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

TÜV SÜD Product Service

Certificate of Conformity

No. ESY 119530 0008 Rev. 00

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

Product: **Converter (Hybrid Inverter)**

Model(s): **HKW10NVP3**

Parameters: See page 2

Applicable standards: VDE-AR-N 4105:2018
DIN VDE V 0124-100 (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.: 64290233043001

Date, 2023-04-04

(Billy Qiu)

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Parameters:

Model:	HKW10NVP3
PV input parameter	
Maximum input voltage	1100 Vd.c.
MPPT voltage range	140~1000 Vd.c.
MPPT voltage range (full load)	420~850 Vd.c.
Maximum input current	2*15 Ad.c.
PV I_{SC}	2*20 Ad.c.
Battery input/output parameter	
Battery type	Lithium or lead-acid
Input voltage range	44~58 Vd.c.
Maximum input/output voltage	58 Vd.c.
Maximum charging current	160 Ad.c.
Maximum charging power	8000 W
Maximum discharging current	200 Ad.c.
Maximum discharging power	10000 W
Grid parameter	
Rated input/output voltage	3/N/PE, 230/400 Va.c.
Rated input/output frequency	50 Hz
Maximum input current	25 Aa.c.
Maximum input active power	17800 W
Maximum input apparent power	17800 VA
Maximum input active power from grid to battery	8600 W
Rated output current	14.5 Aa.c.
Maximum continuous output current	16.0 Aa.c.
Rated output active power	10000 W
Maximum output active power	10000 W
Maximum output apparent power	11000 VA
Maximum active power P_{Emax}	10124 W
Maximum active power S_{Emax}	11130 VA
Maximum output active power from battery to grid (without PV input)	9300 W
Power factor	0.9 inductive(under-excited) to 0.9 capacitive(over-excited)

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E.4 Unit certificate		
Manufacturer	KKT KOLBE Küchentechnik GmbH & Co. KG	
Power generation unit type	[Converter]: HKW10NVP3	
Assessment values	max. active power P_{Emax}	10124 W (HKW10NVP3)
	max. apparent power S_{Emax}	11130 VA (HKW10NVP3)
	Rated voltage	3/N/PE~, 230/400 Va.c.
	Rated current (AC) I_r	
	Initial short-circuit AC current I''_k	
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	64.290.23.30430.01 from 2023-03-20	
The above designated power generation unit meets the requirements of VDE-AR-N 4105.		

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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 Küchentechnik GmbH & Co. KG Ohmstraße 17 D-96175 Pettstadt (Germany)	
Manufacturer indications:	Type of system	Hybrid inverter for PV systems
	Max. active power P_{Emax}	10124 W (HKW10NVP3)
	Rated voltage	3/N/PE~, 230/400 Va.c.
Measurement period:	From 2023-03-15 to 2023-03-20	

Rapid voltage changes	
Model	HKW10NVP3
Connection without provisions (regarding the primary energy carrier)	K_i=0.50
Most adverse case when switching between generator levels	K_i=0.50
Connection at nominal conditions (of the primary energy carrier)	K_i=1.02
Disconnection at rated power	K_i=1.02
Worst value of all switching operations	k_{imax}=1.02

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Flicker–DIN EN 61000-3-3 (HKW10NVP3)								
	Starting			Stopping			Running	
Test items	d_{max}(%)	d_c(%)	$d_{(t)}$ (%)	d_{max}(%)	d_c(%)	$d_{(t)}$ (%)	P_{st}	P_{lt} 2 hours
Limit value	4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65
L1	0	0	0	0	0	0	0.199	0.111
L2	0	0	0	0	0	0	0.181	0.109
L3	0	0	0	0	0	0	0.200	0.113

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Harmonics-DIN EN 61000-3-2(≤16 A) (HKW10NVP3)												
Phase L1												
Active power P/Pn[%]	0	10	20	30	40	50	60	70	80	90	100	Limit value
Ordinal number	A	A	A	A	A	A	A	A	A	A	A	A
0	0.006	0.028	0.029	0.018	0.019	0.022	0.028	0.025	0.026	0.027	0.027	0.073
1	1.083	1.447	2.898	4.344	5.792	7.235	8.702	10.127	11.560	13.171	14.600	-
2	0.064	0.095	0.094	0.068	0.063	0.077	0.143	0.097	0.078	0.066	0.071	1.080
3	0.026	0.049	0.078	0.105	0.112	0.162	0.206	0.261	0.231	0.196	0.161	2.300
4	0.070	0.130	0.199	0.229	0.213	0.241	0.222	0.273	0.230	0.201	0.189	0.430
5	0.080	0.081	0.102	0.130	0.143	0.165	0.170	0.211	0.223	0.223	0.229	1.140
6	0.010	0.013	0.010	0.015	0.014	0.018	0.020	0.020	0.022	0.019	0.016	0.300
7	0.066	0.069	0.056	0.073	0.070	0.067	0.046	0.074	0.080	0.098	0.101	0.770
8	0.019	0.023	0.025	0.016	0.016	0.009	0.024	0.013	0.017	0.021	0.023	0.230
9	0.007	0.005	0.010	0.010	0.010	0.008	0.013	0.007	0.007	0.008	0.009	0.400
10	0.030	0.006	0.014	0.019	0.014	0.007	0.016	0.013	0.017	0.020	0.022	0.184
11	0.068	0.035	0.095	0.027	0.056	0.078	0.098	0.083	0.071	0.050	0.039	0.330
12	0.010	0.005	0.007	0.008	0.009	0.007	0.013	0.008	0.006	0.005	0.006	0.153
13	0.051	0.050	0.066	0.056	0.030	0.055	0.075	0.075	0.069	0.046	0.028	0.210
14	0.010	0.008	0.006	0.007	0.011	0.012	0.011	0.009	0.009	0.011	0.015	0.131
15	0.005	0.009	0.007	0.009	0.009	0.005	0.006	0.004	0.006	0.006	0.006	0.150
16	0.007	0.005	0.010	0.006	0.011	0.010	0.006	0.012	0.014	0.012	0.013	0.115
17	0.024	0.029	0.025	0.058	0.031	0.031	0.040	0.046	0.053	0.043	0.031	0.132
18	0.011	0.003	0.004	0.004	0.007	0.008	0.005	0.005	0.007	0.007	0.005	0.102
19	0.008	0.010	0.021	0.049	0.033	0.018	0.032	0.034	0.037	0.025	0.015	0.118
20	0.004	0.007	0.009	0.007	0.004	0.009	0.006	0.006	0.007	0.008	0.008	0.092
21	0.004	0.004	0.005	0.005	0.005	0.004	0.004	0.005	0.006	0.004	0.006	0.107
22	0.007	0.005	0.005	0.008	0.003	0.007	0.005	0.005	0.007	0.007	0.007	0.084
23	0.016	0.026	0.021	0.019	0.028	0.020	0.018	0.022	0.027	0.019	0.010	0.098
24	0.008	0.003	0.003	0.004	0.004	0.006	0.005	0.003	0.004	0.006	0.005	0.077
25	0.010	0.010	0.016	0.016	0.031	0.024	0.018	0.027	0.033	0.023	0.013	0.090
26	0.005	0.004	0.005	0.007	0.006	0.004	0.007	0.005	0.005	0.007	0.008	0.071
27	0.005	0.003	0.005	0.005	0.006	0.005	0.005	0.008	0.008	0.012	0.013	0.083
28	0.007	0.005	0.008	0.006	0.010	0.005	0.007	0.005	0.005	0.007	0.009	0.066
29	0.020	0.017	0.011	0.026	0.024	0.026	0.016	0.020	0.031	0.027	0.019	0.078
30	0.010	0.003	0.003	0.002	0.006	0.004	0.003	0.006	0.003	0.003	0.004	0.061
31	0.011	0.016	0.016	0.026	0.020	0.026	0.012	0.014	0.024	0.020	0.012	0.073
32	0.004	0.003	0.002	0.004	0.009	0.004	0.003	0.005	0.006	0.009	0.012	0.058
33	0.003	0.004	0.004	0.003	0.007	0.004	0.005	0.009	0.005	0.014	0.015	0.068
34	0.005	0.003	0.002	0.006	0.006	0.006	0.008	0.004	0.006	0.008	0.012	0.054
35	0.010	0.010	0.018	0.020	0.016	0.014	0.014	0.011	0.015	0.017	0.012	0.064
36	0.004	0.002	0.002	0.003	0.004	0.005	0.010	0.016	0.011	0.008	0.006	0.051
37	0.005	0.014	0.009	0.014	0.018	0.022	0.023	0.027	0.027	0.028	0.024	0.061
38	0.003	0.004	0.004	0.009	0.004	0.008	0.008	0.008	0.007	0.016	0.016	0.048
39	0.003	0.003	0.003	0.005	0.009	0.012	0.013	0.029	0.024	0.018	0.044	0.058
40	0.004	0.004	0.003	0.005	0.004	0.009	0.011	0.004	0.005	0.007	0.011	0.046
THD(%)	1.223	1.500	2.015	2.227	2.165	2.549	2.808	3.261	2.997	2.720	2.576	5%
Phase L2												

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Active power P/Pn[%]	0	10	20	30	40	50	60	70	80	90	100	Limit value
Ordinal number	A	A	A	A	A	A	A	A	A	A	A	A
0	0.015	0.014	0.002	0.020	0.018	0.027	0.061	0.006	0.010	0.002	0.003	0.073
1	1.078	1.433	2.880	4.320	5.760	7.197	8.623	10.088	11.525	13.134	14.563	-
2	0.058	0.097	0.086	0.067	0.074	0.073	0.082	0.097	0.081	0.066	0.067	1.080
3	0.014	0.036	0.068	0.087	0.100	0.164	0.198	0.202	0.169	0.126	0.103	2.300
4	0.055	0.139	0.177	0.210	0.188	0.204	0.206	0.207	0.167	0.136	0.133	0.430
5	0.089	0.072	0.049	0.036	0.043	0.053	0.064	0.096	0.105	0.158	0.182	1.140
6	0.011	0.012	0.009	0.011	0.015	0.014	0.022	0.013	0.015	0.013	0.016	0.300
7	0.061	0.065	0.063	0.073	0.076	0.081	0.075	0.083	0.084	0.099	0.104	0.770
8	0.012	0.020	0.027	0.023	0.021	0.022	0.015	0.023	0.027	0.027	0.026	0.230
9	0.007	0.007	0.008	0.012	0.014	0.013	0.012	0.010	0.011	0.011	0.012	0.400
10	0.022	0.006	0.008	0.019	0.016	0.019	0.013	0.015	0.019	0.023	0.024	0.184
11	0.080	0.042	0.098	0.028	0.060	0.092	0.108	0.093	0.078	0.052	0.037	0.330
12	0.010	0.003	0.003	0.004	0.005	0.004	0.009	0.005	0.006	0.005	0.005	0.153
13	0.048	0.048	0.063	0.048	0.037	0.052	0.074	0.073	0.069	0.046	0.026	0.210
14	0.006	0.008	0.005	0.011	0.018	0.010	0.012	0.016	0.016	0.016	0.017	0.131
15	0.006	0.006	0.005	0.004	0.005	0.005	0.009	0.006	0.005	0.009	0.009	0.150
16	0.007	0.003	0.009	0.005	0.006	0.006	0.008	0.011	0.011	0.011	0.012	0.115
17	0.019	0.033	0.026	0.063	0.027	0.030	0.047	0.051	0.054	0.041	0.029	0.132
18	0.005	0.003	0.003	0.004	0.004	0.004	0.005	0.004	0.004	0.006	0.005	0.102
19	0.010	0.007	0.018	0.044	0.029	0.022	0.032	0.032	0.036	0.028	0.018	0.118
20	0.006	0.005	0.007	0.006	0.006	0.009	0.006	0.008	0.012	0.014	0.014	0.092
21	0.005	0.004	0.003	0.005	0.004	0.004	0.005	0.007	0.009	0.006	0.005	0.107
22	0.010	0.003	0.003	0.006	0.007	0.002	0.004	0.005	0.006	0.008	0.008	0.084
23	0.017	0.024	0.021	0.024	0.034	0.019	0.020	0.027	0.028	0.020	0.011	0.098
24	0.005	0.002	0.002	0.003	0.003	0.004	0.003	0.003	0.003	0.004	0.004	0.077
25	0.013	0.012	0.015	0.017	0.029	0.026	0.016	0.026	0.034	0.025	0.014	0.090
26	0.005	0.004	0.006	0.007	0.007	0.005	0.005	0.004	0.006	0.010	0.011	0.071
27	0.006	0.002	0.004	0.005	0.006	0.004	0.004	0.008	0.009	0.012	0.013	0.083
28	0.008	0.004	0.008	0.005	0.007	0.006	0.005	0.004	0.004	0.007	0.008	0.066
29	0.020	0.020	0.013	0.027	0.025	0.028	0.014	0.023	0.030	0.025	0.015	0.078
30	0.007	0.002	0.002	0.003	0.003	0.003	0.005	0.003	0.002	0.005	0.006	0.061
31	0.012	0.014	0.014	0.024	0.019	0.020	0.015	0.013	0.022	0.019	0.010	0.073
32	0.004	0.002	0.003	0.003	0.007	0.004	0.003	0.004	0.004	0.007	0.008	0.058
33	0.004	0.003	0.004	0.006	0.006	0.005	0.005	0.009	0.005	0.014	0.015	0.068
34	0.005	0.004	0.002	0.003	0.003	0.003	0.005	0.004	0.004	0.009	0.011	0.054
35	0.009	0.009	0.016	0.021	0.013	0.018	0.016	0.012	0.020	0.015	0.005	0.064
36	0.004	0.003	0.002	0.006	0.005	0.009	0.008	0.016	0.007	0.005	0.004	0.051
37	0.004	0.010	0.009	0.016	0.018	0.023	0.032	0.026	0.027	0.026	0.016	0.061
38	0.003	0.003	0.003	0.005	0.005	0.006	0.011	0.008	0.005	0.010	0.014	0.048
39	0.003	0.003	0.004	0.009	0.011	0.014	0.013	0.028	0.025	0.016	0.045	0.058
40	0.005	0.004	0.003	0.006	0.004	0.005	0.006	0.007	0.006	0.007	0.007	0.046
THD(%)	1.196	1.496	1.783	1.907	1.830	2.186	2.415	2.510	2.216	2.033	2.024	5%
Phase L3												
Active power P/Pn[%]	0	10	20	30	40	50	60	70	80	90	100	Limit value

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Ordinal number	A	A	A	A	A	A	A	A	A	A	A	A
0	0.010	0.013	0.027	0.038	0.037	0.050	0.036	0.033	0.028	0.027	0.032	0.073
1	1.092	1.450	2.900	4.350	5.798	7.246	8.683	10.123	11.555	13.167	14.596	-
2	0.053	0.093	0.087	0.070	0.072	0.085	0.073	0.100	0.078	0.065	0.070	1.080
3	0.017	0.032	0.051	0.085	0.100	0.127	0.163	0.166	0.158	0.157	0.138	2.300
4	0.054	0.119	0.180	0.188	0.161	0.183	0.183	0.220	0.185	0.151	0.138	0.430
5	0.072	0.063	0.107	0.115	0.118	0.125	0.118	0.136	0.129	0.099	0.093	1.140
6	0.006	0.009	0.010	0.015	0.016	0.026	0.012	0.018	0.021	0.019	0.021	0.300
7	0.064	0.069	0.060	0.069	0.071	0.073	0.074	0.092	0.095	0.107	0.108	0.770
8	0.011	0.020	0.016	0.016	0.026	0.025	0.018	0.021	0.019	0.019	0.024	0.230
9	0.010	0.006	0.006	0.008	0.009	0.015	0.026	0.014	0.008	0.007	0.008	0.400
10	0.018	0.008	0.013	0.022	0.013	0.016	0.026	0.012	0.014	0.018	0.019	0.184
11	0.073	0.034	0.092	0.026	0.065	0.093	0.096	0.085	0.075	0.055	0.044	0.330
12	0.005	0.005	0.006	0.008	0.007	0.005	0.008	0.006	0.005	0.005	0.006	0.153
13	0.052	0.047	0.068	0.050	0.031	0.053	0.071	0.068	0.064	0.044	0.026	0.210
14	0.008	0.011	0.007	0.009	0.011	0.009	0.007	0.016	0.014	0.015	0.016	0.131
15	0.005	0.006	0.006	0.010	0.008	0.007	0.011	0.008	0.007	0.007	0.006	0.150
16	0.008	0.006	0.009	0.007	0.011	0.008	0.010	0.014	0.015	0.014	0.014	0.115
17	0.025	0.031	0.024	0.055	0.023	0.035	0.045	0.047	0.052	0.040	0.029	0.132
18	0.009	0.003	0.005	0.004	0.008	0.006	0.006	0.005	0.006	0.007	0.007	0.102
19	0.012	0.011	0.021	0.049	0.028	0.023	0.030	0.033	0.035	0.027	0.019	0.118
20	0.005	0.004	0.006	0.005	0.005	0.003	0.005	0.007	0.009	0.008	0.008	0.092
21	0.005	0.003	0.003	0.006	0.009	0.005	0.004	0.008	0.008	0.005	0.004	0.107
22	0.007	0.005	0.004	0.009	0.007	0.007	0.006	0.006	0.008	0.012	0.013	0.084
23	0.016	0.024	0.018	0.021	0.028	0.016	0.021	0.027	0.029	0.019	0.011	0.098
24	0.006	0.003	0.002	0.004	0.004	0.006	0.003	0.005	0.006	0.005	0.005	0.077
25	0.015	0.014	0.018	0.016	0.029	0.021	0.022	0.027	0.031	0.024	0.015	0.090
26	0.004	0.003	0.005	0.005	0.008	0.006	0.004	0.006	0.006	0.008	0.010	0.071
27	0.005	0.003	0.005	0.006	0.007	0.007	0.004	0.008	0.009	0.011	0.012	0.083
28	0.009	0.005	0.008	0.006	0.007	0.005	0.007	0.004	0.005	0.007	0.008	0.066
29	0.018	0.018	0.011	0.026	0.027	0.024	0.014	0.025	0.034	0.028	0.019	0.078
30	0.004	0.002	0.002	0.003	0.004	0.003	0.004	0.005	0.004	0.004	0.004	0.061
31	0.014	0.015	0.016	0.027	0.020	0.020	0.008	0.016	0.024	0.019	0.013	0.073
32	0.004	0.003	0.003	0.005	0.005	0.006	0.004	0.006	0.008	0.007	0.007	0.058
33	0.005	0.003	0.003	0.009	0.005	0.010	0.003	0.007	0.005	0.012	0.015	0.068
34	0.006	0.003	0.002	0.004	0.006	0.009	0.005	0.006	0.010	0.008	0.006	0.054
35	0.010	0.012	0.016	0.019	0.011	0.015	0.017	0.011	0.020	0.018	0.014	0.064
36	0.004	0.002	0.003	0.010	0.009	0.009	0.010	0.014	0.012	0.006	0.005	0.051
37	0.005	0.014	0.010	0.012	0.020	0.024	0.032	0.023	0.038	0.037	0.029	0.061
38	0.003	0.002	0.003	0.004	0.004	0.004	0.005	0.005	0.006	0.012	0.014	0.048
39	0.003	0.003	0.003	0.004	0.006	0.008	0.015	0.023	0.021	0.016	0.043	0.058
40	0.003	0.002	0.003	0.005	0.005	0.010	0.007	0.008	0.006	0.008	0.008	0.046
THD(%)	1.118	1.373	1.880	1.929	1.851	2.138	2.260	2.528	2.315	2.033	1.879	5%

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Certificate of Conformity

No. ESY 119530 0008 Rev. 00

E.6 Certificate of the network and system protection

Certificate of NS protection		
Manufacturer	KKT KOLBE Küchentechnik GmbH & Co. KG Ohmstraße 17 D-96175 Pettstadt (Germany)	
Type of NS protection	Integrated NS protection	
Central NS protection	☐	
Integrated NS protection	☒	Assigned to power generation unit of type: HKW10NVP3
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	64.290.23.30430.01 from 2023-03-20	
The network and system protection designated above meets the requirements of VDE-AR-N 4105.		

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No. ESY 119530 0008 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 Küchentechnik GmbH & Co. KG Ohmstraße 17 D-96175 Pettstadt (Germany)		
Measuring period:	From 2022-10-25 to 2023-02-14		

	Inverter		
Protection function	**Setting value**	**Tripping value**	**Tripping time NS protection***
Rise-in-voltage protection *U* >>	1.25 * U_n	L1-N/L2-N/L3-N: 287.28 V/287.23 V/287.33 V L1-N: 287.06 V L2-N: 286.09 V L3-N: 286.36 V	L1-N/L2-N/L3-N: 178.0 ms L1-N: 182.0 ms L2-N: 176.0 ms L3-N: 176.0 ms
Rise-in-voltage protection *U* >	1.10 * U_n	1.10 * U_n	ms**
Voltage drop protection *U* <	0.8 * U_n	L1-N/L2-N/L3-N: 184.49 V/184.38 V/184.33 V L1-N: 184.51 V L2-N: 184.56 V L3-N: 184.33 V	L1-N/L2-N/L3-N: 3.076 s L1-N: 3.080 s L2-N: 3.080 s L3-N: 3.080 s
Voltage drop protection *U* <<	0.45 * U_n	L1-N/L2-N/L3-N: 103.64 V/103.90 V/103.70 V L1-N: 103.48 V L2-N: 104.44 V; L3-N: 103.64 V;	L1-N/L2-N/L3-N: 398 ms L1-N: 398 ms L2-N: 376 ms L3-N: 382 ms
Frequency decrease protection *f* <	47.5 Hz	47.50 Hz	120.0 ms
Frequency increase protection *f* >	51.5 Hz	51.50 Hz	108.0 ms

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*: 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. 487.4 s (from 600s@U_n to 112%U_n) 2. Continuous operation (from 600s@U_n to 108%U_n) 3. 332.8 s (from 600s@106%U_n to 114%U_n)	
☑ **as integrated NS protection**	
Assigned to power generation unit type	HKW10NVP3
Integrated interface switch type	Series-connected relays for all phase conductors each Manufacture: Churod Electronics Co., Ltd. Model: CHFN-V-112HA2F
Response time of interface switch for integrated NS protection	Release time: Max. 10 ms
Verification of the entire functional chain “integrated NS protection – interface switch” has resulted in successful disconnection.	☑

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