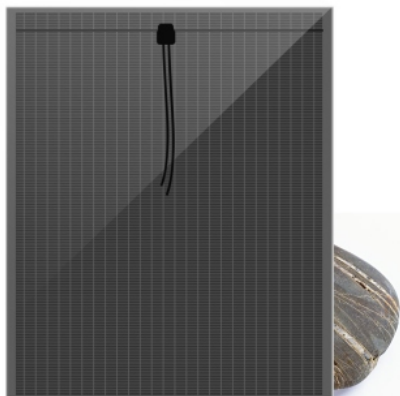




**L-HPK 260/200** is **Sunnytek-Large home power kit** is a package for getting power to houses that are off grid. Here we operate with no grid and power by sun enough for a smaller family to get lamps + power for a fridge and TV set. Components are of highest quality and all key parts are European brands only. System is designed for tropical areas where demands are very high if a long maintenance free like time is a dream. Design criteria is to offer a system where nothing needs service and rapid in 5 years and most parts handle at least 10-15 years or more.



**Solar panels with 260 output** is the key component and here we have selected a special model based on thin film Silicon-Glass design. Reasons are that these panels are far better than crystalline panels when weather is a bit bad and here the main problem of lost energy is most important, Bad weather sets limits of a system and not the best sunny days.

Thin film do often gives 20-30 % more power when weather is bad. Thin film is also far less sensitive to dirt and objects on surface as tree leaves which is a common problem in tropical areas. These panels have by far the best high temperature characteristics.

Silicon glass is also the only green panel as not contains no Cadmium that is dangerous. We use a large model with full 130W in output. This corresponds often to a 15=W Crystalline panel in output as thin film normally is 10% better over one year if we look at produced power in KWH-year. These panels have a 77 Volt DC output making cables losses smaller than on low voltage panels. Warranty is full 25 years specified to 80% of original specifications. Panels are made in glass and frameless. Edges are insulated to avoid galvanic corrosion and we have no aluminum frame by same reasons. Surfaces are glossy polished glass and is not mat in surface, This make cleaning far simpler and water by rain is normally OK.

Installation is very simple. We can supply hard ware as profiles but a mount in wood is also OK.

**MECHANICAL SPECIFICATIONS**

Size(L×W×T)	1,414×1,114×35 mm
Weight	17.83 Kg
IP Rating	Ip67
Connector	MC4
Cable Length	1000mm
Cable Size	2.5 mm <sup>2</sup>
Number of diodes	1
Maximum power voltage (V <sub>pm</sub> at STC)	77V
Maximum power current (I <sub>pm</sub> at STC)	1.42A
Open circuit voltage (V <sub>oc</sub> at STC)	99V
Short circuit current (I <sub>sc</sub> at STC)	1.65A
Diode average rectified output current(I <sub>o</sub> )	10A

STC: Irradiance of 100mW/cm<sup>2</sup>, AM1.5 Spectrum, and cell temperature of 25°C (77°F).  
 NOCT: The estimated temperature of a solar PV module when it is operating under 800 W/m<sup>2</sup> irradiance, 20°C ambient temperature and a wind speed of 1 meter per second)  
 Maximum power may vary by ±5%, and other electrical data may vary by ±10%.  
 \*50Hz Full Sine Wave, 1 cycle, Non-repetitive

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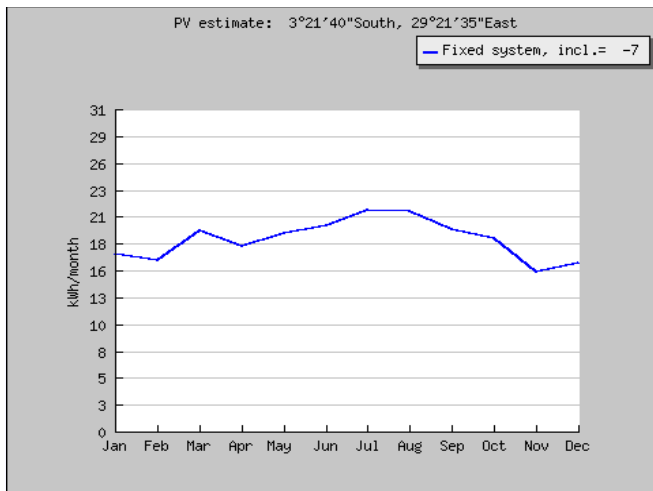
Battery solution is the key of reliability and the most costly component in the system. Here care is needed to get a happy end user and no problems in a reasonable time.

Demands to get a long life time must be clear so the correct solution is selected. Here the deep cycling and charging temperatures are key

numbers to get a good design.

Solar panels in a tropical area will generate electrical power measured in KiloWatt Hours. These shall be charged into the battery in a good way. We have a 130W solar panel and here we get atypical value depending on where we are located.

Here at right we show typical graphs of a tropical area similar to Central Africa and Caribbean area.



Fixed system: inclination=-7°, orientation=0° (Optimum at given orientation)				
Month	Ed	Em	Hd	Hm
Jan	0.56	17.2	5.29	164
Feb	0.59	16.6	5.68	159
Mar	0.63	19.4	6.04	187
Apr	0.60	18.0	5.75	173
May	0.62	19.2	5.88	182
Jun	0.67	20.0	6.30	189
Jul	0.69	21.4	6.57	204
Aug	0.69	21.3	6.61	205
Sep	0.65	19.6	6.31	189
Oct	0.60	18.7	5.82	180
Nov	0.52	15.5	4.93	148
Dec	0.53	16.4	5.03	156
Yearly average	0.612	18.6	5.85	178
Total for year		223		2140

ED column 1 show the daily average power production. Here we see it is typical 0.53-0.67 KWH / day depending on season. This makes the battery to be able to collect and store something like 0.7 KWH per day cycle to be correct.

Lead battery shall not be cycled more that 30-40% of capacity to get a good life life time. Hotter is same as 30% or less and cold can be over 40% but care gives long life and no problems. Here we say we have 30% as a safe value and here we see battery must store about 2-2.5 KWH to be used with little stress. If we use a 24 volt battery this will be about 200AH in capacity and we can use 2 pcs 12 volt in series. GEL solar battery is here the best solution like the Dryfit solar battery we have used since start up.



Li-Fe-Po battery is here different and can handle temperatures up to 60C and over 5000 cycles down to full 80% of capacity. Here we see a 2 pcs of a 90AH battery to 24 Volt to be OK.

This handle deep cycling and high temperatures and is preferred when hot. Lithium is 100% no maintenance.

Simple choice is that it is less 25-30C when battery is charged lead can be OK. The hotter Lithium is absolutely preferred.

Cost to buy is one matter and what is cheapest for 5 years is another matter. In short following is typical at a 25-30C installation.



**Battery selection in short with some criteria with day cycling**

Battery model	Ambient temperature	Deep cycle	Lifetime
Lead Car SMA type	20 C	40%	6 months
Lead Car SMA type	30 C	40%	2-3 months
Lead GEL solar	25 C	40%	4-6 years
Li-Fe-Po	30C	80%	5-10 years

**Solar charger system.**

All parts are important and charger is here a component that can change a lot of performance. There are 2 models. One is called PWM that is Pulse width modulation that is cheapest and simplest. We have a good German design that is cost efficient and best quality.

MPPT solar charger is more advanced and stands for Maximum Peak Power tracking. Here a processor sense and see what can be collected from panels and just all parameters by a DC/DC converter inside unit. Here we typically have 20-30% more KWH added into battery as controller is very efficient. Here we use MPPT as this is by far best and most cost efficient. The 20-30% extra we get here have a good low extra costs so this is a good unit. The unit can handle 250W in power and max 150 W from solar panels so 2 panels can be serial connected if we need extra power later.



**Inverter system 300W**

Inverter is a 24 Volt inverter with 300 W output and clean sine wave wave form. Made in Germany by high quality and best reliability. System is fully protected for tropical applications.



Cable set between solar panels and inverter

All kits have a 10 meter solar panel cable to be used from the panel connector to the solar charger. This is a weather resistant cable as it is used out door in rain and with lots of sun and corrosion.



### Cable and fuse set for battery and electronics

Cable set 3 meter long between charger and battery with an automatic fuse to prevent problems. One box with cable clips is included for use on all cables.



### Cable set with switches and all needed parts for installation

Electric connection set 230 Volt of high quality European equipment. Here we have 3 wall switches of high quality with 20 meter cable. There is 2 wall connectors 230 Volt with earth pole. We have 3 pcs junction box . All parts are IP 54 encapsulated and rugged for a long life with no problems. All parts are CE marked and fulfill international standards of electrical security.



### Lamp unit with socket and lamp unit / led bar for 24 volt DC direct operation

Lamp kit contains 6 LED lamp housings wit E27 sockets of a universal design that works in and outdoor. IP 65 protection is OK in a bathroom so it is water sealed.

Lamp is a 5W LED lamp with E27 socket giving 400 Lumen in light output. This design gives typical 30-50 thousand hours of lifetime.



### Thunderbolt / Lightning protection

Many tropical areas have thunderstorms and lightning problems that destroy equipment. We include a spark arrestor and transient protection to absorb the electrical shocks that can destroy all that is connected by a cable to the solar panel. This device follows the standards of 5000 Ampere transient protection ( 1000 Volt ).

Experience shows this is a key part for long trouble free life of the installation.



**Content of the large solar home kit.**

2 pcs	130 W	Solar panel with 1 meter cables and MP4 connectors
1 set	10 meter	Junction cable with MP4 connectors between panel and charger
1 pcs	240W	MPPT high efficiency solar charger for 24 volt battery operation. EU product
1 set	3 meter	Cable set between charger and battery pack with fuse
1 pcs	Battery	Alternative 1 Lead Gel battery 200 AH 24 volt for 25-30 C ambient Temp. Alternative 2 Lithium Iron Phosphate battery 90 AH 24 volt for higher temperatures and longer life time.
1 pcs	Inverter	300W sine wave high quality inverter. German brand
1 set	Cables	Set of all cables between battery + inverters + fuse etc. Length 1 meter.
1 pcs	Junction	For position close to inverter and battery.
3 pcs	230 Volt	Wall switches European
3 pcs	230 volt	Junction box European
20 m	230 Volt	Cable 3x1.5 mm <sup>2</sup> type EKK
6 pcs	Lamp	Lamp with lamp housing E27 thread and 5 MW led lamp included
1 box	8 mm	Cable clips 8 mm
1 pcs	5KA	Thunder bolt protection transient absorber.

**Calculation criteria for large home system**

6 pcs 5 W led lamps	5 hours per day = 150WH per 24 hours
1 pcs TV LED 100W	6 hours per day = 600WH per 24 hours
1 pcs Fridge 110 Liter 3 energy star system 100W	Intermittent 24 = 200WH per 24 hours
1 pcs Radio 10W	6 hours per day = 60 WH per 24 hours
3 pcs Mobile phone chargers	Intermittent 24 = 20 WH per 24 hours

Summary in KWH per 24 hours **Total 1030 KWH / Day**

2 panels of 130W / each gives typical 1.4 KWH / day Margin about 30%

This is based on a children family with TV and children if front of TV a lot. If family is smaller and do not look to much at TV and area is very sunny a solution with 1 pcs panel may be OK.

**Warranty** Solar panels 25 years with 80% rest power  
 MPPT Inverter 5 years  
 Battery 5 years if we have a service contract and certificate of correct inspection  
 Lamps 3 years

**Extended warranty** If we have a service contract we can give up to 10 years complete warranty of all components.  
 This included service visits and check every year and service at site

