Certificate of compliance

Applicant:	**SolarEdge Technologies Ltd.** **1 HaMada Street** **Herzliya 4673335** **Israel**			
Product:	**Photovoltaic (PV) inverter**			
Model:	**SE40K**	**SE33.3K**	**SE30K**	**SE27.6K**
	SE25K	**--**	**--**	**--**

Inverter for three-phase parallel connection to the public grid. The network monitoring and disconnection device is an integral part of the above-mentioned model.

Applied rules and standards:

DANSK ENERGI:2019
Technical requirements for connection of power-generating plants to the low-voltage grid (≤1kV) Type A
Type A power plants above 50kW

4.1 Tolerance of Frequency and voltage deviations
4.2 Start-up and reconnection of a power-generating plant
4.3 Active power control
4.4 Reactive power control
4.5 Protection
4.6 Power Quality
4.7 Exchange of information

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:	**19TH0534-DK1/DK2_0** **19TH0534-Power Quality_4**	**Certification Program:**	**NSOP-0032-DEU-ZE-V01**
Certificate number:	**U21-0412**	**Date of issue:**	**2021-05-06**

Instytut certyfikacji

Thomas Lammel

Certification body Bureau Veritas Consumer Products Services Germany GmbH accreditation 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

Extract from test report according to DANSK ENERGI **Nr. 19TH0534-DK1/DK2_0**
19TH0534-Power Quality_4

Type Approval and declaration of compliance with the requirements of DANSK ENERGI				
Manufacturer / applicant	SolarEdge Technologies Ltd. 1 HaMada Street Herzliya 4673335 Israel			
Micro-generator Type	Photovoltaic inverter			
	SE30K	SE33.3K	SE40K	--
Input DC voltage range [V]	680 – 1000	680 – 1000	680 – 1000	--
Input DC current [A]	36,25	40,0	48,25	--
Output AC voltage [V]	277 Vac, L-N 480 Vac, L-L	277 Vac, L-N 480 Vac, L-L	277 Vac, L-N 480 Vac, L-L	--
Output AC current [A]	36,25	40,0	48,25	--
Output power [VA]	30000	33300	40000	--
	SE25K	SE27.6K	SE30K	SE30K
Input DC voltage range [V]	680 – 1000	680 – 1000	680 – 1000	680 – 1000
Input DC current [A]	36,25	40,0	43,5	43,5
Output AC voltage [V]	220/230 Vac, L-N 380/400 Vac, L-L	220/230 Vac, L-N 380/400 Vac, L-L	220/230 Vac, L-N 380/400 Vac, L-L	220/230 Vac, L-N 380/400 Vac, L-L
Output AC current [A]	36,25	40	43,5	43,5
Output power [VA]	25000	27600	29990	30000
	SE33.3K	--	--	--
Input DC voltage range [V]	680 – 1000	--	--	--
Input DC current [A]	48,25	--	--	--
Output AC voltage [V]	220/230 Vac, L-N 380/400 Vac, L-L	--	--	--
Output AC current [A]	48,25	--	--	--
Output power [VA]	33300	--	--	--
Firmware version	Beginning with DSP1: 1.20 / DSP2: 2.20			
Measurement period	2019-11-29 – 2020-05-29, 2020-06-01 – 2020-07-31			

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 each line and neutral. This enables a safe disconnection of the power generation unit from the network in case of error.

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19TH0534-Power Quality_4

Setting of the parameter values for DK1 and DK2:		
	Settings for DK1	**Setting for DK2**
	LFSM-O	
Threshold frequency [Hz]	50,2	50,5
Droop [% of Pn]	5% (40% Pn/Hz)	4% (50% Pn/Hz)
Intentional Delay	500ms	500ms
	Reactive Power	
	Q fix	Q fix
Active/disabled [On/Off]	On	On
Q setpoint [VAr]	0	0
	cos φ fix	
Active/disabled [On/Off]	Off	Off
PF setpoint [PF]	1	1
	cos φ (P)	
Active/disabled [On/Off]	Off	Off
cos φ (P) P1 [% of P_n]	0	0
cos φ (P) PF1 [PF]	1	1
cos φ (P) P2 [% of P_n]	50	50
cos φ (P) PF2 [PF]	1	1
cos φ (P) P3 [% of P_n]	100	100
cos φ (P) PF3 [PF]	0,9 inductive	0,9 inductive
cos φ (P) Lockin [% of U_n]	105	105
cos φ (P) Lockout [% of U_n]	100	100
	Connection and Reconnection	
Gradient [% of P_n/min]	20	20
Observation time [seconds]	180	180
U_{min} [% of U_n]	85	85
U_{max} [% of U_n]	110	110
f_{min} [Hz]	47,5	47,5
f_{max} [Hz]	50,2	50,5
	System Protection	
f> [s]	0,2	0,2
f> [Hz]	51,5	51,5
f< [s]	0,2	0,2
f< [Hz]	47,5	47,5
U> [s]	60	60
U> [% of U_n]	110	110
U>> [s]	0,2	0,2
U>> [% of U_n]	115	115
U< [s]	50	50

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19TH0534-Power Quality_4

Setting of the parameter values for DK1 and DK2:		
	Settings for DK1	**Setting for DK2**
U< [% of U_n]	85	85
	Loss of Mains Detection	
U<< [s]	0,2	0,2
U<< [% of U_n]	80	80

Note.

The settings of the interface protection are password protected adjustable.

In case the above stated generators are used with an external protection device, the protection settings of the inverters are to be adjusted according to the manufacturer's declaration.

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19TH0534-Power Quality_4

Setting of the parameter values for DK1 and DK2:

			Settings for DK1	Setting for DK2	
4.5.3.3 Generating plant with synchronous generating technology (FRT) “Poland RoGA NC RFG Article 14”	B	Maximum power resumption time	not defined	≤ 0,1 s	
	B	Voltage-Time-Diagram	see Figure 7, EN 50549-1 Poland NC RFG Article 14 Type B PGMs	Time [s]	U [p.u.]
				N/A	N/A
				N/A	N/A
				N/A	N/A
				N/A	N/A
				N/A	N/A
4.5.4 Over-voltage ride through (OVRT) “Poland RoGA NC RFG nof defined for type A and B”	n.a.	Voltage-Time-Diagram	*The inverters have a DC to DC converter, so there are no limits. The inverters will stay connected till the NS protection setting (voltage and time are reached).	Time [s]	U [p.u.]
				N/A*	N/A*
4.6.1 Power response to over frequency (LFSM-O) “Poland RoGA NC RFG Article 13”	A,B	Threshold frequency f_1	50,0 – 66 Hz	50,2 Hz	
	A,B	Droop	1 % – 12 %	5 %	
	A,B	Power reference	P_M | P_{max}	P_M	
		P(f) soft start	0 – 20 min	10min	
		P(f) reset time	0 – 20 min	30 s	
	n.a.	Intentional delay	0 – 2 s	0 s	
	n.a.	Deactivation threshold fstop	50,0 - 66Hz	deactivated	
	n.a.	Deactivation time t_{stop}	0 – 20 min	N/A	
	A	Acceptance of staged disconnection	yes | no	No	
4.6.2 Power response to under frequency “Poland RoGA NC RFG Article 13, 15”	n.a.	Threshold frequency f_1	44 Hz – 60 Hz	N/A	
	n.a.	Droop	1 – 12 %	N/A	
	n.a.	Power reference	P_M | P_{max}	N/A	
	n.a.	Intentional delay	0 – 2 s	N/A	
4.7.2.2 Capabilities “Poland RoGA NC RFG Article 20”	B	Active factor range overexcited	0,1 – 1	1,0	
	B	Active factor range underexcited	0,1 – 1	1,0	
4.7.2.3 Control modes “Poland RoGA NC RFG Article 13, 14, 15, 18, 21”	n.a.	Enabled control mode	Q setp. Q(U) cos φ setp. cos φ (P)	disabled enabled Q(U) disabled disabled	
4.7.2.3.2 Set point control modes “Poland RoGA NC RFG Article 17, 20”	n.a.	Q setpoint and excitation	0 – 90 % P_{nom}	N/A	
	n.a.	cos φ setpoint and excitation	0,1-1	1	

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Setting of the parameter values for DK1 and DK2:

			Settings for DK1	Setting for DK2
4.7.2.3.3 Voltage related control modes	n.a.	Characteristic curve	Q(U) P(U)	Q(U) 0,0…-0,436 0,92…-0,436 0,94…0,0 1,06…0,0 1,08…0,436 1,2…0,436 disabled P(U)
	n.a.	Time constant	3 s – 60 s	3 s
	n.a.	Min cos φ	0,0 – 1	disabled
	n.a.	Lock in power	0 % – 20 %	deactivated
	n.a.	Lock out power	0 % – 20 %	deactivated
4.7.2.3.4 Power related control mode	n.a.	Characteristic curve	cos φ (P)	disabled
4.7.4.2.2 Zero current mode for converter connected generating technology	n.a.	Enabling	enable | disable	disabled
	n.a	Static voltage range overvoltage	1,0 U_n – 335V	1,15 U_n
	n.a	Static voltage range undervoltage	0,0 U_n – 1,0 U_n	0,85 U_n
4.9.2 Requirements on voltage and frequency protection	n.a	Threshold for protection as dedicated device [in A or kW, kVA]	All activated	N/A
	B	Undervoltage threshold stage 1	0,0 U_n – 1 U_n	0,85 U_n
	B	Undervoltage operate time stage 1	0,04 s – 20 min	1,350 s
	B	Undervoltage threshold stage 2	0,0 U_n – 1 U_n	N/A
	B	Undervoltage operate time stage 2	0,04 s – 20 min	N/A
	B	Overvoltage threshold stage 1	1,0 U_n – 335V	1,15 U_n
	B	Overvoltage operate time stage 1	0,04 s – 20 min	0,150 s
	B	Overvoltage threshold stage 2	1,0 U_n – 335V	N/A
	B	Overvoltage operate time stage 2	0,04 s – 20 min	N/A
	B	Overvoltage threshold 10 min mean protection[a]	1,0 U_n – 335V	1,1 U_n
	B	Overvoltage operate time 10 min mean protection[a]	3 s	10 min (update every 3s)
	B	Underfrequency threshold stage 1	44,0 Hz – 60,0 Hz	47,5 Hz
	B	Underfrequency operate time stage 1	0,06 s – 20 min	0,4 s
	B	Underfrequency threshold stage 2	44,0 Hz – 60,0 Hz	N/A
	B	Underfrequency operate time stage 2	0,06 s – 20 min	N/A
	B	Overfrequency threshold stage 1	50,0 Hz – 66,0 Hz	52,0 Hz
	B	Overfrequency operate time stage 1	0,06 s – 20min	0,4 s
	B	Overfrequency threshold stage 2	50,0 Hz – 66,0 Hz	N/A
	B	Overfrequency operate time stage 2	0,06 s – 20 min	N/A

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Setting of the parameter values for DK1 and DK2:

			Settings for DK1	Setting for DK2
	B	Loss of mains according EN 62116 (LoM)	0-100 s	Rocof 1,0 s
4.10.2 Automatic reconnection after tripping “Poland RoGA NC RFG Article 13, 14”	B	Lower frequency	44,0 Hz – 60,0 Hz	49,00 Hz
	B	Upper frequency	50,0 Hz – 66,0 Hz	50,05 Hz
	B	Lower voltage	0,0 U_n – 1,0 U_n	0,85 Un
	B	Upper voltage	1,0 U_n – 335 V	1,10 Un
	B	Observation time	1 s – 20min	60 s
	B	Active power increase gradient	1 % – 10000 %/min	10 %/min
4.10.3 Starting to generate electrical power “Poland RoGA NC RFG Article 13, 14”	A,B	Lower frequency	44,0 Hz – 60,0 Hz	49,00 Hz
	A,B	Upper frequency	50,0 Hz – 66,0 Hz	50,05 Hz
	A,B	Lower voltage	0,0 U_n – 1,0 U_n	0,85 Un
	A,B	Upper voltage	1,0 U_n – 335 V	1,10 Un
	A,B	Observation time	0s – 20min	60 s
	A,B	Active power increase gradient	1% – 10000 %/min	10 %/min
4.11.1 Ceasing active power “Poland RoGA NC RFG Article 13, 14”	A,B	Remote operation of the logic interface	yes | no	Yes (RS485, DI)
4.11.2 Reduction of active power on set point “Poland RoGA NC RFG Article 13, 14, 15”	B	Remote operation NOTE: If yes further definition is provided by the DSO	yes | no	Yes (RS485, DI)
4.12 Remote information exchange “Poland RoGA NC RFG Article 13, 14”	B	Remote information exchange required NOTE: If yes further definition is provided by the DSO	yes | no	No

Note:

[a] Over voltage – stage1: 10 min-mean-value corresponding to EN 50160.

Default interface setting according to EN 50438:2013, PN-EN 50438:2014, IRiESD (Instrukcja Ruchu i Eksploatacji Sieci Dystrybucyjnej) are used.

The EN 50549-1:2019, PN-EN 50549-1 based on

- Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators (NC RFG), requirements for type A, type B power generating modules
- the general operational requirements resulting from Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators (NC RfG) - approved by the Decision of the President of the Energy Regulatory Office DRE.WOSE.7128.550. 2.2018.ZJ of January 2, 2019.

The settings of the interface protection are password protected adjustable in the stated range above.

In case the above stated generators are used with an external protection device, the protection settings of the inverters must be adjusted according to the manufacturer’s declaration.

Any modification that affects the tests must be named by the manufacturer/supplier of the product to ensure that the product meets all requirements.