



# Certificate of compliance

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

**Product:** Grid-tied photovoltaic (PV) inverter

**Model:**

SE3K	SE7K	SE12.5K
SE4K	SE8K	SE15K
SE5K	SE9K	SE16K
SE6K	SE10K	SE17K

## Use in accordance with regulations:

Automatic disconnection device with three-phase mains surveillance in accordance with Engineering Recommendation G99/N1-1 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 G99/N1-1:2019

Requirements for the connection of generation equipment in parallel with public distribution networks

### DIN V VDE V 0126-1-1:2006-02 (4.1 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-G99/N1-1\_0  
**Certificate number:** U19-0406  
**Date of issue:** 2019-07-07

## Certification body



Holger Schaffer

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

**Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules**

Extract from test report according to the Engineering Recommendation G99/Ni

Nr. 10TH0222-G99/Ni-1\_0

**Type Approval and declaration of compliance with the requirements of Engineering Recommendation G99/Ni**

<b>PGM Technology</b>	Photovoltaic inverter		
<b>Manufacturer:</b>	SolarEdge Technologies Ltd.		
<b>Address</b>	1 HaMada Street Herzeliya 4673335 Israel		
<b>Tel</b>	+972-9-957-6620	<b>Fax</b>	+972-9-957-6591
<b>Email</b>	<a href="mailto:info@solaredge.com">info@solaredge.com</a>	<b>Website</b>	<a href="http://www.solaredge.com">www.solaredge.com</a>

<b>Rated values</b>	SE3K	SE4K	SE5K	SE6K
<b>Maximum rated capacity</b>	3kW	4kW	5kW	6kW
<b>Rated voltage</b>	230 / 400 3 wires, N, PE			
<b>Rated values</b>	SE7K	SE8K	SE9K	SE10K
<b>Maximum rated capacity</b>	7kW	8kW	9kW	10kW
<b>Rated voltage</b>	230 / 400 3 wires, N, PE			
<b>Rated values</b>	SE12.5K	SE15K	SE16K	SE17K
<b>Maximum rated capacity</b>	12,5kW	15kW	16kW	17kW
<b>Rated voltage</b>	230 / 400 3 wires, N, PE			
<b>Firmware version</b>	Main DSP software version is 1.130 Aux DSP software version is 2.19			
<b>Measurement period:</b>	2017-06-14 to 2017-06-29, 2019-01-10 to 2019-02-05, 2019-05-16, 2019-06-10 to 2019-06-27			

**Description of the structure of the power generation unit:**

The power generation unit is equipped with a PV 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 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 inverters of the SExx.xK series consist of the inverter models SE3K, SE4K, SE5K, SE6K, SE7K, SE8K, SE9K, SE10K, SE12,5K, SE15K, SE16K, SE17K. They use generally the same hardware and identical software.

The above stated Generating Units are tested according the requirements in the Engineering Recommendation G99/Ni-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 G99/ Ni-1.

## Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99/Nl

Nr. 10TH0222-G99/Nl-1\_0

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 stage 1	195,5	3,0	195,2	3,206	199,5V / 5s	No trip
U/V stage 2	138,0	2,0	137,6	2,006	142,0V / 2,5s	No trip
					134,0V / 1,98s	No trip
O/V stage 1	253,0	0,5	252,6	1,198	249,0V / 5,0s	No trip
					257,0V / 0,45s	No trip

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Extract from test report according to the Engineering Recommendation G99/Nl

Nr. 10TH0222-G99/Nl-1\_0

**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 stage 1	195,5	3,0	195,2	3,199	199,5V / 5s	No trip
U/V stage 2	138,0	2,0	137,3	2,010	142,0V / 2,5s	No trip
					134,0V / 1,98s	No trip
O/V stage 1	253,0	0,5	252,3	1,201	249,0V / 5,0s	No trip
					257,0V / 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 stage 1	195,5	3,0	194,8	3,203	199,5V / 5s	No trip
U/V stage 2	138,0	2,0	137,3	2,013	142,0V / 2,5s	No trip
					134,0V / 1,98s	No trip
O/V stage 1	253,0	0,5	252,3	1,204	249,0V / 5,0s	No trip
					257,0V / 0,45s	No trip

Note for Voltage tests the Voltage required to trip is the setting  $\pm 3.45$  V. 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  $\pm 4$  V and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

**Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules**

Extract from test report according to the Engineering Recommendation G99/NI

Nr. 10TH0222-G99/NI-1\_0

**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	48,0	0,5	48,001	0,516	48,2Hz / 25s	No trip
					47,8 Hz / 0,45s	No trip
O/F	52,0	1,0	52,001	1,037	51,8Hz / 120,0s	No trip
					52,2 Hz / 0,98s	No trip

Note. For Frequency Trip tests the Frequency required to trip is the setting  $\pm 0,1\text{Hz}$ . 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  $\pm 0,2\text{Hz}$  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.**

**SE10K**

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. Ph2 fuse removed [s]	0,217	0,035	0,325	0,043	0,096	0,115
Trip time. Ph3 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 60 seconds for restoration of voltage and frequency to within the stage 1 settings of table 10.1

Under Voltage				
Time delay setting		Measured delay		
60s		80,0s		
Over Voltage				
Time delay setting		Measured delay		
60s		79,0s		
Under Frequency				
Time delay setting		Measured delay		
60s		84,0		
Over Frequency				
Time delay setting		Measured delay		
60s		84,0		
	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 1.			
	At 257,0V	At 191,5V	At 47,9Hz	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	End Frequency	Confirm no trip
Positive Vector Shift	49,5	+50 degrees		No trip
Negative Vector Shift	50,5	-50 degrees		No trip
	Start Frequency [Hz]	Test frequency ramp	Test Duration	Confirm 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) 50,25	c) 50,70	d) 51,15	e) 50,70	f) 50,25	g) 50,00
1. Measurement a) to g): Active power output > 80% P <sub>n</sub>							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
P <sub>M</sub> [kW]:	N/A	9,40	7,23	5,06	7,23	9,40	N/A
P <sub>E60</sub> [kW]:	9,64	9,41	7,30	5,15	7,18	9,35	9,64
$\Delta P_{E60}/P_M$ [%]:	N/A	0,02	0,07	0,09	-0,05	-0,05	N/A
2. Measurement a) to g): Active power output 40% and 60% after freezing > 80% P <sub>n</sub>							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
P <sub>M</sub> [kW]:	N/A	5,35	4,11	2,88	4,11	5,35	N/A
P <sub>E60</sub> [kW]:	5,49	5,32	4,11	2,89	4,10	5,32	5,82
$\Delta P_{E60}/P_M$ [%]:	N/A	-0,02	0,00	0,01	-0,01	-0,02	N/A

Note. The test was performed with a droop of 4% (50%P<sub>n</sub>/Hz). The default droop setting 8% and is adjustable in the range between 2% and 10% at intervals of 1%.

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Nr. 10TH0222-G99/NI-1\_0

**Power Quality. Harmonics.**

**SE10K**

**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 [%]	Harmonic %	
					Limit in BS EN61000-3-12 in %	
					1 phase	3 phase
2nd	0,020	0,134	0,013	0,091	8%	8%
3rd	0,308	2,082	0,311	2,102	21,6%	N/A
4th	0,005	0,034	0,005	0,036	4%	4%
5th	0,064	0,430	0,058	0,391	10,7%	10,7%
6th	0,003	0,021	0,004	0,026	2,67%	2,67%
7th	0,041	0,279	0,037	0,250	7,2%	7,2%
8th	0,003	0,018	0,004	0,030	2%	2%
9th	0,038	0,255	0,026	0,175	3,8%	N/A
10th	0,003	0,019	0,003	0,021	1,6%	1,6%
11th	0,040	0,273	0,019	0,129	3,1%	3,1%
12th	0,003	0,022	0,003	0,019	1,33%	1,33%
13th	0,040	0,274	0,018	0,120	2%	2%
14th	0,003	0,021	0,003	0,018	N/A	N/A
15th	0,035	0,239	0,016	0,107	N/A	N/A
16th	0,003	0,021	0,003	0,017	N/A	N/A
17th	0,033	0,224	0,014	0,097	N/A	N/A
18th	0,003	0,019	0,002	0,015	N/A	N/A
19th	0,026	0,174	0,012	0,079	N/A	N/A
20th	0,003	0,018	0,002	0,015	N/A	N/A
21th	0,016	0,111	0,009	0,058	N/A	N/A
22th	0,002	0,015	0,002	0,014	N/A	N/A
23th	0,012	0,081	0,008	0,052	N/A	N/A
24th	0,002	0,012	0,002	0,013	N/A	N/A
25th	0,007	0,045	0,006	0,043	N/A	N/A
26th	0,002	0,011	0,002	0,012	N/A	N/A
27th	0,002	0,016	0,004	0,028	N/A	N/A
28th	0,002	0,012	0,002	0,012	N/A	N/A
29th	0,003	0,023	0,003	0,022	N/A	N/A
30th	0,002	0,012	0,002	0,011	N/A	N/A
31th	0,005	0,034	0,002	0,017	N/A	N/A
32th	0,002	0,013	0,002	0,011	N/A	N/A
33th	0,005	0,037	0,002	0,015	N/A	N/A
34th	0,002	0,012	0,002	0,010	N/A	N/A
35th	0,006	0,040	0,002	0,013	N/A	N/A
36th	0,002	0,011	0,001	0,010	N/A	N/A
37th	0,006	0,038	0,002	0,012	N/A	N/A
38th	0,002	0,011	0,001	0,009	N/A	N/A
39th	0,004	0,024	0,002	0,012	N/A	N/A
40th	0,002	0,010	0,001	0,009	N/A	N/A



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Nr. 10TH0222-G99/NI-1\_0

**Power Quality. Harmonics.**

**SE10K**

**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 [%]	Harmonic %	
					Limit in BS EN61000-3-12 in %	
					1 phase	3 phase
2nd	0,019	0,129	0,013	0,086	8%	8%
3rd	0,286	1,922	0,295	1,979	21,6%	N/A
4th	0,005	0,035	0,006	0,038	4%	4%
5th	0,054	0,365	0,055	0,372	10,7%	10,7%
6th	0,003	0,020	0,004	0,026	2,67%	2,67%
7th	0,039	0,259	0,042	0,280	7,2%	7,2%
8th	0,003	0,018	0,004	0,027	2%	2%
9th	0,033	0,219	0,030	0,203	3,8%	N/A
10th	0,003	0,020	0,003	0,019	1,6%	1,6%
11th	0,035	0,237	0,025	0,169	3,1%	3,1%
12th	0,003	0,019	0,003	0,018	1,33%	1,33%
13th	0,040	0,268	0,023	0,154	2%	2%
14th	0,003	0,018	0,002	0,016	N/A	N/A
15th	0,034	0,230	0,016	0,110	N/A	N/A
16th	0,003	0,018	0,002	0,015	N/A	N/A
17th	0,032	0,216	0,014	0,094	N/A	N/A
18th	0,002	0,016	0,002	0,014	N/A	N/A
19th	0,027	0,178	0,012	0,082	N/A	N/A
20th	0,002	0,015	0,002	0,013	N/A	N/A
21th	0,018	0,123	0,009	0,059	N/A	N/A
22th	0,002	0,014	0,002	0,013	N/A	N/A
23th	0,014	0,096	0,008	0,057	N/A	N/A
24th	0,002	0,012	0,002	0,011	N/A	N/A
25th	0,008	0,052	0,006	0,042	N/A	N/A
26th	0,002	0,012	0,002	0,011	N/A	N/A
27th	0,004	0,025	0,004	0,030	N/A	N/A
28th	0,002	0,012	0,002	0,011	N/A	N/A
29th	0,003	0,021	0,005	0,031	N/A	N/A
30th	0,002	0,011	0,002	0,011	N/A	N/A
31th	0,004	0,027	0,004	0,024	N/A	N/A
32th	0,002	0,011	0,001	0,010	N/A	N/A
33th	0,004	0,028	0,002	0,014	N/A	N/A
34th	0,002	0,010	0,001	0,010	N/A	N/A
35th	0,005	0,034	0,002	0,011	N/A	N/A
36th	0,001	0,009	0,001	0,009	N/A	N/A
37th	0,005	0,031	0,001	0,010	N/A	N/A
38th	0,001	0,010	0,001	0,009	N/A	N/A
39th	0,003	0,023	0,002	0,010	N/A	N/A
40th	0,001	0,010	0,001	0,008	N/A	N/A

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Extract from test report according to the Engineering Recommendation G99/NI

Nr. 10TH0222-G99/NI-1\_0

**Power Quality. Harmonics.**

**SE10K**

**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 [%]	Harmonic %	
					Limit in BS EN61000-3-12 in %	
					1 phase	3 phase
2nd	0,019	0,126	0,015	0,103	8%	8%
3rd	0,392	2,677	0,392	2,675	21,6%	N/A
4th	0,006	0,038	0,006	0,038	4%	4%
5th	0,031	0,209	0,023	0,154	10,7%	10,7%
6th	0,003	0,022	0,004	0,027	2,67%	2,67%
7th	0,093	0,634	0,094	0,642	7,2%	7,2%
8th	0,003	0,020	0,004	0,028	2%	2%
9th	0,049	0,335	0,030	0,203	3,8%	N/A
10th	0,003	0,021	0,003	0,018	1,6%	1,6%
11th	0,068	0,464	0,061	0,416	3,1%	3,1%
12th	0,003	0,018	0,003	0,019	1,33%	1,33%
13th	0,042	0,285	0,025	0,171	2%	2%
14th	0,003	0,017	0,002	0,017	N/A	N/A
15th	0,053	0,359	0,040	0,276	N/A	N/A
16th	0,002	0,016	0,002	0,015	N/A	N/A
17th	0,024	0,161	0,017	0,113	N/A	N/A
18th	0,002	0,015	0,002	0,014	N/A	N/A
19th	0,039	0,263	0,027	0,185	N/A	N/A
20th	0,002	0,014	0,002	0,014	N/A	N/A
21th	0,012	0,083	0,013	0,088	N/A	N/A
22th	0,002	0,013	0,002	0,012	N/A	N/A
23th	0,019	0,132	0,015	0,106	N/A	N/A
24th	0,002	0,012	0,002	0,011	N/A	N/A
25th	0,005	0,036	0,008	0,056	N/A	N/A
26th	0,002	0,012	0,002	0,011	N/A	N/A
27th	0,003	0,022	0,006	0,042	N/A	N/A
28th	0,002	0,011	0,002	0,010	N/A	N/A
29th	0,005	0,036	0,005	0,036	N/A	N/A
30th	0,002	0,010	0,001	0,010	N/A	N/A
31th	0,006	0,040	0,003	0,019	N/A	N/A
32th	0,002	0,011	0,001	0,010	N/A	N/A
33th	0,006	0,043	0,004	0,028	N/A	N/A
34th	0,001	0,010	0,001	0,009	N/A	N/A
35th	0,007	0,045	0,003	0,020	N/A	N/A
36th	0,001	0,009	0,001	0,009	N/A	N/A
37th	0,007	0,045	0,003	0,021	N/A	N/A
38th	0,001	0,009	0,001	0,008	N/A	N/A
39th	0,003	0,021	0,004	0,025	N/A	N/A
40th	0,001	0,009	0,001	0,008	N/A	N/A

## Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99/NI

Nr. 10TH0222-G99/NI-1\_0

## Power Quality. Harmonics.

SE17K

Phase 1

SSEG rating per phase (rpp)						
	At 45-55% of rated output 2,83kW		100% of rated output 5,67kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Harmonic %	
					Limit in BS EN61000-3-12 in %	
					1 phase	3 phase
2nd	0,025	0,103	0,026	0,107	8%	8%
3rd	0,206	0,839	0,241	0,982	21,6%	N/A
4th	0,009	0,037	0,008	0,031	4%	4%
5th	0,095	0,389	0,095	0,386	10,7%	10,7%
6th	0,006	0,024	0,006	0,023	2,67%	2,67%
7th	0,071	0,288	0,075	0,307	7,2%	7,2%
8th	0,005	0,020	0,005	0,020	2%	2%
9th	0,050	0,203	0,057	0,233	3,8%	N/A
10th	0,005	0,020	0,005	0,019	1,6%	1,6%
11th	0,041	0,167	0,046	0,186	3,1%	3,1%
12th	0,005	0,020	0,004	0,018	1,33%	1,33%
13th	0,039	0,159	0,038	0,154	2%	2%
14th	0,005	0,022	0,004	0,017	N/A	N/A
15th	0,036	0,148	0,030	0,124	N/A	N/A
16th	0,005	0,021	0,004	0,017	N/A	N/A
17th	0,040	0,164	0,030	0,122	N/A	N/A
18th	0,005	0,020	0,004	0,016	N/A	N/A
19th	0,037	0,152	0,025	0,101	N/A	N/A
20th	0,005	0,020	0,004	0,016	N/A	N/A
21th	0,029	0,117	0,017	0,068	N/A	N/A
22th	0,005	0,020	0,004	0,016	N/A	N/A
23th	0,030	0,124	0,016	0,065	N/A	N/A
24th	0,004	0,016	0,004	0,014	N/A	N/A
25th	0,027	0,111	0,013	0,053	N/A	N/A
26th	0,005	0,019	0,003	0,014	N/A	N/A
27th	0,018	0,073	0,008	0,034	N/A	N/A
28th	0,004	0,016	0,003	0,014	N/A	N/A
29th	0,016	0,066	0,007	0,027	N/A	N/A
30th	0,003	0,014	0,003	0,013	N/A	N/A
31th	0,012	0,049	0,005	0,021	N/A	N/A
32th	0,003	0,014	0,003	0,013	N/A	N/A
33th	0,007	0,028	0,004	0,014	N/A	N/A
34th	0,003	0,013	0,003	0,014	N/A	N/A
35th	0,006	0,024	0,003	0,013	N/A	N/A
36th	0,003	0,013	0,003	0,011	N/A	N/A
37th	0,004	0,015	0,003	0,011	N/A	N/A
38th	0,003	0,012	0,003	0,012	N/A	N/A
39th	0,003	0,012	0,003	0,010	N/A	N/A
40th	0,003	0,013	0,003	0,011	N/A	N/A

## Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99/NI

Nr. 10TH0222-G99/NI-1\_0

## Power Quality. Harmonics.

SE17K

## Phase 2

SSEG rating per phase (rpp)						
	At 45-55% of rated output 2,83kW		100% of rated output 5,67kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Harmonic %	
					Limit in BS EN61000-3-12 in %	
					1 phase	3 phase
2nd	0,024	0,095	0,025	0,102	8%	8%
3rd	0,196	0,792	0,224	0,907	21,6%	N/A
4th	0,008	0,031	0,009	0,035	4%	4%
5th	0,089	0,361	0,090	0,365	10,7%	10,7%
6th	0,005	0,021	0,006	0,023	2,67%	2,67%
7th	0,068	0,275	0,077	0,311	7,2%	7,2%
8th	0,005	0,019	0,005	0,020	2%	2%
9th	0,049	0,197	0,061	0,246	3,8%	N/A
10th	0,006	0,022	0,005	0,020	1,6%	1,6%
11th	0,037	0,148	0,047	0,190	3,1%	3,1%
12th	0,005	0,019	0,004	0,017	1,33%	1,33%
13th	0,037	0,148	0,041	0,166	2%	2%
14th	0,005	0,020	0,004	0,017	N/A	N/A
15th	0,033	0,132	0,030	0,120	N/A	N/A
16th	0,005	0,020	0,004	0,017	N/A	N/A
17th	0,035	0,143	0,028	0,113	N/A	N/A
18th	0,004	0,017	0,004	0,015	N/A	N/A
19th	0,035	0,141	0,024	0,096	N/A	N/A
20th	0,004	0,018	0,004	0,015	N/A	N/A
21th	0,028	0,112	0,016	0,063	N/A	N/A
22th	0,004	0,017	0,003	0,014	N/A	N/A
23th	0,030	0,121	0,016	0,065	N/A	N/A
24th	0,004	0,014	0,003	0,013	N/A	N/A
25th	0,027	0,109	0,012	0,048	N/A	N/A
26th	0,004	0,016	0,003	0,013	N/A	N/A
27th	0,020	0,080	0,007	0,029	N/A	N/A
28th	0,004	0,014	0,003	0,012	N/A	N/A
29th	0,018	0,074	0,007	0,029	N/A	N/A
30th	0,003	0,012	0,003	0,012	N/A	N/A
31th	0,014	0,058	0,005	0,022	N/A	N/A
32th	0,003	0,012	0,003	0,012	N/A	N/A
33th	0,009	0,037	0,003	0,013	N/A	N/A
34th	0,003	0,012	0,003	0,012	N/A	N/A
35th	0,006	0,025	0,003	0,011	N/A	N/A
36th	0,003	0,012	0,003	0,011	N/A	N/A
37th	0,003	0,013	0,003	0,010	N/A	N/A
38th	0,003	0,011	0,003	0,010	N/A	N/A
39th	0,003	0,010	0,003	0,012	N/A	N/A
40th	0,003	0,011	0,002	0,010	N/A	N/A

**Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules**

Extract from test report according to the Engineering Recommendation G99/NI

Nr. 10TH0222-G99/NI-1\_0

**Power Quality. Harmonics.**

**SE17K**

**Phase 3**

SSEG rating per phase (rpp)						
	At 45-55% of rated output 2,83kW		100% of rated output 5,67kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Harmonic %	
					Limit in BS EN61000-3-12 in %	
					1 phase	3 phase
2nd	0,027	0,109	0,025	0,104	8%	8%
3rd	0,250	1,024	0,269	1,102	21,6%	N/A
4th	0,012	0,048	0,007	0,028	4%	4%
5th	0,032	0,132	0,036	0,149	10,7%	10,7%
6th	0,005	0,021	0,006	0,023	2,67%	2,67%
7th	0,118	0,483	0,120	0,490	7,2%	7,2%
8th	0,005	0,022	0,006	0,023	2%	2%
9th	0,046	0,187	0,038	0,158	3,8%	N/A
10th	0,004	0,018	0,004	0,018	1,6%	1,6%
11th	0,072	0,294	0,077	0,315	3,1%	3,1%
12th	0,004	0,015	0,004	0,017	1,33%	1,33%
13th	0,047	0,192	0,027	0,109	2%	2%
14th	0,004	0,017	0,004	0,017	N/A	N/A
15th	0,051	0,209	0,052	0,214	N/A	N/A
16th	0,004	0,016	0,004	0,016	N/A	N/A
17th	0,039	0,159	0,017	0,070	N/A	N/A
18th	0,004	0,015	0,003	0,014	N/A	N/A
19th	0,046	0,188	0,037	0,150	N/A	N/A
20th	0,004	0,014	0,004	0,015	N/A	N/A
21th	0,032	0,131	0,016	0,064	N/A	N/A
22th	0,004	0,015	0,003	0,014	N/A	N/A
23th	0,036	0,146	0,021	0,087	N/A	N/A
24th	0,003	0,013	0,003	0,013	N/A	N/A
25th	0,025	0,104	0,012	0,048	N/A	N/A
26th	0,004	0,015	0,003	0,013	N/A	N/A
27th	0,018	0,073	0,008	0,035	N/A	N/A
28th	0,003	0,012	0,003	0,012	N/A	N/A
29th	0,018	0,074	0,009	0,037	N/A	N/A
30th	0,003	0,011	0,003	0,011	N/A	N/A
31th	0,010	0,040	0,004	0,018	N/A	N/A
32th	0,003	0,012	0,003	0,012	N/A	N/A
33th	0,009	0,038	0,006	0,025	N/A	N/A
34th	0,003	0,011	0,003	0,011	N/A	N/A
35th	0,003	0,011	0,004	0,016	N/A	N/A
36th	0,003	0,011	0,002	0,010	N/A	N/A
37th	0,005	0,022	0,003	0,014	N/A	N/A
38th	0,003	0,011	0,003	0,011	N/A	N/A
39th	0,005	0,022	0,005	0,019	N/A	N/A
40th	0,002	0,010	0,002	0,010	N/A	N/A

**Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules**

Extract from test report according to the Engineering Recommendation G99/NI

Nr. 10TH0222-G99/NI-1\_0

Power Quality. Power factor.				
SE10K				
Output power	216,2V	230V	253V	Measured at three voltage levels and at full output. Voltage to be maintained within ±1,5% of the stated level during the test.
100%	0,999	0,999	0,999	
Limit	>0,95	>0,95	>0,95	
SE17K				
Output power	216,2V	230V	253V	Measured at three voltage levels and at full output. Voltage to be maintained within ±1,5% of the stated level during the test.
100%	0,999	0,999	0,999	
Limit	>0,95	>0,95	>0,95	

Power Quality. Voltage fluctuation and Flicker.								
SE10K								
	Starting			Stopping			Running	
	dmax	dc	d(t)	dmax	dc	d(t)	Pst	Plt 2 hours
Measured values at test impedance	0,29%	2,97%	0%	0,29%	2,97%	0%	0,3410	0,3410
Limits set under BS EN 61000-3-11	4%	3,3%	3,3% 500ms	4%	3,3%	3,3% 500ms	1,0	0,65
SE17K								
	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%	0,0787	0,0787
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	$\Omega$	XI	0,15	$\Omega$		

**Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules**

Extract from test report according to the Engineering Recommendation G99/Nl

Nr. 10TH0222-G99/Nl-1\_0

**Power Quality. DC injection.**

SE17K

**Phase 1**

Test level power [%]	10	55	100
Recorded value [mA]	0,73	15,99	11,52
Recorded value [%]	0,03	0,06	0,05
Limit [%]	0,25	0,25	0,25

**Phase 2**

Test level power [%]	10	55	100
Recorded value [mA]	58,04	39,96	37,65
Recorded value [%]	0,23	0,16	0,15
Limit [%]	0,25	0,25	0,25

**Phase 3**

Test level power [%]	10	55	100
Recorded value [mA]	4,65	15,77	16,22
Recorded value [%]	0,02	0,06	0,06
Limit [%]	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.

**Fault level Contribution.**

SE17K

**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	0,508	In seconds

For rotating machines and linear piston machines the test should produce a 0s – 2s plot of the short circuit current as seen at the Generating Unit terminals.

\* Values for these parameters should be provided where the short circuit duration is sufficiently long to enable interpolation of the plot.

**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.

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 0126-100).

**Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules**

Extract from test report according to the Engineering Recommendation G99/Ni

Nr. 10TH0222-G99/Ni-1\_0

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