ZERTIFIKAT ◆ CERTIFICATE ◆ 認證證書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

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

TÜV SÜD Product Service

Certificate of Conformity

No. ESY 114387 0147 Rev. 00

Holder of Certificate: **Huawei Digital Power Technologies Co., Ltd.**
Office 01, 39th Floor, Block A
Antuoshan Headquarters Towers
33 Antuoshan 6th Road, Futian District
518043 Shenzhen
PEOPLE'S REPUBLIC OF CHINA

Product: **Converter (PV Inverter)**

Model(s): **SUN2000-3K-LB0, SUN2000-3.68K-LB0, SUN2000-4K-LB0, SUN2000-4.6K-LB0, SUN5000-3K-LB0**

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.: 64290243007701

Date, 2024-12-12

(Billy Qiu)

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Parameters:

Model	SUN2000-3K-LB0 / SUN5000-3K-LB0	SUN2000-3.68K-LB0	SUN2000-4K-LB0	SUN2000-4.6K-LB0
PV terminal parameters				
Maximum PV voltage [V_{DC}]	600			
Rated voltage [V_{DC}]	360			
MPPT voltage range [V_{DC}]	40-560			
MPPT voltage range (full load) [V_{DC}]	120-480	140-480	155-480	180-530
Maximum input current [A_{DC}]	16/16			
Isc PV [A_{DC}]	20/20			
MPPT tracker number	2			
Maximum input power [W]	4500	5520	6000	6900
Grid terminal input/output parameters				
Rated input/output voltage [V_{AC}]	1P+N+PE, 230			
Rated input/output frequency [Hz]	50			
Rated output current [A_{AC}]	13.00	16.00	17.40	20.00
Maximum continuous input/output current [A_{AC}]	15.00	16.00	20.00	23.00
Rated output active power [W]	3000	3680	4000	4600
Maximum continuous input/output active power [W]	3300	3680	4400	4600
Maximum continuous input/output apparent power [VA]	3300	3680	4400	4600
Power factor range	0.8 under-excited to 0.8 over-excited			

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E.4 Unit certificate

Unit certificate		
Manufacturer	Huawei Digital Power Technologies Co.,Ltd.	
Power generation unit type	[PV Inverter]: SUN2000-3K-LB0, SUN2000-3.68K-LB0, SUN2000-4K-LB0, SUN2000-4.6K-LB0, SUN5000-3K-LB0 Remark: certified on representative model SUN2000-4.6K-LB0 of family design products, results of the measurement of SUN2000-4.6K-LB0 can be transferred to other models based on transferability rule of measurements in DIN VDE V 0124-100 (VDE V 0124-100):2020-06.	
Assessment values	max. active power P_{Emax}	4600 W (SUN2000-4.6K-LB0)
	max. apparent power S_{Emax}	4600 VA (SUN2000-4.6K-LB0)
	Rated voltage	1/N/PE~, 230V$_{AC}$
	Rated current (AC) I_r	20.0 A (SUN2000-4.6K-LB0)
	Initial short-circuit AC current I''_k	23.0 A (SUN2000-4.6K-LB0)
Network connection rule	**VDE-AR-N 4105:2018-11 "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):2020-06 "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	64.290.24.30077.01 from 2024-11-12	
The above designated power generation unit meets the requirements of VDE-AR-N 4105:2018-11.		

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No. ESY 114387 0147 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:	Huawei Digital Power Technologies Co.,Ltd. Office 01, 39th Floor, Block A, Antuoshan Headquarters Towers, 33 Antuoshan 6th Road, Futian District, 518043, Shenzhen, PEOPLE'S REPUBLIC OF CHINA	
Manufacturer indications:	Type of system	PV Inverter
	Max. active power P_{Emax}	3300 W (SUN2000-3K-LB0) 3680 W (SUN2000-3.68K-LB0) 4400 W (SUN2000-4K-LB0) 4600 W (SUN2000-4.6K-LB0) 3300 W (SUN5000-3K-LB0)
	Rated voltage	1/N/PE~, 230V$_{AC}$
Measurement period:	From 2024-09-17 to 2024-11-01	

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Rapid voltage changes		
Model	SUN2000-3.68K-LB0	
Connection without provisions (regarding the primary energy carrier)		K_i=0.498
Most adverse case when switching between generator levels		K_i=0.503
Connection at nominal conditions (of the primary energy carrier)		K_i=0.998
Disconnection at rated power		K_i=1.002
Worst value of all switching operations		K_{imax}=1.002

Rapid voltage changes		
Model	SUN2000-4.6K-LB0	
Connection without provisions (regarding the primary energy carrier)		K_i=0.499
Most adverse case when switching between generator levels		K_i=0.502
Connection at nominal conditions (of the primary energy carrier)		K_i=0.997
Disconnection at rated power		K_i=1.000
Worst value of all switching operations		K_{imax}=1.000

Flicker (SUN2000-3.68K-LB0)					
Network impedance angle Ψ_k	30°	50°	70°	85°	32°
Coefficient of system flicker C_ψ (Maximum)					
L1	--	--	--	--	0.396

Flicker (SUN2000-4.6K-LB0)					
Network impedance angle Ψ_k	30°	50°	70°	85°	32°
Coefficient of system flicker C_ψ (Maximum)					
L1	--	--	--	--	0.132

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Harmonics (≤16 A) (SUN2000-3.68K-LB0)												
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
2	0.026	0.020	0.028	0.029	0.037	0.047	0.058	0.068	0.076	0.086	0.105	1.080
3	0.095	0.033	0.041	0.031	0.025	0.028	0.033	0.043	0.052	0.065	0.066	2.300
4	0.005	0.004	0.012	0.015	0.010	0.010	0.014	0.014	0.016	0.018	0.023	0.430
5	0.056	0.080	0.014	0.012	0.009	0.006	0.008	0.006	0.007	0.005	0.006	1.140
6	0.004	0.007	0.004	0.007	0.009	0.011	0.013	0.010	0.010	0.011	0.013	0.300
7	0.228	0.087	0.216	0.107	0.016	0.019	0.031	0.037	0.037	0.042	0.047	0.770
8	0.002	0.002	0.005	0.006	0.009	0.013	0.015	0.012	0.013	0.013	0.018	0.230
9	0.144	0.166	0.144	0.118	0.036	0.029	0.040	0.042	0.046	0.050	0.051	0.400
10	0.003	0.003	0.005	0.005	0.006	0.009	0.010	0.009	0.009	0.008	0.010	0.184
11	0.076	0.098	0.066	0.112	0.057	0.031	0.035	0.038	0.037	0.041	0.041	0.330
12	0.003	0.004	0.006	0.006	0.005	0.007	0.008	0.009	0.010	0.009	0.011	0.153
13	0.041	0.047	0.066	0.086	0.071	0.042	0.042	0.045	0.043	0.044	0.043	0.210
14	0.002	0.003	0.005	0.007	0.005	0.006	0.008	0.009	0.010	0.010	0.013	0.131
15	0.019	0.044	0.047	0.052	0.071	0.048	0.043	0.047	0.046	0.046	0.044	0.150
16	0.002	0.003	0.005	0.007	0.005	0.006	0.007	0.008	0.008	0.008	0.009	0.115
17	0.009	0.021	0.025	0.033	0.063	0.050	0.042	0.045	0.044	0.044	0.042	0.132
18	0.003	0.002	0.006	0.007	0.006	0.006	0.007	0.008	0.008	0.008	0.010	0.102
19	0.013	0.005	0.031	0.030	0.049	0.050	0.042	0.044	0.044	0.044	0.041	0.118
20	0.002	0.002	0.005	0.006	0.006	0.006	0.007	0.008	0.008	0.008	0.009	0.092
21	0.020	0.017	0.019	0.023	0.034	0.049	0.042	0.043	0.042	0.043	0.041	0.107
22	0.002	0.002	0.004	0.005	0.005	0.006	0.006	0.007	0.008	0.008	0.008	0.084
23	0.024	0.016	0.007	0.012	0.022	0.043	0.040	0.040	0.041	0.042	0.040	0.098
24	0.002	0.002	0.004	0.005	0.005	0.006	0.006	0.007	0.008	0.008	0.009	0.077
25	0.026	0.024	0.024	0.015	0.019	0.036	0.038	0.038	0.039	0.041	0.040	0.090
26	0.002	0.002	0.004	0.004	0.004	0.006	0.006	0.007	0.008	0.008	0.009	0.071
27	0.027	0.027	0.020	0.018	0.019	0.027	0.034	0.034	0.037	0.039	0.038	0.083
28	0.002	0.002	0.004	0.004	0.004	0.005	0.006	0.006	0.007	0.007	0.008	0.066
29	0.028	0.031	0.021	0.014	0.017	0.019	0.030	0.030	0.033	0.037	0.036	0.078
30	0.002	0.002	0.004	0.003	0.003	0.005	0.005	0.006	0.007	0.007	0.008	0.061
31	0.028	0.033	0.030	0.014	0.013	0.013	0.024	0.025	0.029	0.033	0.034	0.073
32	0.002	0.002	0.004	0.003	0.003	0.004	0.005	0.005	0.006	0.006	0.007	0.058
33	0.027	0.035	0.029	0.023	0.011	0.012	0.019	0.021	0.025	0.030	0.031	0.068
34	0.002	0.002	0.004	0.003	0.003	0.004	0.005	0.005	0.005	0.006	0.007	0.054
35	0.027	0.036	0.032	0.028	0.013	0.014	0.015	0.017	0.021	0.026	0.028	0.064
36	0.002	0.002	0.004	0.004	0.003	0.004	0.004	0.004	0.005	0.006	0.007	0.051
37	0.027	0.036	0.036	0.026	0.015	0.015	0.012	0.014	0.018	0.022	0.026	0.061
38	0.002	0.002	0.003	0.004	0.003	0.004	0.004	0.004	0.004	0.005	0.006	0.048
39	0.026	0.036	0.031	0.024	0.016	0.015	0.010	0.011	0.013	0.018	0.022	0.058
40	0.002	0.002	0.004	0.004	0.003	0.004	0.004	0.004	0.004	0.004	0.006	0.046
THD	1.981%	1.611%	1.874%	1.490%	1.033%	0.944%	0.987%	1.067%	1.128%	1.230%	1.297%	5%
Remark: Iref=16 A.												

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Harmonics (>16 A and ≤75 A) (SUN2000-4.6K-LB0)												
Active power P/Pn[%]	0	10	20	30	40	50	60	70	80	90	100	Limit value
Ordinal number	Ih/Iref [%]											[%]
2	0.124	0.115	0.132	0.159	0.222	0.290	0.338	0.401	0.455	0.532	0.559	8
3	0.486	0.296	0.172	0.126	0.131	0.178	0.231	0.307	0.367	0.440	0.526	21.6
4	0.021	0.054	0.074	0.063	0.048	0.071	0.071	0.094	0.105	0.122	0.119	4
5	0.285	0.342	0.063	0.048	0.032	0.035	0.037	0.026	0.026	0.047	0.101	10.7
6	0.016	0.017	0.030	0.038	0.054	0.056	0.048	0.045	0.052	0.081	0.091	2.67
7	1.174	0.950	0.825	0.178	0.091	0.151	0.187	0.196	0.217	0.313	0.365	7.2
8	0.012	0.029	0.024	0.034	0.061	0.064	0.061	0.060	0.064	0.098	0.107	2
9	0.729	0.305	0.737	0.274	0.136	0.204	0.202	0.238	0.254	0.349	0.387	3.8
10	0.014	0.018	0.026	0.028	0.040	0.046	0.042	0.042	0.038	0.062	0.060	1.6
11	0.374	0.699	0.522	0.368	0.150	0.178	0.188	0.192	0.201	0.273	0.306	3.1
12	0.015	0.021	0.036	0.028	0.029	0.039	0.044	0.045	0.047	0.059	0.047	1.33
13	0.191	0.210	0.270	0.412	0.204	0.218	0.218	0.219	0.219	0.271	0.295	2
14	0.011	0.023	0.036	0.027	0.027	0.039	0.043	0.050	0.051	0.063	0.053	-
15	0.085	0.250	0.210	0.372	0.228	0.218	0.226	0.222	0.215	0.261	0.283	-
16	0.011	0.013	0.031	0.028	0.027	0.034	0.037	0.042	0.044	0.053	0.043	-
17	0.039	0.119	0.196	0.289	0.242	0.215	0.222	0.221	0.209	0.241	0.252	-
18	0.013	0.018	0.031	0.031	0.027	0.034	0.038	0.042	0.044	0.049	0.041	-
19	0.062	0.116	0.101	0.201	0.246	0.213	0.219	0.219	0.210	0.236	0.242	-
20	0.011	0.013	0.027	0.032	0.028	0.035	0.040	0.042	0.043	0.049	0.042	-
21	0.097	0.037	0.089	0.129	0.241	0.211	0.216	0.219	0.208	0.228	0.234	-
22	0.011	0.012	0.026	0.027	0.030	0.032	0.038	0.042	0.040	0.043	0.036	-
23	0.117	0.122	0.107	0.104	0.210	0.199	0.206	0.212	0.204	0.219	0.220	-
24	0.010	0.012	0.025	0.023	0.028	0.029	0.036	0.039	0.041	0.044	0.036	-
25	0.126	0.105	0.052	0.099	0.174	0.189	0.197	0.206	0.203	0.211	0.217	-
26	0.010	0.012	0.021	0.022	0.028	0.029	0.035	0.039	0.038	0.042	0.038	-
27	0.134	0.126	0.073	0.080	0.130	0.168	0.181	0.197	0.195	0.198	0.202	-
28	0.011	0.013	0.019	0.020	0.025	0.027	0.032	0.038	0.039	0.040	0.034	-
29	0.136	0.157	0.137	0.061	0.089	0.149	0.163	0.181	0.188	0.191	0.194	-
30	0.010	0.013	0.020	0.019	0.021	0.026	0.031	0.035	0.037	0.039	0.036	-
31	0.136	0.160	0.136	0.063	0.063	0.121	0.139	0.163	0.175	0.174	0.179	-
32	0.010	0.012	0.020	0.017	0.019	0.023	0.026	0.033	0.035	0.036	0.034	-
33	0.134	0.171	0.129	0.077	0.061	0.102	0.119	0.146	0.163	0.161	0.169	-
34	0.010	0.012	0.019	0.016	0.018	0.022	0.026	0.030	0.033	0.033	0.032	-
35	0.132	0.167	0.148	0.082	0.070	0.080	0.096	0.126	0.148	0.145	0.156	-
36	0.010	0.012	0.019	0.015	0.018	0.020	0.022	0.027	0.031	0.030	0.031	-
37	0.131	0.188	0.153	0.076	0.076	0.066	0.080	0.109	0.135	0.127	0.141	-
38	0.009	0.011	0.020	0.016	0.017	0.019	0.020	0.023	0.029	0.025	0.028	-
39	0.129	0.170	0.138	0.080	0.077	0.054	0.058	0.086	0.117	0.112	0.126	-
40	0.011	0.013	0.021	0.016	0.018	0.018	0.020	0.022	0.027	0.023	0.026	-
THC/I_{ref}	1.612	1.434	1.369	0.899	0.729	0.797	0.863	0.953	1.014	1.190	1.293	23
PWHC/I_{ref}	2.287	2.906	2.527	2.563	2.770	2.840	3.034	3.292	3.393	3.560	3.692	23
Remark: Iref=20 A.												

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E.6 Certificate of the network and system protection

Certificate of NS protection		
Manufacturer	Huawei Digital Power Technologies Co.,Ltd.	
Type of NS protection	Integrated NS protection	
Central NS protection	☐	
Integrated NS protection	☒	Assigned to power generation unit of type: SUN2000-3K-LB0, SUN2000-3.68K-LB0, SUN2000-4K-LB0, SUN2000-4.6K-LB0, SUN5000-3K-LB0
Network connection rule	**VDE-AR-N 4105:2018-11 "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):2020-06 "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	64.290.24.30077.01 from 2024-11-12	
The network and system protection designated above meets the requirements of VDE-AR-N 4105:2018-11.		

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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:	V300R024	
Manufacturer:	Huawei Digital Power Technologies Co.,Ltd. Office 01, 39th Floor, Block A, Antuoshan Headquarters Towers, 33 Antuoshan 6th Road, Futian District, 518043, Shenzhen, PEOPLE'S REPUBLIC OF CHINA	
Measuring period:	From 2024-09-17 to 2024-11-01	

	Inverter		
Protection function	**Setting value**	**Tripping value**	**Tripping time NS protection***
Rise-in-voltage protection *U* >>	1.25 * U_n	L1-N: 287.64V	L1-N: 130.85ms
Rise-in-voltage protection *U* >	1.10 * U_n	1.10 * U_n	ms**
Voltage drop protection *U* <	0.8 * U_n	L1-N: 183.03V	L1-N: 3030.00ms
Voltage drop protection *U* <<	0.45 * U_n	L1-N: 102.08V	L1-N: 326.75ms
Frequency decrease protection *f* <	47.5 Hz	47.48Hz	162.05ms
Frequency increase protection *f* >	51.5 Hz	51.52Hz	150.50ms

*: 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. 460.50s (L1-N from 600s@U_n to 112%U_n)
2. Continuous operation (L1-N from 600s@U_n to 108%U_n)
3. 262.80s (L1-N from 600s@106%U_n to 114%U_n)

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☑ **as integrated NS protection**	
Assigned to power generation unit type	SUN2000-3K-LB0, SUN2000-3.68K-LB0, SUN2000-4K-LB0, SUN2000-4.6K-LB0, SUN5000-3K-LB0
Integrated interface switch type	Series-connected relays for all phase conductors each Relay type: HF161F-40W/12-HTF
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.	☑