Certificate of compliance

Applicant:	**SMA Solar Technology AG** Sonnenallee 1 34266 Niestetal **Germany**
Product:	**Photovoltaic and battery inverter (Hybrid-Inverter)**
Model:	**STPH5-60, STPH6-60,** **STPH8-60, STPH10-60,** **STPH12-60, STPH15-60**

The device is designed to work as a generation unit of the type: A and B*

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:

EN 50549-1:2019/A1:2023
Requirements for parallel connection of installations with distribution networks - Part 1: Connection to an LV distribution network - Production of installations up to and including Type B

4.4 Normal operating range
4.5 Immunity to disturbances*
4.6 Active response to frequency deviation
4.7 Power response to voltage variations and voltage changes
4.8 EMC and power quality
4.9 Interface protection
4.10 Connection and starting to generate electrical power
4.11 Ceasing and reduction of active power on set point
4.12 Remote information exchange
4.13 Requirements regarding single fault tolerance of interface protection system and interface switch

EN 50549-10:2022
Requirements for generating plants to be connected in parallel with distribution networks - Part 10: Tests for conformity assessment of generating units

Compliance with the parameters in Annex C of the standard
(see appendix parameter table)

Commission Regulation (EU) 2016/631 of 14 April 2016
Establishing a network code on requirements for grid connection of generators (NC RFG).
Type approval for generation units to use in Type A and B* plants.

* 4.5 Immunity to disturbances, only limited grid support mode was tested (zero current mode) for FRT function

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: **ES2025019571A00 | ES2025019571B00** **Certification Program:** **NSOP-0032-DEU-ZE-ES-V11**

Certificate number: **U26-0591** **Date of issue:** **2026-07-07**

Certification body

Domenik Koll
Head of Energy Systems Germany

Accreditation

EUROPEAN RECOGNITION
DAkkS Deutsche Akkreditierungsstelle D-ZE-12024-01-00

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Type Approval and declaration of compliance with the requirements of EN 50549-1 and Commission Regulation (EU) 2016/631 of 14 April 2016	
Manufacturer	SMA Solar Technology AG Sonnenallee 1 34266 Niestetal Germany
Product type	Photovoltaic and battery inverter (Hybrid-Inverter)

Static converter model	STPH5-60	STPH6-60	STPH8-60	STPH10-60
Input (PV DC)				
MPP voltage range [V]	100 – 850	120 – 850	160 – 850	200 – 850
Max. input voltage [V]	1000	1000	1000	1000
Max. input current per MPP tracker [A]	18 / 18 / 18	18 / 18 / 18	18 / 18 / 18	18 / 18 / 18
Max. short current per MPP tracker [A]	24 / 24 / 24	24 / 24 / 24	24 / 24 / 24	24 / 24 / 24
Input (battery DC)				
DC voltage range [V]	80 – 600	80 – 600	80 – 600	80 – 600
Max. DC voltage [V]	600	600	600	600
Max. charge current [A]	50	50	50	50
Max discharge current [A]	50	50	50	50
Max. charge power [W]	10000	10000	10000	10000
Max. discharge power [W]	5264	6316	8422	10527
AC connection				
Nominal AC voltage [V] *1	380 (3/N/PE) **400** (3/N/PE) 415 (3/N/PE)	380 (3/N/PE) **400** (3/N/PE) 415 (3/N/PE)	380 (3/N/PE) **400** (3/N/PE) 415 (3/N/PE)	380 (3/N/PE) **400** (3/N/PE) 415 (3/N/PE)
Nominal frequency [Hz]	50	50	50	50
Nominal current [A]	7,2	8,7	11,6	14,5
Max. current [A]	7,6	9,1	12,1	15,2
Nominal power [W]	5000	6000	8000	10000
Nominal apparent power [VA]	5000	6000	8000	10000
Initial short-circuit AC current Ik''[A]	19,2	20,9	26,0	31,2
Off-Grid AC Connection (differences to On-Grid)				
Max. current [A]	15,2	15,2	15,2	15,2
Max. power [W]	10000	10000	10000	10000
Max. apparent power [VA]	10000	10000	10000	10000
On-grid battery mode *2				
P_{sn} (nominal discharge power) [W]	5000	6000	8000	10000
P_{cn} (nominal charging power) [W]	5000	6000	8000	10000
P_{smax} (max. discharge power) [W]	5000	6000	8000	10000
P_{cmax} (max. charging power) [W]	5000	6000	8000	10000
Type	bidirectional	bidirectional	bidirectional	bidirectional
Off-grid battery mode *2				
P_{sn} (nominal discharge power) [W]	10000	10000	10000	10000
P_{smax} (max. discharge power) [W]	10000	10000	10000	10000

Static converter model	STPH12-60	STPH15-60	--	--
Input (PV DC)				
MPP voltage range [V]	240 – 850	300 – 850	--	--
Max. input voltage [V]	1000	1000	--	--
Max. input current per MPP tracker [A]	18 / 18 / 18	18 / 18 / 18	--	--
Max. short current per MPP tracker [A]	24 / 24 / 24	24 / 24 / 24	--	--
Input (battery DC)				
DC voltage range [V]	80 – 600	80 – 600	--	--
Max. DC voltage [V]	600	600	--	--
Max. charge current [A]	50	50	--	--
Max discharge current [A]	50	50	--	--
Max. charge power [W]	15000	15000	--	--
Max. discharge power [W]	12632	15790	--	--
AC connection				
Nominal AC voltage [V] *1	380 (3/N/PE) **400** (3/N/PE) 415 (3/N/PE)	380 (3/N/PE) **400** (3/N/PE) 415 (3/N/PE)	--	--
Nominal frequency [Hz]	50	50	--	--
Nominal current [A]	17,4	21,7	--	--
Max. current [A]	18,2	22,7	--	--
Nominal power [W]	12000	15000	--	--
Nominal apparent power [VA]	12000	15000	--	--
Initial short-circuit AC current Ik''[A]	41,6	52,0	--	--
Off-Grid AC Connection (differences to On-Grid)				
Max. current [A]	22,7	22,7	--	--
Max. power [W]	15000	15000	--	--
Max. apparent power [VA]	15000	15000	--	--
On-grid battery mode *2				
P_{sn} (nominal discharge power) [W]	12000	15000	--	--
P_{cn} (nominal charging power) [W]	12000	15000	--	--
P_{smax} (max. discharge power) [W]	12000	15000	--	--
P_{cmax} (max. charging power) [W]	12000	15000	--	--
Type	bidirectional	bidirectional	--	--
Off-grid battery mode *2				
P_{sn} (nominal discharge power) [W]	15000	15000	--	--
P_{smax} (max. discharge power) [W]	15000	15000	--	--

Note:

*1: The rated AC voltage of the devices is 400 V. 380 V and 415 V is also shown above, to state that the device is also able to work at such grids.

*2: The charging and discharging power shown under the 'On- & Off-Grid Battery Mode' section is equivalent to the AC power at the inverter terminals when the inverter is only charging or discharging the battery (no additional power from the PV side)

P_{sn} = rated discharge power, the maximum power that the system can deliver across the entire CUS range.

P_{cn} = rated charge power, the maximum power that the system can charge across the entire CUS range.

P_{smax} = maximum discharge power; the discharge power that the system must be able to deliver in the range from 10% to 90% of the CUS.

P_{cmax} = maximum charging power; the charging power that the system must guarantee in the range from 10% to 90% of the CUS.

CUS = usable capacity of the storage system; the amount of energy available at the connections of the storage system between the minimum and maximum state of charge.

Interface protection system and interface switch (Network and system protection "NS-protection")	
Type of protection	integrated NS-protection
Assigned to generation unit type	STPH5-60, STPH6-60, STPH8-60, STPH10-60, STPH12-60, STPH15-60
Integrated interface switch	Type of switching equipment 1: Relay (Model CHS01-V-112HA2(60H) Type of switching equipment 2: Relay (Model CHS01-V-112HA2(60H)
	Note: The output is switched off by the inverter bridge and two relay in series in each line and neutral.
Software	
Firmware version	03.xx.xx.R
	Note: The tests were performed with firmware version 03.17.80.R Changes in the firmware version on position "x" have no effect on the required electrical properties as declared by the manufacturer. "x" could be any number higher than the tested version.

Note

The settings of the product are password protected adjustable.

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

The above stated generators are tested according to the requirements in the EN 50549-1 and the Commission Regulation (EU) 2016/631 of 14 April 2016. 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.

Type Approval and declaration of compliance with the requirements of EN 50549-1 and Commission Regulation (EU) 2016/631 of 14 April 2016					
Parameter Table					
Software version	03.17.80.R				
Name of parameter set	EN50549-1:2018 LV				
specific technical requirement (e.g. grid codes)	EN 50549-1				
Clause(s) / subclause(s) of EN 50549-1:2019	**Parameter[a]**	**Remarks/ additional information[b]**	**Typical value range**	**value default (defined in EN 50549-1:2019 Table C.1)**	**implementation in the inverter**
4.3.2 Interface switch	Single fault tolerance for interface switch required		yes | no	no	yes (always available)
4.4.2 Operating frequency range	47,0 – 47,5 Hz Duration		0 s – 20 s	0 s	< 0,1 s (based on frequency monitoring see 4.9.3)
	47,5 – 48,5 Hz Duration		30 – 90 min	30 min	> 30 min (unlimited)
	48,5 – 49,0 Hz Duration		30 – 90 min	30 min	> 30 min (unlimited)
	49,0 – 51,0 Hz Duration		not configurable	unlimited	unlimited
	51,0 – 51,5 Hz Duration		30 – 90 min	30 min	> 30 min (unlimited)
	51,5 – 52,0 Hz Duration		0 – 15 min	0 s	< 0,1 s (based on frequency monitoring see 4.9.3)
4.4.3 Minimal requirement for active power delivery at underfrequency	Reduction threshold		49,0 Hz – 49,5 Hz	49,5 Hz	No relevant power reduction in defined frequency range
	Maximum reduction rate		2% – 10% P_M/Hz	10% P_M/Hz	
4.4.4 Continuous operating voltage range	Upper limit		not configurable	*110% U_n	-1,0 U_n - 1,15 U_n: continuous operation - above 1,15 U_n: disconnection in 0,2 s based on 4.9.3
	Lower limit		not configurable	*85% U_n	-1,0 U_n – 0,8 U_n: Continuous operation - below 0,8 U_n: disconnection in 3 s based on 4.9.3
4.5.2 Rate of change of frequency (ROCOF) immunity	ROCOF withstand capability (defined with a sliding measurement window of 0,500 s) non-synchronous generating technology (inverter): synchronous generating technology:		not configurable yes no	2 Hz/s N/A	≥ 2 Hz/s (not configurable)

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Parameter Table						
Software version	03.17.80.R					
Name of parameter set	EN50549-1:2018 LV					
specific technical requirement (e.g. grid codes)	EN 50549-1					
Clause(s) / subclause(s) of EN 50549-1:2019	**Parameter[a]**	**Remarks/ additional information[b]**	**Typical value range**	**value default (defined in EN 50549-1:2019 Table C.1)**		**implementation in the inverter**
4.5.3.2 Generating plant with nonsynchronous generating technology (UVRT)	Maximum power resumption time		not defined	1 s		≤1 s
	Voltage-Time- Diagram		see Figure 6	Time [s]	U [p.u.]	The inverter remains connected to the grid. However, the time-dependent UVRT is severely limited by the protection settings see 4.9.3.
				0,00	0,20	
				0,15	0,20	
				1,50	0,85	
4.5.3.3 Generating plant with synchronous generating technology	Maximum power resumption time		not defined	3 s		N/A (non synchronous)
	Voltage-Time-Diagram		see Figure 7	Time [s]	U [p.u.]	
				0,00	0,30	
				0,15	0,30	
				0,15	0,70	
				0,70	0,70	
				1,50	0,85	
4.5.4 Over-voltage ride through (OVRT)	Voltage-Time- Diagram		not configurable	Time [s]	U [p.u.]	The inverter remains connected to the grid. However, the time-dependent OVRT is severely limited by the protection settings see 4.9.3.
				0,0	1,25	
				0,1	1,25	
				0,1	1,20	
				5,0	1,20	
				5,0	1,15	
				60,0	1,15	
				60,0	1,10	
4.5.5 Phase Jump immunity	Phase jump immunity		not configurable	20°		not configurable The inverter remains connected to the grid.

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Parameter Table					
Software version	03.17.80.R				
Name of parameter set	EN50549-1:2018 LV				
specific technical requirement (e.g. grid codes)	EN 50549-1				
Clause(s) / subclause(s) of EN 50549-1:2019	**Parameter[a]**	**Remarks/ additional information[b]**	**Typical value range**	**value default (defined in EN 50549-1:2019 Table C.1)**	**implementation in the inverter**
4.6.1 Power response to overfrequency	Threshold frequency f_1		50,2 Hz – 52,0 Hz	50,2 Hz	50,2 Hz
	Droop		2% – 12%	5%	5%
	Power reference		P_M | P_{max}	P_{max} for synchronous technology and EESS P_M for other non-synchronous generating technology (inverter)	P_M (non synchronous)
	Intentional delay		0 s – 2 s	0 s	0 s
	Deactivation threshold f_{stop}		50,0 Hz – f_1	deactivated	deactivated (same value as f_1)
	Deactivation time t_{stop}		0 s – 600 s	--	30 s
	Acceptance of staged disconnection		yes | no	Yes	The inverter reduces the power output in accordance with the static defined in 4.6.1
4.6.2 Power response to underfrequency	Threshold frequency f_1		49,8 Hz – 46,0 Hz	49,8 Hz	49,8 Hz
	Droop		2% – 12%	5%	5%
	Power reference		P_M | P_{max}	P_{max}	P_{max}
	Intentional delay		0 s – 2 s	0 s	0 s
4.7.2.2-Capabilities	Active factor range overexcited		0,90 – 1	0,9	power factor is adjustable 0,8 overexcited to 0,8 underexcited
	Active range underexcited		0,90 – 1	0,9	
4.7.2.3 Control modes	Enabled control mode		Q setp. Q(U) cos φ setp. cos φ (P)	Q setpoint	The control modes are implemented and can be configured.
4.7.2.3.2 Set point control modes	Q set point and excitation		0% – 48% P_D	0	0 (control mode is disabled by default)
	cos φ set point and excitation		1,0 – 0,9	1	1 (control mode is disabled by default)

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Parameter Table					
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Name of parameter set	EN50549-1:2018 LV				
specific technical requirement (e.g. grid codes)	EN 50549-1				
Clause(s) / subclause(s) of EN 50549-1:2019	**Parameter[a]**	**Remarks/ additional information[b]**	**Typical value range**	**value default (defined in EN 50549-1:2019 Table C.1)**	**implementation in the inverter**
4.7.2.3.3-Voltage related control modes	Characteristic curve		--	--	-- (control mode is disabled by default)
	Time constant		3 s – 60 s	10 s	10 s
	Min cos φ		0,0 – 1	0,9	0,0
	Lock-in power		0% – 20%	deactivated	deactivated
	Lock-out power		0% – 20%	deactivated	deactivated
4.7.2.3.4 Power related control mode	Characteristic curve		--	--	-- (control mode is disabled by default)
4.7.4.2.2 Zero current mode for converter connected generating technology / Generating Plant with non-synchronous generator	Enabling		enable | disable	disable	disabled
	Static voltage range overvoltage		100% U_n – 120% U_n	120% U_n	120% U_n
	Static voltage range undervoltage		20% U_n – 100% U_n	50% U_n	50% U_n
4.9.3 Requirements on voltage and frequency protection	Threshold for protection as dedicated device [in A or kW, kVA]		Inverter name: xx A Inverter name: xx A Note: Rated current of internal safety device! 16 A – 250 kVA	--	Internal safety device (I_{nom} = 60 A)
	Undervoltage threshold stage 1		0,2 U_n – 1,0 U_n	0,8 U_n	0,8
	Undervoltage operate time stage 1		0 s – 1000 s	3 s	3 s
	Undervoltage threshold stage 2		0 U_n – 1,0 U_n	0,2 U_n Disabled	disabled
	Undervoltage operate time stage 2		0,1 s – 100 s	10 s Disabled	disabled
	Overvoltage threshold stage 1		1,0 U_n – 2,0 U_n	1,2 U_n	1,2 U_n
	Overvoltage operate time stage 1		0,1 s – 1000 s	0,2 s	0,2 s
	Overvoltage threshold stage 2		1,0 U_n – 2,0 U_n	1,25 U_n	1,25 U_n

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Parameter Table					
Software version	03.17.80.R				
Name of parameter set	EN50549-1:2018 LV				
specific technical requirement (e.g. grid codes)	EN 50549-1				
Clause(s) / subclause(s) of EN 50549-1:2019	**Parameter[a]**	**Remarks/ additional information[b]**	**Typical value range**	**value default (defined in EN 50549-1:2019 Table C.1)**	**implementation in the inverter**
	Overvoltage operate time stage 2		0,1 s – 1000 s	0,1 s	0,1 s
	Overvoltage threshold 10 min mean protection		1,0 U_n – 1,15 U_n	1,15 U_n	1,15 U_n
	Overvoltage operate time 10 min mean protection		0,04 s – 10,00 s	0,04 s after 10 min	0,04 s
	Underfrequency threshold stage 1		44,0 Hz – 60,0 Hz	47,5 Hz	47,5 Hz
	Underfrequency operate time stage 1		0 s – 1000 s	0,1 s	0,1 s
	Underfrequency threshold stage 2		47,0 Hz – 50,0 Hz	disabled	disabled
	Underfrequency operate time stage 2		0,1 s – 5,0 s	disabled	disabled
	Overfrequency threshold stage 1		50,0 Hz – 66,0 Hz	51,5 Hz	51,5 Hz
	Overfrequency operate time stage 1		0 s – 1000 s	0,1 s	0,1 s
	Overfrequency threshold stage 2		50,0 Hz – 52,0 Hz	disabled	disabled
	Overfrequency operate time stage 2		0,1 s – 5,0 s	disabled	disabled
	Loss of mains according EN 62116 (LoM)		0 s – 10 s	2 s	2 s
4.10.2 Automatic reconnection after tripping	Lower frequency		44,0 Hz – 60,0 Hz	49,5 Hz	49,5 Hz
	Upper frequency		50,0 Hz – 66,0 Hz	50,2 Hz	50,2 Hz
	Lower voltage		0% U_n – 100% U_n	85% U_n	85% U_n
	Upper voltage		100% U_n – 200% U_n	110% U_n	110% U_n
	Observation time		0 s – 1600 s	60 s	60 s
	Active power increase gradient		1% – 10000% / min	10% / min	9% / min

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Parameter Table

Software version	03.17.80.R
Name of parameter set	EN50549-1:2018 LV
specific technical requirement (e.g. grid codes)	EN 50549-1

Clause(s) / subclause(s) of EN 50549-1:2019	**Parameter[a]**	**Remarks/ additional information[b]**	**Typical value range**	**value default (defined in EN 50549-1:2019 Table C.1)**	**implementation in the inverter**
4.10.3 Starting to generate electrical power	Lower frequency		44,0 Hz – 60,0 Hz	49,5 Hz	49,5 Hz
	Upper frequency		50,0 Hz – 66,0 Hz	50,1 Hz	50,1 Hz
	Lower voltage		0% – 100% U_n	85% U_n	85% U_n
	Upper voltage		100% – 200% U_n	110% U_n	110% U_n
	Observation time		10 s – 1600 s	60 s	60 s
	Active power increase gradient		1% – 10000% / min	deactivated	1200% / min
4.11.1 Ceasing active power	activation option	e.g. digital input, IEC 61850, sunspec	yes | no	no	no
4.11.2 Reduction of active power on set point	activation option	e.g. digital input, IEC 61850, sunspec	yes | no	no	no
4.12 Remote information exchange	available communication standards	e.g. IEC 61850, sunspec	yes | no	no	no

[a] If additional parameters have been evaluated during the test, these shall be added as additional lines in the table.

[b] This column should be used for manufacturer specific parameter descriptions.

Note:

* limited by 4.9.3 Requirements on voltage and frequency protection