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# Certificate of compliance

**Applicant:** SMA Solar Technology AG  
Sonnenallee 1  
34266 Niestetal  
Germany

**Product:** Photovoltaic (PV) inverter

**Model:** STP 50-40  
STP 50-41

Inverter for three-phase parallel connection to a MV distribution network.

**Applied rules and standards:**

**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

- 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

**DIN V VDE V 0126-1-1:2006 (4.1 Functional safety)**

Automatic disconnection device between a generator and the public low-voltage grid

**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 B and Type C plants.

**Note:**

This certificate proves the conformity of a generating unit based on NC RFG. However, some requirements, such as frequency sensitive mode (FSM), reactive power capacity etc. can be applicable on the generating plant level, which assessment can be out of the scope of this certificate. Consequently, it is possible that the conformity assessment of a generating unit does not cover all aspects of the above-mentioned standardization documents, typically when a requirement is rather evaluated on a plant level.

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:** 17TH0199-EN50549-2\_1  
17TH0199-FRT\_1

**Certification Program:** NSOP-0032-DEU-ZE-V01

**Certificate number:** U21-0149

**Date of issue:** 2021-02-16

**Certification body**



Thomas Lammel



Deutsche  
Akkreditierungsstelle  
D-ZE-12024-01-00

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 EN 50549-2

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### Type Approval and declaration of compliance with the requirements of EN 50549-2.

<b>Manufacturer / applicant:</b>	SMA Solar Technology AG Sonnenallee 1 34266 Niestetal Germany
<b>Micro-generator Type</b>	Photovoltaic inverter
	STP 50-40 STP 50-41
<b>MPP DC voltage range [V]</b>	500 – 800
<b>Input DC voltage range [V]</b>	max. 1000
<b>Input DC current [A]</b>	6 x 20
<b>Output AC voltage [V]</b>	400
<b>Output AC current [A]</b>	72,5
<b>Output power [VA]</b>	50000
<b>Firmware version</b>	Beginning with V03.10.03.R
<b>Measurement period:</b>	2019-12-27 to 2020-02-21
<b>Description of the structure of the power generation unit:</b> 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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**Type Approval and declaration of compliance with the requirements of EN 50549-2 and Commission Regulation (EU) 2016/631 of 14 April 2016**

### Parameter Table:

Clause EN 50549-2	Ref	Parameter	Micro generator setting range	Default settings used	
4.3.2 Interface switch (EN 50549-1)	n.a.	Single fault tolerance for interface switch	yes   no	yes	
4.4.2 Operating frequency range	A,B	47,0 – 47,5 Hz Duration	0 – 20 s	0,3 s	
	A,B	47,5 – 48,5 Hz Duration	30 – 90 min	unlimited	
	A,B	48,5 – 49,0 Hz Duration	30 – 90 min	unlimited	
	A,B	49,0 – 51,0 Hz Duration	not configurable	unlimited	
	A,B	51,0 – 51,5 Hz Duration	30 – 90 min	unlimited	
	A,B	51, 5 – 52 Hz Duration	0 – 15 min	0,1 s	
4.4.3 Minimal requirement for active power delivery at under frequency	A,B	Reduction threshold	49 Hz – 49,5 Hz	Electronic inverter no power reduction take place	
	A,B	Maximum reduction rate	2 – 10 % $P_M$ /Hz	≤ 2 %	
4.4.4 Continuous operating voltage range	n.a.	Upper limit	100 – 110%	N/A	
	n.a.	Lower limit	90 – 100%	N/A	
4.5.2 Rate of change of frequency (ROCOF) immunity	A,B	ROCOF withstand capability (defined with a sliding measurement window of 500 ms) non-synchronous generating technology: synchronous generating technology:	--	2,5 Hz/s	
4.5.3.2 Generating plant with non-synchronous generating technology (FRT)	B	Maximum power resumption time	not defined	≤1 s	
	B	Voltage-Time-Diagram	see Figure 6, EN 50549-2	Time [s]	U [p.u.]
				0,0	0,05
				0,25	0,05
				3,0	0,85
4.5.3.3 Generating plant with synchronous generating technology (FRT)	B	Maximum power resumption time	not defined	N/A	
	B	Voltage-Time-Diagram	see Figure 7, EN 50549-2	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

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4.5.4 Over-voltage ride through (OVRT)	n.a.	Voltage-Time-Diagram	not configurable	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
4.6.1 Power response to over frequency (LFSM-O)	A,B	Threshold frequency $f_1$	50,2 Hz – 52 Hz	50,2 Hz	
	A,B	Droop	2 % – 12 %	5 %	
	A,B	Power reference	$P_M$   $P_{max}$	$P_M$	
	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	-	
	A	Acceptance of staged disconnection	yes   no	No	
4.6.2 Power response to under frequency	n.a.	Threshold frequency $f_1$	49,8 Hz – 46 Hz	N/A	
	n.a.	Droop	2 – 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	B	Active factor range overexcited	0,9 – 1	0,9	
	B	Active factor range underexcited	0,9 – 1	0,9	
4.7.2.3 Control modes	n.a.	Enabled control mode	Q setp. Q(U) cos $\varphi$ setp. cos $\varphi$ (P)	All can be set!	
4.7.2.3.2 Set point control modes	n.a.	Q setpoint and excitation	0 – 48 % $P_D$	0	
	n.a.	cos $\varphi$ setpoint and excitation	1 – 0,9	1	
4.7.2.3.3 Voltage related control modes	n.a.	Characteristic curve	Q(U) P(U)	deactivated	
	n.a.	Time constant	3 s – 60 s	10 s	
	n.a.	Min cos $\varphi$	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 $\varphi$ (P)	deactivated	
4.7.4.2.2 Zero current mode for converter connected generating technology	n.a.	Enabling	enable   disable	disable	
	n.a.	Static voltage range overvoltage	100 % $U_n$ – 120 % $U_n$	N/A	
	n.a.	Static voltage range undervoltage	20 % $U_n$ – 100 % $U_n$	N/A	

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4.9.2 Requirements on voltage and frequency protection	n.a	Threshold for protection as dedicated device [in A or kW, kVA]	16 A – 250 kVA	N/A
	B	Undervoltage threshold stage 1	$0,2 U_n - 1 U_n$	$0,8 U_n$
	B	Undervoltage operate time stage 1	0,1 s – 100 s	3 s
	B	Undervoltage threshold stage 2	$0,2 U_n - 1 U_n$	N/A
	B	Undervoltage operate time stage 2	0,1 s – 5 s	N/A
	B	Overvoltage threshold stage 1	$1,0 U_n - 1,2 U_n$	$1,20 U_n$
	B	Overvoltage operate time stage 1	0,1 s – 100 s	0,2 s
	B	Overvoltage threshold stage 2	$1,0 U_n - 1,3 U_n$	$1,25 U_n$
	B	Overvoltage operate time stage 2	0,1 s – 5 s	0,1 s
	B	Overvoltage threshold 10 min mean protection <sup>a</sup>	$1,0 U_n - 1,15 U_n$	$1,15 U_n$
	B	Overvoltage operate time 10 min mean protection <sup>a</sup>	0 – 3 s	10 min (disconnection after 0,4s)
	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	0,3 s
	B	Underfrequency threshold stage 2	47,0 Hz – 50,0 Hz	N/A
	B	Underfrequency operate time stage 2	0,1 s – 5 s	N/A
	B	Overfrequency threshold stage 1	50,0 Hz – 52,0 Hz	51,5 Hz
	B	Overfrequency operate time stage 1	0,1 s – 100 s	0,1s
	B	Overfrequency threshold stage 2	50,0 Hz – 52,0 Hz	N/A
	B	Overfrequency operate time stage 2	0,1 s – 5 s	N/A
	B	Loss of mains according EN 62116 (LoM)	0-6000s	disabled
4.10.2 Automatic reconnection after tripping	B	Lower frequency	47,0 Hz – 50,0 Hz	49,5 Hz
	B	Upper frequency	50,0 Hz – 52,0 Hz	50,1 Hz
	B	Lower voltage	$50 \% U_n - 100 \% U_n$	$90 \% U_n$
	B	Upper voltage	$100 \% U_n - 120 \% U_n$	$110 \% U_n$
	B	Observation time	10 s – 600 s	60 s
	B	Active power increase gradient	6 % – 3000 %/min	10 % /min
4.10.3 Starting to generate electrical power	A,B	Lower frequency	47,0 Hz – 50,0 Hz	49,5 Hz
	A,B	Upper frequency	50,0 Hz – 52,0 Hz	50,1 Hz
	A,B	Lower voltage	$50 \% - 100 \% U_n$	$90 \% U_n$
	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 increase gradient	6 % – 3000 %/min	disabled



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Annex to the EN 50549-2 certificate of compliance No. U21-0149

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4.11.1 Ceasing active power	A,B	Remote operation of the logic interface	yes   no	No
4.11.2 Reduction of active power on set point	B	Remote operation NOTE: If yes further definition is provided by the DSO	yes   no	No
4.12 Remote information exchange	B	Remote information exchange required NOTE: If yes further definition is provided by the DSO	yes   no	No

**Note:**

<sup>a</sup> Over voltage – stage1: 10 min-mean-value corresponding to EN 50160.

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 are to be adjusted according to the manufacturer's declaration.

The above stated generators are tested according to the requirements in the EN 50549-2:2019 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.