Certificate of compliance

Applicant:	**GoodWe Technologies Co., Ltd.** No.90 Zijin Rd., New District, Suzhou, 215011, P.R. China
Product:	**Photovoltaic inverter**
Model:	**GW60K-SMT-G20**

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.

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.

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Certification body

Domenik Koll
Head of Energy Systems Germany

Accreditation

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	**GoodWe Technologies Co., Ltd.** No.90 Zijin Rd., New District, Suzhou, 215011, P.R. China			
Product type	Photovoltaic inverter			
Static converter model	GW60K-SMT-G20	--	--	--
Input DC (photovoltaic)				
MPP voltage range [V]	160-1000	--	--	--
Max. input voltage [V]	1100	--	--	--
Max. input current per MPPT [A]	4*42,0	--	--	--
Output AC				
Rated AC voltage [V]	230, 3L/N/PE or 3L/PE	--	--	--
Rated output current [A]	87,0	--	--	--
Max. output current [A]	95,7	--	--	--
Nom. converter output (P_{NINV}) [kW]	60	--	--	--
Rated apparent power [kVA]	60	--	--	--
Interface protection system and interface switch (Network and system protection "NS-protection")				
Type of protection	integrated NS-protection			
Assigned to generation unit type	Photovoltaic inverter			
Integrated interface switch	Type of switching equipment 1: Relay (Model HF172F-100/12-HF) Type of switching equipment 2: Relay (Model HF172F-100/12-HF)			
	Note: The output is switched off by the inverter bridge and two relay in series in each line and neutral.			
Software version: V1.01.01				
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

Name of parameter set	EN 50549-1
Specific technical requirement	EN 50549-1:2019 + A1:2023 for type A and B plants

Clause of EN 50549-1	**Parameter**	**Remarks / additional information[b]**	**setting range**	**default settings used**	
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 – 20 s	0 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 Hz Duration		0 – 15 min	0 s	
4.4.3 Minimal requirement for active power delivery at under frequency	Reduction threshold		not configurable	Electronic inverter, no power reduction take place	
	Maximum reduction rate		not configurable	≤ 2 %	
4.4.4 Continuous operating voltage range	Upper limit		1,0 U_n – 1,3 U_n	1,10 U_n	
	Lower limit		0 U_n – 1,0 U_n	0,85 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 – 20 Hz/s yes no	2 Hz/s	
4.5.3.2 Generating plant with non-synchronous generating technology (inverter)	Maximum power resumption time		configurable	Start at 85% Un	
	Voltage-Time-Diagram		see Figure 6, EN 50549-1	Time [s]	U [p.u.]
				0,00	0,05
				0,25	0,05
				3,00	0,85
				180	0,85
				180	0,90
4.5.4 Over-voltage ride through (OVRT)	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
				60,0	1,15
				60,0	1,10

4.6.1 Power response to over frequency (LFSM-O)	Threshold frequency f_1		50,0 Hz – 55,0 Hz	50,2 Hz
	Droop		2 % – 15 %	5 %
	Power reference		P_M | P_{max}	P_M
	Intentional delay		0 – 2 s	0 s
	Deactivation threshold fstop		50,0 Hz – f_1	deactivated
	Deactivation time t_{stop}		0 – 600 s	deactivated
	Acceptance of staged disconnection		yes | no	yes
4.6.2 Power response to under frequency (LFSM-U)	Threshold frequency f_1		N/A	N/A
	Droop		N/A	N/A
	Power reference		N/A	N/A
	Intentional delay		N/A	N/A
4.7.2.2 Capabilities	Active factor range overexcited		0,80 – 1 / 60% P_D - 0	1 / 0
	Active factor range underexcited		0,80 – 1 / 60% P_n - 0	1 / 0
4.7.2.3 Control modes	Enabled control mode		Q setp. Q(U) cos φ setp. cos φ (P)	activated deactivated deactivated deactivated
4.7.2.3.2 Set point control modes	Q setpoint and excitation		0% – 60% P_D	0
	cos φ setpoint and excitation		1 – 0,8	1
4.7.2.3.3 Voltage related control modes	Characteristic curve		Q(U) P(U)	indicate default characteristic
	Time constant		0 s – 200 s	3 s
	Min cos φ		0,0 – 0,5	deactivated
	Lock in power		0 % – 50 %	deactivated
	Lock out power		0 % – 50 %	deactivated
4.7.2.3.4 Power related control mode	Characteristic curve		Q(P) cos φ (P)	indicate default characteristic
4.7.4.2.2 Zero current mode for converter connected generating technology	Enabling		enable | disable	enabled
	Static voltage range overvoltage		1,0Un -1,35Un	1,20Un
	Static voltage range undervoltage		0,0Un – 1,0Un	0,5Un
4.9.3 Requirements on voltage and frequency protection	Threshold for protection as dedicated device [in A or kW, kVA]		GW60K-SMT-G20: 86,96 A Note: Rated current of internal safety device!	Internal safety device
	Undervoltage threshold stage 1		0,0 U_n – 1,0 U_n	0,80 U_n
	Undervoltage operate time stage 1		0,1 s – 100 s	5,0 s
	Undervoltage threshold stage 2		0,0 U_n – 1,0 U_n	0,50 U_n

	Undervoltage operate time stage 2		0,0 s – 100 s	2,0 s
	Overvoltage threshold stage 1		1,0 U_n – 1,35 U_n	1,15 U_n
	Overvoltage operate time stage 1		0,0 s – 100 s	3,0 s
	Overvoltage threshold stage 2		1,0 U_n – 1,35 U_n	1,25 U_n
	Overvoltage operate time stage 2		0,10s – 100s	0,20 s
	Overvoltage threshold 10 min mean protection[a]		1,0 U_n – 1,2 U_n	1,10 U_n
	Overvoltage operate time 10 min mean protection[a]		0,04 s – 10,00 s	10 min (update every 3s)
	Underfrequency threshold stage 1		45,0 Hz – 50,0 Hz	47,5 Hz
	Underfrequency operate time stage 1		0,0 s – 100 s	0,5 s
	Underfrequency threshold stage 2		45,0 Hz – 50,0 Hz	47,0 Hz
	Underfrequency operate time stage 2		0,0 s –100 s	0,2 s
	Overfrequency threshold stage 1		50,0 Hz – 55,0 Hz	51,5 Hz
	Overfrequency operate time stage 1		0,0 s – 100 s	0,2 s
	Overfrequency threshold stage 2		50,0 Hz – 55,0 Hz	52,0 Hz
	Overfrequency operate time stage 2		0,0 s – 100,0 s	0,2 s
	Loss of mains according EN 62116 (LoM)		0 s – 6000 s	ROCOF 2,5 Hz/s (0,5 s) active 2 s
4.10.2 Automatic reconnection after tripping	Lower frequency		45,0 Hz – 50,0 Hz	49,5 Hz
	Upper frequency		50,0 Hz – 55,0 Hz	50,2 Hz
	Lower voltage		0% U_n – 100 % U_n	85% U_n
	Upper voltage		100% U_n – 130% U_n	110% U_n
	Observation time		0 s – 600 s	60 s
	Active power increase gradient		0% – 10000% Pn / min	10% Pn / min
4.10.3 Starting to generate electrical power	Lower frequency		45,0 Hz – 50,0 Hz	49,5 Hz
	Upper frequency		50,0 Hz – 55,0 Hz	50,1 Hz
	Lower voltage		0% – 100% U_n	85% U_n
	Upper voltage		100% – 130% U_n	110% U_n
	Observation time		0 s – 600 s	60 s
	Active power increase gradient		0% – 10000% Pn / min	10000% Pn / min

4.11.1 Ceasing active power	Remote operation of the logic interface	A Modbus signal via RS485 or USB can be used to change or stop the active output	yes | no	yes
4.11.2 Reduction of active power on set point	Remote operation NOTE: If yes further definition is provided by the DSO	A Modbus signal via RS485 or USB can be used to change or stop the active output:	yes | no	yes
4.12 Remote information exchange	Remote information exchange required NOTE: If yes further definition is provided by the DSO		yes | no	Yes, SunSpec and Modbus