Certificate of compliance

Applicant:	**KOSTAL Solar Electric GmbH** Hanferstraße 6 79108 Freiburg i. Br. **Germany**
Product:	**Photovoltaic (PV) inverter**
Model:	**PIKO MP plus 1.5-1, PIKO MP plus 2.0-1, PIKO MP plus 2.5-1, PIKO MP plus 3.0-1, PIKO MP plus 3.0-2, PIKO MP plus 3.6-1, PIKO MP plus 3.6-2, PIKO MP plus 4.6-2; PIKO MP plus 5.0-2**

Use in accordance with regulations:

Automatic disconnection device with single-phase mains surveillance in accordance with DANSK ENERGI DK1/DK2:2019 for photovoltaic systems with a single-phase parallel coupling via an inverter in the public mains supply. The automatic disconnection device is an integral part of the aforementioned inverter.

Applied rules and standards:

DANSK ENERGI:2019
Technical requirements for connection of power-generating plants to the low-voltage grid (≤1kV) Type A

4.1 Tolerance of Frequency and voltage deviations
4.2 Start-up and reconnection of a power-generating plant
4.3 Active power control
4.4 Reactive power control
4.5 Protection
4.6 Power Quality
4.7 Exchange of information

DIN V VDE V 0126-1-1:2006-02 (4.1 Functional safety)
Automatic disconnection device between a generator and the public low-voltage grid

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:	**18TH0316-PIKO-PV-DK1/DK2_0**	**Certification Program:**	**NSOP-0032-DEU-ZE-V01**
Certificate number:	**U20-0887**	**Date of issue:**	**2020-11-16**

Certification body

Thomas Lammel

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

Type Verification Test Report

Extract from test report according to DANSK ENERGI **Nr. 18TH0316-PIKO-PV-DK1/DK2_0**

Type Approval and declaration of compliance with the requirements of DANKS ENERGI				
Manufacturer / applicant:	KOSTAL Solar Electric GmbH Hanferstraße 6 79108 Freiburg i. Br. Germany			
Micro-generator Type	Photovoltaic inverter			
	PIKO MP plus 1.5-1	PIKO MP plus 2.0-1	PIKO MP plus 2.5-1	PIKO MP plus 3.0-1
MPP DC voltage range [V]	75-360	75-360	75-360	125-600
Input DC voltage range [V]	Max 450	Max 450	Max 450	Max 750
Input DC current [A]	13	13	13	13
Output AC voltage [V]	230; N; PE	230; N; PE	230; N; PE	230; N; PE
Output AC current [A]	12	12	14	14
Output power [VA]	1500	2000	2500	3000
	PIKO MP plus 3.0-2	PIKO MP plus 3.6-1	PIKO MP plus 3.6-2	PIKO MP plus 4.6-2
MPP DC voltage range [V]	125-600	125-600	150-600	150-600
Input DC voltage range [V]	Max 750	Max 750	Max 750	Max 750
Input DC current [A]	13	13	13	13
Output AC voltage [V]	230; N; PE	230; N; PE	230; N; PE	230; N; PE
Output AC current [A]	14	16	16	20
Output power [VA]	3000	3680	3680	4600
	PIKO MP plus 5.0-2			
MPP DC voltage range [V]	150-600			
Input DC voltage range [V]	Max 750			
Input DC current [A]	13			
Output AC voltage [V]	230; N; PE			
Output AC current [A]	22			
Output power [VA]	5000			
Firmware version	PU_APP_4.2.0 and PAR_23.0.16 or higher			
Measurement period:	2019-11-11 to 2020-08-25			

Description of the structure of the power generation unit:

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.

Note:

The single-phase generation units PIKO MP plus 4.6-2 and PIKO MP plus 5.0-2 exceed the limit of 3.68 kVA for the maximum output power of single-phase connected generation units according to DANSK ENERGI DK1/DK2:2019. The plant installer must therefore take appropriate measures to ensure that the asymmetry of the entire generating plant is limited to a value of less than or equal to 3.68 kVA. With these generation units, the requirement of the symmetry behaviour of three-phase converter units is not met.

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Setting of the parameter values for DK1 and DK2:		
	Settings for DK1	**Setting for DK2**
	LFSM-O	
Threshold frequency [Hz]	50,2	50,5
Droop [% of Pn]	5% (40% Pn/Hz)	4% (50% Pn/Hz)
Intentional Delay	500ms	500ms
	Reactive Power	
	Q fix	Q fix
Active/disabled [On/Off]	On	On
Q setpoint [VAr]	0	0
	cos φ fix	
Active/disabled [On/Off]	Off	Off
PF setpoint [PF]	1	1

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	Settings for DK1	Setting for DK2
	cos φ (P)	
Active/disabled [On/Off]	Off	Off
Cos φ (P) P1 [% of P_n]	0	0
Cos φ (P) PF1 [PF]	1	1
Cos φ (P) P2 [% of P_n]	50	50
Cos φ (P) PF2 [PF]	1	1
Cos φ (P) P3 [% of P_n]	100	100
Cos φ (P) PF3 [PF]	0,9 inductive	0,9 inductive
Cos φ (P) Lockin [% of U_n]	105	105
Cos φ (P) Lockout [% of U_n]	100	100
	Connection and Reconnection	
Gradient [% of P_n/min]	20	20
Observation time [seconds]	180	180
U_{min} [% of U_n]	85	85
U_{max} [% of U_n]	110	110
f_{min} [Hz]	47,5	47,5
f_{max} [Hz]	50,2	50,5
	System Protection	
f> [s]	0,2	0,2
f> [Hz]	51,5	51,5
f< [s]	0,2	0,2
f< [Hz]	47,5	47,5
U> [s]	60	60
U> [% of U_n]	110	110
U>> [s]	0,2	0,2
U>> [% of U_n]	115	115
U< [s]	50	50
U< [% of U_n]	85	85
	Loss of Mains Detection	
U<< [s]	0,2	0,2
U<< [% of U_n]	80	80

Note.

The settings of the interface protection are password protected adjustable.

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.