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DAkkS Deutsche Akkreditierungsstelle D-ZE-11321-01-00

TÜV SÜD Product Service

Certificate of Conformity

No. ESY 119530 0006 Rev. 00

Holder of Certificate: **KKT KOLBE Küchentechnik GmbH & Co. KG**
Ohmstraße 17
96175 Pettstadt
GERMANY

Product: **Converter (Hybrid Inverter)**

Model(s): **HKW3680P1, HKW5000P1**

Parameters: See page 2

Applicable standards: VDE-AR-N 4105:2018
DIN VDE V 0124-100:2020

This Certificate of Conformity confirms the compliance with the above listed standards on a voluntary basis. It refers only to the sample submitted to TÜV SÜD Product Service GmbH and does not certify the quality or safety of the serial products. It was issued according to TÜV SÜD Product Service certification program Photovoltaics and Grid Integration. For details see: www.tuvsud.com/ps-cert

Test report no.: 64290223175001

Date, 2023-03-08

(Billy Qiu)

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TÜV SÜD Product Service

Certificate of Conformity

No. ESY 119530 0006 Rev. 00

Parameters:

Model	HKW3680P1	HKW5000P1
PV terminal		
Vmax. PV	580Vd.c.	
Rate Voltage	400Vd.c.	
MPPT Voltage Range	80 ~ 560Vd.c.	
MPPT Voltage Range (full load)	165 ~ 520Vd.c.	210 ~ 520Vd.c.
MPPT Tracker number	2	
Max. continuous PV input current per tracker	15Ad.c.	
Isc PV per tracker	18Ad.c.	
Max. continuous PV input power	4800W	6500W
Battery terminal		
Battery type	Lithium or lead-acid batteries	
Voltage range	40 ~ 60Vd.c.	
Rated voltage	48Vd.c.	
Maximum charge/discharge current	50Ad.c./80Ad.c.	100Ad.c./100Ad.c.
Maximum charge/discharge power	3000W/4000W	4600W/4600W
Grid terminal parameter		
Rated voltage	230Va.c.	
Rated frequency	50Hz	
Rated input Current	20Aa.c.	
Maximum continuous input current	20Aa.c.	
Maximum continuous input power	4600VA	
Rated output Current	16Aa.c.	20Aa.c.
Maximum continuous output current	16Aa.c.	20Aa.c.
Power factor (Cos phi), adjustable	0.95 leading ~ 0.95 lagging	
Maximum continuous output power	3680VA	4600VA
PEmax, max. active power	3674W	4593W
SEmax, max apparent power	3676VA	4595VA
Back up load terminal parameter		
Rated voltage	230Va.c.	
Rated frequency	50Hz	
Rated output Current	16Aa.c.	20Aa.c.
Maximum continuous output current	16Aa.c.	20Aa.c.
Rated continuous output power	3680W	4600W
Maximum output apparent power	4000VA	4600VA

DAkkS Deutsche Akkreditierungsstelle D-ZE-11321-01-00

TÜV SÜD Product Service

Certificate of Conformity

No. ESY 119530 0006 Rev. 00

E.4 Unit certificate		
Manufacturer	KKT KOLBE GmbH & Co. KG	
Power generation unit type	[Converter]: HKW3680P1, HKW5000P1 Remark: certified on representative model HKW5000P1 of family design products, results of the measurement of HKW5000P1 can be transferred to other models based on transferability rule of measurements in DIN VDE V 0124-100 (VDE V 0124-100):2020.	
Assessment values	max. active power P_{Emax}	4593 W (HKW5000P1)
	max. apparent power S_{Emax}	4595 VA (HKW5000P1)
	Rated voltage	230Va.c.
	Rated current (AC) I_r	20 A (HKW5000P1)
	Initial short-circuit AC current I''_k	20 A (HKW5000P1)
Network connection rule	**VDE-AR-N 4105 "Generators connected to the low-voltage distribution network"** Technical minimum requirements for connection and parallel operation of power generation systems connected to the low-voltage network	
Test requirement	**DIN VDE V 0124-100 (VDE V 0124-100) "Network integration of power generation systems – Low voltage"** Test requirements for power generation units intended for connection to and parallel operation on the low-voltage network	
Test report	64.290.22.31750.01 from 2022-11-29	
The above designated power generation unit meets the requirements of VDE-AR-N 4105.		

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TÜV SÜD Product Service

Certificate of Conformity

No. ESY 119530 0006 Rev. 00

E.5 Test report "Network interactions" for power generation units with an input current > 75 A

Extract of the test report for power generation units "Determination of electrical properties"		
System manufacturer:	KKT KOLBE GmbH & Co. KG Ohmstraße 17, D-96175 Pettstadt (Germany)	
Manufacturer indications:	Type of system	Hybrid inverter for PV systems
	Max. active power P_{Emax}	3674 W (HKW3680P1) 4593 W (HKW5000P1)
	Rated voltage	230Va.c.
Measurement period:	From 2022-12-13 to 2022-12-13	

Rapid voltage changes	
Connection without provisions (regarding the primary energy carrier)	K_i=
Most adverse case when switching between generator levels	K_i=
Connection at nominal conditions (of the primary energy carrier)	K_i=
Disconnection at rated power	K_i=
Worst value of all switching operations	k_{imax}=

Flicker–DIN EN 61000-3-11 (HKW5000P1)					
Test items	$d_{(t)\ -\ 500ms}$ [%]	d_c [%]	d_{max} [%]	P_{st}	P_{lt}
Limit value	3.30	3.30	4.00	1.00	0.65
L1	0.00	0.00	0.00	0.180	0.136
L2	--	--	--	--	--
L3	--	--	--	--	--

Harmonics-DIN EN 61000-3-12(>16 A and ≤75 A) (HKW5000P1)														
Description	Permissible individual harmonic current I_h/I_{ref} % (minimum Rsce=33)												Permissible harmonics Parameter (%)	
Harmonics	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}	I_{11}	I_{12}	I_{13}	THC/ I_{ref}	PWHC/I_{ref}
Limit value	8.0	21.6	4.0	10.7	2.67	7.2	2.0	3.8	1.6	3.1	1.33	2.0	13	22
Actual value	0.94	3.04	0.37	1.70	0.24	0.88	0.23	0.73	0.12	0.52	0.08	0.36	3.60	2.36
Note: The harmonic values are maximum values from all phases.														

DAkkS Deutsche Akkreditierungsstelle D-ZE-11321-01-00

TÜV SÜD Product Service

Certificate of Conformity

No. ESY 119530 0006 Rev. 00

Harmonics-DIN EN 61000-3-12(>16 A and ≤75 A) (HKW5000P1)												
Active power P/Pn[%]	0	10	20	30	40	50	60	70	80	90	100	Limit value
Ordinal number	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
2	0.64	0.94	0.30	0.31	0.35	0.20	0.13	0.12	0.09	0.07	0.20	8
3	0.65	3.04	2.07	1.36	1.28	1.15	1.21	1.25	1.25	1.30	1.41	21.6
4	0.24	0.37	0.06	0.03	0.09	0.03	0.03	0.01	0.01	0.03	0.12	4
5	0.92	1.70	1.68	0.83	0.74	0.57	0.61	0.48	0.49	0.51	0.67	10.7
6	0.52	0.24	0.05	0.03	0.08	0.05	0.04	0.05	0.02	0.03	0.11	2.67
7	0.37	0.88	1.41	0.65	0.57	0.50	0.54	0.40	0.43	0.35	0.44	7.2
8	0.36	0.23	0.14	0.06	0.11	0.03	0.06	0.06	0.04	0.04	0.10	2
9	0.20	0.73	1.27	0.42	0.48	0.47	0.49	0.39	0.45	0.36	0.43	3.8
10	0.29	0.12	0.05	0.11	0.19	0.13	0.10	0.05	0.09	0.02	0.13	1.6
11	0.61	0.52	0.94	0.26	0.40	0.39	0.39	0.26	0.40	0.34	0.41	3.1
12	0.32	0.08	0.09	0.07	0.11	0.05	0.05	0.03	0.03	0.02	0.09	1.33
13	0.13	0.36	0.72	0.32	0.29	0.30	0.31	0.18	0.29	0.26	0.35	2
14	0.16	0.04	0.04	0.05	0.09	0.03	0.02	0.02	0.06	0.03	0.05	-
15	0.50	0.34	0.52	0.20	0.19	0.12	0.18	0.14	0.21	0.19	0.23	-
16	0.33	0.05	0.06	0.03	0.06	0.03	0.02	0.03	0.03	0.02	0.06	-
17	0.12	0.27	0.37	0.16	0.09	0.09	0.08	0.10	0.14	0.14	0.10	-
18	0.14	0.07	0.04	0.01	0.01	0.01	0.01	0.03	0.02	0.02	0.03	-
19	0.18	0.18	0.28	0.09	0.05	0.06	0.05	0.07	0.08	0.07	0.05	-
20	0.48	0.07	0.03	0.05	0.02	0.00	0.03	0.02	0.02	0.03	0.05	-
21	0.54	0.13	0.22	0.04	0.00	0.02	0.04	0.04	0.04	0.03	0.02	-
22	0.61	0.01	0.02	0.02	0.03	0.01	0.00	0.02	0.00	0.01	0.01	-
23	0.28	0.15	0.12	0.04	0.03	0.03	0.03	0.02	0.01	0.02	0.02	-
24	0.65	0.01	0.01	0.02	0.03	0.00	0.01	0.01	0.02	0.02	0.01	-
25	0.37	0.10	0.09	0.02	0.05	0.03	0.02	0.02	0.01	0.02	0.00	-
26	0.88	0.01	0.02	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.00	-
27	0.53	0.07	0.06	0.02	0.02	0.01	0.02	0.01	0.00	0.01	0.02	-
28	0.17	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	-
29	0.65	0.08	0.05	0.03	0.01	0.01	0.01	0.01	0.01	0.02	0.01	-
30	0.57	0.00	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	-
31	0.68	0.06	0.04	0.02	0.00	0.01	0.01	0.01	0.01	0.01	0.01	-
32	0.32	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.00	-
33	0.63	0.05	0.03	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	-
34	0.50	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
35	0.17	0.04	0.02	0.02	0.00	0.00	0.00	0.01	0.00	0.01	0.01	-
36	0.96	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
37	0.52	0.03	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.00	-
38	0.57	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
39	0.91	0.04	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	-
40	0.69	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
THC/I_{ref}	3.04	3.60	3.30	1.73	1.66	1.44	1.51	1.39	1.46	2.04	2.36	-
PWHC/I_{ref}	15.46	2.36	3.13	1.18	1.02	0.72	0.87	0.82	1.13	1.03	1.11	-
Anmerkung: Iref = 20 A THC und PWHC werden bis zu 40th berechnet.												

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Certificate of Conformity

No. ESY 119530 0006 Rev. 00

E.6 Certificate of the network and system protection

Certificate of NS protection		
Manufacturer	KKT KOLBE GmbH & Co. KG	
Type of NS protection	Integrated NS protection	
Central NS protection	☐	
Integrated NS protection	☒	Assigned to power generation unit of type: HKW3680P1, HKW5000P1
Network connection rule	**VDE-AR-N 4105 "Generators connected to the low-voltage distribution network"** Technical minimum requirements for connection and parallel operation of power generation systems connected to the low-voltage network	
Test requirement	**DIN VDE V 0124-100 (VDE V 0124-100) "Network integration of power generation systems – Low voltage"** Test requirements for power generation units intended for connection to and parallel operation on the low-voltage network	
Test report	64.290.22.31750.01 from 2022-11-29	
The network and system protection designated above meets the requirements of VDE-AR-N 4105.		

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TÜV SÜD Product Service

Certificate of Conformity

No. ESY 119530 0006 Rev. 00

E.7 Requirements for the test report for the NS protection

Extract from test report for NS protection "Determination of electrical properties"			
NS protection test report			
Type of NS system:	Integrated NS protection		**Other Manufacturer indications**
Software version:	A1		
Manufacturer:	KKT KOLBE GmbH & Co. KG Ohmstraße 17, D-96175 Pettstadt (Germany)		
Measuring period:	From 2022-12-13 to 2022-12-13		
	Inverter		
Protection function	**Setting value**	**Tripping value**	**Tripping time NS protection***
Rise-in-voltage protection *U* >>	1.25 * U_n	L1-N: 289.00 V;	L1-N: 169 ms;
Rise-in-voltage protection *U* >	1.10 * U_n	1.12 * U_n	ms**
Voltage drop protection *U* <	0.8 * U_n	L1-N: 183.92 V;	L1-N: 3075 ms;
Voltage drop protection *U* <<	0.45 * U_n	L1-N: 104.59 V;	L1-N: 373 ms;
Frequency decrease protection *f* <	47.5 Hz	47.461 Hz	146 ms
Frequency increase protection *f* >	51.5 Hz	51.516 Hz	136 ms

*: The tripping time includes the period from the limit value violation *U*/*f* until the tripping signal to the interface switch.
When planning the power generation system, the response time of the interface switch shall be added to the maximum time value obtained as indicated above.
The disconnection time (sum of tripping time of the NS protection plus response time of the interface switch) shall not exceed 200 ms.

**: Verification disconnection time of moving 10-min-average value.
Disconnecting time as below:

1. 475s (L1-N from 600s@Un to 112%Un)
2. Continuous operation (L1-N from 600s@Un to 108%Un)
3. 289s (L1-N from 600s@106%Un to 114%Un)

☑ **as integrated NS protection**	
Assigned to power generation unit type	HKW3680P1, HKW5000P1
Integrated interface switch type	Series-connected relays for all phase conductors each Relay type: HF161F-W
Response time of interface switch for integrated NS protection	Release time: Max. 10 ms (HF161F-W)

DAkkS Deutsche Akkreditierungsstelle D-ZE-11321-01-00

TÜV SÜD Product Service

Certificate of Conformity

No. ESY 119530 0006 Rev. 00

Verification of the entire functional chain “integrated NS protection – interface switch” has resulted in successful disconnection.	☑