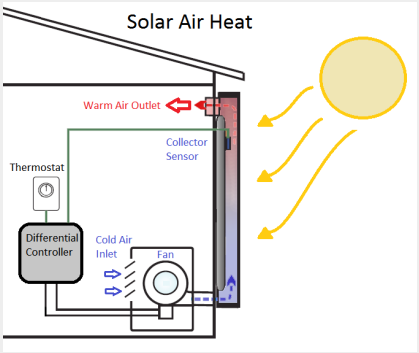
# 3in1 Solar Energy System - Introduction

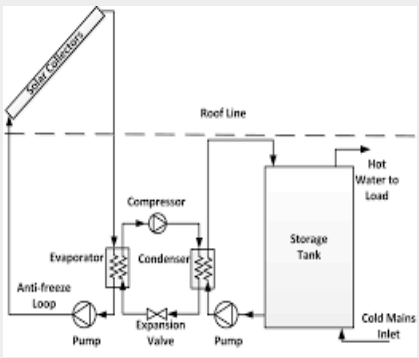
The Three-In-One solar system basically generates heat and electricity avoiding direct CO2 emissions.

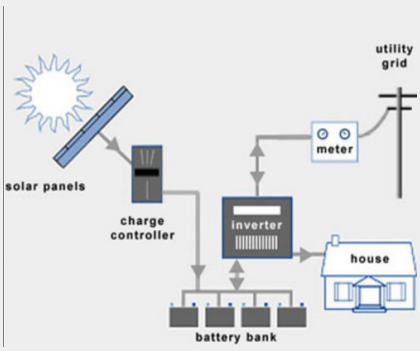
While photovoltaic cells typically achieve an electrical efficiency of 15% to 20%, the largest share (65% to 70%) of the solar spectrum is converted into heat, leading to an increase in the temperature of the PV modules.

The Three-In-One solar energy system is designed to cool the cells by transferring heat from PV cells to a liquid and air, thereby increasing their efficiency.
Most photovoltaic cells (eg silicon-based) suffer from a decrease in efficiency with increasing cell temperatures.
Increasing cell temperature reduces efficiency by 0.2-0.5% for each Kelvin. Therefore, removing heat from PV cells can lower their temperature and thus increase the efficiency of the cells.

By combining solar electricity, hot liquid and hot air , this excess heat is made useful and can be used with; apart from generating electricity, for example, as a heat source for heating liquid; such as solar assisted heat pumps as well as for agricultural product drying or zone heating by supplying hot air. Thus, the Three-In-One solar power system makes much better use of the solar spectrum.



# 3in1 Solar Energy System

## Model: LarAs-325

Dimensions: 1250*2000*220 mm
Weight (empty): 69 kg

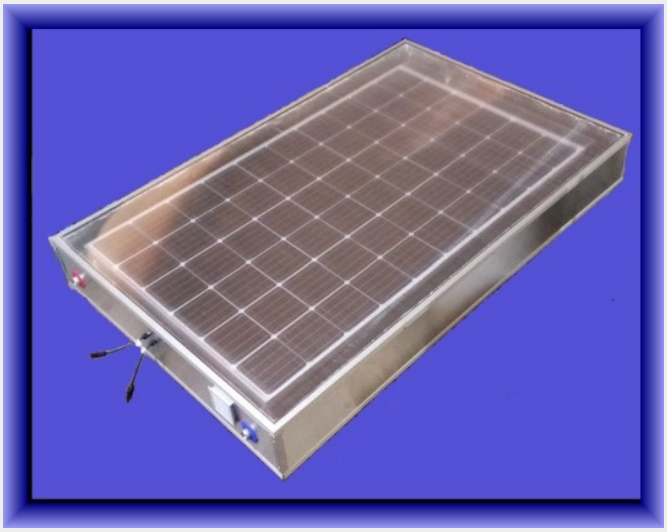
Photovoltaic Panel: 325 watt Mono Perc/24 VDC

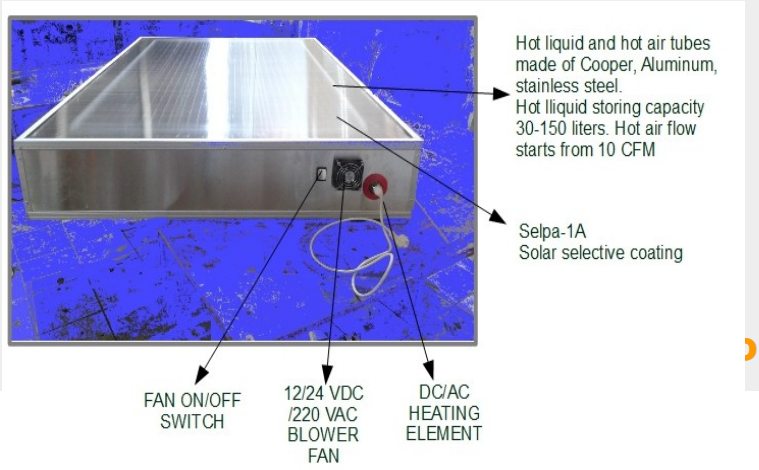
Solar Liquid heating area: 1,75 m2
Solar hot liquid storing capacity: 38 liters
Solar Liquid heating material: Copper
Solar Liquid cold/hot inlet/outlet couplings: Brass ½ ''

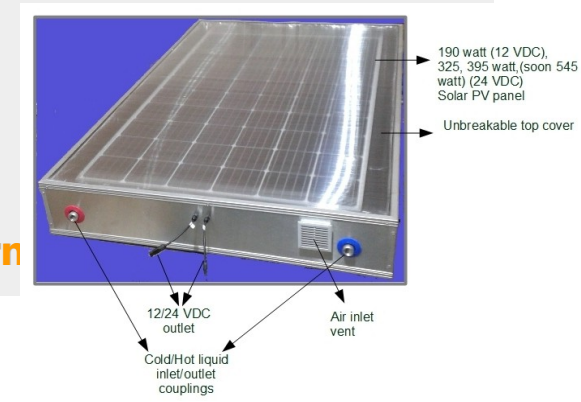
Solar Air heating area: 0,66 m2
Solar Air heating area material: Copper
Solar Air heating blowing fan: 24 VDC, 30 watt, 65 CFM

Heating element coupling: ½ ''
Heating element material: Stainless Steel
Heating element power: 300 Watt /220 VAC

Casing material: Aluminum
İnsulation: Pressed glass wool
Top cover: Clear twinwall polycarbonate sheet

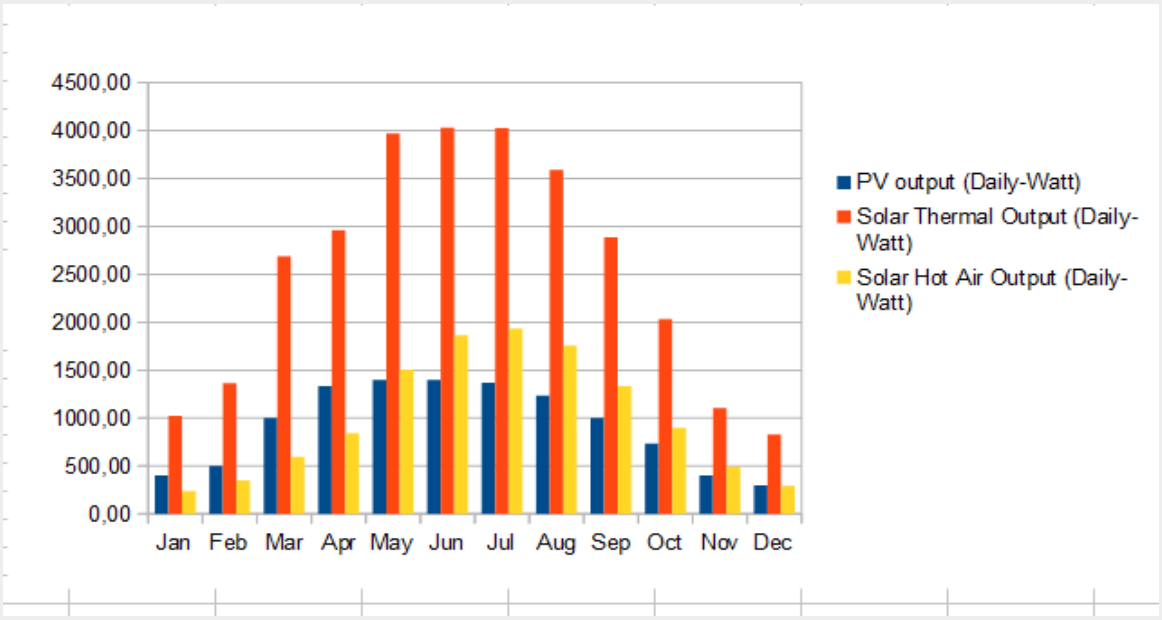




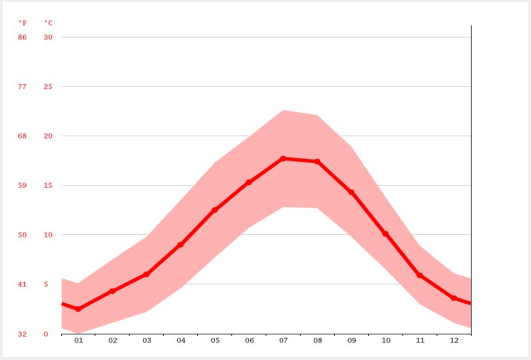



## Model: LarAs-325

Location: Rotterdam




## Rotterdam Temp. /Solar Irradiation Data



PERFORMANCE OF GRID-CONNECTED PV: RESULTS

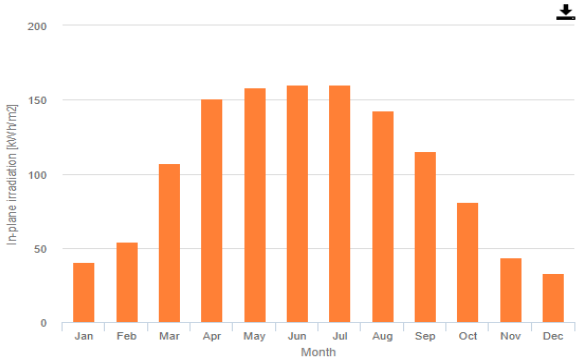
PV output | Radiation | Info | PDF

**Summary**

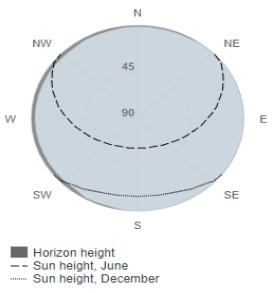
| Provided inputs: | |
|---|---|
| Location [Lat/Lon]: | 51.924, 4.436 |
| Horizon: | Calculated |
| Database used: | PVGIS-SARAH |
| PV technology: | Crystalline silicon |
| PV installed [kWp]: | 0.325 |
| System loss [%]: | 14 |

| Simulation outputs: | |
|---|---|
| Slope angle [°]: | 35 |
| Azimuth angle [°]: | 0 |
| Yearly PV energy production [kWh]: | 328.23 |
| Yearly in-plane irradiation [kWh/m²]: | 1247.6 |
| Year-to-year variability [kWh]: | 15.32 |
| Changes in output due to: | |
| Angle of incidence [%]: | -3.05 |
| Spectral effects [%]: | 1.69 |
| Temperature and low irradiance [%]: | -4.52 |
| Total loss [%]: | -19.05 |

**Monthly in-plane irradiation for fixed angle**




**Outline of horizon**




InterSun