Certificate of conformity

Applicant:	**SMA Solar Technology AG** **Sonnenallee 1** **34266 Niestetal** **Germany**
Product:	**Photovoltaic inverter**
Model:	**SB3.0-1AV-41** **SB3.6-1AV-41** **SB4.0-1AV-41** **SB5.0-1AV-41** **SB6.0-1AV-41**

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

Inverter for single-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 plants.

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: **ES2025001791A00, ES2025001791B00** **Certification Program:** **NSOP-0032-DEU-ZE-ES-V11**

Certificate number: **U26-1004** **Date of issue:** **2026-10-26**

Certification body

Georg LORITZ
Lab Supervisor Energy Systems

Accreditation

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

Accredited certification body by Deutsche Akkreditierungsstelle GmbH (DAkkS) according to ISO/IEC 17065. The accreditation is valid only for the scope listed in the annex of the accreditation certificate D-ZE-12024-01-00. The Deutsche Akkreditierungsstelle GmbH (DAkkS) is signatory of the multilateral arrangements of EA, ILAC and IAF for mutual recognition.

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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 inverter			
Static converter model	SB3.0-1AV-41	SB3.6-1AV-41	SB4.0-1AV-41	SB5.0-1AV-41
Input DC (photovoltaic)				
MPP voltage range [V]	110 – 500	130 – 500	140 – 500	175 – 500
Max. input voltage [V]	600	600	600	600
Max. input current per MPPT [A]	15/15	15/15	15/15	15/15
Output AC				
Rated AC voltage [V]	220 (1/N/PE) 230 (1/N/PE) 240 (1/N/PE) 50/60 Hz	220 (1/N/PE) 230 (1/N/PE) 240 (1/N/PE) 50/60 Hz	220 (1/N/PE) 230 (1/N/PE) 240 (1/N/PE) 50/60 Hz	220 (1/N/PE) 230 (1/N/PE) 240 (1/N/PE) 50/60 Hz
Rated output current [A]	13,1	16,0	17,4	22,0
Max. output current [A]	13,7	16,0	18,2	22,8
Nom. converter output (P_{NINV}) [W]	3000	3680	4000	5000
Rated apparent power [VA]	3000	3680	4000	5000
Static converter model	SB6.0-1AV-41	--	--	--
Input DC (photovoltaic)				
MPP voltage range [V]	210 – 500	--	--	--
Max. input voltage [V]	600	--	--	--
Max. input current per MPPT [A]	15/15	--	--	--
Output AC				
Rated AC voltage [V]	220 (1/N/PE) 230 (1/N/PE) 240 (1/N/PE) 50/60 Hz	--	--	--
Rated output current [A]	26,1	--	--	--
Max. output current [A]	26,1	--	--	--
Nom. converter output (P_{NINV}) [W]	6000	--	--	--
Rated apparent power [VA]	6000	--	--	--

Interface protection system and interface switch (Network and system protection “NS-protection”)	
Type of protection	integrated NS-protection
Assigned to generation unit type	SB3.0-1AV-41 SB3.6-1AV-41 SB4.0-1AV-41 SB5.0-1AV-41 SB6.0-1AV-41
Integrated interface switch	Type of switching equipment 1: Relay (Model FTR-K3-PS) Type of switching equipment 2: Relay (Model FTR-K3-PS)
	Note: The output is switched off by the inverter bridge and two relay in series in each line and neutral.
Software	
Firmware version	04.xx.xx.R
	Note: The tests were performed with firmware version 04.02.01.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.

Software version	04.02.01.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]**	**configurable value range**	**default value**	
4.3.2 Interface switch	Single fault tolerance for interface switch		yes | no	yes	
4.4.2 Operating frequency range	47,0 – 47,5 Hz Duration		0 s – 20 s	*0,1 s	
	47,5 – 48,5 Hz Duration		30 – 90 min	unlimited	
	48,5 – 49,0 Hz Duration		30 – 90 min	unlimited	
	49,0 – 51,0 Hz Duration		not configurable	unlimited	
	51,0 – 51,5 Hz Duration		30 – 90 min	unlimited	
	51,5 – 52,0 Hz Duration		0 – 15 min	*0,1 s	
4.4.3 Minimal requirement for active power delivery at underfrequency	Reduction threshold		49,0 Hz – 49,5 Hz	Electronic inverter, no power reduction take place	
	Maximum reduction rate		2% – 10% P_M/Hz	N/A	
4.4.4 Continuous operating voltage range	Upper limit		1,0 U_n – 2,0 U_n	*1,15 U_n	
	Lower limit		0 U_n – 1,0 U_n	*0,8 U_n	
4.5.2 Rate of change of frequency (ROCOF) immunity	ROCOF withstand capability (defined with a sliding measurement window of 500 ms) non-synchronous generating technology (inverter): synchronous generating technology:		0 – 10 Hz/s yes no	N/A	
4.5.3.2 Under-voltage ride through (UVRT) Generating plant with non-synchronous generating technology (inverter)	Voltage-Time- Diagram		see Figure 6 of EN 50549-1:2019	Time [s]	U [p.u.]
				3,0	0,20
				3,0	0,85
				180	0,85
				180	0,90
	Fast fault current		Not configurable	inverter model: rated current	
	Active power recovery after a short circuit		configurable	Start at 90% U_n	
	Fault recovery of active power (times calculated from the removal of the short circuit)		configurable	≤ 5 s	
	Value for recovered active power		configurable	≥ 90%	
	Accuracy for recovery of active power		not configurable	≤ 10%	
	Reactive power contribution has priority		yes | no	Yes	

Software version	04.02.01.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]**	**configurable value range**	**default value**	
4.5.4 Over-voltage ride through (OVRT)	Voltage-Time- Diagram		EN 50549-1:2019	Time [s]	U [p.u.]
				0,1	1,25
				0,2	1,20
				60,0	1,20
				60,0	1,15
				60,0	1,10
	Active power recovery after a short circuit		configurable	Start at 90% U_n	
	Fault recovery of active power (times calculated from the removal of the short circuit)		configurable	≤ 5 s	
	Value for recovered active power		configurable	≥ 90%	
	Accuracy for recovery of active power		not configurable	≤ 10%	
4.6.1 Power response to overfrequency	Threshold frequency f1		50,2 Hz – 52,0 Hz	50,2 Hz	
	Droop		2% – 12%	5%	
	Power reference		P_M | P_{max}	P_M for other non-synchronous generating technology (inverter)	
	Intentional delay		0 s – 2 s	0 s	
	Deactivation threshold fstop		50,0 Hz – f_1	deactivated	
	Deactivation time tstop		0 s – 600 s	--	
	Acceptance of staged disconnection		yes | no	Yes	
4.6.2 Power response to underfrequency	Threshold frequency f1		49,8 Hz – 46,0 Hz	N/A	
	Droop		2% – 12%	N/A	
	Power reference		P_M | P_{max}	N/A	
	Intentional delay		0 s – 2 s	N/A	
4.7.2.2 voltage support by reactive power - Capabilities	Active factor / Reactive power (% P_d) range overexcited		0,90 – 1 / 48% P_d - 0 0,95 – 1 / 33% P_d - 0	0,95 – 1 / 33% P_d - 0	
	Active factor / Reactive power (% P_d) range underexcited		0,90 – 1 / 48% Pd - 0 0,95 – 1 / 33% Pd - 0	0,95 – 1 / 33% Pd - 0	

Software version	04.02.01.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]**	**configurable value range**	**default value**
4.7.2.3 voltage support by reactive power - Control modes	Enabled control mode		Q setp Q(U) Q(P) cos φ setp cos φ (P)	deactivated deactivated deactivated deactivated deactivated
4.7.2.3.2 voltage support by reactive power - Set point control modes	Q set point and excitation		0% – 48% P_D, 0% – 33% P_D	0
	cos φ set point and excitation		1,0 – 0,9	1
4.7.2.3.3 voltage support by reactive power - Voltage related control modes	Characteristic curve		cos φ (P) Q(P)	Both can be set
	Time constant		3 s – 60 s	10 s
	Min cos φ		0,0 – 1	deactivated
	Lock-in power		0% – 20%	deactivated
	Lock-out power		0% – 20%	deactivated
4.7.2.3.4 voltage support by reactive power - Power related control mode	Characteristic curve		Q(U) P(U)	Q(U) (three-phase inverter) 0,94…0,44 0,97…0 1,03…0 1,06…-0,44 P(U) and Q(U) deactivated
4.7.4.2.2 Zero current mode for converter connected generating technology / Generating Plant with non-synchronous generator	Enabling		enable | disable	disable
	Static voltage range overvoltage		100% U_n – 120% U_n	120% U_n
	Static voltage range undervoltage		20% U_n – 100% U_n	50% U_n

Software version	04.02.01.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]**	**configurable value range**	**default value**
4.9.3 Requirements on voltage and frequency protection	Threshold for protection as dedicated device [in A or kW, kVA]		SB3.0-1AV-41: 32 A SB3.6-1AV-41: 32 A SB4.0-1AV-41: 32 A SB5.0-1AV-41: 32 A SB6.0-1AV-41: 32 A Note: Rated current of internal safety device!	Internal safety device
	Undervoltage threshold stage 1		0 U_n – 1,0 U_n	0,8 U_n
	Undervoltage operate time stage 1		0 s – 1000 s	3 s
	Undervoltage threshold stage 2		0 U_n – 1,0 U_n	0,2 U_n. Disabled
	Undervoltage operate time stage 2		0,1 s – 100 s	10 s. Disabled
	Overvoltage threshold stage 1		1,0 U_n – 2,0 U_n	1,2 U_n
	Overvoltage operate time stage 1		0,1 s – 1000 s	0,2 s
	Overvoltage threshold stage 2		1,0 U_n – 2,0 U_n	1,25 U_n
	Overvoltage operate time stage 2		0,1 s – 1000 s	0,1 s
	Overvoltage threshold 10 min mean protection		1,0 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
	Underfrequency threshold stage 1		44,0 Hz – 60,0 Hz	47,5 Hz
	Underfrequency operate time stage 1		0 s – 1000 s	0,1 s
	Underfrequency threshold stage 2		47,0 Hz – 50,0 Hz	disabled
	Underfrequency operate time stage 2		0,1 s – 5,0 s	disabled
	Overfrequency threshold stage 1		50,0 Hz – 66,0 Hz	51,5 Hz
	Overfrequency operate time stage 1		0 s – 1000 s	0,1 s
	Overfrequency threshold stage 2		50,0 Hz – 52,0 Hz	disabled
	Overfrequency operate time stage 2		0,1 s – 5,0 s	disabled

Software version		04.02.01.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]**	**configurable value range**	**default value**
	Loss of mains according EN 62116 (LoM)		0 s – 10 s	2 s
4.10.2 Automatic reconnection after tripping	Lower frequency		44,0 Hz – 60,0 Hz	49,5 Hz
	Upper frequency		50,0 Hz – 66,0 Hz	50,2 Hz
	Lower voltage		0% U_n – 100 % U_n	85% U_n
	Upper voltage		100% U_n – 200% U_n	110% U_n
	Observation time		0 s – 1600 s	60 s
	Active power increase gradient		1% – 10000% / min	9% / min
4.10.3 Starting to generate electrical power	Lower frequency		44,0 Hz – 60,0 Hz	49,5 Hz
	Upper frequency		50,0 Hz – 66,0 Hz	50,1 Hz
	Lower voltage		0% – 100% U_n	85% U_n
	Upper voltage		100% – 200% U_n	110% U_n
	Observation time		10 s – 1600 s	60 s
	Active power increase gradient		1% – 10000% / min	1200% / min
4.11.1 Ceasing active power	activation option	e.g. digital input, IEC 61850, sunspec	yes | no	yes
4.11.2 Reduction of active power on set point	activation option	e.g. digital input, IEC 61850, sunspec	yes | no	yes
4.12 Remote information exchange	available communication standards	e.g. IEC 61850, sunspec	yes | no	yes

[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