CLEAN ENERGY FOR GENERATIONS

COMBINED MODULE PV-THERM
Innovative solution for a physical problem

The cooler they are, the greater the amount of electricity photovoltaic modules can generate. This presents a problem, particularly when exposed to high temperatures in summer. An increase in the temperature of solar cells by 1 °C reduces performance by up to 0.5 %. This means a reduction in efficiency. It therefore makes sense to cool the modules in order to improve efficiency. And that is exactly the secret of the PV-Therm module: a heat transfer fluid is used for cooling – the performance increases. But there's even more to it: at the same time, heat is recovered during the cooling process that can also be used – for example, for heating water or supporting heat generation.

Award-winning idea from Germany

Experts have often complained that solar thermal energy and photovoltaic applications interfere too strongly with each other to enable power and heat to be efficiently generated from roofs. This provided Willi Bihler with the incentive to develop a combination module for WIOSUN GmbH & Co. KG that effectively combines the two technologies. In 2008 he was awarded the German national prize for excellent innovative services for the craft and trades sector.

BUNDESPREIS
2008
FÜR HERVORRAGENDE
INNOVATORISCHE LEISTUNGEN
FÜR DAS HANDWERK
INTERNATIONALE HANDWERKSMESSE

![Image of solar panels and text]

---

Figs. 1 and 2: Production PV-Therm

Technical Data

- Nominal power: 180 Wp - 190 Wp
- Collector energy output: approx 550 W/m²
- Power tolerance: -0/+3%
- Thermal Properties: Operating temperature: approx -20 °C to 75 °C
- Product warranty: 5 Years
- Collector energy output: approx 550 W/m²
- Thermal Properties: Operating temperature: approx -20 °C to 75 °C
- Collector energy output: approx 550 W/m²
- Power tolerance: -0/+3%
- Product warranty: 5 Years

---

Solar-generated power even in snowy and icy conditions.

Is it possible to obtain abundant amounts of electricity when exposed to snow and ice? Why not?

There are many different uses of PV-Therm particularly in the

- Brine water heating
- Groundwater preheating
- Hot water generation

What is done with the dissipated heat?

- Heat storage in the soil
- Thawing of snow of ice

In combination with a heat pump:

- Increases in annual yields of at least 10 %
- Performance increases of up to 30 %

Electricity as an uncooled PV system.

The PV-Therm combination module successfully combines the

- Energy systems and photovoltaic systems. A heat transfer fluid flows through a steel sump attached

Idle temperature: 75 °C

Power tolerance: -0/+3%

Thermal Properties:

- Collector energy output: approx 550 W/m²
- Power tolerance: -0/+3%
- Product warranty: 5 Years
Two technologies combined in one module

The PV-Therm combination module successfully combines the advantages of two previously separate systems, thermal solar energy systems and photovoltaic systems. A heat transfer fluid for cooling the solar cells flows through a steel sump attached underneath the module. The heat, which would normally impair the efficiency of the modules, helps in this case to save energy and money.

**Technical Data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal power</td>
<td>180 Wp - 190 Wp</td>
</tr>
<tr>
<td>Power tolerance</td>
<td>-0/+3%</td>
</tr>
<tr>
<td>Product warranty</td>
<td>5 Years</td>
</tr>
<tr>
<td>Performance guarantee</td>
<td>90/80% - 10/25 Years</td>
</tr>
</tbody>
</table>

**Thermal Properties**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>approx -20 °C to 75 °C</td>
</tr>
<tr>
<td>Idle temperature</td>
<td>75 °C</td>
</tr>
<tr>
<td>Collector energy output</td>
<td>approx 550 W/m²</td>
</tr>
</tbody>
</table>

**Advantages of use**

- Performance increases of up to 30%
- Increases in annual yields of at least 10%
- Swimming pool heating
- In combination with a heat pump:
  - Heat storage in the soil
  - Groundwater preheating
  - Brine water heating
- Hot water generation
- Support of heating systems
- Thawing of snow of ice
**What is done with the dissipated heat?**

There are many different uses of PV-Therm particularly in the low-temperature range. For example, the resulting heat that is dissipated through the heat exchangers in the combination modules can be used to heat drinking water or for supporting heat generation.

Swimming pool operators also have a distinct advantage with PV-Therm: it generates electricity that is fed into the public grid or credited against an operator's own electricity bills. The pool is heated practically for free.

**What happens when the water stops flowing?**

If the cooling medium (storage tank/swimming pool) has reached its maximum temperature, the solar controller switches off the solar pump. The heat transfer fluid ceases to flow. From that point on, PV-Therm differs substantially from a standard retail solar thermal collector, since this kind of thermal collector heats the still fluid so strongly that it begins to steam in the collector, which in turn strongly affects the lifetime of the fluid. This is not the case with PV-Therm as the stagnation temperature is distinctly lower than 100 °C. The rest of the system generates the same amount of electricity as an uncooled PV system.

**Solar-generated power even in snowy and icy conditions**

Is it possible to obtain abundant amounts of electricity when exposed to snow and ice? Why not? Conventional photovoltaic modules have a problem with snow and ice, but PV-Therm combination modules have no difficulty whatsoever. The sophisticated cooling system in the PV-Therm unit is simply used in this case to heat the modules. With the aid of the solar pump, the cold transfer fluid is pumped from the roof into the storage tank. The storage tank contains water that is warmer than the transfer fluid. The transfer fluid absorbs this heat in the heat exchanger and is pumped back under the modules. The snow thaws, a liquid sliding layer results and the unwanted snow simply slides off. Depending on the snow layer and size of the system, the entire process lasts between one and three hours. The modules are free and can absorb the valuable sunrays again.
German quality standards
All WIOSUN® photovoltaic modules are subject to our strict quality standards. To ensure this, we continually monitor all manufacturers and suppliers worldwide that deliver products to WIOSUN®. All of our 25 year know-how together with selected individual components in premium quality have gone into them. These modules are also particularly suitable for use in hot regions due to their high degree of laminated membrane integration.

Positive-only tolerance
You can count on our quality, because WIOSUN® delivers only modules with positive tolerance up to +4.99 Wp.

Suitable for all snow load regions
The newly developed and strengthened 35 millimetre hollow chamber frame gives our modules extremely high stability – in all weather conditions.

10 year warranty on our products
With the 10 year product warranty on the WIOSUN® module series, as well as a 25 year performance guarantee, WIOSUN® photovoltaic modules are among the most reliably calculable components for efficient PV systems.
PHOTOVOLTAIC MODULE DE-CM Series

General
- Cells: 60 (6x10) monocrystalline
- Frame: Anodized aluminium
- Connection: Plastics, IP65, 3 bypass-diodes
- Connector: MC4 compatible

Electrical Datas (STC*)

<table>
<thead>
<tr>
<th>MODULETYPE</th>
<th>DE-C245M</th>
<th>DE-C250M</th>
<th>DE-C255M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Power</td>
<td>P_{off} Wp</td>
<td>245</td>
<td>250</td>
</tr>
<tr>
<td>MPP-Voltage</td>
<td>U_{off} V</td>
<td>30.10</td>
<td>30.35</td>
</tr>
<tr>
<td>MPP-Current</td>
<td>I_{off} A</td>
<td>8.14</td>
<td>8.24</td>
</tr>
<tr>
<td>Open-circuit voltage</td>
<td>U_{oc} V</td>
<td>37.40</td>
<td>37.88</td>
</tr>
<tr>
<td>Short-circuit current</td>
<td>I_{sc} A</td>
<td>8.59</td>
<td>8.66</td>
</tr>
<tr>
<td>Module efficiency</td>
<td>η%</td>
<td>15.09</td>
<td>15.40</td>
</tr>
<tr>
<td>Cell efficiency</td>
<td>η%</td>
<td>18.43</td>
<td>18.63</td>
</tr>
</tbody>
</table>

Electrical Datas (NOCT**) | DE-C245M | DE-C250M | DE-C255M |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Power</td>
<td>P_{off} Wp</td>
<td>197.85</td>
<td>201.89</td>
</tr>
<tr>
<td>MPP-Voltage</td>
<td>U_{off} V</td>
<td>30.64</td>
<td>30.99</td>
</tr>
<tr>
<td>Open-circuit voltage</td>
<td>U_{oc} V</td>
<td>37.25</td>
<td>37.51</td>
</tr>
<tr>
<td>Short-circuit current</td>
<td>I_{sc} A</td>
<td>6.88</td>
<td>6.94</td>
</tr>
</tbody>
</table>

Temperature coefficients
- Temperature coefficients I_{sc} + 0.04 %/K
- Temperature coefficients U_{oc} − 0.34 %/K
- Temperature coefficients P_{off} − 0.43 %/K
- NOCT 68 °C ± 2 °C

Limits
- System voltage max. 600V/1000V
- Reverse current max. 15 A
- Operating temperature −40 °C to 90 °C
- Maximum load 5400 Pa/m² = 550 kg/m² (75 lbs/ft²)
- Safety class II

Certifications and warranty
- TÜV IEC 61215, IEC 61730, 1703 i.p.
- Product warranty 10 years
- Performance warranty linear 25 years

Mechanical Datas
- Dimensions 1640 x 990 x 35 mm ± 1 mm
- Weight 18 kg | 39.68 lbs

Technical drawing

Packing configuration:
- Modules/Cardboard: 30
- Cardboard/Container: 28
- Modules/Container: 840

All figures are according to DIN EN 50380.
Tolerance at rated power 0 to +4.99 Wp. All other specifications ± 3%.
At a low irradiation intensity of 200 W/m² (AM 1.5, cell temperature 25 °C) 96% of the STC module efficiency will be archived.
* Standard Test conditions (1000 W/m², AM 1.5, cell temperature 25 °C)
** Normal Operating Cell Temperature (800 W/m², AM 1.5, windspeed 1 m/s, ambient temperature 25 °C)
German quality standards
All WIOSUN® photovoltaic modules are subject to our strict quality standards. To ensure this, we continually monitor all manufacturers and suppliers worldwide that deliver products to WIOSUN®. All of our 25 year know-how together with selected individual components in premium quality have gone into them. These modules are also particularly suitable for use in hot regions due to their high degree of laminated membrane integration.

Positive-only tolerance
You can count on our quality, because WIOSUN® delivers only modules with positive tolerance up to +4.99 Wp.

Suitable for all snow load regions
The newly developed and strengthened 35 millimetre hollow chamber frame gives our modules extremely high stability - in all weather conditions.

10 year warranty on our products
With the 10 year product warranty on the WIOSUN® module series, as well as a 25 year performance guarantee, WIOSUN® photovoltaic modules are among the most reliably calculable components for efficient PV systems.
PHOTOVOLTAIC MODULE DE-CP Series

General
- Cells: 60 (6x10) polycrystalline
- Frame: Anodized aluminium
- Connection: Plastics, IP65, 3 bypass-diodes
- Connector: MC4 compatible

Electrical Data (STC*)

<table>
<thead>
<tr>
<th>Module Type</th>
<th>DE-C245P</th>
<th>DE-C250P</th>
<th>DE-C255P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Power</td>
<td>$P_{mpp}$ Wp</td>
<td>245</td>
<td>250</td>
</tr>
<tr>
<td>MPP-Voltage</td>
<td>$U_{mpp}$ V</td>
<td>29.63</td>
<td>29.98</td>
</tr>
<tr>
<td>MPP-Current</td>
<td>$I_{mpp}$ A</td>
<td>8.27</td>
<td>8.34</td>
</tr>
<tr>
<td>Open-circuit voltage</td>
<td>$U_{oc}$ V</td>
<td>37.45</td>
<td>37.54</td>
</tr>
<tr>
<td>Short-circuit current</td>
<td>$I_{sc}$ A</td>
<td>8.78</td>
<td>8.84</td>
</tr>
<tr>
<td>Module efficiency</td>
<td>$\eta$ %</td>
<td>15.09</td>
<td>15.40</td>
</tr>
<tr>
<td>Cell efficiency</td>
<td>$\eta$ %</td>
<td>17.60</td>
<td>17.80</td>
</tr>
</tbody>
</table>

Electrical Data (NOCT**)

<table>
<thead>
<tr>
<th>Module Type</th>
<th>DE-C245P</th>
<th>DE-C250P</th>
<th>DE-C255P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Power</td>
<td>$P_{mpp}$ Wp</td>
<td>196.98</td>
<td>201.00</td>
</tr>
<tr>
<td>MPP-Voltage</td>
<td>$U_{mpp}$ V</td>
<td>29.44</td>
<td>29.79</td>
</tr>
<tr>
<td>Open-circuit voltage</td>
<td>$U_{oc}$ V</td>
<td>36.90</td>
<td>36.99</td>
</tr>
<tr>
<td>Short-circuit current</td>
<td>$I_{sc}$ A</td>
<td>7.02</td>
<td>7.07</td>
</tr>
</tbody>
</table>

Temperature coefficients
- Temperature coefficients $I_{sc}$: +0.05 %/K
- Temperature coefficients $U_{oc}$: −0.33 %/K
- Temperature coefficients $P_{mpp}$: −0.45 %/K
- NOCT: 47 °C ± 2 °C

Limits
- System voltage max.: 600V / 1000V
- Reverse current max.: 15 A
- Operating temperature: −40 °C ~ 80 °C
- Maximum load: 5400 Pa/m² = 550 kg/m² (75 lbs/ft²)
- Safety class: II

Certifications and warranty
- Product warranty: 10 years
- Performance warranty: linear 25 years

Mechanical Data
- Dimensions: 1640 x 990 x 35 mm ±1 mm
- Weight: 18 kg | 39.68 lbs
- Packing configuration: 35 mm
- Modules/Cardboard: 30
- Cardboard/Container: 28
- Modules/Container: 840

All figures are according to DIN EN 50380.
Tolerance at rated power 0 to + 4.99 Wp. All other specifications ± 3%.

Diagram:
- Technical drawing

Your WIOSUN® Dealer

* Standard Test conditions (1000W/m², AM 1.5, cell temperature 25 °C)
** Normal Operating Cell Temperature (800 W/m², AM 1.5, windspeed 3 m/s, ambient temperature 25 °C)
Hightech from Germany

The WIOSUN® PV-Therm combination modules are engineered in Germany and are subject to our strict quality standards. With over 25 years of experience in photovoltaics, we offer high-tech products at fair prices. In all WIOSUN® modules only selected high-quality individual components are used.

Positive-only tolerance

You can count on our quality, because WIOSUN® delivers only modules with positive tolerance up to +5 Wp.

Efficiency of up to 30%

This combined module, with a surface temperature of up to 80°C, can be cooled down to a temperature below 20°C in a very short period of time using water at a temperature of 12°C. This equals an increase in efficiency of up to 30 percent.

Heat for free

In addition to the very easy installation, the combined engine by the association of photovoltaic and solar thermal energy is space-saving and economically advantageous. Additionally the thermal yield is financed by the feed-in remuneration for the photovoltaic.

5 year product warranty

With the 5 year product warranty on the PVT-SERIES, as well as a 20 year performance guarantee, WIOSUN® photovoltaic modules are among the most reliably calculable components for efficient PV systems.
## General

<table>
<thead>
<tr>
<th>Cells</th>
<th>60 (6x10) monocrystalline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame</td>
<td>aluminium, black anodized</td>
</tr>
<tr>
<td>Connection</td>
<td>power optimizer solaredge</td>
</tr>
<tr>
<td>Connector</td>
<td>MC4 compatible</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cellsize</th>
<th>156x156 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire</td>
<td>4 mm² Solarglass, 1000 mm length</td>
</tr>
<tr>
<td>Power tolerance</td>
<td>0 to +5 Wp</td>
</tr>
</tbody>
</table>

## Electrical Datas (STC*)

<table>
<thead>
<tr>
<th>Module Type</th>
<th>PVT-260M</th>
<th>PVT-270M</th>
<th>PVT-280M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Power</td>
<td>P_{ref} Wp</td>
<td>260</td>
<td>270</td>
</tr>
<tr>
<td>MPP-Voltage</td>
<td>U_{mp} V</td>
<td>31.25</td>
<td>30.96</td>
</tr>
<tr>
<td>MPP-Current</td>
<td>I_{mp} A</td>
<td>8.40</td>
<td>8.72</td>
</tr>
<tr>
<td>Open-circuit voltage</td>
<td>U_{oc} V</td>
<td>39.35</td>
<td>38.08</td>
</tr>
<tr>
<td>Short-circuit current</td>
<td>I_{sc} A</td>
<td>8.97</td>
<td>9.32</td>
</tr>
<tr>
<td>Module efficiency</td>
<td>η%</td>
<td>16.00</td>
<td>16.40</td>
</tr>
</tbody>
</table>

## Electrical Datas (NOCT**)

<table>
<thead>
<tr>
<th>Module Type</th>
<th>PVT-179</th>
<th>PVT-196</th>
<th>PVT-203</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Power</td>
<td>P_{ref} Wp</td>
<td>179</td>
<td>196</td>
</tr>
<tr>
<td>MPP-Voltage</td>
<td>U_{mp} V</td>
<td>26.87</td>
<td>27.7</td>
</tr>
<tr>
<td>Open-circuit voltage</td>
<td>U_{oc} V</td>
<td>34.96</td>
<td>34.62</td>
</tr>
<tr>
<td>Short-circuit current</td>
<td>I_{sc} A</td>
<td>7.07</td>
<td>7.55</td>
</tr>
</tbody>
</table>

## Thermal Datas

| Absorber area | 1.58 m² |
| Connections | DN 16 |
| Liquid capacity | 3.88 l |
| System pressure | max. 1.5 bar |
| Test pressure | max. 2.5 bar |
| Flow rate per module | 30–150 l/h |
| Delta T | ca. 5 K bei STC |
| Operating temperature | −20 °C bis 75 °C |
| Stagnation temperature | 75 °C |
| Efficiency (η_T) | 63 % |
| Collector energy output (η_C) | ca. 995 Wc |
| Thickness heat exchanger | 0.8 / 1.0 mm |

## Temperature coefficients

| Temperature coefficients | I_{sc} | +0.04 %/K |
| Temperature coefficients | U_{oc} | −0.367 %/K |
| Temperature coefficients | P_{ref} | −0.46 %/K |

## NOCT

| 48 °C ± 2 °C |

## Limits

| System voltage max. | 600 V / 1000 V |
| Reverse current max. | 15 A |
| Operating temperature | −40 °C − 85 °C |
| Maximum load | 5kPaPa/m² = 550 kg/m² (75 lbs/R²) |
| Safety class | II |

## Certifications and warranty

| TÜV | IEC 61215, IEC 61730, 1703 i.p. |
| Product warranty | 5 years |
| Performance warranty | linear 25 years |

## Mechanical Datas

| Dimensions | 1655 x 1010 (995) x 45 mm ±1 mm |
| Wire | 65.16 x 39.76 x 1.77 inch ±0.01 inch |
| Weight | 36 kg | 79 lbs |

* All figures are according to DIN EN 50380. Tolerance at rated power 0 to +4.99 Wp. All other specifications ± 3%.
* At a low irradiation intensity of 200 W/m² (AM 1.5, cell temperature 25 °C) 96 % of the STC module efficiency will be archived.
* Standard test conditions (1000 W/m², AM 1.5, cell temperature 25 °C)
* Normal Operating Cell Temperature (800 W/m², AM 1.5, wind speed 1 m/s, ambient temperature 25 °C)
Structure
Combined module PV-Therm

Glass | Cells | EVA | Tedlar-foil

Polyurethane frame | Heat exchanger
Awarded
Combined module PV-Therm

- One of the first awards our product PV-Therm received in 2007 was the Euromold in Frankfurt
- Also we won the »Innovation Prize 2007« of the district Ostallgäu
- The combined module »PV-Therm« has been awarded by the Federal Ministry of Economics and Technology with the »Federal Prize for outstanding work«
- In addition, we were selected in 2009 as a »Special Landmark in the Country of Ideas«
- 2011 we received the first TUV Certificate worldwide for our combination module
References PV-Therm

33 PV-Therm modules for swimming pool heating = 5.94 kWp
- Low temperature on the module = high efficiency
- Relaxing temperature to feel well in the pool
- Supplementary output power is financing the pool
- Possibility in winter to defrost snow

60 PV-Therm modules on tracker = 10.80 kWp
- up to 30% supplementary output power
- Independent from the roof construction, respectively, when there is no roof available

33 PV-Therm modules for hot water generation = 5.94 kWp
- Effective benefit of power and heat when the roof area is limited
- Optically attractive as it’s only one system
- Roof integrated
- Possibility to defrost snow and ice in winter
Why should photovoltaic modules be cooled?

- First of all you should know, if the module /cell temperature increases of 1° C, the electrical power decreases approximately of 0.5%

- In our latitudes combined with direct sun irradiation, modules can reach temperatures of up to 85°C

- Compared to the Standard Test Conditions of 25°C (1000W/m²), the top performance breaks in up to approximately 30%, which also includes a decrease of electrical profit.

- The cooling of modules generates the optimum result of electrical profit!
The sun heats up the PV-Therm modules to a temperature of around 65 °C. Then they were cooled down to 25 °C with cold rain water.

Because of this, the electrical output rises from 1110 W (not cooled) up to 1350 W (cooled).
PV-Therm Module
for swimmingpool heating

Benefits: High electrical yields because of big amounts of cooling medium, nice temperatures in the swimming pool

Einsatz: Swimmingpools, indoor swimmingpools, Wellness hotels
PV-Therm Modul and WIOSUN Heat Pump with combined storage tank

Benefits:
- Autarkic and economical energy generation, low chilling effect

Application:
- Family homes
PV-Therm Module for heating support

Benefits: Economical energy generation, no fossil heating element in the summer time, low chilling effect

Application: All buildings, ideal for refitting
Due to the nominal widths of the tubes, max. 10 modules can be included thermically in line, respectively 60 modules per block. The material for the roof mounting is included in the connection set. Volume tank, pump, heat exchanger, buffer storage and storage for industrial water, security valves as well as antifreeze fluid and incidentals must be calculated object-related.

Connection set consisting of:
- Air separator
- End cap
- Connection socket
- T-piece
- Immersion sleeve
- Armoured tube (1m)

If buffer storages are used, the following empirical formula is valid: 50l/module

Flow rate > 50l/h = high cooling effect
Flow rate < 50l/h = high heating effect

If you have any question regarding the installation, feel free to contact us anytime: +49 8342 89 69 0
The new WIOSUN heat pump has decisive advantages as compared to traditional heat pumps and does no longer require drilling.

**Advantages**
- No drilling necessary
- Double-pipe heat exchanger, extremely robust, no power loss due to deposits like with plate heat exchangers
- High efficiency
- Powerful Copeland Scroll compressor
- Works at temperatures from -15°C to +30°C
- Alternative cooling function, as well as separate process water charging circuit
- Low purchase price
- Little space required
- Reasonable utilisation of the thermal energy of the modules

**Operating principle**

The heat pump deprives a heat source of energy (75%) and by supplying it with electrical energy brings it to a higher temperature level.

---

We are a dynamic and innovative family company having more than 25 years of experience. Our philosophy is to live and work with awareness and sustainability for our environment, i.e. for all of us. In our company, we enjoy having fun, we are all about people and we are happy if thanks to targeted perfectionism everything works at the right time at the correct speed. We develop, test and produce high-quality, future-oriented energy systems “MADE in Allgäu”. Due to our broad range of solutions, we allow our customers to independently provide for their own energy supply and to save money. And in addition, you make your contribution to a clean environment and secure the future for the generations to come.

WIOSUN Production GmbH
Gewerbepark Altdorf 5 – 13
DE-87640 Biessenhofen

Phone: +49 (0) 8342 89 69 0
Fax: +49 (0) 8342 89 69 270

info@wiosun.de
www.wiosun.de
The latest combination from the company WIOSUN is the connection of the award-winning PV-Therm hybrid module and the powerful WIOSUN heat pump.

The PV-Therm combination module sends the naturally generated heat directly into the accumulator. If it is not sufficient, it is fed into the heat pump and brought to the required temperature level there. The simultaneously generated power can be directly used to supply the pump and other actuators.

Gain your independence now!

As complete solution, as support for your heating or for the renovation of existing buildings: The intelligent combination of these components is the correct step into a future without fossil fuels!

**Advantages**

- High energy efficiency of the heat pump due to high temperature of the heat source. Every temperature increase in the heat source of one °C results in an increase in the heating power of the heat pump of 2-4%.
- Thanks to the long operating times of the heat pump: improvement in the cooling for the PV-Therm modules.
- Due to the cooling of the modules, increase in the electrical power by up to 30%.
- No drilling of probes or to the groundwater necessary.
- Reasonable utilisation of the thermally generated energy.

**Advantages**

- Power increase by up to 30%.
- Increase in the annual yield by at least 10%.
- Swimming pool heating.
- In connection with a heat pump:
  - Heat storage in the soil.
  - Ground water pre-heating.
  - Brine heating.
- Hot water preparation.
- Heating support.
- Defrosting of snow and ice.
WIOSUN® products are certified and patented by TÜV (German Technical Inspection Agency) or VDE via IEC 61215 / IEC 61730.

WIOSUN® is a fully fledged member of PV-Cycle. After expiration of the product life of a module, each module will be disassembled in its component parts and recycled. Thus, the sustainability of the energy production becomes central importance to the company’s R&D department in which our WIOSUN® modules are continually optimized and produced by high-level production standards.
CERTIFICATE
on the Grant of the

Patents

No. 10 2011 050 643

IPC
F24J 2/40

Description:
Combined photovoltaic system - and solar thermal system

Patent Owner:
Willi Bihler, 87640 Biessenhofen, Germany

Inventor:
Bihler, Willi, 87640 Biessenhofen, Germany

Day of Registration:
26.05.2011

Munich, den 04.04.2013

The President of the German Patent and Trademark Office

Rudloff-Schäffer
FEDERAL REPUBLIC of GERMANY

CERTIFICATE
of Trademark Registration

No. 30 2009 024 761
File No.: 30 2009 024 761.7/19

Trademark Owner:
Bihler, Willi, 87640 Biessenhofen, Germany


The President of the German Patent and Trademark Office

Rudloff-Schäffer
südcert
CERTIFICATE

südcert hereby confirms that the Company

Solarzentrum Allgäu GmbH & Co. KG
Gewerbepark 13
D-87640 Biessenhofen

has introduced a quality management system, according to

DIN EN ISO 9001:2008

for the following areas

Production, Planning and Installation of Solar Energy Systems

Proof has been furnished, that the requirements of DIN EN ISO 9001:2008 are fulfilled.
This is documented in the audit report – No Solarzentrum 09.
This certificate is valid until 18.09.2012.
Within this period regular surveillance is done by our certification body.
Certificate-Registration No. 90029091

Marktoberdorf, September 19th 2009

Harald Linder
Head of certification body
Certificate

Registration No.: PV 72112057
Page 2
Report No.: 31172140.002

License Holder:
Solarszentrum Algäu GmbH & Co. KG
GewerbePark 13
Blassenhofen-Altdorf 07640
Germany

Product:
PV Module
Type:
Wiosun PVT 180
Model Family:
Wiosun PVT xxx
(XXX = 165-195)

Manufacturing Plant:
Jic Solar Co., Ltd.
No. 523 Nanxiashu Seciton, Wuyi Road
Wujin Hi-tech Industrial Zone
Changzhou, Jiangsu Province 213161
China

Basis:
- IEC 61730-1: 2004
- IEC 61730-2: 2004
- EN 61730-1: 2007
- EN 61730-2: 2007
  "Photovoltaic (PV) module safety qualification"
- Qualified, IEC 61215
- Safety Tested, IEC 61730
- Periodic Inspection

Factory Inspection
To document the consistent quality of the product factory inspections are performed periodically.

Remarks:
- IEC EN 61730 consists of part 1 (Requirements for construction) and part 2 (Requirements for testing).
- The above listed PV modules fulfill the requirements of Application Class A (Safety Class II). They may be used in PV plants at a maximum system voltage (Veac at STC) of up to 1,000 VDC.
- The details of the factory inspection are documented in TÜV Report No. 202354413 (21214570), see page 1, and 00754411 (10037500.002), see above.

Conditions:
The product test is voluntary according to technical regulations. Any change of the design, materials, components or processing may require the repetition of some of the qualification tests in order to retain type approval.
The certificate has a validity of 5 years counting from date of issue.

Certification Body

Newtown, August 04, 2011

Dipl.-Ing. M. Raap

Certification Body: TÜV Rheinland of North America, Inc. 12 Commerce Road, Newtown, Connecticut 06470
Testing Laboratory: TÜV Rheinland PTI, LLC, 5210 South Roosevelt Street, Tempe, Arizona 85283
FEDERAL REPUBLIC of GERMANY

CERTIFICATE

of Trademark Registration

No. 30 2009 033 184

File No.: 30 2009 033 184.7/06

Trademark Owner:
Bihler, Willi, 87640 Biessenhofen, Germany

Day of Application: 03.06.2009

Day of Registration: 07.07.2009

The President of the German Patent and Trademark Office

Rudloff-Schäffer
FEDERAL REPUBLIC of GERMANY

CERTIFICATE

of Trademark Registration

No. 30 2009 024 761

File No.: 30 2009 024 761.7/19

Trademark Owner:
Bihler, Willi, 87640 Biessenhofen, Germany


Day of Registration: 25.06.2009

The President of the German Patent and Trademark Office

Rudloff-Schäffer
OHIM – OFFICE FOR HARMONIZATION IN THE INTERNAL MARKET
TRADE MARKS AND DESIGNS

CERTIFICATE OF REGISTRATION

This Certificate of Registration is hereby issued for the Community Trade Mark identified below. The corresponding entries have been recorded in the Register of Community Trade Marks.

Pre The President

António Campinos
CERTIFICATE OF REGISTRATION OF

TRADE MARK

No. 1442381

I, Fatima Beattie, Registrar of Trade Marks hereby certify -

that the trade mark represented on this certificate was filed as Trade Mark No. 1442381 on 12 August 2011. It is due for renewal on 12 August 2021 and Willi Eihler of Dortstrasse 2 87540 Bissenhofen GERMANY has been entered in the Register of Trade Marks as the owner of the trade mark.

WIOSUN

The goods and/or services for which the trade mark is registered, plus any endorsement, additional owners or other information relating to the registration, are listed on the attached pages.

Given under my hand and the seal of the Trade Marks Office on 20 April 2012

Fatima Beattie
REGISTRAR OF TRADE MARKS

TRADE MARKS ACT 1995
CERTIFICATE OF REGISTRATION OF
TRADE MARK

No. 1442380

I, Fatima Beattie, Registrar of Trade Marks hereby certify -

that the trade mark represented on this certificate was filed as Trade Mark No. 1442380 on 12 August 2011. It is due for renewal on 12 August 2021 and Willi Bihler of Dorfstrasse 2 87640 Biessenhofen GERMANY has been entered in the Register of Trade Marks as the owner of the trade mark.

PV-THERM

The goods and/or services for which the trade mark is registered, plus any endorsement, additional owners or other information relating to the registration, are listed on the attached pages.

Given under my hand and the seal of the Trade Marks Office on 20 April 2012

Fatima Beattie
REGISTRAR OF TRADE MARKS

TRADE MARKS ACT 1995