems.
- Less roof space required than equivalent system comprised of a separate Solar PV and Solar thermal systems. In North Europe this equates to approx 12m<sup>2</sup> of PV-T panels compared to 17m<sup>2</sup> of combined separate systems (12m<sup>2</sup> PV and 5m<sup>2</sup> solar thermal for 200L of hot water).
- · Hybrid PV-T System's ROI (Return on Investment) is shorter than standard PV systems due to higher electrical yield and off-set heating costs.
- Lifetime of PV cells is lengthened because cell operating temperature is reduced.

## Specifications of TESZEUS® PV-T Photovoltaic-Thermal Hybrid Solar Collector

## Polycrystalline PV-T Hybrid Collector

TESZEUS 240P		
External Dimensions (mm)	1650 x 992 x 50	
Thermal Absorber material	Copper/Aluminum	
Peak power (pm)	240W	
Open Circuit (Voc)	37.00V	
Short Circuit (Isc)	8.54A	
Maximum Power Voltage (Vmp)	30.20V	
Maximum Power Current (Imp)	7.95A	
Cell efficiency	16.75%	
Panel efficiency	14.60%	
Loss Factor Pmax [%/K]	0.40%	
Working Temperature	-40°C TO +85°C	
Tolerance	±3%	

TESZEUS 280P		
External Dimensions (mm)	1956 x 992 x 50	
Thermal Absorber material	Copper/Aluminum	
Peak power (pm)	280W	
Open Circuit (Voc)	44.30V	
Short Circuit (Isc)	8.40A	
Maximum Power Voltage (Vmp)	36.10V	
Maximum Power Current (Imp)	7.76A	
Cell efficiency	16.00%	
Panel efficiency	14.46%	
Loss Factor Pmax [%/K]	0.40%	
Working Temperature	-40°C TO +85°C	
Tolerance	±3%	

# Monocrystalline PV-T Hybrid Collector

TESZEUS 250M		
External Dimensions (mm)	1650 x 992 x 50	
Thermal Absorber material	Copper/Aluminum	
Peak power (pm)	250W	
Open Circuit (Voc)	36.50V	
Short Circuit (Isc)	9.51A	
Maximum Power Voltage (Vmp)	29.80V	
Maximum Power Current (Imp)	8.39A	
Cell efficiency	17.36%	
Panel efficiency	16.83%	
Loss Factor Pmax [%/K]	0.40%	
Working Temperature	-40°C TO +85°C	
Tolerance	±3%	

TESZEUS 300M		
External Dimensions (mm)	1956 x 992 x 50	
Thermal Absorber material	Copper/Aluminum	
Peak power (pm)	300W	
Open Circuit (Voc)	37.10V	
Short Circuit (Isc)	8.09A	
Maximum Power Voltage (Vmp)	44.53V	
Maximum Power Current (Imp)	8.90A	
Cell efficiency	17.35%	
Panel efficiency	15.54%	
Loss Factor Pmax [%/K]	0.40%	
Working Temperature	-40°C TO +85°C	
Tolerance	±3%	

### TESZEUS PV-T Thermal Power Output

Peak Power output for G = 1000 W $/m^2$ and u = 0 m/s = 651 W					
Power output per collector unit					
Tm – Ta = 2K	Net irradiance G				
	G = 400 W / m <sup>2</sup>	G = 700 W / m²	G = 1000 W / m <sup>2</sup>		
u = 0.0 m/s	248	448	651		
u = 1.0 m/s	245	438	644		
u = 1.5 m/s	244	441	641		
u = 2.0 m/s	242	438	637		
u = 2.5 m/s	241	436	634		
u = 3.0 m/s	240	429	630		
u = 3.5 m/s	238	432	627		

Certifications: CE, ROHS, IEC 61215:2005, EN 61000-6-1:2007, EN61000-6-3:2007, IEC61730



