Certificate

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

Product: **Photovoltaic Inverter with integrated automatic disconnection device between a generator and the public low-voltage grid**

Model:	**SE25K**	**SE27.6K**
Rating:	**25,0kVA**	**27,6kVA**

Intended use:

An automatic disconnection device with three-phase mains surveillance in accordance with Engineering Recommendation G59/3 for photovoltaic systems with a three-phase parallel coupling via an inverter to the public mains supply. The automatic disconnection device is an integral part of the aforementioned inverter.

Applied standards and guidelines:

Engineering Recommendation G59/3
Issue 3 – September 2013
Recommendations for the connection of generating plant to the distribution systems of licensed distribution network operators

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

Report No: 15PP010-05

Certificate No: 15-118-00

Date of issue: 2015-07-07

DAkkS
Deutsche
Akkreditierungsstelle
D-ZE-12089-01-01

Andreas Aufmuth
Certification Department

CERTIFICATION primara Test- und Zertifizier-GmbH Grid Code Compliance G59/3

Primara Test- und Zertifizier-GmbH | Gewerbestraße 28 | 87600 Kaufbeuren | Germany | www.primara.net

Annex to certificate 15-118-00:

Power Quality. Harmonics.

Generating Unit tested to BS EN 61000-3-12.						
Generating Unit rating per phase (rpp)			9,2	kVA	Harmonics % =Measured Value (Amps) x 23/rating per phase (kVA)	
Harmonic	At 45-55% of rated output		100% of rated output		Limit in BS EN 61000-3-12	
	Measured Value (MV) in Amps*	%	Measured Value (MV) in Amps*	%	1 phase	3 phase
2	0,076	0,190	0,172	0,430	8%	8%
3	0,120	0,300	0,328	0,820	21,6%	Not stated
4	0,076	0,190	0,180	0,450	4%	4%
5	0,484	1,210	0,336	0,840	10,7%	10,7%
6	0,036	0,090	0,112	0,280	2,67%	2,67%
7	0,468	1,170	0,268	0,670	7,2%	7,2%
8	0,020	0,050	0,032	0,080	2%	2%
9	0,060	0,150	0,080	0,200	3,8%	Not stated
10	0,012	0,030	0,032	0,080	1,6%	1,6%
11	0,272	0,680	0,220	0,550	3,1%	3,1%
12	0,012	0,030	0,016	0,040	1,33%	1,33%
13	0,196	0,490	0,204	0,510	2%	2%
THD	-	3,970	-	1,898	23%	13%
PWHD	-	2,786	-	3,095	23%	22%
Generating Unit tested to BS EN 61000-3-2						
Generating Unit rating per phase (rpp)			-	kW	-	
Harmonic	At 45-55% of rated output		100% of rated output			
	Measured Value (MV) in Amps		Measured Value (MV) in Amps		Limit in BS EN 61000-3-2 in Amps	Higher limit for odd harmonics 21 and above
2	-		-		1,080	
3	-		-		2,300	
4	-		-		0,430	
5	-		-		1,140	
6	-		-		0,300	
7	-		-		0,770	
8	-		-		0,230	
9	-		-		0,400	
10	-		-		0,184	
11	-		-		0,330	
12	-		-		0,153	
13	-		-		0,210	
14	-		-		0,131	
15	-		-		0,150	
16	-		-		0,115	
17	-		-		0,132	
18	-		-		0,102	
19	-		-		0,118	
20	-		-		0,092	
21	-		-		0,107	0,160

22	-		-		0,084	
23	-		-		0,098	0,147
24	-		-		0,077	
25	-		-		0,090	0,135
26	-		-		0,071	
27	-		-		0,083	0,124
28	-		-		0,066	
29	-		-		0,078	0,117
30	-		-		0,061	
31	-		-		0,073	0,109
32	-		-		0,058	
33	-		-		0,068	0,102
34	-		-		0,054	
35	-		-		0,064	0,096
36	-		-		0,051	
37	-		-		0,061	0,091
38	-		-		0,048	
39	-		-		0,058	0,087
40	-		-		0,046	

Power Quality. Voltage fluctuations and flicker

	Starting			Stopping from full load			Running	
	d_{max}	d_c	$d_{(t)}$	d_{max}	d_c	$d_{(t)}$	P_{st}	P_{lt} 2 hours
Measured Values at test impedance	0,63	0,00	0,00	3,98	0,00	489ms	0,016	0,017
Normalised to standard impedance	0,63	0,00	0,00	3,98	0,00	489ms	0,016	0,017
Normalised to required maximum impedance	N/A							
Limits set under BS EN 61000-3-11	4%	3,3%	3,3%	4%	3,3%	3,3%	1,0	0,65

Test impedance	R	0,24	Ω	XI	0,15	Ω
Standard impedance	R	0,24* 0,4^	Ω	XI	0,15* 0,25^	Ω
Maximum impedance	R	N/A	Ω	XI	N/A	Ω

Power Quality. DC injection.

Test power level	10%	55%	100%
Recorded value in Amps	-0,034A	0,040A	0,041A
As % of rated AC current	-0,08%	0,10%	0,10%
Limit	0,25%	0,25%	0,25%

Power Quality. Power factor.

	216,2V	230V	253V	Measured at three voltage levels and at full output. Voltage to be maintained within + or – 1,5% of the stated level during test.
Measured Value	0,99	0,99	0,99	
Limit	>0,95	>0,95	>0,95	

Protection. Frequency tests

Function	Setting		Trip test		"No trip tests"	
	Frequency	Time delay	Frequency	Time delay	Frequency / time	Confirm no trip
U/F stage 1	47,5Hz	20,0s	47,51Hz	20,03s	47,7Hz 25s	No trip
U/F stage 2	47,0Hz	0,5s	47,01Hz	525ms	47,2Hz 19,98s	No trip
					46,8Hz 0,48s	No trip
O/F stage 1	51,5Hz	90,0s	51,50Hz	90,03s	51,3Hz 95s	No trip
O/F stage 2	52,0Hz	0,5s	52,00Hz	540ms	51,8Hz 89,98s	No trip
					52,2Hz 0,48s	No trip

Protection. Voltage tests

Function	Setting		Trip test		"No trip tests"	
	Voltage	Time delay	Voltage	Time delay	Voltage / time	Confirm no trip
U/V stage 1	200,1V	2,5s	200,0V	2515ms	204,1V 3,5s	No trip
U/V stage 2	184,0V	0,5s	183,9V	514ms	188,0V 2,48s	No trip
					180,0V 0,48s	No trip
O/V stage 1	262,2V	1.0s	261,7V	1013ms	258,2V 2,0s	No trip
O/V stage 2	273,7V	0,5s	273,2V	511ms	269,7V 0,98s	No trip
					277,7V 0,48s	No trip

a) Protection. Loss of Mains test and single phase test

Note as an alternative, inverters can be tested to BS EN 62116. The following sub set of tests should be recorded in the following table.

Test power and imbalance	33% -5% Q Tests 22	66% -5% Q Test 12	100% -5% P Test 5	33% +5% Q Test 31	66% +5% Q Test 21	100% +5% P Test 10
Trip time. Limit is 0.5s	0,040s	0,035s	0,043s	0,043s	0,028s	0,034s

Single phase test for multi phase **Generating Units**. Confirm that when generating in parallel with a network operating at around 50Hz with no network disturbance, that the removal of a single phase connection to the **Generating Unit**, with the remaining phases connected causes a disconnection of the generating unit within a maximum of 1s.

Ph 1 removed	Confirm trip	Ph 2 removed	Confirm trip	Ph 3 removed	Confirm trip

b) Protection. Frequency change, Stability test.

	Start frequnecy	Change	End frequency	Confirm no trip
Positive vector shift	49,5Hz	+9 dregrees		No trip
Negative vector shift	50,5Hz	-9 dregrees		No trip
Positive frequency drift	49,5Hz	+0,19Hz/sec	51,5Hz	No trip
Negative frequency drift	50,5Hz	-0,19Hz/sec	47,5Hz	No trip

c) Protection. Re-connection timer.

Time delay settings (s)	Measured delay (s)	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 10.5.7.1			
20	60,2	At 266,2V	At 196,1V	At 47,4Hz	At 51,6Hz
Confirmation that the **Generating Unit** does not re-connect		No reconnection	No reconnection	No reconnection	No reconnection

d) Faul Level contribution.

For machines with electro-magnetic output			For inverter output		
Parameter	Symbol	Value	Time after fault	Volts	Amps
Peak Short Circuit current	i_p	N/A	20ms	54,4	38,9
Initial Value of aperiodic current	A	N/A	100ms	52,9	39,9
Initial symmetrical short-circuit current	I_K	N/A	250ms	52,6	39,6
Decaying (aperiodic) component of short-circuit current	i_{DC}	N/A	500ms	21,1	0,1
Reactance/Resistance Ratio of source	X/R	N/A	Time to trip	0,48	In seconds

E) Self Monitoring solid state switching.

It has been verified that in the event of the solid state switching device failing to disconnect the Generating Plant, the voltage on the output side of the switching device is reduced to a value below 50 volt within 0,5s.	N/A