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Product Service

Compliance Document

No. D 082496 0049 Rev. 00

Holder of Certificate:	**SolarEdge Technologies Ltd.** 1 Hamada Street 4673335 Herzeliya ISRAEL
Product:	**Converter** **(Energy Storage Inverter)**
Model(s):	**PCS050**
Parameters:	See page 2
Tested according to:	EN 50549-1:2019/A1:2023 EN 50549-10:2022

This Compliance document confirms the compliance with the listed standards on a voluntary basis. It refers only to the sample submitted for testing and certification and does not certify the quality or safety of the serial products. For details see: www.tuvsud.com/ps-cert

Test report no.: 64290243111001

Date, 2025-01-08

(Billy Qiu)

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Parameters:

Model	PCS050
Battery input/output parameters	
Battery type	Lithium-ion
Maximum voltage [V_{DC}]	750
Battery rated voltage [V_{DC}]	512
Battery voltage range [V_{DC}]	480 - 750
Maximum charge power [W]	55000
Maximum discharge power [W]	55000
Maximum charge current [A_{DC}]	55/55
Maximum discharge current [A_{DC}]	55/55
Grid terminal input/output parameters	
Rated input/output voltage [V_{AC}]	3P+N+PE, 230/400
Rated input/output frequency [Hz]	50
Rated input/output current [A_{AC}]	72
Maximum continuous input/output current [A_{AC}]	80
Rated input/output active power [W]	50000
Maximum input/output active power [W]	50000
Maximum input/output apparent power [VA]	55000
Power factor range	0.9 inductive(under-excited) to 0.9 capacitive(over-excited)

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Evaluated protection function and operational capabilities

Clause(s) / subclause(s) of EN 50549-1:2019+ A1:2023	Applicable clause(s) / subclause (s) of EN 50549-10:2022	Remarks, optional modes and constraints	Verdict
4.4.2 Operating frequency range	5.2.1 Frequency operating range	--	Pass
4.4.3 Minimal requirement for active power delivery at underfrequency	5.2.1 Frequency operating range	--	Pass
4.4.4 Continuous operating voltage range	5.2.2 Voltage operating range	--	Pass
4.5.2 Rate of change of frequency (ROCOF) immunity	5.3.1 Immunity to disturbances - Rated of change of frequency (ROCOF)	--	Pass
4.5.3.2 Generating plant with nonsynchronous generating technology	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.5.4 Over-voltage ride through (OVRT)	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.5.5 Phase jump immunity	5.3.2 Phase jump	--	Pass
4.6.1 Power response to overfrequency	5.4 Active response to frequency deviation	--	Pass
4.6.2 Power response to underfrequency	5.4 Active response to frequency deviation	--	Pass
4.7.2.2 Voltage support by reactive power, Capabilities	5.5.1 Power capabilities assessment	--	Pass
4.7.2.3 Voltage support by reactive power, Control modes	5.5.2 Voltage support by reactive power - test to determine the reactive power control modes	Q setp Q(U) Cos φ setp Cos φ (P)	Pass
4.7.2.3.2 Set point control modes	5.5.2.3 Verification procedure for set point control	Q setp	Pass
4.7.2.3.3 Voltage related control modes	5.5.2.4 Verification procedure for voltage related control mode for reactive power Q(U)	Q(U)	Pass
4.7.2.3.4 Power related control mode	5.5.2.5 Verification procedure for power related control modes for reactive power	Cos φ (P)	Pass
4.7.3 Voltage related active power reduction	5.6 Voltage related active power reduction - P(U)	P(U)	Pass

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4.7.4.2.1 Voltage support during faults and voltage steps	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.7.4.2.2 Zero current mode for converter connected generating technology	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.9.3 Requirements on voltage and frequency protection	5.8.3 Verification procedure for generating plants to be connected to a LV distribution network with Interface protection as internal device	--	Pass
4.9.4 Means to detect island situation	5.8.6 Islanding detection	--	Pass
4.10.2 Automatic reconnection after tripping	5.9.3 Automatic reconnection after tripping	--	Pass
4.10.3 Starting to generate electrical power	5.9.4 Starting to generate electrical power	--	Pass
4.11.1 Ceasing active power	5.10 Active power reduction on set point	--	Pass
4.11.2 Reduction of active power on set point	5.10 Active power reduction on set point	--	Pass
4.12 Remote information exchange	5.11 Remote information exchange	Standardized communication protocol not provided by manufacturer	N/A
4.13 single fault tolerance of interface protection system and interface switch	5.12 Requirements regarding single fault tolerance of interface protection system and interface switch	--	Pass

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Evaluated parameter and parameter range

Specific technical requirement (e.g. grid codes)		**EN 50549-1:2019+A1:2023**			
Clause(s) / subclause(s) of EN 50549-1:2019+A1:2023	Parameter	Remarks/ additional information	Configurable value range	Default value	
4.4.2 Operating frequency range	47.0 - 47.5 Hz Duration	--	0 - 20 s	20 s	
	47.5 - 48.5 Hz Duration	--	30 - 90 min	30 min	
	48.5 - 49.0 Hz Duration	--	30 - 90 min	30 min	
	49.0 - 51.0 Hz Duration	--	not configurable	unlimited	
	51.0 - 51.5 Hz Duration	--	30 - 90 min	30 min	
	51.5 - 52.0 Hz Duration	--	0 - 15 min	15 min	
4.4.3 Minimal requirement for active power delivery at underfrequency	Reduction threshold	--	not configurable	No reduction.	
	Maximum reduction rate	--	not configurable	Maximum allow 10 % of P_{max} per 1 Hz	
4.4.4 Continuous operating voltage range	Upper limit	--	not configurable	253 V	
	Lower limit	--	not configurable	195.5 V	
4.5.2 Rate of change of frequency (ROCOF) immunity	ROCOF withstand capability (defined with a sliding measurement window of 500 ms)	--	not configurable	2 Hz/s	
4.5.3.2 Under-voltage ride through (UVRT) Generating plant with non-synchronous generating technology	Maximum power resumption time	--	not configurable	1 s	
	Voltage-Time-Diagram	--	See figure 6 most stringent curve of EN 50549-1:2019	Time[s]	U [p.u.]
				0.0	0.05
		--		0.25	0.05
		--		3.0	0.85
4.5.4 Over-voltage ride through (OVRT)	Voltage-Time-Diagram	--	See figure 8 of EN 50549-1:2019	Time[s]	U [p.u.]
				0.0	1.25
		--		0.1	1.25
		--		0.1	1.20
		--		5.0	1.20
		--		5.0	1.15
		--		60	1.15
		--		60	1.10

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4.5.5 Phase jump immunity	Phase jump immunity	--	not configurable	180°
4.6.1 Power response to overfrequency	Threshold frequency f1		50.2 Hz - 52 Hz	50.2 Hz
	Droop	--	2 % - 12 %	5 %
	Power reference	--	P_M | P_{max}	P_{max} for EESS
	Intentional delay	--	0 - 2 s	0s
	Deactivation threshold fstop	--	50.0 Hz - f1	deactivated
	Deactivation time tstop	--	0 - 600 s	--
	Acceptance of staged disconnection	--	yes | no	yes
4.6.2 Power response to underfrequency	Threshold frequency f1	--	49.8 Hz - 46 Hz	49.8 Hz
	Droop	--	2 - 12 %	5 %
	Power reference	--	P_M | P_{max}	P_{max}
	Intentional delay	--	0 - 2 s	0 s
4.7.2.2 Voltage support by reactive power - Capabilities	Active factor / Reactive power (%P_n) range overexcited	--	0.9 - 1 / 24 kVar - 0 kVar	1 / 0 kVar
	Active factor / Reactive power (%P_n) range underexcited	--	0.9 - 1 / -24 kVar - 0 kVar	1 / 0 kVar
4.7.2.3 Voltage support by reactive power - Control modes	Enabled control mode	--	Q setp Q(U) Cos φ setp Cos φ (P)	Q setp(Q setpoint)
4.7.2.3.2 Voltage support by reactive power - Setpoint control modes	Q setpoint and excitation	--	-24 kVar - 24 kVar	0 kVar
	cos φ setpoint and excitation	--	0.9 underexcited - 0.9 overexcited	1
4.7.2.3.3 Voltage support by reactive power - Voltage related control modes	Characteristic curve - Q (U)	--	--	Indicate default characteristic
	Point a	--	195.5 V - 230 V / 0% - 48%P_n ($Q_{max\ over}$)	213.9 V / 48%P_n ($Q_{max\ over}$)
	Point b	--	195.5 V - 230 V / 0% - 48%P_n ($Q_{max\ over}$)	216.2 V / 0%P_n

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	Point c	--	230 V - 253 V / 0% - 48%P_n ($Q_{max\ under}$)	243.8 V / 0%P_n
	Point d	--	230 V - 253 V / 0% - 48%P_n ($Q_{max\ under}$)	248.4 V / 48%P_n ($Q_{max\ under}$)
	Time constant	--	3 s - 60 s	3 s
	Min cos φ	--	0.0 – 0.95	0.4
	Lock in power	--	0 % - 20 % P_n	deactivated
	Lock out power	--	0 % - 20 % P_n	deactivated
4.7.2.3.4 Voltage support by reactive power - Power related control mode	Characteristic curve - Cos φ (P) and Q (P)	--	--	Indicate default characteristic
	Point a	--	0% - 100% P_n / Cos φ (P) mode: 0.9 un to 0.9 ov	15% P_n / Cos φ (P) mode: 0.9 ov
	Point b	--	0% - 100% P_n / Cos φ (P) mode: 0.9 un to 0.9 ov	20% P_n / Cos φ (P) mode: 1
	Point c	--	0% - 100% P_n / Cos φ (P) mode: 0.9 un to 0.9 ov	80% P_n / Cos φ (P) mode: 1
	Point d	--	0% - 100% P_n / Cos φ (P) mode: 0.9 un to 0.9 ov	90% P_n / Cos φ (P) mode: 0.9 un
	Cos φ	--	0.9 un to 0.9 ov	0.9 un
	Time constant	--	3 s - 60 s	3 s
	Lock in voltage	--	105%Un	deactivated
	Lock out voltage	--	100%Un	deactivated
4.7.3 Voltage related active power reduction	Characteristic curve - P (U)	--	--	Indicate default characteristic
	Point a	--	0% - 100%P_n / 230 V - 276 V	100%P_n / 253 V
	Point b	--	0% - 100%P_n / 230 V - 276 V	0%P_n / 257.6 V
	Time constant	--	3 s - 60 s	3 s
4.7.4.2.1 Voltage support during faults and voltage steps	Enabling	For type B	enable | disable	disabled
	Static voltage range overvoltage		230 V - 276 V	253 V

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	Static voltage range undervoltage		184 V - 230 V	195.5 V
	Gradient k1		0 - 6	2
	Gradient k2		0 - 6	2
4.7.4.2.2 Zero current mode for converter connected generating technology	Enabling	For type A	enable | disable	disabled
	Static voltage range overvoltage		230 V - 276 V	276 V
	Static voltage range undervoltage		46 V - 230 V	115 V
4.9.3 Requirements on voltage and frequency protection	Threshold for protection as dedicated device [in A or kW, kVA]	--	16 A - 250 kVA	Not specified, inverter integrated as default
	Undervoltage threshold stage 1	--	46 V - 230 V	195.5 V
	Undervoltage operate time stage 1	--	0.1 s - 100 s	2 s
	Undervoltage threshold stage 2	--	46 V - 230 V	184 V
	Undervoltage operate time stage 2	--	0.1 s - 5 s	0.1 s
	Overvoltage threshold stage 1	--	230 V - 276 V	264.5 V
	Overvoltage operate time stage 1	--	0.1 s - 100 s	2 s
	Overvoltage threshold stage 2	--	46 V - 299 V	276 V
	Overvoltage operate time stage 2	--	0.1 s - 5 s	0.1 s
	Overvoltage threshold 10 min mean protection	--	230 V – 264.5 V	253 V
	Underfrequency threshold stage 1	--	47.0 Hz - 50.0 Hz	47.5 Hz
	Underfrequency operate time stage 1	--	0.1 s - 100 s	2 s
	Underfrequency threshold stage 2	--	47.0 Hz - 50.0 Hz	47.0 Hz
	Underfrequency operate time stage 2	--	0.1 s - 5 s	0.1 s

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	Overfrequency threshold stage 1	--	50.0 Hz - 52.0 Hz	51.5 Hz
	Overfrequency operate time stage 1	--	0.1 s - 100 s	2 s
	Overfrequency threshold stage 2	--	50.0 Hz - 52.0 Hz	52.0 Hz
	Overfrequency operate time stage 2	--	0.1 s - 5 s	0.1 s
4.10.2 Automatic reconnection after tripping	Lower frequency	--	47.0 Hz - 50.0 Hz	49.5 Hz
	Upper frequency	--	50.0 Hz - 52.0 Hz	50.2 Hz
	Lower voltage	--	115 V - 230 V	195.5 V
	Upper voltage	--	230 V - 276 V	253 V
	Observation time	--	10 s - 600 s	60 s
	Active power increase gradient	--	6% - 3000%/min	10 %P_n/min
4.10.3 Starting to generate electrical power	Lower frequency	--	47.0 Hz - 50.0 Hz	49.5 Hz
	Upper frequency	--	50.0 Hz - 52.0 Hz	50.1 Hz
	Lower voltage	--	115 V - 230 V	195.5 V
	Upper voltage	--	230 V - 276 V	253 V
	Observation time	--	10 s - 600 s	60 s
	Active power increase gradient	--	6% - 3000 %/min	disabled
4.11.1 Ceasing active power	Activation option	--	Can be achieved by COM port via Modbus communication protocol, decision should be made by the DSO and responsible party	
4.11.2 Reduction of active power on set point	Activation option	--	Can be achieved by COM port via Modbus communication protocol, decision should be made by the DSO and responsible party	
4.12 Remote information exchange	Available communication standards	--	Standardized communication protocol not provided by manufacturer	