

Certificate of Conformity

No. ESY 070122 0039 Rev. 00

Holder of Certificate: **SMA Solar Technology AG**
Sonnenallee 1
34266 Niestetal
GERMANY

Product: **PV inverter**

This Certificate of Conformity confirms the compliance with the above listed standards on a voluntary basis. It refers only to the sample submitted to TÜV SÜD Product Service GmbH and does not certify the quality or safety of the serial products. It was issued according to TÜV SÜD Product Service certification program Photovoltaics and Grid Integration. For details see: www.tuvsud.com/ps-cert

Test report no.: 713254379-010

Date, 2023-01-24



(Kristijan Cizmar)

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Model(s):
 SUNNY TRIPOWER STP 12-50
 SUNNY TRIPOWER STP 15-50
 SUNNY TRIPOWER STP 20-50
 SUNNY TRIPOWER STP 25-50

Parameters:

Model	SUNNY TRIPower STP 12-50	SUNNY TRIPower STP 15-50	SUNNY TRIPower STP 20-50	SUNNY TRIPower STP 25-50
Grid terminal parameters				
Rated voltage / frequency	$U_n : 400 V_{AC,P-P} (3ph+PE), f_n : 50 \text{ Hz}$			
Rated active power	12 kW	15 kW	20 kW	25 kW
Rated current	17,4 A	21,7 A	29,0 A	36,2 A
PV terminal parameters				
MPPT range	206 – 800 V_{MPP}	257 – 800 V_{MPP}	340 – 800 V_{MPP}	430 – 800 V_{MPP}

Remarks/CoA (e.g. nomenclature; conditions of acceptability):

Technical Certifier (Kristijan Cizmar) appointed by the certification body TÜV SÜD Product Service GmbH has performed the assessment of the products listed in this certificate at Ridlerstraße 65, 80339 Munich, Germany.

Valid until: 2027-11-17

The devices of the type SUNNY TRIPOWER STP 12-50, SUNNY TRIPOWER STP 15-50, SUNNY TRIPOWER STP 20-50 and SUNNY TRIPOWER STP 25-50 comply with following documents:

RfG:2016

Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on the requirements for connecting generating units to the network (Journal of Laws UE L 112/1 of 27 April 2016)

NC RfG:2018

General Application Requirements resulting from the EU Commission Regulation 2016/631 of 14 April 2016 establishing the grid code on requirements for connecting generation units to the grid - approved by the Decision of the President of the Energy Regulatory Office DRE.WOSE.7128.550.2.2018.ZJ of January 2, 2019

PTPIREE:2021

Conditions and procedures for the use of certificates in the process of connecting energy generation modules to power grids V1.2

Applicable standards:

RfG:2016
 NC RfG:2018
 PTPIREE:2021
 EN 50549-1:2019
 EN 50549-2:2019

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Annex to the certificate of conformity with PTPIREE:2021, tested according to EN 50549-1 and EN 50549-2				
Manufacturer:		SMA Technology AG, Sonnenallee 134266 Niestetal , Germany		
Device type:		PV inverter		
Model		SUNNY TRIPower STP 12-50	SUNNY TRIPower STP 15-50	SUNNY TRIPower STP 20-50
Ratings	AC:	U _n : 400 V _{AC} , f _n : 50 Hz		
		P _n : 12 kW	P _n : 15 kW	P _n : 20 kW
		I _n : 17,4 A	I _n : 21,7 A	I _n : 29,0 A
	DC:	206 – 800 V _{MPP}	257 – 800 V _{MPP}	340 – 800 V _{MPP}
Software Version:		from 1.16.03.R (main processor)		
Measurement period:		2022-02-05 – 2022-06-04		
Type of certification program		1(a) according to EN ISO/IEC 17067 Based on Photovoltaics and Grid Integration Certification Program (Revision 6, Dated 5 Dec 2021) for Poland Grid Code		
Grid connection rule:		PTPIREE:2021		
Test requirement:		EN 50549-1:2019 - Requirements for generating plants to be connected in parallel with distribution networks - Part 1: Connection to a LV distribution network - Generating plants up to and including Type B PN-EN 50549-2:2019 - Requirements for generating plants to be connected in parallel with distribution networks - Part 2: Connection to a MV distribution network - Generating plants up to and including Type B		
Test report:		EN 50549-1:2019: 713254379-002, released 2022-08-08 EN 50549-2:2019: 713254379-003, released 2022-08-09		
Remarks:		The following functionalities from the list below have been assessed based on the rules of using device certificates for power park modules (PPM) in accordance with type A and B, as set out in sections 7 and 9 of PTPIREE 2021 (which is identical to PTPIREE 2021-04-28). To relate the clauses of EN 50549-1:2019 and PN-EN 50549-2:2019 with the clause labels of the EU commission regulations, the numbers are given in brackets “[]”.		

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PTPiREE:2021 parameters as in EN 50549-1:2019 and EN 50549-2:2019 - Annex C Parameter table					
Clauses / sub-sections	Ref	Parameter	Typical range of values	Default	
4.4.2 Operating frequency range [13.1(a)]	A, B	47.0 – 47.5 Hz Duration	0 – 20 s	0,1 s	
	A, B	47.5 – 48.5 Hz Duration	30 – 90 min	30 min	
	A, B	48.5 – 49.0 Hz Duration	30 – 90 min	30 min	
	A, B	49.0 – 51.0 Hz Duration	not configurable	unlimited	
	A, B	51.0 – 51.5 Hz Duration	30 – 90 min	30 min	
	A, B	51, 5 – 52 Hz Duration	0 – 15 min	0,1 s	
4.4.3 Minimum requirement for the supply of active power at low frequency [13.4]	A, B	Reduction threshold	49 Hz – 49.5 Hz	49,5 Hz	
	A, B	Maximum reduction rate	2 – 10% P _M / Hz	2% P _M / Hz	
4.4.4 Continuous operating voltage range [16.2(a)(i)]	N/A	Upper limit	100%U _n -120%U _n	115% U _n	
	N/A	Lower limit	50%U _n -100%U _n	80% U _n	
4.5.2 Resistance to frequency change rate (ROCOF) [13.1(b)]	A, B	ROCOF withstand capability (defined with a sliding measurement window of 500 ms) non-synchronous generation technology: synchronous generation technology:	0 – 10 Hz/s	Max. 2,5 Hz/s	
				2 Hz/s	
				1 Hz/s	
4.5.3.2 Plant with non-synchronous manufacturing technology [14.3(a)(i), 14.3(b), 16.3(a)(i), 16.3(c), 20.2(b)(c), 20.3(a), 21.3(e)]	B	Maximum power recovery time	Undefined	1 s	
	B	Voltage and time diagram	See EN 50549-1:2019, Figure 6	Time / s	U / p.u.
				0,15	0,05
				2,5	0,85
4.6.1 Power response to over-frequency [13.2]	A, B	Threshold frequency f ₁	50.2 Hz – 52 Hz	50,2 Hz	
	A, B	Droop	2% – 12%	5%	
	A, B	Power reference	P _M P _{max}	P _{max}	
	N/A	Intentional delay	0 – 2 s	0 s	
	N/A	deactivation threshold F _{stop}	50,0 Hz – f ₁	deactivated	
	N/A	deactivation time T _{stop}	0 – 600 s	not applicable	
	AND	Acceptance of staged disconnection	yes no	no	
4.6.2 Power response to under-frequency (LFSM-U) [15.2]	N/A	Threshold frequency f ₁	49.8 Hz – 46 Hz	49,0 Hz	
	N/A	Droop	2 – 12 %	2%	
	N/A	Reference power	P _M P _{max}	P _{max}	
	N/A	Intentional delay	0 – 2 s	not applicable	

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Clauses / sub-sections	Ref	Parameter	Typical range of values	Default
4.7.2.2 Capabilities [20.2(a), 21.3]	B	Reactive power range overexcited	0,9 - 1	0,9
	B	Reactive power range underexcited	0,9 - 1	0,9
4.7.2.3 Control modes	N/A	Control mode enabled	Q setp. Q(U) Q(P) cos φ (P)	All parameters can be set.
4.7.2.3.2 Setpoint control modes	N/A	Q setting and excitation	0 –33% P _D	0
	N/A	something φ setting and excitation	1 – 0,9	1
4.7.2.3.3 Voltage-related control modes	N/A	Characteristic curve	-	-
	N/A	Time constant	3 s – 60 s	10 s
	N/A	Min cos φ	0,0 – 1	0,9
	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)	deactivated
4.7.4.2.1 Voltage backup during faults and power surges – General [20.2(b)(c), 20.3(a)]	B	Enabling	enable disable	Disabled
	B	Static voltage range overvoltage	100 % U _n – 120 % U _n	110 % U _n
	B	Static voltage range undervoltage	80% U _n – 100% U _n	90 % U _n
	B	Insensitivity range ΔU _{50per}	0% – 15%	5%
	B	Gradient k1	0 – 6	2
	B	Gradient k2	0 – 6	2
4.7.4.2.1.2 Optional modes	N/A	Active power priority	enable disable	Disabled
	N/A	Limiting reactive current [% rated current]	0%–100%	Disabled
	N/A	Zero current threshold	20% U _n – 100% U _n	Disabled
4.7.4.2.2 Zero current mode for generation technology connected to the converter	N/A	Enabling	enable disable	Disabled
	N/A	Static voltage range undervoltage	20% U _n – 100% U _n	50% U _n
4.9.2 Voltage and frequency protection requirements	N/A	Threshold for protection as dedicated device [in A or kW, kVA]	16 A – 250 kVA	not applicable
	B	Undervoltage threshold stage 1	0,2 U _n – 1 U _n	85% U _n
	B	Undervoltage operate time stage 1	0,1 s – 100 s	1,5 s
	B	Undervoltage threshold stage 2	0,2 U _n – 1 U _n	not applicable

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Clauses / sub-sections	Ref	Parameter	Typical range of values	Default
	B	Undervoltage operate time stage 2	0,1 s – 5 s	not applicable
	B	Overvoltage threshold stage 1	1,0 U _n – 1,2 U _n	115% U _n
	B	Overvoltage operate time stage 1	0,1 s – 100 s	0,2 s
	B	Overvoltage threshold stage 2	1,0 U _n – 1,3 U _n	Disabled
	B	Overvoltage operate time stage 2	0,1 s – 5 s	Disabled
	B	Overvoltage threshold 10 min mean protection ¹⁾	1,0 U _n – 1,15 U _n	Provided by external protection relay
	B	Overvoltage operate time 10 min mean protection ¹⁾	0,04 s – 10 s	Provided by external protection relay
	B	Underfrequency threshold stage 1	47.0 Hz – 50.0 Hz	47,5 Hz
	B	Underfrequency operate time stage 1	0,1 s – 100 s	0,5 s
	B	Underfrequency threshold stage 2	47.0 Hz – 50.0 Hz	not applicable
	B	Underfrequency operate time stage 2	0,1 s – 5 s	not applicable
	B	Overfrequency threshold stage 1	50.0 Hz – 52.0 Hz	52,0 Hz
	B	Overfrequency operate time stage 1	0,1 s – 100 s	0,5 s
	B	Overfrequency threshold stage 2	50.0 Hz – 52.0 Hz	not applicable
	B	Overfrequency operate time stage 2	0,1 s – 5 s	not applicable
	B	Positive sequence under-voltage protection threshold	20% – 100%	not applicable
	B	Positive sequence under-voltage protection operate time	0,2 s – 100 s	not applicable
	B	Negative sequence under-voltage protection threshold	1% – 100%	not applicable
	B	Negative sequence under-voltage protection operate time	0,2 s – 100 s	not applicable
	B	Zero sequence over-voltage protection threshold	0% – 100%	not applicable
	B	Zero sequence over-voltage protection time	0,2 s – 100 s	not applicable
	B	Loss of Mains according to EN 62116 (LoM)	0 - 20 s	0,5 s

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PTPiREE:2021 parameters as in EN 50549-1:2019 and EN 50549-2:2019 - Annex C Parameter table				
Clauses / sub-sections	Ref	Parameter	Typical range of values	Default
4.10.2 Automatic reconnection when disabled [13.7, 14.4]	B	Lower frequency	47,0 Hz – 50,0 Hz	49,0 Hz
	B	Upper frequency	50,0 Hz – 52,0 Hz	50,05 Hz
	B	Lower voltage	50% U _n – 100% U _n	85 % U _n
	B	Upper voltage	100 % U _n - 120 % U _n	110 % U _n
	B	Observation time	10 s – 600 s	60 s
	B	active power growth coefficient	6 % – 10000 %/min	9 %/min
4.10.3 Start of electricity generation [13.7, 14.4]	A, B	Lower frequency	47.0 Hz – 50.0 Hz	49,00 Hz
	A, B	Upper frequency	50.0 Hz – 52.0 Hz	50,05 Hz
	A, B	Lower voltage	50% – 100% U _n	85 % U _n
	A, B	Upper voltage	100% – 120% U _n	110 % U _n
	A, B	Observation time	10 s – 600 s	60 s
	A, B	active power growth coefficient	6 % – 3000 %/min	Disabled
4.11.1 Cessation of active power [13.6, 14.2, 15.2]	A, B	Remote operation of the logic interface	yes no	yes The Modbus signal via RS485 or Ethernet can be used to change or stop the active output power. For RS485, a Modbus transceiver from RS 485 to Ethernet is required. Note: The SunSpec protocol is implemented in SMA inverters.
4.11.2 Reduction of active power at a preset point [13.6, 14.2, 15.2]	B	Remote information exchange required NOTE: If yes further definition is provided by the DSO	yes no	yes The Modbus signal via RS485 or Ethernet can be used to change or stop the active output power. For RS485, a Modbus transceiver from RS 485 to Ethernet is required. Note: The SunSpec protocol is implemented in SMA inverters.
4.12 Remote exchange of information [14.5(d)]	B	Remote information exchange required NOTE: If yes further definition is provided by the DSO	yes no	No

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Clauses / sub-sections	Ref	Parameter	Typical range of values	Default
<p>1) Overvoltage – stage 1: 10 min-average value according to EN 50160.</p> <p>Note:</p> <p>Interface protection settings are adjustable and password protected.</p> <p>Where the units listed above are connected via an external safety device, the protection settings of the inverters must be adjusted in accordance with the manufacturer's declaration.</p> <p>The above-mentioned units have been tested in accordance with the requirements of PTPiREE:2021 and according to EN 50549-1:2019 and EN 50549-2:2019. Any modifications that affect these results must be reported by the manufacturer/supplier of the product to ensure that the product meets all the requirements of PTPiREE:2021.</p> <p>The EN 50549-1:2019 and PN-EN 50549-2:2019 are based on</p> <ol style="list-style-type: none"> 1) Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on the requirements for connecting generating units to the network (Journal of Laws UE L 112/1 of 27 April 2016) 2) General Application Requirements resulting from the EU Commission Regulation 2016/631 of 14 April 2016 establishing the grid code on requirements for connecting generation units to the grid - approved by the Decision of the President of the Energy Regulatory Office DRE.WOSE.7128.550.2.2018.ZJ of January 2, 2019 				