



**BUREAU
VERITAS**

Certificate of compliance

Applicant: **SolarEdge Technologies Ltd.**
1 HaMada Street
Herzeliya 4673335
Israel

Product: **Photovoltaic (PV) and Battery Inverter**

Model: **SE3K SE7K SE5K-RWS**
SE4K SE8K SE7K-RWS
SE5K SE9K SE8K-RWS
SE6K SE10K SE10K-RWS

Use in accordance with regulations:

Automatic disconnection device with three-phase mains surveillance in accordance with Engineering Recommendation G98/1 for photovoltaic systems with a three-phase parallel coupling via an inverter in the public mains supply. The automatic disconnection device is an integral part of the aforementioned inverter. This serves as a replacement for the disconnection device with isolating function that can access the distribution network provider at any time.

Applied rules and standards:

Engineering Recommendation G98/1-4:2019

Requirements for the connection of Fully Type Tested Micro-generators (up to and including 16 A per phase) in parallel with public Low Voltage Distribution Networks

DIN V VDE V 0126-1-1:2006-02 (Functional safety)

Automatic disconnection device between a generator and the public low-voltage grid

At the time of issue of this certificate the safety concept of an aforementioned representative product corresponds to the valid safety specifications for the specified use in accordance with regulations.

Report number:	10TH0222-G98/1_3	Certification program:	NSOP-0032-DEU-ZE-V01
Certificate number:	U20-0163	Date of issue:	2020-03-18

Certification body



Holger Schaffer

Certification body of Bureau Veritas Consumer Products Services Germany GmbH
Accredited according to DIN EN ISO/IEC 17065

A partial representation of the certificate requires the written approval of Bureau Veritas Consumer Products Services Germany GmbH

Appendix C Type Test Verification Report

Extract from test report according to the Engineering Recommendation G98

Nr. 10TH0222-G98/1_3

Type Approval and declaration of compliance with the requirements of Engineering Recommendation G98

PGM Technology	Photovoltaic and Battery Inverter		
Manufacturer:	SolarEdge Technologies Ltd.		
Address	1 HaMada Street Herzliya 4673335 Israel		
Tel	+972-9-957-6620	Fax	+972-9-957-6591
Email	info@solaredge.com	Website	www.solaredge.com

Photovoltaic Inverter

Rated values	SE3K	SE4K	SE5K	SE6K
Maximum rated capacity	3kW	4kW	5kW	6kW
Rated voltage	230 / 400 3 wires, N, PE			
Rated values	SE7K	SE8K	SE9K	SE10K
Maximum rated capacity	7kW	8kW	9kW	10kW
Rated voltage	230 / 400 3 wires, N, PE			

Photovoltaic and Battery Inverter

Rated values	SE5K-RWS	SE7K-RWS	SE8K-RWS	SE10K-RWS
Maximum rated capacity	5kW	7kW	8kW	10kW
Rated voltage	230 / 400 3 wires, N, PE			

Firmware version
Main DSP software version is 1.130
Aux DSP software version is 2.19

Measurement period: 2017-06-14 to 2017-06-29, 2019-01-10 to 2019-02-05, 2019-05-16

Description of the structure of the power generation unit:

The power generation unit is equipped with a PV/DC and line-side EMC filter. The power generation unit has no galvanic isolation between DC input and AC output. Output switch-off is performed with single-fault tolerance based on two series-connected relays in (each) line and neutral. This enables a safe disconnection of the power generation unit from the network in case of error.

Differences between Generating Units:

The photovoltaic inverters of the SExx.xK series consist of the inverter models SE3K, SE4K, SE5K, SE6K, SE7K, SE8K, SE9K, SE10K. They use the same hardware platform and are identical in software.

The photovoltaic and battery inverters of the SExxK-RWS series consist of the inverter models SE5K-RWS, SE7K-RWS, SE8K-RWS and SE10K-RWS. They use the same hardware platform as the photovoltaic inverters stated above but have additional a low voltage battery input terminal and are identical in software.

The above stated Generating Units are tested according the requirements in the Engineering Recommendation G98/1. Any modification that affects the stated tests must be named by the manufacturer/supplier of the product to ensure that the product meets all requirements of the Engineering Recommendation G98/1.

Appendix C Type Test Verification Report

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Operating Range.	
Connection:	Always connected
Limit:	Always connected
Test 1	Voltage = 85% of nominal (195,5 V) Frequency = 47,5 Hz Power Factor = 1 Period of test 90 minutes
Connection:	Always connected
Limit:	Always connected
Test 2	Voltage = 110% of nominal (253 V) Frequency = 51,5 Hz Power Factor = 1 Period of test 90 minutes
Connection:	Always connected
Limit:	Always connected
Test 3	Voltage = 110% of nominal (253 V) Frequency = 52,0 Hz Power Factor = 1 Period of test 15 minutes
Connection:	Always connected
Limit:	Always connected

Protection. Voltage tests.						
Phase 1						
Function	Setting		Trip test		No trip test	
	Voltage [V]	Time delay [s]	Voltage [V]	Time delay [s]	Voltage / time	Confirm no trip
U/V	184,0	2,5	184,1	2,782	188V / 5,0s	No trip
					180V / 2,45s	No trip
O/V stage 1	262,2V	1,0	261,5	1,255	258,2V 5,0s	No trip
O/V stage 2	273,7V	0,5	273,1	0,761	269,7V 0,95s	No trip
					277,7V 0,45s	No trip

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Protection. Voltage tests.

Phase 2

Function	Setting		Trip test		No trip test	
	Voltage [V]	Time delay [s]	Voltage [V]	Time delay [s]	Voltage / time	Confirm no trip
U/V	184,0	2,5	184,1	2,748	188V / 5,0s	No trip
					180V / 2,45s	No trip
O/V stage 1	262,2	1,0	261,5	1,261	258,2V / 5,0s	No trip
O/V stage 2	273,7V	0,5	273,1	0,748	269,7V / 0,95s	No trip
					277,7V / 0,45s	No trip

Protection. Voltage tests.

Phase 3

Function	Setting		Trip test		No trip test	
	Voltage [V]	Time delay [s]	Voltage [V]	Time delay [s]	Voltage / time	Confirm no trip
U/V	184,0	2,5	184,0	2,755	188V / 5,0s	No trip
					180V / 2,45s	No trip
O/V stage 1	262,2	1,0	261,5	1,255	258,2V / 5,0s	No trip
O/V stage 2	273,7	0,5	273,2	0,755	269,7V / 0,95s	No trip
					277,7V / 0,45s	No trip

Note. For Voltage tests the Voltage required to trip is the setting $\pm 3,45V$. The time delay can be measured at a larger deviation than the minimum required to operate the protection. The No trip tests need to be carried out at the setting $\pm 4V$ and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

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Protection. Frequency tests.

Function	Setting		Trip test		No trip test	
	Frequency [Hz]	Time delay [s]	Frequency [Hz]	Time delay [s]	Frequency / time	Confirm no trip
U/F stage 1	47,5	20	47,50	20,270	47,7Hz / 30s	No trip
U/F stage 2	47	0,5	47,00	0,785	47,2Hz / 19,5s	No trip
					46,8Hz / 0,45s	No trip
O/F stage 2	52	0,5	52,00	0,762	51,8Hz / 120s	No trip
					52,2Hz / 0,45s	No trip

Note. For Frequency Trip tests the Frequency required to trip is the setting $\pm 0,1$ Hz. In order to measure the time delay a larger deviation than the minimum required to operate the projection can be used. The "No-trip tests" need to be carried out at the setting $\pm 0,2$ Hz and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

Protection. Loss of Mains.

Inverters tested according to BS EN 62116.

Balancing load on islanded network	33% of -5% Q Test 22	66% of -5% Q Test 12	100% of -5% P Test 5	33% of +5% Q Test 31	66% of +5% Q Test 21	100% of +5% P Test 10
Trip time. Ph1 fuse removed [s]	0,217	0,035	0,325	0,043	0,096	0,115
Trip time. Ph1 fuse removed [s]	0,217	0,035	0,325	0,043	0,096	0,115
Trip time. Ph1 fuse removed [s]	0,217	0,035	0,325	0,043	0,096	0,115

Note. Trip time limit is 0,5s. For technologies which have a substantial shut down time this can be added to the 0,5s in establishing that the trip occurred in less than 0,5s maximum. Shut down time could therefore be up to 1,0s for these technologies.

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Protection. Re-connection timer.

Test should prove that the reconnection sequence starts in no less than 20 seconds for restoration of voltage and frequency to within the stage 1 settings of table 10.5.7.1.

Over Voltage				
Time delay setting	Measured delay			
20s	37s			
Under Voltage				
Time delay setting	Measured delay			
20s	35s			
Over Frequency				
Time delay setting	Measured delay			
20s	34s			
Under Frequency				
Time delay setting	Measured delay			
20s	35s			
	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 1.			
	At 266,2V	At 180,0V	At 47,4Hz	At 52,1Hz
Confirmation that the Generating Unit does not re-connect.	No reconnection	No reconnection	No reconnection	No reconnection

Protection. Frequency change, Stability test.				
	Start Frequency [Hz]	Change	Test Duration	Confirm no trip
Positive Vector Shift	49,5	+50 degrees		No trip
Negative Vector Shift	50,5	-50 degrees		No trip
Positive Frequency drift	49,0 to 51,0	+0,95Hz/sec	2,1s	No trip
Negative Frequency drift	51,0 to 49,0	-0,95Hz/sec	2,1s	No trip

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Limited Frequency Sensitive Mode – Over Frequency

1-min mean value [Hz]:	a) 50,00	b) 50,45	c) 50,70	d) 51,15	e) 50,70	f) 50,45	g) 50,00
1. Measurement a) to g): Active power output > 80% Pn							
Frequency [Hz]:	50,00	50,45	50,70	51,15	50,70	50,45	50,00
P _{expected} [kW]:	N/A	10,04	9,53	8,62	9,53	10,04	N/A
P _{measured} [kW]:	10,14	10,04	9,53	8,62	9,53	10,04	10,14
2. Measurement a) to g): Active power output 40% and 60% after freezing > 80% Pn							
Frequency [Hz]:	50,00	50,45	50,70	51,15	50,70	50,45	50,00
P _{expected} [kW]:	N/A	5,19	4,93	4,46	4,93	5,19	N/A
P _{measured} [kW]:	5,25	5,19	4,93	4,46	4,93	5,19	5,25

Output Power with falling Frequency

5-min mean value (each)	a) 50 ± 0,01 Hz	b) - 0,4 to - 0,5 Hz	c) - 2,4 to - 2,5 Hz
Frequency [Hz]:	50,00	49,55	47,55
Active power [W]:	10331	10332	10341
ΔP/P _{max} [%]:			0

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Power Quality. Harmonics.

SE10K / SE10K-RWS

Phase 1

SSEG rating per phase (rpp)						
	At 45-55% of rated output 1,66kW		100% of rated output 3,33kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-2 in Amps	Higher limit for odd harmonics 21 and above
2nd	0,020	0,134	0,013	0,091	1,080	
3rd	0,308	2,082	0,311	2,102	2,300	
4th	0,005	0,034	0,005	0,036	0,430	
5th	0,064	0,430	0,058	0,391	1,140	
6th	0,003	0,021	0,004	0,026	0,300	
7th	0,041	0,279	0,037	0,250	0,770	
8th	0,003	0,018	0,004	0,030	0,230	
9th	0,038	0,255	0,026	0,175	0,400	
10th	0,003	0,019	0,003	0,021	0,184	
11th	0,040	0,273	0,019	0,129	0,330	
12th	0,003	0,022	0,003	0,019	0,153	
13th	0,040	0,274	0,018	0,120	0,210	
14th	0,003	0,021	0,003	0,018	0,131	
15th	0,035	0,239	0,016	0,107	0,150	
16th	0,003	0,021	0,003	0,017	0,115	
17th	0,033	0,224	0,014	0,097	0,132	
18th	0,003	0,019	0,002	0,015	0,102	
19th	0,026	0,174	0,012	0,079	0,118	
20th	0,003	0,018	0,002	0,015	0,092	
21th	0,016	0,111	0,009	0,058	0,107	0,160
22th	0,002	0,015	0,002	0,014	0,084	
23th	0,012	0,081	0,008	0,052	0,098	0,147
24th	0,002	0,012	0,002	0,013	0,077	
25th	0,007	0,045	0,006	0,043	0,090	0,135
26th	0,002	0,011	0,002	0,012	0,071	
27th	0,002	0,016	0,004	0,028	0,083	0,124
28th	0,002	0,012	0,002	0,012	0,066	
29th	0,003	0,023	0,003	0,022	0,078	0,117
30th	0,002	0,012	0,002	0,011	0,061	
31th	0,005	0,034	0,002	0,017	0,073	0,109
32th	0,002	0,013	0,002	0,011	0,058	
33th	0,005	0,037	0,002	0,015	0,068	0,102
34th	0,002	0,012	0,002	0,010	0,054	
35th	0,006	0,040	0,002	0,013	0,064	0,096
36th	0,002	0,011	0,001	0,010	0,051	
37th	0,006	0,038	0,002	0,012	0,061	0,091
38th	0,002	0,011	0,001	0,009	0,048	
39th	0,004	0,024	0,002	0,012	0,058	0,087
40th	0,002	0,010	0,001	0,009	0,046	

Note the higher limits for odd harmonics 21 and above are only allowable under certain conditions, if these higher limits are utilised please state the exemption used as detailed in part 6.2.3.4 of BS EN 61000-3-2 in the box below.



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Extract from test report according to the Engineering Recommendation G98 Nr. 10TH0222-G98/1_3

Power Quality. Harmonics.						
SE10K / SE10K-RWS						
Phase 2						
SSEG rating per phase (rpp)						
	At 45-55% of rated output 1,66kW		100% of rated output 3,33kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-2 in Amps	Higher limit for odd harmonics 21 and above
2nd	0,019	0,129	0,013	0,086	1,080	
3rd	0,286	1,922	0,295	1,979	2,300	
4th	0,005	0,035	0,006	0,038	0,430	
5th	0,054	0,365	0,055	0,372	1,140	
6th	0,003	0,020	0,004	0,026	0,300	
7th	0,039	0,259	0,042	0,280	0,770	
8th	0,003	0,018	0,004	0,027	0,230	
9th	0,033	0,219	0,030	0,203	0,400	
10th	0,003	0,020	0,003	0,019	0,184	
11th	0,035	0,237	0,025	0,169	0,330	
12th	0,003	0,019	0,003	0,018	0,153	
13th	0,040	0,268	0,023	0,154	0,210	
14th	0,003	0,018	0,002	0,016	0,131	
15th	0,034	0,230	0,016	0,110	0,150	
16th	0,003	0,018	0,002	0,015	0,115	
17th	0,032	0,216	0,014	0,094	0,132	
18th	0,002	0,016	0,002	0,014	0,102	
19th	0,027	0,178	0,012	0,082	0,118	
20th	0,002	0,015	0,002	0,013	0,092	
21th	0,018	0,123	0,009	0,059	0,107	0,160
22th	0,002	0,014	0,002	0,013	0,084	
23th	0,014	0,096	0,008	0,057	0,098	0,147
24th	0,002	0,012	0,002	0,011	0,077	
25th	0,008	0,052	0,006	0,042	0,090	0,135
26th	0,002	0,012	0,002	0,011	0,071	
27th	0,004	0,025	0,004	0,030	0,083	0,124
28th	0,002	0,012	0,002	0,011	0,066	
29th	0,003	0,021	0,005	0,031	0,078	0,117
30th	0,002	0,011	0,002	0,011	0,061	
31th	0,004	0,027	0,004	0,024	0,073	0,109
32th	0,002	0,011	0,001	0,010	0,058	
33th	0,004	0,028	0,002	0,014	0,068	0,102
34th	0,002	0,010	0,001	0,010	0,054	
35th	0,005	0,034	0,002	0,011	0,064	0,096
36th	0,001	0,009	0,001	0,009	0,051	
37th	0,005	0,031	0,001	0,010	0,061	0,091
38th	0,001	0,010	0,001	0,009	0,048	
39th	0,003	0,023	0,002	0,010	0,058	0,087
40th	0,001	0,010	0,001	0,008	0,046	

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Power Quality. Harmonics.						
SE10K / SE10K-RWS						
Phase 3						
SSEG rating per phase (rpp)						
	At 45-55% of rated output 1,66kW		100% of rated output 3,33kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-2 in Amps	Higher limit for odd harmonics 21 and above
2nd	0,019	0,126	0,015	0,103	1,080	
3rd	0,392	2,677	0,392	2,675	2,300	
4th	0,006	0,038	0,006	0,038	0,430	
5th	0,031	0,209	0,023	0,154	1,140	
6th	0,003	0,022	0,004	0,027	0,300	
7th	0,093	0,634	0,094	0,642	0,770	
8th	0,003	0,020	0,004	0,028	0,230	
9th	0,049	0,335	0,030	0,203	0,400	
10th	0,003	0,021	0,003	0,018	0,184	
11th	0,068	0,464	0,061	0,416	0,330	
12th	0,003	0,018	0,003	0,019	0,153	
13th	0,042	0,285	0,025	0,171	0,210	
14th	0,003	0,017	0,002	0,017	0,131	
15th	0,053	0,359	0,040	0,276	0,150	
16th	0,002	0,016	0,002	0,015	0,115	
17th	0,024	0,161	0,017	0,113	0,132	
18th	0,002	0,015	0,002	0,014	0,102	
19th	0,039	0,263	0,027	0,185	0,118	
20th	0,002	0,014	0,002	0,014	0,092	
21th	0,012	0,083	0,013	0,088	0,107	0,160
22th	0,002	0,013	0,002	0,012	0,084	
23th	0,019	0,132	0,015	0,106	0,098	0,147
24th	0,002	0,012	0,002	0,011	0,077	
25th	0,005	0,036	0,008	0,056	0,090	0,135
26th	0,002	0,012	0,002	0,011	0,071	
27th	0,003	0,022	0,006	0,042	0,083	0,124
28th	0,002	0,011	0,002	0,010	0,066	
29th	0,005	0,036	0,005	0,036	0,078	0,117
30th	0,002	0,010	0,001	0,010	0,061	
31th	0,006	0,040	0,003	0,019	0,073	0,109
32th	0,002	0,011	0,001	0,010	0,058	
33th	0,006	0,043	0,004	0,028	0,068	0,102
34th	0,001	0,010	0,001	0,009	0,054	
35th	0,007	0,045	0,003	0,020	0,064	0,096
36th	0,001	0,009	0,001	0,009	0,051	
37th	0,007	0,045	0,003	0,021	0,061	0,091
38th	0,001	0,009	0,001	0,008	0,048	
39th	0,003	0,021	0,004	0,025	0,058	0,087
40th	0,001	0,009	0,001	0,008	0,046	

Note the higher limits for odd harmonics 21 and above are only allowable under certain conditions, if these higher limits are utilised please state the exemption used as detailed in part 6.2.3.4 of BS EN 61000-3-2 in the box below.

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Power Quality. Power factor.

Output power	216,2V	230V	253V	Measured at three voltage levels and at full output. Voltage to be maintained within $\pm 1,5\%$ of the stated level during the test.
20%	0,998	0,997	0,996	
50%	0,999	0,999	0,999	
75%	0,999	0,999	0,999	
100%	0,999	0,999	0,999	
Limit	>0,95	>0,95	>0,95	

Power Quality. Voltage fluctuation and Flicker.

SE10K / SE10K-RWS	Starting			Stopping			Running	
	dmax	dc	d(t)	dmax	dc	d(t)	Pst	Plt 2 hours
Measured values at test impedance	0,30%	3,03%	0%	0,30%	3,03%	0%	0,08	0,08
Normalised to standard impedance	0,30%	3,03%	0%	0,30%	3,03%	0%	0,08	0,08
Limits set under BS EN 61000-3-11	4%	3,3%	3,3% 500ms	4%	3,3%	3,3% 500ms	1,0	0,65
Test impedance	R	0,24	Ω	XI	0,15	Ω		
	Z	0,283	Ω					
Standard impedance	R	0,24	Ω	XI	0,15	Ω		
	Z	0,283	Ω					

Power Quality. DC injection.

Phase 1				
Test level power [%]	20	50	75	100
Recorded value [mA]	13,65	8,02	7,44	9,51
Recorded value [%]	0,07	0,05	0,06	0,10
Limit [%]	0,25	0,25	0,25	0,25
Phase 2				
Test level power [%]	20	50	75	100
Recorded value [mA]	19,92	14,98	14,09	16,67
Recorded value [%]	0,14	0,11	0,10	0,12
Limit [%]	0,25	0,25	0,25	0,25
Phase 3				
Test level power [%]	20	50	75	100
Recorded value [mA]	7,77	1,89	2,06	4,36
Recorded value [%]	0,06	0,01	0,01	0,03
Limit [%]	0,25	0,25	0,25	0,25

Note. DC-injection is tested at each phase of the inverter and a limit of 0,25% per phase was used as pass criteria.

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Fault level Contribution.

For a directly coupled SSEG			For a Inverter SSEG		
Parameter	Symbol	Value	Time after fault	Volts [V]	Amps [A]
Peak Short Circuit current	I_p	N/A	20ms	131,95	23,50
Initial Value of aperiodic current	A	N/A	100ms	87,46	24,97
Initial symmetrical short-circuit current*	I_k	N/A	250ms	78,39	25,46
Decaying (aperiodic) component of short circuit current*	i_{DC}	N/A	500ms	75,14	25,64
Reactance/Resistance Ratio of source*	X/R	N/A	Time to Trip [s]	0,508	

Self Monitoring – Solid state switching.	N/A
It has been verified that in the event of the solid state switching device failing to disconnect the Power Park Module, the voltage on the output side of the switching device is reduced to a value below 50 volts within 0,5 seconds.	N/A (No solid state switching device)
Note. Unit do not provide solid state switching relays. In case the semiconductor bridge is switched off, then the voltage on the output drops to 0. In this case the relays on the output will also open (Functional safety of the internal automatic disconnection device according to VDE 0126-1-1).	

Logic Interface (input port)	P
Confirm that an input port is provided and can be used to shut down the module.	Yes