

**Photovoltaic Module
ES - 230 P60 Q**



**More Yield.
Efficiency
You Can Feel!**

- ◆ **selected components**
- ◆ **reliable workmanship**
- ◆ **value added**



Photovoltaic Module ES - 230 P60 Q



Electrical Data at 1000 W/m², 25 °C and AM 1.5 (STC in Accordance with EN 60904-3)

	220 Wp	225 Wp	230 Wp	235 Wp	240 Wp ²
rated power at STC ¹	220 Wp	225 Wp	230 Wp	235 Wp	240 Wp ²
module efficiency at STC ³	13.0 %	13.3 %	13.6 %	13.9 %	14.2 %
cell efficiency	15.8 %	16.1 %	16.4 %	16.7 %	17.0 %
open-circuit voltage V _{oc}	35.93 V	36.31 V	36.60 V	36.92 V	37.23 V
short-circuit current I _{sc}	8.08 A	8.18 A	8.30 A	8.40 A	8.51 A
rated voltage V _{mpp}	28.99 V	29.30 V	29.53 V	29.79 V	30.04 V
rated current I _{mpp}	7.59 A	7.68 A	7.79 A	7.89 A	7.99 A

¹ The measurement tolerance of the rated power is ± 3%. The modules delivered are sorted in a range of ± 2.5 Wp. ² Available in limited amounts upon request. ³ At low irradiance (200 W/m², 25°C and AM 1.5) the module yields at least 97% of the STC efficiency.

Electrical Data at 800 W/m², NOCT, 1m/s Wind Speed and AM 1.5

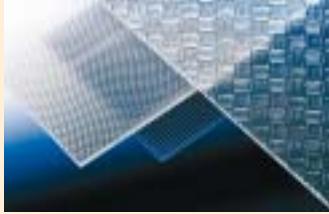
	178.2 W	182.3 W	186.3 W	190.4 W	194.4 W
open-circuit voltage V _{oc}	35.59 V	35.97 V	36.25 V	36.57 V	36.88 V
short-circuit current I _{sc}	6.49 A	6.57 A	6.66 A	6.75 A	6.84 A
rated voltage V _{mpp}	29.09 V	29.40 V	29.63 V	29.90 V	30.15 V
rated current I _{mpp}	6.13 A	6.20 A	6.29 A	6.37 A	6.45 A

Thermal Data

temperature coefficient open-circuit voltage	- 0.36 %/K
temperature coefficient short-circuit current	+0.06 %/K
temperature coefficient rated power	- 0.43 %/K
noct (normal operating cell temperature)	47 °C ± 2 K

Mechanical Data

number of cells and cell type	60 polycrystalline solar cells (156 x 156 mm, 3-Bus-Bar)
cell manufacturer	Q-Cells, Germany
dimensions: length x width	1,691 mm x 1,002 mm
frame thickness	50 mm anodized aluminum
weight	25.1 kg (Albarino S) / 23.5 kg (Albarino P) / 22.2 kg (Albarino G)
front glass	4 mm Albarino S, P or G (Saint Gobain Solar)
embedding	EVA (Solutia Solar)
back sheet	TPT Tedlar®/Polyester/Tedlar® (Krempele)
	KPK Kynar®/Polyester/Kynar® (Krempele)
junction box	Spelsberg/Lumberg; plastic, protection class IP 65, 141 x 101 x 28 mm
number of bypass diodes	3
cables	4 mm ² solar cables, length 920 mm
connectors	MC4/LC4



The distinctive feature of **ES-230 P60** is the standard application of Albarino P or G of Saint-Gobain Solar as front glass. The special surface texture of this glass traps the light in the modules and provides a surplus of at least **3% annually**.

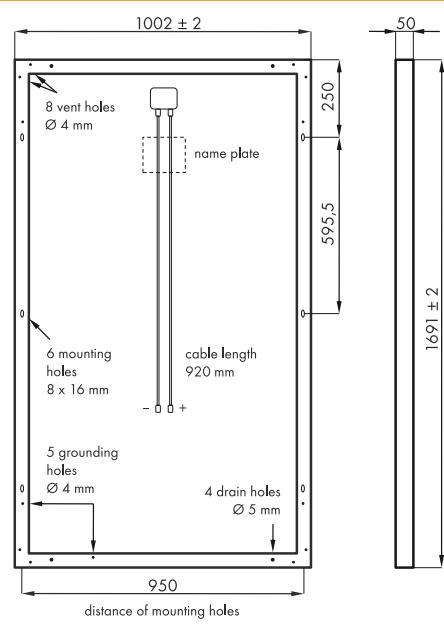
Permissible Operating Conditions

operating temperature range	- 40 °C to 85 °C
max. system voltage	1000 V DC
max. reverse current	15 A
maximum surface load capacity	5400 Pa or 550 kg/m ²
resistance against hail	maximum diameter of 24 mm with impact speed of 83 km/h
protection class	II

Warranty and Certificates

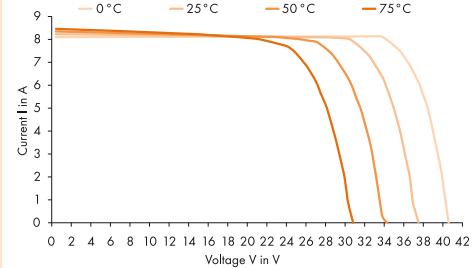
product warranty	10 years
performance warranty	90% up to 10 years, 80% up to 25 years
certifications	IEC 61215 Ed. 2 & IEC 61730 TÜV Rheinland; UL 1703; IEC 61701; MCS accredited; ISO 9001 & ISO 14001

Technical Drawing – All Dimensions in mm



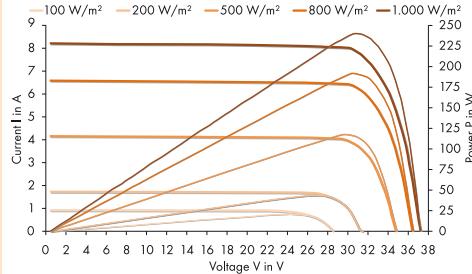
Characteristic Curve of ES-230 P60

with a variety of cell temperatures at 1000 W/m²



Characteristic Curve of ES-230 P60

with a variety of radiation levels at 25 °C



Your Retailer:

For more details, see Installation Manual.
Datasheet according to EN 50380.



- Qualified, IEC 61215
- Safety tested, IEC 61730
- Periodic Inspection

