

## ES-SERIES photovoltaic modules



Made in Germany

A range of high quality String Ribbon™ solar panels offering exceptional performance, cost effective installation and industry-leading environmental credentials made with our revolutionary wafer technology.

- Best-in-class performance ratings proven by field installations
- 98% of rated power guaranteed for 180, 190W product; 100% guaranteed for 195W product
- 5 year workmanship and 25 year power warranty for ultimate peace of mind\*
- More installation versatility with our extensive range of mounting options
- Higher strength with wind and snow loads guaranteed up to 3.8 kN/m<sup>2</sup>
- Tested to all major industry certifications and regulatory standards
- Smallest carbon foot-print leading the fight against global warming
- Quickest energy payback time for the maximum energy conservation
- Cardboard-free packaging for minimal on-site waste and disposal cost

\*For full details see the **Evergreen Solar Limited Warranty** available on request or online.

This product is designed and tested to UL 1703, UL Fire Safety Class C, IEC 61215 Ed.2 and TÜV Safety Class 2 standards.

String Ribbon is a trademark of Evergreen Solar, Inc. Evergreen Solar's wafer manufacturing technology is patented in the United States and other countries.

## Electrical Characteristics

### Standard Test Conditions (STC)<sup>1</sup>

		ES-180 RL-T or RL-TU*	ES-190 RL-T or RL-TU*	ES-195 RL-T or RL-TU*
$P_{mp}^2$	(W)	180	190	195
$P_{tolerance}$	(%)	-2 / +3	-2 / +2.5	-0 / +2.5
$P_{mp, max}$	(W)	186.1	194.9	199.9
$P_{mp, min}$	(W)	176.4	186.2	195.0
$V_{mp}$	(V)	25.9	26.7	27.1
$I_{mp}$	(A)	6.95	7.12	7.20
$V_{oc}$	(V)	32.6	32.8	32.9
$I_{sc}$	(A)	7.78	8.05	8.15

### Nominal Operating Cell Temperature Conditions (NOCT)<sup>3</sup>

$P_{mp}$	(W)	129.0	136.7	140.1
$V_{mp}$	(V)	23.3	23.8	23.9
$I_{mp}$	(A)	5.53	5.75	5.86
$V_{oc}$	(V)	29.8	30.3	30.5
$I_{sc}$	(A)	6.20	6.46	6.59
$T_{NOCT}$	(°C)	45.9	45.9	45.9

<sup>1</sup> 1000 W/m<sup>2</sup>, 25°C cell temperature, AM 1.5 spectrum;

<sup>2</sup> Maximum power point or rated power

<sup>3</sup> 800 W/m<sup>2</sup>, 20°C ambient temperature, 1m/s wind speed, AM 1.5 spectrum

\* RL-T model suitable for use only in systems where the DC negative pole of the array is hard grounded; RL-TU model also suitable for use in electrically ungrounded systems where local regulation allows

### Low Irradiance

The typical relative reduction of module efficiency at an irradiance of 200W/m<sup>2</sup> in relation to 1000W/m<sup>2</sup> both at 25°C cell temperature and spectrum AM 1.5 is 0%.

### Temperature Coefficients

$P_{mp}$	(%/ °C)	-0.49
$V_{mp}$	(%/ °C)	-0.47
$I_{mp}$	(%/ °C)	-0.02
$V_{oc}$	(%/ °C)	-0.34
$I_{sc}$	(%/ °C)	0.06

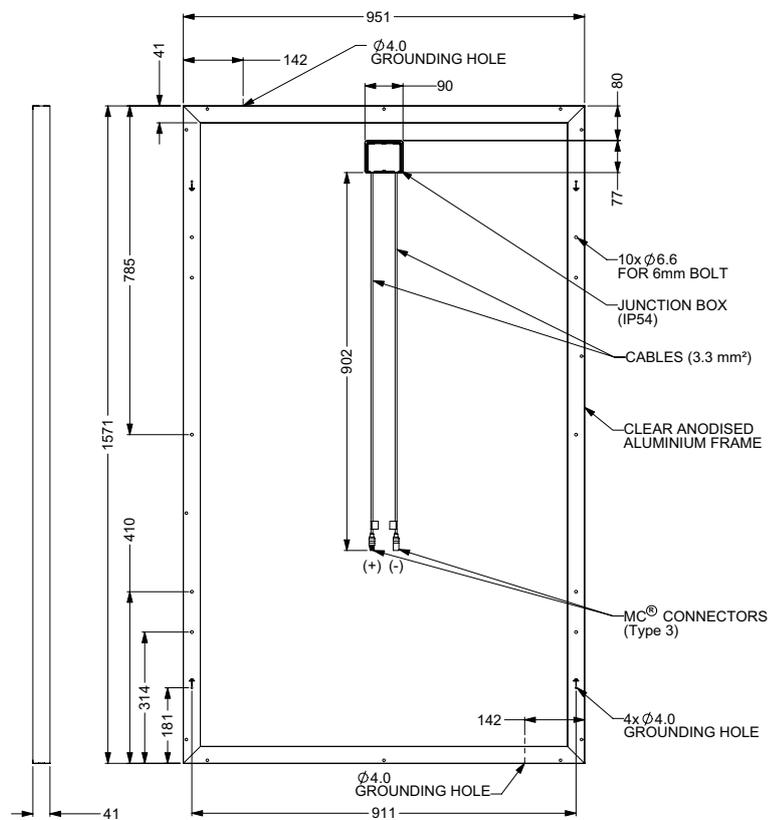
### System Design

Maximum Reverse Current <sup>4</sup>	15 A
Maximum System Voltage	1000 V

<sup>4</sup> Also known as Series Fuse Rating

ELECTRICAL EQUIPMENT  
CHECK WITH YOUR INSTALLER

## Mechanical Specifications



All dimensions in mm; module weight 18.2 kg

Product constructed with 108 poly-crystalline silicon solar cells, anti-reflective tempered solar glass, EVA encapsulant, polymer back-skin and a double-walled anodized aluminum frame. Product packaging tested to International Safe Transit Association (ISTA) Standard 2B and DIN EN ISO Standards 12048, 13355, 2244, 10531. All specifications in this product information sheet conform to EN50380. See the **Evergreen Solar Safety, Installation and Operation Manual** and **Mounting Design Guide** for further information on approved installation and use of this product.

Due to continuous innovation, research and product improvement, the specifications in this product information sheet are subject to change without notice. No rights can be derived from this product information sheet and Evergreen Solar assumes no liability whatsoever connected to or resulting from the use of any information contained herein.

### Partner:

S195\_EN\_010408; effective April 1<sup>st</sup> 2008