



## Water-Cooled High-Performance Electric and Thermal Hybrid Solar Collector

**320Wp  
HIGHPOWER!**

**highly efficient  
heat production**

Capillary of the copper heat  
exchanger with new geometry

The water-cooled photovoltaic module combines electric and hot water solar panels in one single product, i.e. the photovoltaic surface generates power, and the copper heat exchanger on the back dissipates the heat. This process is extremely effective due to the quick-response capillary technology developed by res. The cooling feature increases the efficiency of the panels considerably: It provides for a higher power output, and the dissipated thermal energy is used to support the heating system and hot water supply.

The special features of **resPV++** modules: Thermal energy can be used directly via heat pumps – so the PVT panels even gain thermal energy in temperatures near freezing point, during rain, in the night, and in the winter.

The res-PV++ modules in combination with our heat pumps are the foundation of our **res-solAutark** and **res-solSupport\*** energy and climate systems.



### res-PV++ 320 modules The advantages at a glance

- ▶ an integrated hydraulic circuit (filled with antifreeze) cools the heat-sensitive PV cells and results in up to 20% more output
- ▶ highly efficient, quick-response copper heat exchanger: capillary tubes with new D-profile optimize the heat exchanger surface
- ▶ are operated in combination with heat pumps and therefore also gain thermal energy near freezing point
- ▶ gather thermal energy almost the whole year for hot water preparation & support of the heating system
- ▶ between 0°C and 40°C the degree of utilization increases, at the same time the power consumption of the heat pump declines
- ▶ the hydraulic circuit of the res-solAutark\* energy and climate system uses the evaporation effect (morning dew) and cooling energy of the modules, which cool down during the night, for passive cooling
- ▶ in the winter the hydraulic circuit melts the snow on the roof by briefly warming the modules for continued energy production
- ▶ are part of res-solAutark air, ice & terra, multiQ, res-solSupport and res-solAutark pool\*
- ▶ can be combined with existing heating systems
- ▶ elegant all-black design: backsheet and frame

\*energy and climate systems from res have a broad range of applications: res-solSupport for the heating support of existing plants; res-solAutark air, ice & terra for passive and low energy houses, for new buildings and redevelopment and as complete systems that heat, cool and prepare hot water while producing more electrical energy than they actually need - emission-free and without burning renewable resources and fossil fuels. Systems from res protect resources, environment and climate - and they are independent of rising commodity prices.

More information: [www.res-energie.de](http://www.res-energie.de)





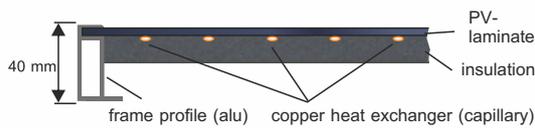
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above: 5 busbar technology,  
in harmonious look;  
module rear with hydraulic circuit,  
elevated (mounting example)

below: construction res-PV++

### Hybrid module res-PV++ structure



Electrical data		
Rated power $P_{MPP}$	Wp	320
Electrical data $U_{MPP}$	V	34,15
Rated current $I_{MPP}$	A	9,37
No-load voltage $U_{OC}$	V	42,01
Short circuit current $I_{SC}$	A	10,02
Performance tolerance		plus-sorting +5 / +0 Wp
Temperature coefficient $P_{MPP}$	%/K	-0,38
Temperature coefficient $I_{SC}$	%/K	+0,06
Temperature coefficient $U_{OC}$	%/K	-0,30
Max. Voltage	V	1.000
Resistance		max. pressure load 5400 N/m <sup>2</sup> , protection class II, fire class C
Efficiency	%	19,18
Cells per module		60
Bypass diodes		3

Thermal capacity		
Thermal capacity*	W	840
Flow rate*	l(m <sup>2</sup> h)	50
Fluid volume	ml	550
Pressure loss	mbar	43
Operating pressure	bar	1,5 - 2,5
max. operating pressure	bar	3
Heat transfer medium		water-glycol-mixture
Stagnation temperature	°C	75

On-roof module standard frame		
Dimensions (LxWxH)	mm	1.665 x 1.002 x 40
Weight (empty)	kg	24,30

All electrical values correspond to STC, Standard Test Conditions.  
Irradiation 1000 W/m<sup>2</sup>, cell temperature 25°C, AM 1.5

Measuring tolerance  $P_{mpp}$ : +/- 4%

Tolerance of other electric values: +/- 10%

\*Thermal capacity at 1000 W/m<sup>2</sup>,  $T_m - T_a = 2,5$  K

For further operating points please refer power curve

\*A flow rate between 1 - 2 l/min yields 36,4 - 72,7 l/(h and m<sup>2</sup>)

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