

WKE 250PT

Hybrid thermo-photovoltaic system



HYBRID THERMAL PHOTOVOLTAIC MODULE

Double Sun panel is a hybrid thermal photovoltaic module (PVT). It produces electrical energy and thermal energy.

It is built using the application of a heat exchanger on the rear surface (the surface opposite the one receiving solar irradiation) where a fluid flows and heats up due to the heat that the solar radiation transmits to the photovoltaic cells and which is not transformed into electrical energy. A special high density polyurethane thermal insulation protection maximises thermal energy production, making any energy loss due to convection negligible.

ADVANTAGES COMMON TO EVERY APPLICATION

DOUBLE SUN and architectural integration:

Our cooled module is the best and top performing solution available whenever you wish to adopt fully integrated photovoltaic solutions, where the temperature containing function of DOUBLE SUN PVT is carried out directly by the thermal component on the panel.

DOUBLE SUN costs & revenue

The DOUBLE SUN system makes it possible to cut down considerably on plant engineering costs required for the use of geothermal heat pumps, without lowering system performance.

On average, for residential applications, and if there are any feasibility requirements, the cost of geothermal probes is around €15,000, without counting the inconvenience of digging, getting permits, etc. At the same price, with our solution it is possible to install a 3 kW photovoltaic system with integrated heat pump terminals, equal to the geothermal probes.

DOUBLE SUN and snow clearance

Roof temperature control makes it possible to defrost the panels during the winter, providing electrical energy production immediately following snow falls, even when copious.

DOUBLE SUN and the service life of the module

No matter how well a photovoltaic system performs and lasts, it takes operating conditions of lower thermal stress from the cooling system, ensuring improved use of the photovoltaic cells themselves, extending the average service life span.

DOUBLE SUN and natural Cooling

The DOUBLE SUN module, (especially the version with rear insulation) lowers the temperature of the surfaces that it is placed on top of.

A system with these characteristics contributes significantly to reducing the frigories required during the summer season to condition the rooms, especially when they are directly exposed to solar irradiation.



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MAIN APPLICATIONS

DOUBLE SUN hybrid module can produce:

- 1.1. Domestic hot water (DHW);
- 1.2. DHW and heating;
- 1.3. DHW, winter and conditioning;
- 1.4. Cooling of the photovoltaic system

Below there is a more detailed description of the main applications.

1.1. DOUBLE SUN – Domestic hot water production (DHW)

From a thermal point of view, the system operates in the same way as normal systems with solar thermal panels. The special characteristics of the PVT system offer the photovoltaic cells a favourable operating condition, especially in-between seasons and the summer season.

The hot water produced over the eight months of the year with the most irradiation, usually exceeds the requirements of the average family. It is produced at a temperature close to 40°C, making it possible to use it directly without the typical waste due to mixing with cooler water.

Traditional solar thermal panels are subject to a dangerous phenomena known as stagnation, when, during the summer months, the system has no heat load. In these conditions, the heat contained in the collector increases the temperature of the collector itself, especially of the absorber containing fluid at temperatures exceeding 200°C. These high temperatures, in addition to permanently ruining the circulation fluid, lower the average service life of the system.

The DOUBLE SUN system never reaches summer overheating conditions as its temperatures almost never exceed 80°C. Also, the greater surface area of the thermal absorbing system provides markedly superior thermal energy production.

During the more disadvantageous months, any accumulated thermal energy can be used to support traditional production and heating systems such as washing machines, dishwashers, rather than all the other utilities that function better with hot water. The result is a vertical drop in energy consumption by the above house-hold appliances, by as much as 80% of the previous electrical energy consumption.

1.2. DHW production and winter heating

DOUBLE SUN modules connected to heat pumps offer considerable global output and reduced energy consumption, typical of geothermal plants, at costs that are significantly lower than with ground probes.

The best known heat pump application is definitely in the house-hold refrigerator. The system is made up of a small compressor that moves the heat from the inside to the outside of the refrigerator. A cold zone is therefore created inside the enclosure and a hot zone behind the refrigerator.

The special feature of this machine is the fact that it does not make the client pay for the requested amount of energy, but only for the work required to recover this energy to make it available. The miniaturisation of the HEXs, the continuous improvement of their technical performance and the designated workers' growing knowledge of the products, are making it spread rapidly, even in house-hold terms, not only in combination with traditional heating systems, but also and especially as an alternative to them.

For example, with an average COP value of 5, it is possible to have 10 kWh of thermal energy available using the equivalent of 2 kWh of electrical energy. In other words, one can have enough energy to heat a 100 m² apartment consuming only, and therefore paying for, the energy required to feed a simple clothing iron!!!

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MAIN APPLICATIONS

In house-hold terms, the heat pump represents the same level of innovation that the condensing boiler brought ten years ago.

A heat pump combined with a PVT represents, on the other hand, an extraordinarily efficient way to recover heat from RENEWABLE sources with average cost reductions equal to or greater than 60%, compared to the most convenient fossil fuels.

The PVT module carries out the same function as the geothermal probe, by collecting heat from the Sun and outdoor environment rather than from the ground: rain, wind, snow; acting as an air-water exchanger even when there is no irradiation.

Its on position building tops makes it easy to use, very non-invasive.

As it does not have any geothermal probes, it has a considerably greater target of applications and, being possible in almost any zone, all one needs is available roof space.

In terms of performance, the HEX connected to DOUBLE SUN systems represents an absolutely remarkable solution, already making currently emerging technological solutions in the thermodynamic field obsolete, such as the STIRLING technology, as well as the hydrogen boilers which are being used for their first applications, mainly in northern Europe.

1.3. DHW production, winter heating and summer conditioning

The HEXs can work with cycle inversion, also for summer cooling, maintaining all of the advantages offered by traditional technology.

Summer operation involves using the heat pump to discharge the heat drawn from the controlled-temperature room (cooled), through an external heat sink, suitably sized to manage all of the withdrawn energy.

Winter operation and DHW production are the same as described in the paragraph above.

1.4. Cooling for photovoltaic systems. Operating principle

The exchanger applied to the rear surface of the photovoltaic cells makes it possible to maintain their temperature as close as possible to the standard temperature (25°C). This condition makes it possible to achieve the maximum output from the photovoltaic cells, subsequently obtaining the greatest possible electrical production, precisely during the hottest months which are also the months of greatest solar irradiation.

Due to the high surface temperature, traditional photovoltaic panels tend to lose 25-30% of their output during the summer months, penalising electrical production.

A decrease in panel temperature increases electrical output by 5% every 10°C, and therefore any relative state contributions as well.

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DOUBLE SUN AND INDUSTRIAL APPLICATIONS

With industrial and semi-industrial buildings using large amounts of water for hygienic reasons or industrial cycles, the DOUBLE SUN PVT panel can become a more lucrative “Financial partner”.

It takes over 3 tonnes of water to process a tonne of fruit.

To avoid penalising the characteristics of the product, it is necessary to reduce any thermal stress that the product is subject to, to a minimum. This means having water at higher temperatures than the average distribution temperature.

Relaxing treatments of fibres and fabrics is more effective and quicker in liquid solutions, as is product washing. Never carried out at rigid temperatures, nor at excessively high temperatures, which may nonetheless be required in later processes, such as pasteurisation or sterilisation.

USEFUL CONCEPTS FOR DESIGNING THERMAL SYSTEMS

The pros of working with low-temperature systems

Generally speaking, low temperatures lead to increased system efficiency, in terms of dispersion and generation costs. Maintaining a fluid at 90°C, for example, requires more energy than maintaining it at 35°C. For this reason the more knowledgeable engineers try to calibrate home systems so that the temperature is as close as possible to the requirements of the utilities. A “perfect” system, for example, should heat the domestic hot water of the shower directly at the required temperature so as not to require the classic mixing with cold water.

For this reason radiant panel heating systems are currently very popular: the increased exchange surface makes it possible to use lower temperatures and combine them with renewable energy sources.

The DOUBLE SUN PVT module is the ideal partner for renovations, i.e. last generation residential use. With these systems, in fact, the energy required for heating **MUST** be expressed at quite a contained temperature, than compared with traditional solutions.

If they are well-designed, the thermal load that needs to be connected to our panels can have an average operating temperature of around 35°C.

Given the above condition, the DOUBLE SUN PVT module can take over heating functions directly, for a daily time slot of three hours, which is also considerable during the cold months, even without the use of heat pumps. You will quickly discover the advantages in terms of **COSTS**, when you save 50% or more on your power **BILL**.

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DOUBLE MODULE THERMAL-PHOTOVOLTAIC
for the production of electricity, sanitary water
and heating.

Certifications

- IEC61215: 2005, IEC61730-1,
IEC61730-2:2004 + A1:2001

Photovoltaic characteristics

Peak output Pm	250W
Tolerance (%)	± 2,5
MPP voltage Vm (V)	30,03
MPP current Im (A)	8,33
Open Circuit Voltage (Voc)	37,68
Closed Circuit voltage (Isc)	8,81
Max system voltage (VDC)	1000
Module efficiency (%)	15,06
Max surface load	4500 /m ²
Insulation resistance	>100M Ω



MADE IN ITALY



Thermal functional parameters

Instant efficiency absorber area	0,650
Coefficient of linear thermal dispersion	7,500W/(m ² °K)
Thermal coefficient	0,012W / (m ² °K ²)
Angle of incidence 50°, reduced optical efficiency	94%
Thermal peak power	1040 W
Load loss	150 mbar
Maximum operating temperature	80°C
Maximum working temperature	3 bar
Minimum recommended flow	2 lt/m
Weight empty module	31 kg
Module fluid volume	1 lt
Total area	1,66 m ²
Open area	1,60 m ²
Absorption area	1,60 m ²
Tubing diameter for connection	10 x 1,5mm

Operating Characteristics

Voltage Temperature Coefficient (Voc)	-128,4 mV/°C
Power Temperature Coefficient (Pmp)	-1,01 W/°C
Current Temperature Coefficient (Isc)	+4,93 mA/°C
NOCT (Nominal Operating Cell Temperature)	46 °C
Working Temperature Range	-40°C +85°C

