



PVCOOL-SP95

*cogeneration Solar Module 200 watts electrical
+540 watts thermal power 2 sun x concentration*

PVCOOL-SP95 watt monocrystalline concentration module made with air cooling aluminium heat sink at rear side for minimizing the temperature of cells and transfer most of thermal heat to rear side.

Module has multiple advantages and applications

1. Solar module produces 200Watts electrical and 540watts thermal power at 2 sun concentration with passive convectional cooling. It dramatically reduces cost PV system and energy generation. Such applications are solar tracking concentrators with reflectors or Fresnel lenses, static concentrators.

2. Module can be used for normal 1 sun irradiation as 95 Watts module with advantages of 15-25 degree lower operating temperature. That increases electrical output of cells (7-12%), reduces thermal cycling stresses and ageing processes. Best application for this is BIPV. It is estimated that an average Building Integrated PV module operates at a temperature of up to 40 deg.C above ambient. This represents a loss of performance of 20% of power produced.

3. Due to the front/rear cooling surface ratio 1/20 , 95% of heat dissipates at rear side. Module can be used for hybrid electricity /thermal heating cogeneration.

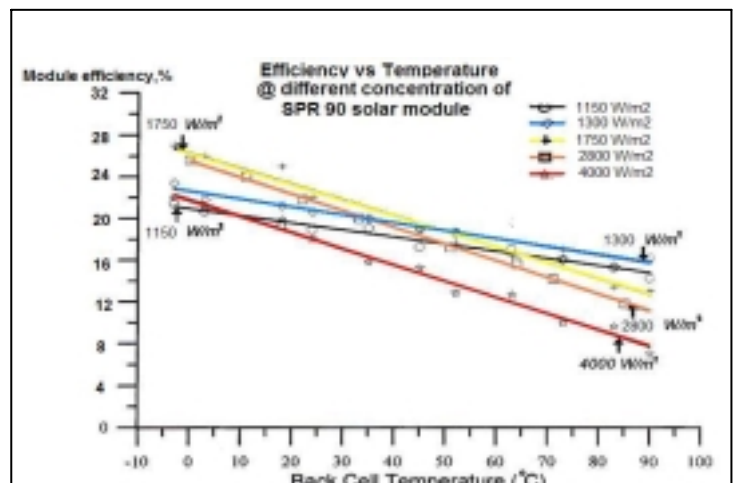


Applications

- Telecommunication
- Desalination systems
- Water pumping for various agriculture
- Electricity for on/off grid systems
- Security cameras
- Cathodic protection
- Lighting systems for emergency use and railroad
- Telemetry equipment

Limited Warranty

10 years limited power warranty of 90% minimum specified of power rating



PVcool-SP95 200/540 watts 2xsun Concentration Solar Module

Made with high efficiency back-contact solar cells and air cooling radiator

Dimensions

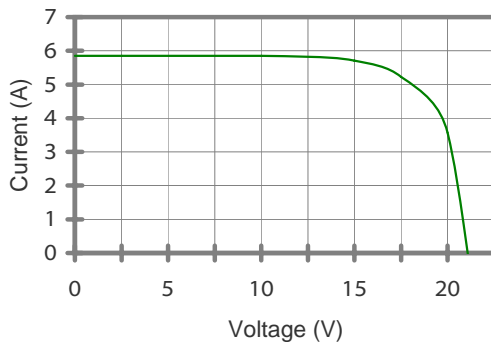
Electrical Characteristics at 1 and 2 sun concentration

Model Number: PVcool-SP95		1sun/2suns	
Max Power 1sun/2xSun	Pmax	95/200W	
Max Power Voltage	Vmp	17.6/18.7V	
Max Power Current	Imp	5.4/10.8A	
Open Circuit Voltage	Voc	21.4/22.5V	
Short Circuit Current	Isc	5.66/ 11.32A	
Maximum System Voltage		70V	
Series Fuse Rating		15A	
Temperature Co-efficients			
	Power	-0.38%/°C	
	Voltage	-60.8mV/°C	
	Current	2.3mA/°C	
Cell Efficiency		20.9/22.90%	
PTC power		93W	
Normal cell operating temperature NOCT(1 Sun/2 Suns)		28/45°C	
Max Power Tolerance		+/-5%	
Max Thermal Power	Pmaxt	270/540W	

Mechanical Characteristics

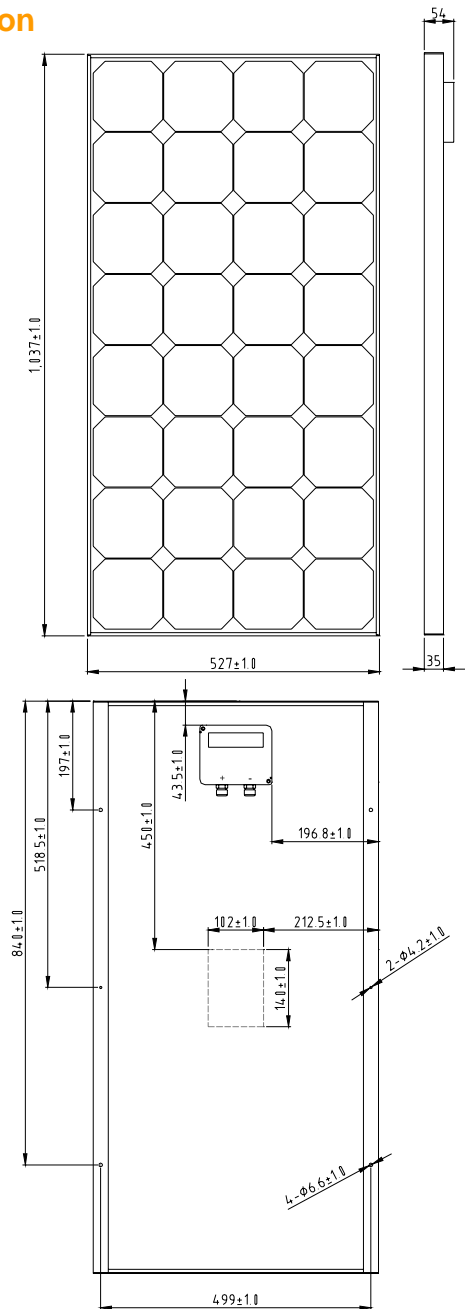
Weight	9.4kg
Dimension	1037 x 527mm
Thickness, including junction box	54mm
Frame	>10µm clear anodized

IV Curve (1Sun Irradiance)



Note: All electrical parameters are rated at standard test conditions (irradiance of 1000W/m², AM 1.5G, cell temperature 77°F/25°C)

Specifications included in this datasheet are subject to change without notice.



Unit: mm

PVCOOL

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Static concentrators



Cogeneration electric power/heat



Tracking concentrators

Features

The back of module is made with air cooling fins. Photovoltaic concentration modules made with unique back-contact cells high conversion efficiency up to 23%.

Due to higher efficiency the module is smaller in size than modules made with conventional cells.

Designed to be used in Building Integrated PV and concentrator applications.

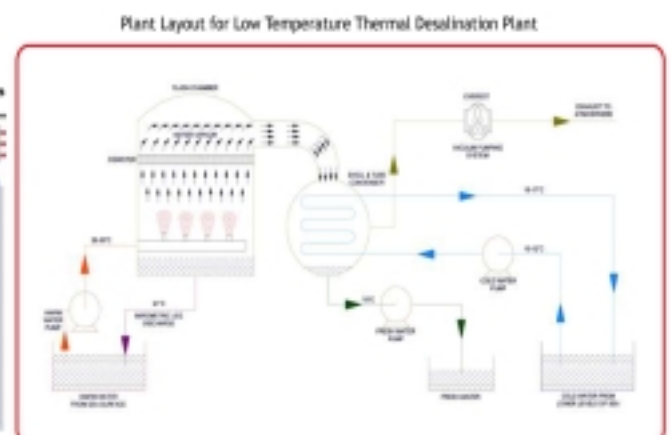
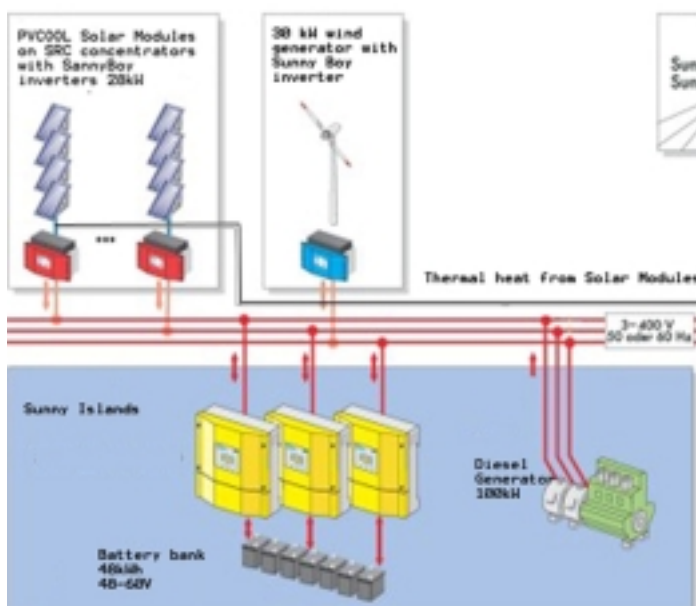
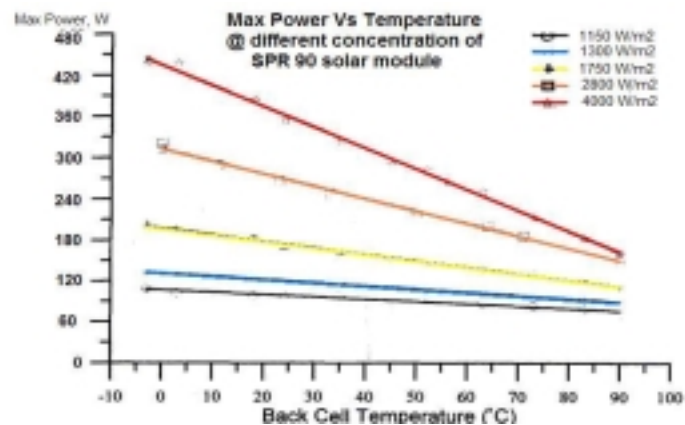
Pirfectly suitable for caravans, motorhomes and boats application

Can be used for electricity/thermal heating co-generation, such as buildings heating , water desalination, Algae growing plants Normal cell operating temperature up to 25 C lower compared to solar modules without heat sink.

PVCOOL modules are made with high quality materials which qualifies the high reliability of the module.

Designed to charge 12 to 48 volt batteries for off grid remote power systems.

Manufactured in ISO9001 certified factory.



PVCOOL 100kW PV/Thermal/Wind plant for Low Temperature Desalination

PVCOOL-SP95

NOCT and RTC power

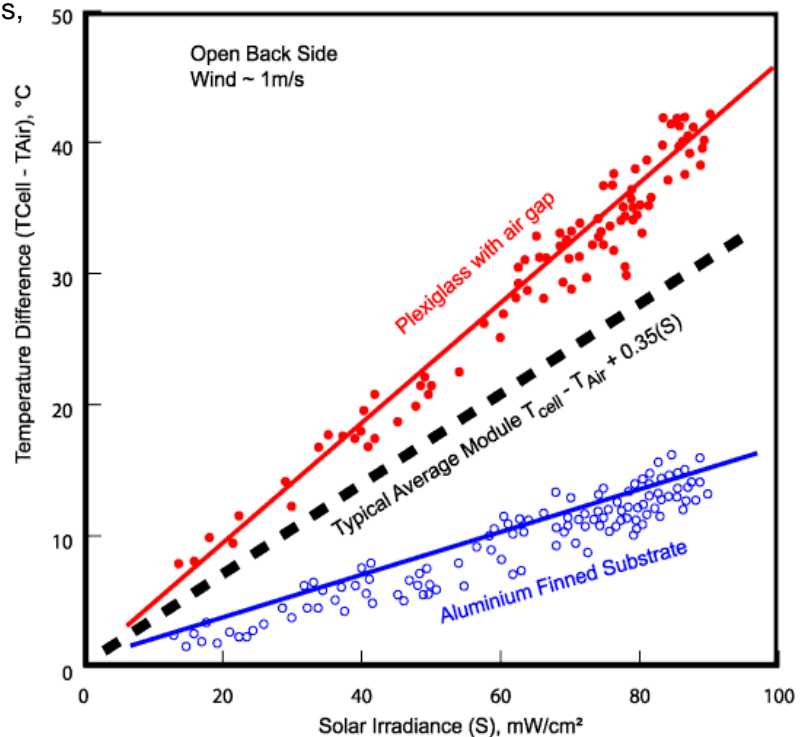
All PV modules are typically STC rated at 25 °C under 1 kW/m². However, when operating in the field, they typically operate at higher temperatures and at somewhat lower insolation conditions. In order to determine the power output of the solar cell, it is important to determine the expected operating temperature of the PV module. The Nominal Operating Cell Temperature (NOCT) and PVUSA Test Conditions or "PTC" is defined as the Temperature and Power reached by open circuited cells in a module under the conditions as listed below:

Irradiance on cell surface = 800 W/m² (NOCT) test
 Irradiance on cell surface = 1000 W/m² for PTC test
 Air Temperature = 20°C
 Wind Velocity = 1 m/s
 Mounting = open back side.

The equations for solar radiation and temperature difference between the module and air show that both conduction and convective losses are linear with incident solar insolation for a given wind speed, provided that the thermal resistance and heat transfer coefficient do not vary strongly with temperature. The NOCT for best case, worst case and average PV modules are shown below. The best case include aluminium fins at the rear of the module for cooling which reduces the thermal resistance and increases the surface area for convection.

Temperature increases, above ambient levels, with increasing solar irradiance for different module types.

The best module operated at a NOCT of 28°C is PVCOOL-SP95 , the worst at 58°C and the typical module at 48°C respectively.



PVCOOL-SP95 has PTC power rating 93 Watts compared to 82-84 watts similar wattage modules without cooling fins.

PTC rating is very important because it is only used for Rebate calculation in USA.

Impact of Mounting Conditions

Both conductive and convective heat transfer are significantly affected by the mounting conditions of the PV module. A rear surface which cannot exchange heat with the ambient (i.e., a covered rear surface such as that directly mounted on a roof with no air gap), will effectively have an infinite rear thermal resistance. Similarly, convection in these conditions is limited to the convection from the front of the module. Roof integrated mounting thus causes higher operating temperature, often increasing the temperature of the solar modules without heat sink by 40°C above ambient air

PVCOOL-SP95 solar modules

as 150 Watts PV Power + 400Watts thermal power in Solar Concentrators

Simple, reliable and low cost of photovoltaic energy generated
Generates twice more energy compared to fixed modules

23% efficient solar cells

60% total PV/Thermal conversion efficiency

Designed to operate in hottest ambient temperature

PVCOOL Solar panels with heat sink

Generates 95 % thermal air heat from rear side

Perfectly suitable for cogeneration electricity /low temperature heat supply for houses and buildings, salt water desalinations plants,

Algae growing plants and many other applications

Seasonal sun angle inclination automatic or manual adjustments

Electronic MOSFET transistors tracker control 12-48 v

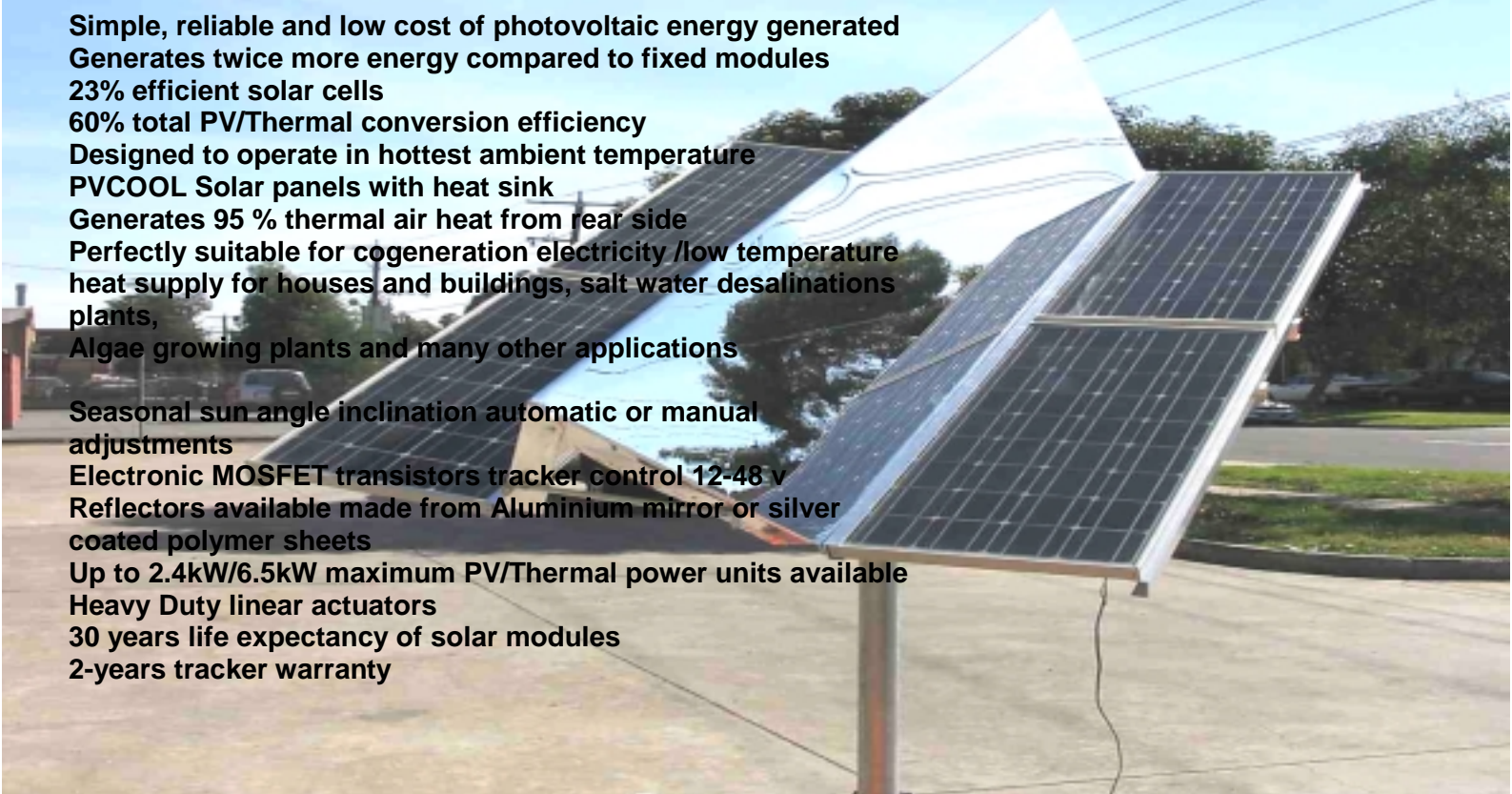
Reflectors available made from Aluminium mirror or silver coated polymer sheets

Up to 2.4kW/6.5kW maximum PV/Thermal power units available

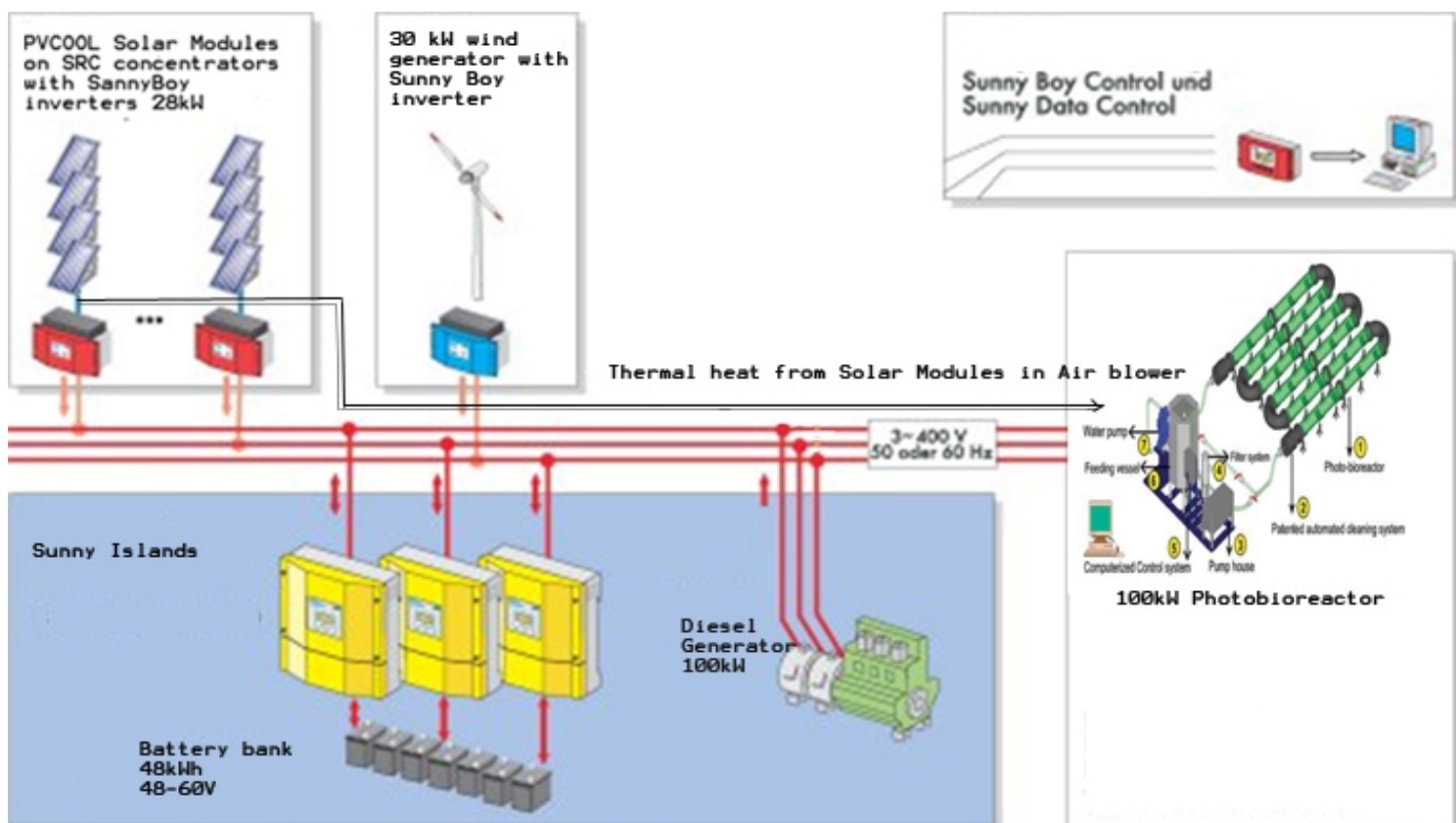
Heavy Duty linear actuators

30 years life expectancy of solar modules

2-years tracker warranty



SRC4 concentrator



PVCOOL 100kW PV/Thermal/Wind Photobioreactor plant for Biodiesel Algae production

TABLE1 SPECIFICATION

Concentrator Model	Solar Modules	Concentration Ratio, C	Maximum Electrical/ Heat power [Watt]	Average daily energy output * elec./heat [kWatt-hour]	Array dimation [LxW,mm]	Total weight [kg]	Poles size [mm]	Type of tracker
SRC-4	PVCOOL-SP95x4	1.6	600/1620	3.5-4.5/9.5-12	2080x1650	95	92	12-48 Volt DC Electric with PV sensors
SRC-16	PVCOOL-SP95x16	1.6	2400/6480	14-18/37-48	8320x1650	215	100x100mm 2 poles	12-48 Volt DC Electric with PV sensors

*This value is indicative only and depends of total solar irradiation

Performance and construction

With a total PV/Thermal conversion efficiency 60%, concentrators generate 95% of thermal heat from rear-side which can be used for heating of buildings, turbine generators and other low heat energy applications

SRC concentrators with PVCOOL-SP modules are perfectly suitable for **Algae growing and biodiesel production**. SRC-16 concentrators achieved unbeatable in PV industry energy cost results US12cents per kW-hour and up to 6.5 kW extra heat power available for Algae photobioreactors temperature control in cold time to keep temperature above +15 Degree C, which save up to US\$2500-00 per year/each SRC-16 .

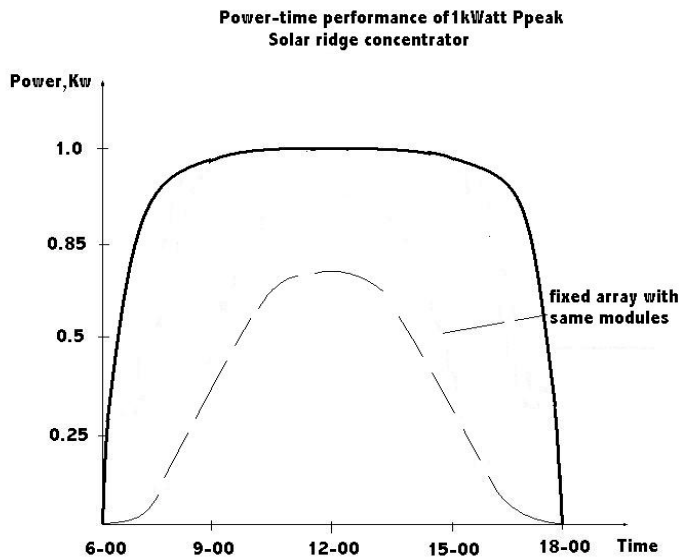
SRC concentrators with PVCOOL-SP modules are used for **Low Temperature Thermal Desalination fresh water** production. Extra thermal heat power is available for heating up salt water temperature up to 35-40 degree C in vaporization chamber.

Ridge concentrators do not require precise tracking compared to other concentrators, which makes them **very simple in installation and reliable in operation**.

Solar modules operate in low concentration ratio C=1.6 and do not require any additional active cooling system due to the use **PVcool Solar modules**. For higher up to 4X concentration ratio, SRC **PVcool** concentrators are available with multiple air cooling fans. Active cooling increases life expectancy of solar modules, which totally eliminates browning of EVA films.

Electronic Control Unit works in 2 seconds working pulse and 10 min waiting period mode. Our superior microprocessor locates the brightest spot in the sky and is always pointing the array to the optimal direction. After sunset, the tracker automatically returns to the sunrise morning position. MOSFET transistors make Electronic Control Unit more reliable compared to the conventional units on relays. Heavy-duty linear actuator is completely protected against overload. During accelerated tests the tracker performed 4,000 tracking cycles, representing 11 years of field operation.

SRC Concentrator combines years of experience in manufacturing PVCOOL Solar Trackers.

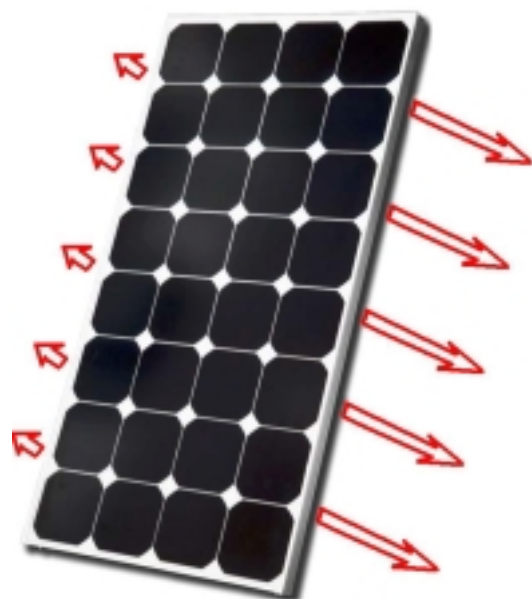


PVCOOL-SP95

as 95 Watts Electric Power / 270Watts thermal power
Co-generation Solar Module

Module made with air cooling aluminium heat sink at rear side

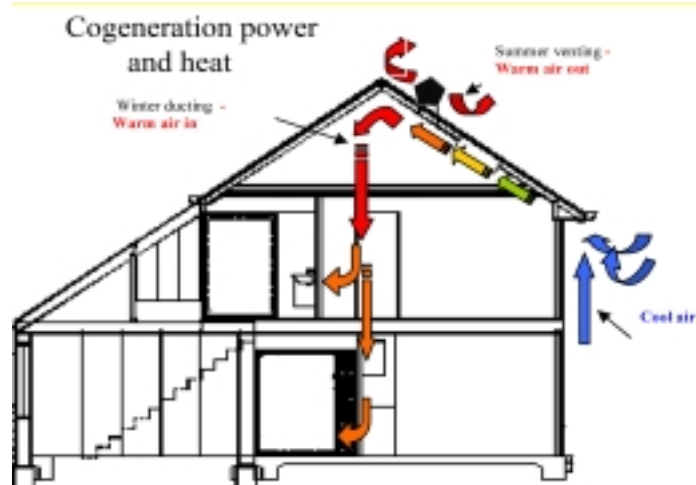
With a built-in roof array PVCOOL-SP95 solar module can be used for electricity/thermal heating co-generation. With front to rear cooling surface ratio 1/20, 95% of all heat dissipates at rear side of PVCOOL solar module. Also with heat sinks at rear the solar module operates cooler and produce more electricity. Solar modules with a flat rear surface can dissipate at rear side only 50% of all thermal power. Thermal energy can be used to cut energy costs and increase comfort levels in buildings at minor installation cost. On sunny winter days PVCOOL-SP95 solar module generates 95 Watts (peak) and 270 watts thermal heat power from the back surface. An installation of 1.9 kW (peak) PV array can generate extra of about 5 kW (peak) thermal power, average about 30kWh of low-grade heat can be collected on sunny day and transferred as tempered air into cool rooms to warm temperature.



95% of thermal heat dissipates at rear side



PVCOOL Co-generation electricity and thermal heat



In summer, this effect is reversible as cooling occurs at the back of the PV array, which faces the night sky as a radiant surface. In PVCOOL module, 4 times more thermal heat can be absorbed by rear heat sinks compared to flat rear modules.

In non-cloudy nights, black color panels cool down at 5-7 degrees C below ambient air temperature due to the heat radiation to sky.

Cooling air can be transferred to the living rooms to reduce air temperature.

House designs can be made with underground storage facilities for accumulation thermal heat or cool energy with further use accumulated heat/cool energy in appropriate time.

PVCOOL-SP95

as 130 Watts Electric Power / 350Watts thermal power
Co-generation Solar Module in static concentration

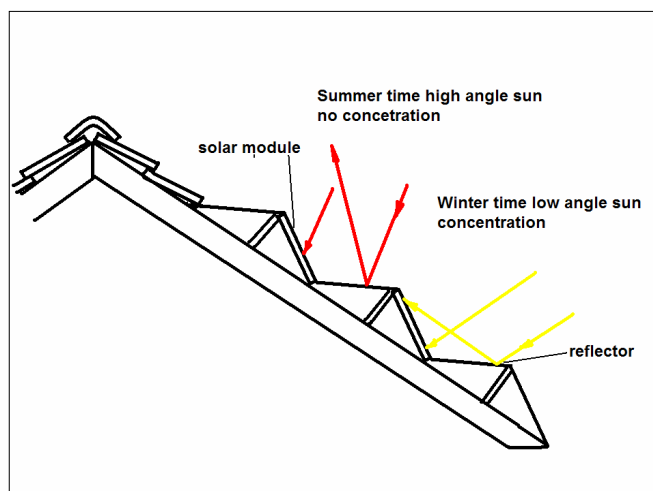
PVCOOL-SP95 can be used in static concentration application as roof integrated panels.

Biggest problems in existed stand alone systems: Solar modules generate 3-4 times less energy in winter months compared to summer.

The advantage of static concentration design is only winter time concentration effect and electrical/heat energy boost. In winter, sun position is low, solar modules have additional illumination from reflectors.

In summer time position of the sun is high, so reflections are not reaching solar modules. The tilt of the solar module and reflectors must be installed according to geographic location.

Due to the use of heat sink fins at rear side, 95% of heat dissipates at rear side and solar modules are working in cooler mode, compared to modules with flat rear surface. Thermal energy can be used to cut energy costs and increase comfort levels in buildings. Reflector material made from stainless steel mirror or alluminium mirror sheet laid on timber base.



BIPV one side reflector static concentrator 1.4 C



Two reflectors static concentrator 1.8 C

BIPV one side reflector static concentrator can be built at 1.4 C concentration, PVCOOL-SP95 Solar module can generate 130 Watts (peak) electric power and 350 Watts (peak) thermal power. It can save 20-25% cost on solar modules and fully replace gas heaters.

Your local dealer



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