

SOLARSENSE UK LTD PRODUCT OFFERING 24 JANUARY 2011-01-24

- **SANYO 235Wp – for black appearance, top performance and ideal for small roof areas as well as large.**
- **MOSERBAER 220Wp – budget module for large roof areas, minimum cost/kWp installed**
- **ROMAG 180Wp – ‘short and fat’ soon available in all black appearance, British made**

SELLING PRICE FOR STANDARD PV INSTALLATIONS 20th Jan 2011

Moserbaer 220Wp Polycrystalline											
Nearest kWp	Actual kWp	No. of mods	Inverter	Cost (£)	vat (£)	Cost/kWp inc. Vat (£)	Total Cost (£)	kWh/yr (850kWh /kWp)	FIT income (£)	Cost/kWh (£)	CO2 saved (kg)
2.0	1.980	9	SB1700	7344	367.20	3894.55	7711.20	1683	695	4.58	870.11
2.2	2.200	10	SB2500	7733	386.64	3690.65	8119.44	1870	772	4.34	966.79
3.0	3.080	14	SB3000	9747	487.35	3322.84	10234.35	2618	1081	3.91	1353.51
4.0	3.960	18	SB3800	11900	595.01	3155.37	12495.26	3366	1390	3.71	1740.22
10.0	9.900	45	IG+120	28000	1400.00	2969.70	29400.00	8415	3071	3.49	4350.56

Romag 180Wp polycrystalline											
Nearest kWp	Actual kWp	No. of mods	Inverter	Cost (£)	vat (£)	Cost/kWp inc. Vat (£)	Total Cost (£)	kWh/yr (850kWh /kWp)	FIT income (£)	Cost/kWh (£)	CO2 saved (kg)
1.8	1.800	10	IG15	7323	366.15	4271.74	7689	1530	632	5.03	791.01
2.0	2.160	12	IG20	8200	409.99	3985.97	8610	1836	758	4.69	949.21
2.5	2.520	14	IG30	9055	452.76	3772.99	9508	2142	885	4.44	1107.41
3.0	3.240	18	IG30	10694	534.71	3465.73	11229	2754	1137	4.08	1423.82
4.0	3.960	22	IG40	12491	624.53	3311.92	13115	3366	1390	3.90	1740.22
5.0	5.040	28	IG60	15885	794.26	3309.43	16680	4284	1769	3.89	2214.83
10.0	9.36	52	IG1+120	28000	1400.00	3141.03	29400	7956	2864	3.70	4113.25

Sanyo 235Wp hybrid module HIT-N235SE10

Nearest kWp	Actual kWp	No. of mods	Inverter	Cost exc vat (£)	vat (£)	Cost/kWp inc. Vat (£)	Total Cost (£)	kWh/yr (925kWh /kWp)	FIT income (£)	Cost/kWh (£)	CO2 saved (kg)
1.5	1.41	6	IG15	7796	389.78	5805.19	8185.32	1304	539	6.28	674.30
2.0	2.12	9	IG20	8956	447.81	4446.36	9404.05	1956	808	4.81	1011.45
2.3	2.35	10	IG30	9805	490.26	4381.07	10295.51	2174	898	4.74	1123.83
3.0	2.82	12	IG30	11452	572.59	4263.93	12024.29	2609	1077	4.61	1348.59
4.0	3.76	16	IG40	14585	729.24	4072.86	15313.94	3478	1436	4.40	1798.13

Notes*

Scaffold not included, £450 extra
 Fronius or SMA Remote display extra £200
 Datalogger extra £280

Inverter warranty 10years included

Job 50 miles away, add £5.00/mile if further

SANYO 235Wp features and benefits:

- Most efficient module on the market – maximum annual output for module area
- Ideal for small roofs where polycrystalline would not fit
- Black appearance
- Mechanical warranty 5 years
- Power output warranty 20 years at 80% of as new performance

HIT[®] photovoltaic module



HIT-N235SE10
HIT-N230SE10
HIT-N225SE10

R&D technology adaptation

Reducing carrier recombination loss

- Preserving as much of the generated electricity as possible
- Realizing even higher voltage

Reduction of optical loss

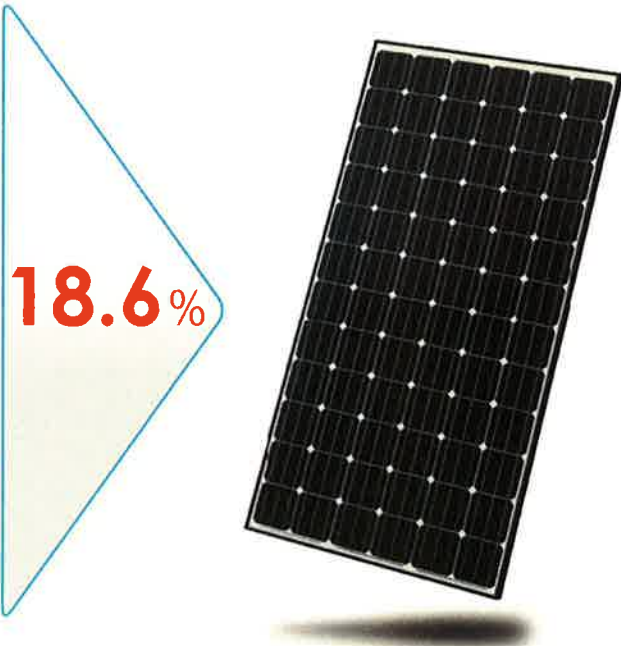
- Enabling as much incoming sunlight as possible to reach the electrical generating layer (crystalline silicon)
- Realizing even higher current

Anti-reflection glass

New tab design

Reducing resistance loss

- Extracting as much of the generated electricity as possible
- Realizing even higher fill factor



HIT cell technology

The SANYO HIT (Heterojunction with Intrinsic Thin layer) solar cell is made of a thin mono crystalline silicon wafer surrounded by ultra-thin amorphous silicon layers. This product provides the industry's leading performance and value using state-of-the-art manufacturing techniques.

Environmentally-Friendly Solar Cell

More Clean Energy
 HIT can generate more clean Energy than other conventional crystalline solar cells.

Special Features

SANYO HIT solar modules are 100% emission free, have no moving parts and produce no noise. The dimensions of the HIT modules allow space-saving installation and achievement of maximum output power possible on given roof area.

High performance at high temperatures

Even at high temperatures, the HIT solar cell can maintain higher efficiency than a conventional crystalline silicon solar cell.

HIT⁺ Solar Cell Structure

Changes in generated power daytime

The HIT cell and module have very high conversion efficiency in mass production.

Model	Cell Efficiency	Module Efficiency
HIT-N235SE10	21.1%	18.6%
HIT-N230SE10	20.7%	18.2%
HIT-N225SE10	20.2%	17.8%



HIT is a registered trademark of SANYO Electric Co., Ltd. The name "HIT" comes from "Heterojunction with intrinsic Thin-layer" which is an original technology of SANYO Electric Co., Ltd.

Electrical data (at STC)

Models HIT-NxxxSE10

	235	230	225
Maximum power (Pmax) [W]	235	230	225
Max. power voltage (Vmp) [V]	43.0	42.3	41.6
Max. power current (Imp) [A]	5.48	5.45	5.42
Open circuit voltage (Voc) [V]	51.8	51.2	50.6
Short circuit current (Isc) [A]	5.84	5.83	5.83
Maximum over current rating [A]		15	
Output power tolerance [%]		+10/-5	
Maximum system voltage [V]		1000	

Note: Standard Test Conditions: Air mass 1.5, Irradiance = 1000W/m², cell temperature = 25°C

Temperature characteristics

	235	230	225
Temperature (NOCT) [°C]	44.0	44.0	44.0
Temperature coefficient of Pmax [%/°C]	-0.30	-0.30	-0.30
Temperature coefficient of Voc [V/°C]	-0.130	-0.128	-0.127
Temperature coefficient of Isc [mA/°C]	1.75	1.75	1.75

At NOCT

	235	230	225
Maximum power (Pmax) [W]	178	174.3	170.1
Max. power voltage (Vmp) [V]	40.5	39.9	39.2
Max. power current (Imp) [A]	4.41	4.38	4.34
Open circuit voltage (Voc) [V]	48.9	48.3	47.7
Short circuit current (Isc) [A]	4.70	4.70	4.70

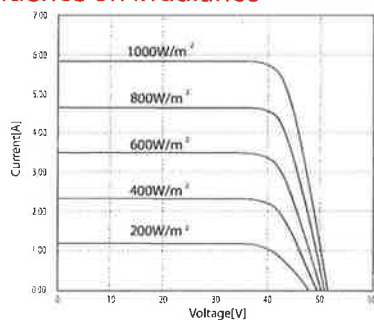
Note: Nominal Operating Cell Temperature: Air mass 1.5 spectrum, Irradiance = 800W/m², Air temperature = 20°C, wind speed 1 m/s

At low irradiance

	235	230	225
Maximum power (Pmax) [W]	44.9	43.8	42.9
Max. power voltage (Vmp) [V]	41.0	40.6	40.1
Max. power current (Imp) [A]	1.09	1.08	1.07
Open circuit voltage (Voc) [V]	48.4	47.8	47.2
Short circuit current (Isc) [A]	1.17	1.17	1.17

Note: Low irradiance: Air mass 1.5 spectrum, Irradiance = 200W/m², cell temperature = 25°C

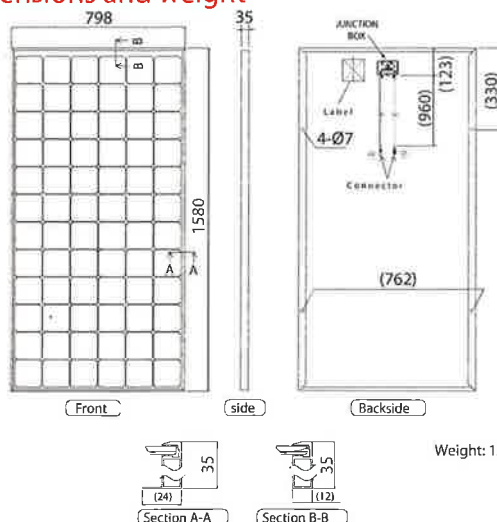
Dependence on irradiance



Reference data for model HIT-N235SE10 (Cell temperature 25°C)

Dimensions and weight

unit: mm



Weight: 15kg

Warranty

Power output: 10 years (90% of Pmin) 20 years (80% of Pmin)
Product workmanship: 5 years
(Based on contract terms)

Materials

Cell material: 5 inches HIT cells
Glass material: AR coated tempered glass
Frame materials: Black anodized aluminium

Certificates



- Safety tested IEC 61730
- Periodic inspection IEC 61215

IEC 61730

IEC 61215



Electrical Protection Class II



Member of



Please consult your local dealer for more information

CAUTION! Please read the installation manual carefully before using the products.

Due to our policy of continual improvement the products covered by this brochure may be changed without notice.

SANYO Component Europe GmbH
Solar Division

Stahlgruberring 4
81829 Munich, Germany
Tel. +49-(0)89-460095-0
Fax. +49-(0)89-460095-170
<http://www.sanyo-solar.eu>
email: info.solar@sanyo-solar.eu

SANYO Electric Co., Ltd.
Solar Division
<http://www.sanyo.com/solar/>

MOSERBAER 220Wp – budget module for large roof areas

- Lowest cost / installed kWp
- Used where roof area is not a consideration
- Mechanical warranty 5 years
- Power output warranty 20 years at 80% of as new performance
- Swiss / Indian company that have a very high standard of accreditation
- Only 5 star TUV rated module in the world at the present time
- ISO 14001
- ISO 9001
- ISO 2600 (voluntary CSR standard basically meaning they meet strict employer standards for staff terms and conditions eg they don't employ children!

MBPV Max Series (210W_p - 240W_p) Model «MBPV -CAAP»

MBPV Max Series modules are specifically designed to generate optimum energy from sunlight and can withstand the roughest of conditions. They are designed for versatility in applications suited for residential, commercial and industrial purposes.

High Energy Yields (kW_n/kW_p) - Best-in-class diffused light response leading to less power degradation and potentially delivering one of the lowest levelized cost of energy

Rigorous Quality Control - Top-of-the-line manufacturing equipment from Europe and Japan along with raw materials from renowned international suppliers backed by in-house reliability testing capabilities

Highest Safety Standards - All modules conform to CE standards and are pre-fabricated with grounding holes to ensure highest safety standards

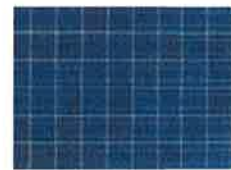
Robust Design - Anodized frames ensure protection in all-weather-conditions. High quality, low iron, high transmissivity, tempered and textured glass to ensure higher light absorption

Best-in-Class Warranty - Mechanical warranty of 5 years and performance warranty of 12 years at 90% of rated output power and 25 years at 80% of rated output power

Ease of Installation - IEC and UL approved IP65 rated junction box, pre-fitted with cables and plug & play connectors for quick and safe installation



With uniform cell color and high quality anodization on the frames, MBPV modules deliver superior aesthetics



Hybrid lamination technology for bubble-free lamination ensures long-term product performance



Certifications:
IEC 61215 (Edition II),
IEC 61730 (Safety Class II), CE, UL 1703, PV Cycle.



Certified as per:
ISO 9001, ISO 14001,
OHSAS 18001,
SA 8000, Awarded a 5-Star Rating from TUV Rheinland along with 100% rating for Quality Systems



MBPV Max Series (210W_p - 240W_p)

Model «MBPV -CAAP»

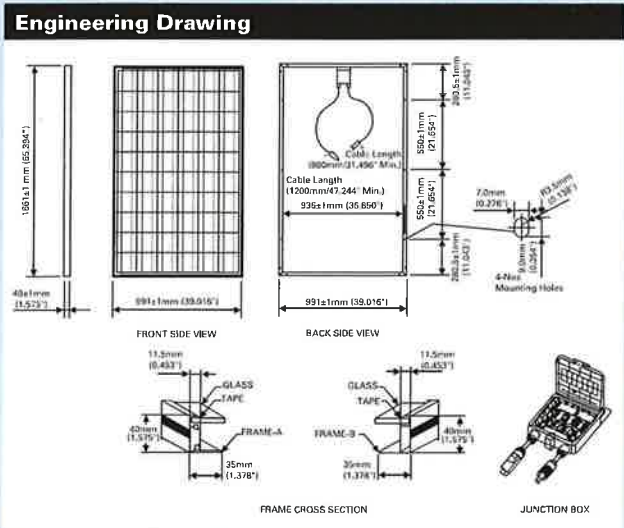
	210 W _p	215 W _p	220 W _p	225 W _p	230 W _p	235 W _p	240 W _p
Electrical Characteristics							
Maximum Power, P _{max} (W)	210	215	220	225	230	235	240
Voltage at Pmax, V _{mp} (V)	29.12	29.21	29.42	29.80	30.12	30.59	30.80
Current at Pmax, I _{mp} (A)	7.21	7.36	7.47	7.55	7.62	7.68	7.80
Open Circuit Voltage V _{oc} (V)	36.02	36.21	36.46	36.85	37.11	37.34	37.69
Short Circuit Current I _{sc} (A)	7.85	7.93	8.00	8.09	8.18	8.24	8.34
Temperature Coefficient of P _{max} (%/K)			-0.43				
Temperature Coefficient of V _{oc} (%/K)			-0.344				
Temperature Coefficient of I _{sc} (%/K)			0.11				
Power Tolerance (%)			+ 3	± 3	± 3	± 3	± 3
Maximum System Voltage (IEC/UL) (V DC)			1000/600				
NOCT (°C)			47.0	± 2			

- Standard Test Conditions (STC): Irradiance 1000W/m², Module temperature at 25°C and AM 1.5G Spectrum
- Max Series fuse ratings: 10A
- Operating Temperature (°C): (-40 to +)85
- 3 by-pass Diodes

Environmental Test Conditions

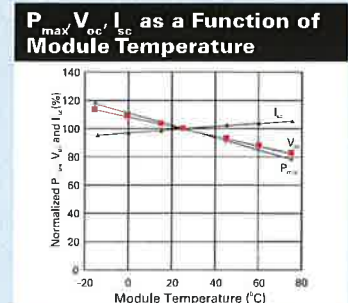
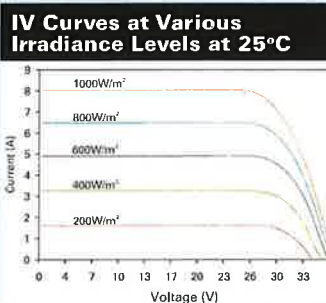
- Operating Temperature (temperature cycling range): (-40°C to +)85°C for 200 cycles
- Static Load Front and Back (e.g. wind): 50 lbs/ft² or 2400 Pa
- Impact Resistance (e.g. hail): 25mm at 23 m/s (1" at 52 mph) at 11 impact locations
- Humidity Freeze, Damp Heat: 85°C and 85% relative humidity for 1,000 hours
- Front Loading (e.g., snow): 113 lbs/ft² or 5400 Pa

Mechanical Characteristics	
Number and Arrangement of Cells	156mmx156mm (6") Multicrystalline Silicon Solar PV Cells, 6x10 configuration
Dimensions	1661mmx991mmx40mm/65.394"x39.016"x1.575"
Weight (lbs/kgs)	43/19.5
Frame	Anodized aluminium frame with twin-wall profile
Anodization Thickness	17 μ
Front Glass	High transmission, low iron, tempered and textured glass, 3.2mm/0.126"
Junction Box	IEC/UL approved IP65 rated 4 terminal junction box with 3 by-pass diodes (12A, 200V)
Output Cables	USE-2 Solar cables, 4mm ² /0.0062" cross-section, asymmetric length 800mmx1200mm/31.496"x47.244"
Type of Connector	Low resistance, IEC/UL approved (compatible with MC4)
Mounting Holes	Elliptical and 4 nos (9mmx7mm/0.354"x0.276")
Grounding Hole	Circular and 2 nos (4mm/0.157" dia) – In accordance with NEC Article 250 (USA) or CEC (Canada)
Drainage Hole	Circular and 8 nos (4mm/0.157" dia)



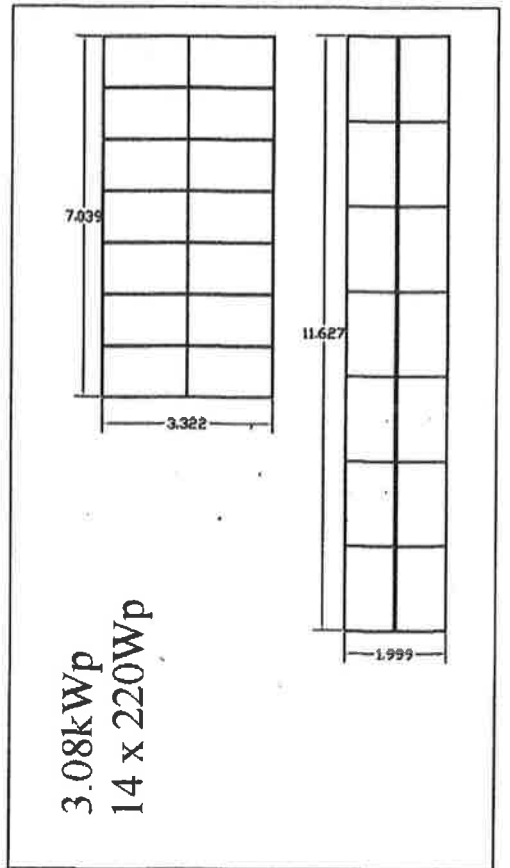
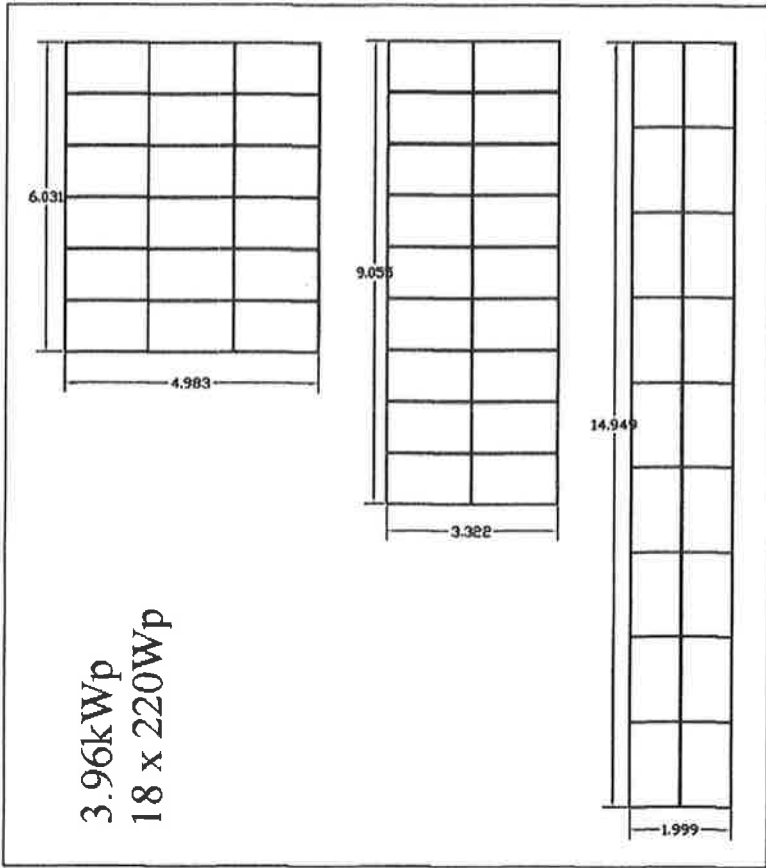
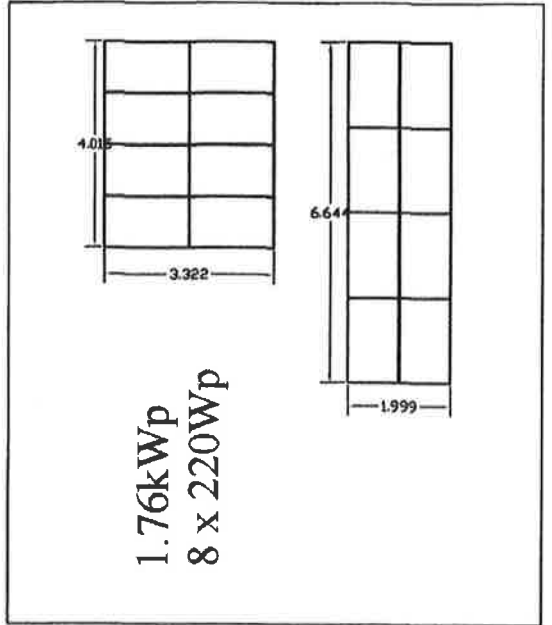
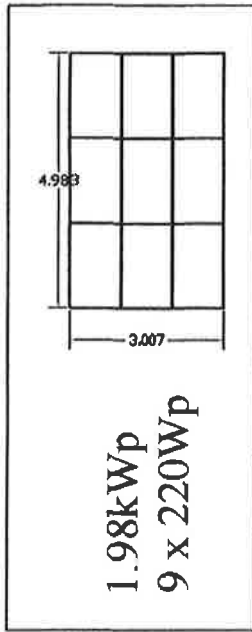
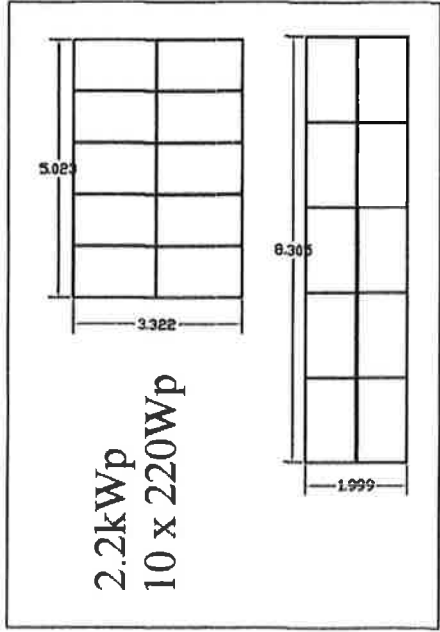
Packaging

Dimensions of pallets (mm/inch)	1690x750x1157/66.535x29.528x45.551
No of modules per pallet	17
No of pallets per 40ft HC container	42 (714 modules)
Gross weight per pallet (Kgs/lbs)	355/783



*Specifications are subject to change without notice

MOBASOLAR 220Wp



ROMAG 180Wp – ‘short and fat’ soon available in all black appearance, British made

- Dimensions allow different layout to above
- British made in Durham
- All black appearance
- Mechanical warranty 5 years
- Power output warranty 20 years at 80% of as new performance

Polycrystalline Silicon Photovoltaic Modules

The PowerGlaz[®] SMT 6(48)P photovoltaic module series has 48 enhanced-efficiency Polycrystalline silicon cells in series. With up to 185 watts of nominal maximum power, it is well-suited to utility grid-supplemental systems, in roof and on roof PV systems and also grid independent systems.

Romag has used its extensive glass processing experience to produce the high quality PowerGlaz[®] SMT 6(48)P photovoltaic modules using the latest materials. Textured low iron glass is used as the outer component of the laminate to maximize the light transmission to the cells. 48 Polycrystalline

cells are connected in series and encapsulated in EVA bonded to the glass sheet. A final backing layer is laminated to the rear of the module to complete the weather protection. Lead free materials and components are used throughout the manufacture.

Mechanical Characteristics

Weight:	17 Kg
Dimensions:	1318 x 994 x 46mm
Overall tolerances	±3mm

Warranty

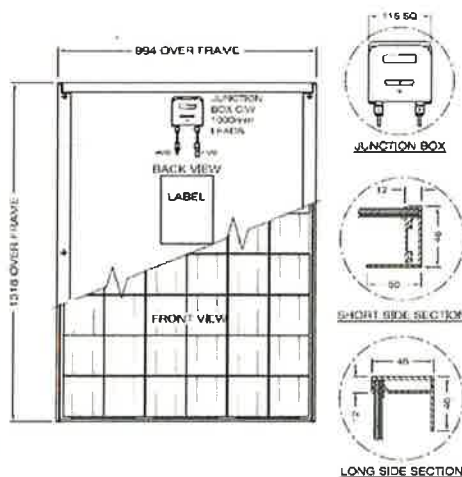
- ◆ 80 % Power output for 25 years
- ◆ Freedom from defects in materials and workmanship for 5 years.

Quality

- ◆ Independently certified to IEC 61215 ed 2 / IEC 61730
- ◆ Suitable use in systems up to 1000 VDC
- ◆ Static loading, front and back, of 5400 pascals.
- ◆ These products are manufactured in our ISO 9000-certified factory to demanding specifications.
- ◆ Factory is subject to periodic inspection by TUV.
- ◆ repetitive cycling between -40°C and 85°C at 85% relative humidity;
- ◆ simulated impact of 25mm (one-inch) hail at terminal velocity;
- ◆ 2200 VDC frame/cell string isolation test;
- ◆ Bypass diodes to counteract shading effects

Advantages

- ◆ High power module manufactured using Polycrystalline cells
- ◆ MC Junction box and connectors to enable quick and easy site connection
- ◆ Sturdy Hollow Section Aluminium frame with drain holes.
- ◆ Black anodized frames and black backing sheet available
- ◆ Glass Structurally bonded to frame for increased safety.
- ◆ Lead Free materials used throughout.
- ◆ Frameless module available on request.
- ◆ Textured low iron glass to maximize light transmission to the cells



En 61215 ed. 2
En 61730



Electrical Characteristics

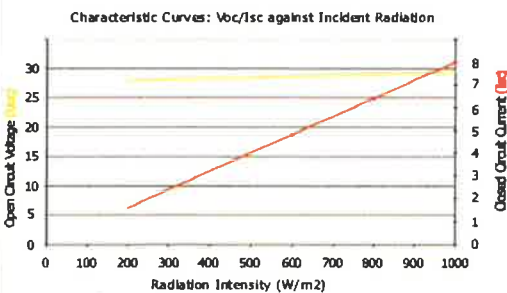
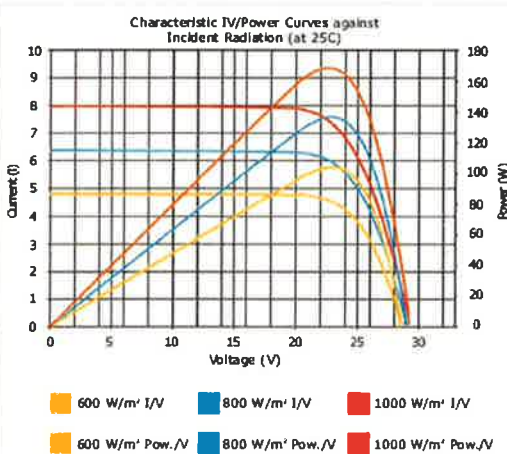
SMT 6 (48)P Module Grade	648185	648180	648175	648170	648165	648160
Maximum power (Pmax) ²	185w	180W	175W	170W	165W	160W
Voltage at Pmax (V _{mp})	24.60V	24.09V	23.58V	22.97V	22.47V	21.88V
Current at Pmax (I _{mp})	7.58A	7.47A	7.42A	7.40A	7.34A	7.31A
Short-circuit current (I _{sc})	8.04A	8.00A	7.95A	7.90A	7.85A	7.80A
Open-circuit voltage (V _{oc})	29.76V	29.47V	29.18V	29.00V	28.89V	28.84V

Rated power may vary by +/-3% from the above

Temperature Coefficients

Isc 4.2mA/K Voc -106mV/K NOCT 40.4 C

Characteristic Curves



This publication summarizes product warranty and specifications, which are subject to change without notice and should not be used as the definitive source of information for final system design. Additional warranty and technical information may be found on our website www.powerglaz.co.uk.

Romag
GLASS SPECIALIST

Leadgate Industrial Estate
Leadgate
Consett
Co. Durham
DH8 7RS
UK

Phone: +44 (0) 1207 5000000

Fax: +44(0) 1207 591979

E-mail: info@romag.co.uk

1. This data represents the performance of typical PowerGlaz® SMT 6 (48)P modules and laminates as measured at their output connectors. The data are based on measurements made in accordance with ASTM E1036 corrected to SRC (Standard Reporting Conditions, also known as STC or Standard Test Conditions), which are:

- illumination of 1 kW/m², (1 sun) at spectral distribution of AM1.5 (ASTM E892 global spectral irradiance);
- cell temperature of 25°C.

The power of solar cells varies in the normal course of production; specifications of these products reflect that variation.

2. During the stabilization process which occurs during the first few months of deployment, module power may decrease approximately 3% from typical Pmax.

3. The cells in an illuminated module operate hotter than the ambient temperature. NOCT (Nominal Operating Cell Temperature) is an indicator of this temperature differential, and is the cell temperature under Standard Operating Conditions: ambient temperature of 20°C, solar irradiation of 0.8 kW/m², and wind speed of 1m/s.