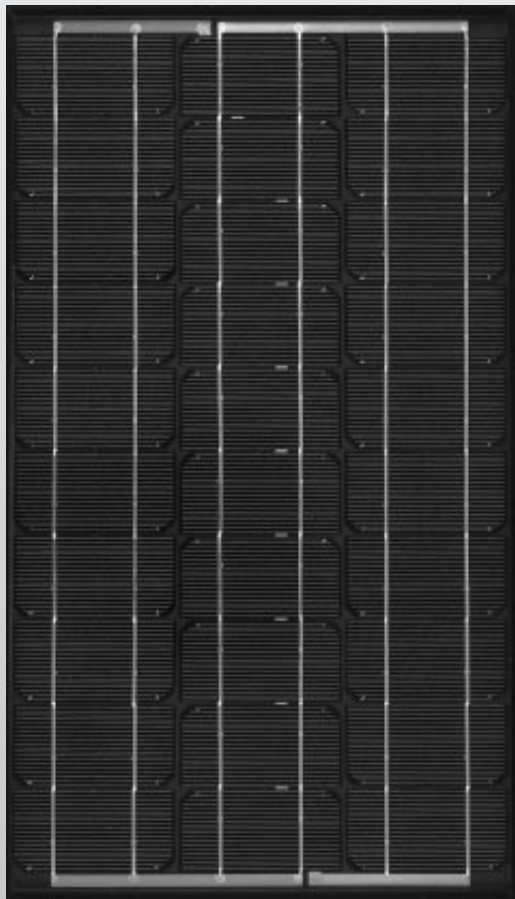


Solar module SM20



When it comes to reliable and environmentally-friendly generation of electricity from sunlight, solar modules from Siemens provide the perfect solution. Manufactured in compliance with the most stringent quality standards, Siemens Solar modules are designed to withstand the toughest environmental conditions and are characterized by their long service life. Siemens Solar modules are covered by a 10-year limited warranty on power output – your guarantee of trouble-free solar power generation.

PowerMax® technology

Siemens' proprietary PowerMax® technology optimizes the energy production of individual cells and solar modules for all types of environmental conditions. PowerMax® process optimization includes a special refining technique for ingots, a clean room semiconductor grade production process, and a multistage proprietary TOPST™ (Texture Optimized Pyramidal Surface) process. The TOPS process incorporates the formation of textured pyramids on the surface of the solar cell. These pyramids are then specially treated to passivate the surface which optimizes the cell's optical properties for maximum absorption of photons from the sun's light. TOPS also maximizes photon absorption from direct and diffused light (typical under cloudy conditions). This means that light absorption is especially high, even at low light levels. Siemens PowerMax® solar cells deliver maximum energy throughout the day.

Solar module

Model:	SM20
Rated power:	20 Watts
Limited warranty:	10 Years

Certifications and Qualifications

- UL-Listing 1703
- MIL Standard 810
- JPL Specification No. 5101-161
- CE mark
- FM Certification

Intelligent module design

- All cells are electrically matched to assure the greatest power output possible.
- Ultra-clear tempered glass provides excellent light transmission and protects from wind, hail, and impact.
- Torsion and corrosion-resistant anodized aluminum module frame ensures dependable performance, even through harsh weather conditions and in marine environments.
- Intended for 12V systems only, the SM20 regulates its electrical output to the needs of the battery.

High quality

- Every module is subject to final factory review, inspection, and testing to assure compliance with electrical, mechanical, and visual criteria.
- 30 PowerMax® single-crystalline solar cells deliver excellent performance even in reduced light or poor weather conditions.
- Cell surfaces are treated with the Texture Optimized Pyramidal Surface (TOPS™) process to generate more energy from available light.
- Fault tolerant multi-redundant contacts on the front and back of cells provide superior reliability.
- Solar cells are laminated between a multi-layered polymer backsheet and layers of ethylene vinyl acetate (EVA) for environmental protection, moisture resistance, and electrical isolation.
- Durable back sheet provides the module underside with protection from scratching, cuts, breakage, and most environmental conditions.
- Laboratory tested and certified for a wide range of operating conditions.
- Ground continuity of less than 1 ohm for all metallic surfaces.
- Manufactured in ISO 9001 certified facilities to exacting Siemens quality standards.

Easy installation

- Lightweight aluminum frame and pre-drilled mounting holes for easy installation.
- Sealed terminal cover includes a cable with color-coded lead wires for fast, safe, and easy field connections.

Performance warranty

- 10 Year limited warranty on power output.

Further information on solar products, systems, principles, and applications is available in the Siemens Solar product catalog.

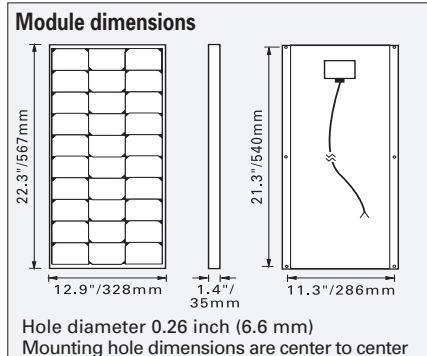
Siemens modules are recyclable.

Siemens Solar GmbH
A joint venture of
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Germany

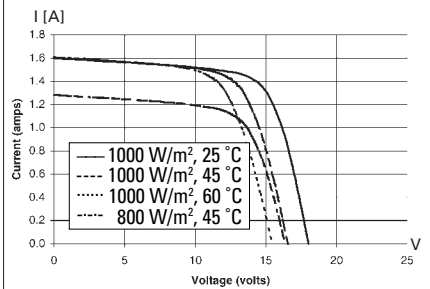
Solar module SM20

Electrical parameters		
Maximum power rating P_{max} [W_p] ¹⁾		20
Rated current I_{MPP} [A]		1.38
Rated voltage V_{MPP} [V]		14.5
Short circuit current I_{SC} [A]		1.6
Open circuit voltage V_{OC} [V]		18.0
Thermal parameters		
NOCT ²⁾ [°C]		45±2
Temp. coefficient: short-circuit current		1.2 mA / °C
Temp. coefficient: open-circuit voltage		-.077 V / °C
Qualification test parameters ⁴⁾		
Temperature cycling range [°C]		-40 to +85
Humidity freeze, Damp heat [%RH]		85
Maximum system voltage [V]		20
Wind loading PSF [M/m^2]		50 [2400]
Maximum distortion ³⁾ [°]		1.2
Hailstone impact Inches [mm]		1.0 [25]
	MPH [m/s]	52 [v=23]
Weight Pounds [kg]		5.6 [2.5]

- W_p (Watt peak) = Peak power (Minimum $W_p = 18$ Watts)
Air Mass AM = 1.5
Irradiance E = 1000 W/m²
Cell temperature $T_c = 25$ °C
- Normal Operating Cell Temperature at:
Irradiance E = 800 W/m²
Ambient temperature $T_u = 20$ °C
Wind speed $v_w = 1$ m/s
- Diagonal lifting of module plane
- Per EIC 1215 test requirement
- 12 Volt configuration



Voltage-current characteristic ⁵⁾



Your address for photovoltaics from Siemens Solar

Status 3/98 – Subject to modification.

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