PowerOptimal Elon® 100 specification

Version 2.20 · Last updated June 2026

INTRODUCING THE PowerOptimal Elon® 100

The innovative PowerOptimal Elon® 100 incorporates proprietary solar PV (photovoltaic) power management technology to allow for direct connection of solar PV arrays to electric geysers (water heaters) with optimised solar power use in a single compact unit. The system can be connected to the grid (AC mains) as well, and intelligently switches between AC and solar power supply. The system requires no inverter and no battery. It can be connected to standard AC geyser heating elements and AC thermostats, which translates into the most cost-effective solar water heating option today.

SPECIFICATIONS

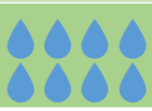
Rated input voltage	250V AC, 250V DC
Rated input current	25A AC, 20A DC
Mains (AC) voltage range (over-voltage & undervoltage protection)	-50% to +100%. Overvoltage protection up to 500V and undervoltage protection down to 125V. Will disconnect all loads when breach is greater than +/- 15%.
System power supply	Solar or 230V AC mains
Power consumption	<3W on mains power; <0.5W on solar power
Shutdown	Sufficient power supply capacity to manage processor, switching and data storage if both mains and solar supply fail
Solar voltage (V_{oc} at STC)	20 – 250 V DC
Solar power availability sensing	Automatically determines availability of sufficient solar power before supplying load from solar PV array
Controller settings	Can be adjusted to run from “solar only” (100% solar energy use) to “mains only” (no solar energy use) with 3 settings in between to allocate different proportions of the day to solar and mains.
Thermostat	Uses the standard thermostat switch associated with the geyser element as a sensor only, with less than 10mA sense current, to control power to the element
Reverse polarity protection	Protected against reverse connection of solar array
Enclosure ingress protection rating	Elon 100 main unit: IP65 Elon 100 remote control: IP40 (install indoors or in waterproof enclosure)
Max. distance Elon® unit to controller	10 m (can be extended)
Annual energy production compared to inverter-based system	> 90% when solar array and geyser element are matched correctly
Standards conformance	IEC / SANS 60669-1, 60669-2-1, 60730-1, 60335-1, 60335-2-21, CISPR 11 & IEC 61000-6-1
Dimensions & weight	Elon® 100 main unit: 200 x 150 x 90 mm (LxWxH), 1.75 kg. Controller: 50 x 72 x 41 mm (LxWxH) Box information (for shipping): 230 x 150 x 150 mm (LxWxH), 2 kg.
Patents	ZA 2019/02129

It is important to match the solar PV array and heating elements for maximum power transfer efficiency. See **Table 1B** for the recommended AC heating element power rating for different solar panel specifications and configurations.

Contact PowerOptimal for advice on module-element matching if module properties are significantly different to typical values or for **bifacial, high current or high voltage modules**.

TABLE 1A. ELON® KIT EASY SELECTION GUIDE – HOW MANY SOLAR PV MODULES DO I NEED?

The below table provides an easy selection guide based on number of people in the household and/or hot water use (showers/day). Minimum recommended array size is 1 kW_p. More detailed information and selection guidelines are provided in Tables 2-7.

Solar PV array size (kW_p)	Showers per day*	50%+ of daily hot water use provided for how many people?	How many people off-grid for hot water?	Typical number of solar PV modules
1 – 1.6				2 -3 modules
1.6 – 2				3 - 4 modules
2 - 3				4 - 5 modules
3 – 4 (two parallel PV strings)				6 - 8 modules

* 6-minute showers at 40 ºC with 8 litre/min (low-flow) showerheads

TABLE 1B. ELON® KIT EASY SELECTION GUIDE – WHAT SIZE GEYSER ELEMENT IS THE BEST MATCH?

To get the best performance from your Elon® solar PV water heater, it is important that the geyser element is a good match for the size of your solar PV array. This table helps you match the size of the solar PV array with the size of the geyser element.

Solar PV array size (kW_p)	Best matching geyser element size (kW)	2nd choice geyser element size (kW)	Geyser size – bigger is better (litres)
1 – 1.6	4	3	100 - 200
1.6 - 2	3	4 or 2	100 - 200
2 – 3	3	4	150 – 300
2 – 4 (two parallel PV strings)	4	NA	150 – 300

Short-Circuit Current @ STC I_{sc} < 20A **Open-Circuit Voltage @ STC V_{oc} < 250V**

TABLE 2. ANNUAL AVERAGE LITRES OF WATER HEATED PER DAY

The below example table indicates the average number of litres of water per day that the system will heat from 15 to 60 °C over a year period for different solar array peak power ratings. (The amount of water heated will vary with weather conditions, by geographic location and by season. Water heated per day will be significantly lower in winter and significantly higher in summer. These numbers indicate heating capacity – i.e. if no hot water is used on a given day, there will be less water heated on that day. This is only an approximate guide.)

	Solar + Elon®	Annual average litres of water heated per day for X kW_p installed solar capacity									
Location	**kWh/kW_p/yr**	**0.8 kW_p**	**1 kW_p**	**1.2 kW_p**	**1.4 kW_p**	**1.6 kW_p**	**1.8 kW_p**	**2 kW_p**	**2.5 kW_p**	**3 kW_p**	**3.5 kW_p**
Bloemfontein	**1894**	80	99	119	139	159	179	199	249	298	348
Cape Town	**1624**	68	85	102	119	136	154	171	213	256	299

Durban	**1447**	61	76	91	106	122	137	152	190	228	266
Jhb/Pretoria	**1724**	72	91	109	127	145	163	181	226	272	317
Mbombela	**1627**	68	85	103	120	137	154	171	214	256	299
Port Elizabeth	**1565**	66	82	99	115	132	148	164	205	247	288
Upington	**1912**	80	100	121	141	161	181	201	251	301	352
Saldanha	**1623**	68	85	102	119	136	153	170	213	256	298

Example:

For a solar PV array of **1.2 kW_p**, an installation in Johannesburg would yield about 1724 kWh/kW_p/yr, or 1724 x 1.2 kW_p = **2069 kWh/yr**. This would be sufficient to **heat on average 109 litres of water per day**. For a family of 2 each using 80 litres of hot water per day, this would provide about 109 ÷ (80 x 2) or **68% of the annual hot water requirement**.

TABLE 3. ANNUAL AVERAGE NUMBER OF SHOWERS PER DAY

The below table indicates the average number of showers per day for which the system will supply hot water over a year period for different solar array peak power ratings. (The amount of water heated will vary with weather conditions, by geographic location and by season. Water heated per day will be significantly lower in winter and significantly higher in summer. These numbers indicate heating capacity – i.e. if no hot water is used on a given day, there will be less water heated on that day. This is only an approximate guide.)

	Solar + Elon®	**Number of showers per day (based on annual average) for X kW_p installed solar capacity**									
Location	**kWh/kW_p/yr**	**0.8 kW_p**	**1 kW_p**	**1.2 kW_p**	**1.4 kW_p**	**1.6 kW_p**	**1.8 kW_p**	**2 kW_p**	**2.5 kW_p**	**3 kW_p**	**3.5 kW_p**
Bloemfontein	**1894**	**2.4**	**3.0**	**3.6**	**4.2**	**4.8**	**5.4**	**6.0**	**7.5**	**9.0**	**10.4**
Cape Town	**1624**	**2.0**	**2.6**	**3.1**	**3.6**	**4.1**	**4.6**	**5.1**	**6.4**	**7.7**	**9.0**
Durban	**1447**	**1.8**	**2.3**	**2.7**	**3.2**	**3.6**	**4.1**	**4.6**	**5.7**	**6.8**	**8.0**
Jhb/Pretoria	**1724**	**2.2**	**2.7**	**3.3**	**3.8**	**4.3**	**4.9**	**5.4**	**6.8**	**8.2**	**9.5**
Mbombela	**1627**	**2.1**	**2.6**	**3.1**	**3.6**	**4.1**	**4.6**	**5.1**	**6.4**	**7.7**	**9.0**
Port Elizabeth	**1565**	**2.0**	**2.5**	**3.0**	**3.5**	**3.9**	**4.4**	**4.9**	**6.2**	**7.4**	**8.6**
Upington	**1912**	**2.4**	**3.0**	**3.6**	**4.2**	**4.8**	**5.4**	**6.0**	**7.5**	**9.0**	**10.5**
Saldanha	**1623**	**2.0**	**2.6**	**3.1**	**3.6**	**4.1**	**4.6**	**5.1**	**6.4**	**7.7**	**9.0**

The table is based on **6-minute** showers at **40 °C** and **8 litres/min** low flow showerheads. Old showerheads can use up to 15 litres/min and would substantially reduce the number of showers.

Example:

For a solar PV array of **2.5 kW_p**, an installation in Johannesburg would yield about 1724 kWh/kW_p/yr, or 1724 x 2.5 kW_p = **4 310 kWh/yr**. This would be sufficient for about **6 to 7 showers per day**.

TABLE 4. PERCENTAGE OF ANNUAL HOT WATER REQUIREMENT

The below example table indicates what % of the annual hot water requirement will on average be supplied by the system for **2 people each using 80 litres of hot (60 °C) water per day**. (The amount of water heated will vary with weather conditions, by geographic location and by season. Water heated per day will be significantly lower in winter and significantly higher in summer. These numbers indicate heating capacity – i.e. if no hot water is used on a given day, there will be less water heated on that day. This is only an approximate guide.)

	Solar + Elon®	**Annual average % of hot water requirement supplied for 2 people each using 80 litres of hot water per day for X kW_p installed solar capacity**									
Location	**kWh/kW_p/yr**	**0.8 kW_p**	**1 kW_p**	**1.2 kW_p**	**1.4 kW_p**	**1.6 kW_p**	**1.8 kW_p**	**2 kW_p**	**2.5 kW_p**	**3 kW_p**	**3.5 kW_p**
Bloemfontein	**1894**	**50%**	**62%**	**75%**	**87%**	**99%**	**112%**	**124%**	**155%**	**187%**	**218%**
Cape Town	**1624**	**43%**	**53%**	**64%**	**75%**	**85%**	**96%**	**107%**	**133%**	**160%**	**187%**
Durban	**1447**	**38%**	**47%**	**57%**	**66%**	**76%**	**85%**	**95%**	**119%**	**142%**	**166%**

Jhb/Pretoria	**1724**	**45%**	**57%**	**68%**	**79%**	**91%**	**102%**	**113%**	**142%**	**170%**	**198%**
Nelspruit	**1627**	**43%**	**53%**	**64%**	**75%**	**85%**	**96%**	**107%**	**134%**	**160%**	**187%**
Port Elizabeth	**1565**	**41%**	**51%**	**62%**	**72%**	**82%**	**92%**	**103%**	**128%**	**154%**	**180%**
Upington	**1912**	**50%**	**63%**	**75%**	**88%**	**100%**	**113%**	**126%**	**157%**	**188%**	**220%**
Saldanha	**1623**	**43%**	**53%**	**64%**	**75%**	**85%**	**96%**	**107%**	**133%**	**160%**	**186%**

Examples:

An array of **1.2 kW_p** will provide approximately **64%** of the annual hot water requirement for a family of two people in Cape Town.

An array of **2 kW_p** will provide approximately 124% x (2 / 4) =**62%** of the annual hot water requirement for a family of four people in Bloemfontein.

TABLE 5. PEAK POWER OUTPUT FOR VARIOUS SOLAR MODULES AND ARRAY SIZES

The peak power production (W_p) of the modules at STC (Standard Test Conditions: irradiance 1000 W/m², spectrum AM 1.5, module temperature 25 °C) and at NOCT (Nominal Operating Cell Temperature, irradiance 800 W/m², spectrum AM 1.5, module temperature ~43 – 45 °C) are provided by the solar PV module manufacturer. The below table indicates the peak power at STC for a range of solar module power ratings and array sizes.

No. of cells per module	**Module STC power rating (W_p)**	**Total peak power at STC in kW_p for an array of X modules**						
		3 modules	**4 modules**	**5 modules**	**6 modules**	**8 (2 x 4) modules**	**10 (2 x 5) modules**	**12 (2 x 6) modules**
60 or 120	265	0.795	1.06	1.325	1.59	2.12	2.65	3.18
60 or 120	270	0.81	1.08	1.35	1.62	2.16	2.70	3.24
60 or 120	275	0.825	1.10	1.375	1.65	2.20	2.75	3.30
60 or 120	280	0.84	1.12	1.40	1.68	2.24	2.80	3.36
60 or 120	285	0.855	1.14	1.425	1.71	2.28	2.85	3.42
60 or 120	290	0.87	1.16	1.45	1.74	2.32	2.90	3.48
60 or 120	295	0.885	1.18	1.475	1.77	2.36	2.95	3.54
60 or 120	300	0.90	1.20	1.50	1.80	2.40	3.00	3.60
60 or 120	305	0.915	1.22	1.525	1.83	2.44	3.05	3.66
60 or 120	310	0.93	1.24	1.55	1.86	2.48	3.1	3.72
60 or 120	315	0.945	1.26	1.575	1.89	2.52	3.15	3.78
60 or 120	320	0.96	1.28	1.6	1.92	2.56	3.2	3.84
60 or 120	325	0.975	1.3	1.625	1.95	2.6	3.25	3.9
60 or 120	330	0.99	1.32	1.65	1.98	2.64	3.3	3.96
72 or 144	310	0.93	1.24	1.55	1.86	2.48	3.10	3.72
72 or 144	315	0.945	1.26	1.575	1.89	2.52	3.15	3.78
72 or 144	320	0.96	1.28	1.60	1.92	2.56	3.20	3.84 **NOT ALLOWED (exceeds maximum rated Elon® 100 voltage)**
72 or 144	325	0.975	1.30	1.625	1.95	2.60	3.25	3.90
72 or 144	330	0.99	1.32	1.65	1.98	2.64	3.30	3.96
72 or 144	335	1.005	1.34	1.675	2.01	2.68	3.35	4.02
72 or 144	340	1.02	1.36	1.70 **NOT ALLOWED (exceeds maximum rated Elon® 100 voltage)**	2.04	2.72	3.40	4.08
72 or 144	345	1.035	1.38	1.725	2.07	2.76	3.45	4.14
72 or 144	350	1.05	1.40	1.75	2.10	2.80	3.50	4.20
72 or 144	355	1.065	1.42	1.775	2.13	2.84	3.55	4.26
72 or 144	360	1.08	1.44	1.8	2.16	2.88	3.6	4.32

No. of cells per module	Module STC power rating (W_p)	Total peak power at STC in kW_p for an array of X modules						
		3 modules	4 modules	5 modules	6 modules	8 (2 x 4) modules	10 (2 x 5) modules	12 (2 x 6) modules
72 or 144	365	1.095	1.46	1.825	2.19	2.92	3.65	4.38
72 or 144	370	1.11	1.48	1.85	2.22	2.96	3.7	4.44
72 or 144	375	1.125	1.5	1.875	2.25	3	3.75	4.5
72 or 144	380	1.14	1.52	1.9	2.28	3.04	3.8	4.56
72 or 144	385	1.155	1.54	1.925	2.31	3.08	3.85	4.62
72 or 144	390	1.17	1.56	1.95	2.34	3.12	3.9	4.68
72 or 144	395	1.185	1.58	1.975	2.37	3.16	3.95	4.74
72 or 144	400	1.2	1.6	2	2.4	3.2	4	4.8
72 or 144	405	1.215	1.62	2.025	2.43	3.24	4.05	4.86
72 or 144	410	1.23	1.64	2.05	2.46	3.28	4.1	4.92
72 or 144	415	1.245	1.66	2.075	2.49 **NOT ALLOWED (exceeds maximum rated Elon® 100 voltage)**	3.32	4.15	4.98
72 or 144	420	1.26	1.68	2.1	2.52	3.36	4.2	5.04 **NOT ALLOWED (exceeds maximum rated Elon® 100 voltage)**
72 or 144	425	1.275	1.7	2.125	2.55	3.4	4.25	5.1
72 or 144	430	1.29	1.72	2.15	2.58	3.44	4.3 **NOT ALLOWED (exceeds maximum Elon® 100 power rating)**	5.16
72 or 144	435	1.305	1.74	2.175	2.61	3.48	4.35	5.22
72 or 144	440	1.32	1.76	2.2	2.64	3.52	4.4	5.28
72 or 144	445	1.335	1.78	2.225	2.67	3.56	4.45	5.34
72 or 144	450	1.35	1.8	2.25	2.7	3.6	4.5	5.4
72 or 144	455	1.365	1.82	2.275	2.73	3.64	4.55	5.46

Examples:

An array of **4 x 325 W_p modules** in series will have a total peak power (at STC) of **1.3 kW_p**.

An array of **2 parallel strings of 5 modules of 280 W_p each** (10 modules of 280 W_p in total) will have a total peak power (at STC) of **2.8 kW_p**.

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