

# Certificate of Conformity

No. ESY 114387 0056 Rev. 03

**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 & Hybrid Inverter)**

**Model(s):** **PV Inverter models:**  
**SUN2000-12KTL-M5, SUN2000-15KTL-M5,**  
**SUN2000-17KTL-M5, SUN2000-20KTL-M5,**  
**SUN2000-25KTL-M5**  
**Hybrid Inverter models:**  
**SUN2000-12K-MB0, SUN2000-15K-MB0,**  
**SUN2000-17K-MB0, SUN2000-20K-MB0,**  
**SUN2000-25K-MB0, SUN5000-17K-MB0,**  
**SUN5000-25K-MB0**


**Parameters:** See pages 2-4

**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](http://www.tuvsud.com/ps-cert)

**Test report no.:** 64290223060203

**Date,** 2024-06-27



( Billy Qiu )

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## Parameters:

Model	SUN2000-12KTL-M5	SUN2000-15KTL-M5	SUN2000-17KTL-M5	SUN2000-20KTL-M5	SUN2000-25KTL-M5
PV terminal parameters					
Maximum PV voltage [V <sub>DC</sub> ]	1100				
Rated voltage [V <sub>DC</sub> ]	600				
MPPT voltage range [V <sub>DC</sub> ]	200 - 1000				
MPPT voltage range (full load) [V <sub>DC</sub> ]	370 - 800	410 - 800	440 - 800	480 - 800	530 - 800
Maximum input current [A <sub>DC</sub> ]	30/30				
Isc PV [A <sub>DC</sub> ]	40/40				
MPPT tracker number	2				
Maximum input power [W]	18000	22500	25500	30000	37500
Grid output terminal parameters					
Rated output voltage [V <sub>AC</sub> ]	3P+N+PE, 230/400				
Rated output frequency [Hz]	50				
Rated output current [A <sub>AC</sub> ]	17.3	21.7	24.5	28.9	36.1
Maximum continuous output current [A <sub>AC</sub> ]	20.2	25.2	28.6	33.6	42.0
Rated output active power [W]	12000	15000	17000	20000	25000
Maximum output active power P <sub>E<sub>max</sub></sub> [W]	13200	16500	18700	22000	27500
Maximum output apparent power S <sub>E<sub>max</sub></sub> [VA]	13200	16500	18700	22000	27500
Power factor range	0.8 under-excited to 0.8 over-excited				

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Model	SUN2000-12K-MB0	SUN2000-15K-MB0	SUN2000-17K-MB0	SUN2000-20K-MB0	SUN2000-25K-MB0
<b>PV terminal parameters</b>					
Maximum PV voltage [V <sub>DC</sub> ]	1100				
Rated voltage [V <sub>DC</sub> ]	600				
MPPT voltage range [V <sub>DC</sub> ]	200 - 1000				
MPPT voltage range (full load) [V <sub>DC</sub> ]	370 - 800	410 - 800	440 - 800	480 - 800	530 - 800
Maximum input current [A <sub>DC</sub> ]	30/30				
Isc PV [A <sub>DC</sub> ]	40/40				
MPPT tracker number	2				
Maximum input power [W]	18000	22500	25500	30000	37500
<b>Battery input/output parameters</b>					
Battery type	Lithium-ion				
Maximum voltage [V <sub>DC</sub> ]	980				
Battery rated voltage [V <sub>DC</sub> ]	600				
Battery voltage range [V <sub>DC</sub> ]	600 - 980				
Maximum charge power [W]	25000	25000	25000	25000	25000
Maximum discharge power [W]	13200	16500	18700	22000	25000
Maximum charge current [A <sub>DC</sub> ]	26.25/26.25				
Maximum discharge current [A <sub>DC</sub> ]	26.25/26.25				
Maximum charge power from grid to battery [W]	13200	15000	15000	15000	15000
<b>Grid input terminal parameters</b>					
Rated input voltage [V <sub>AC</sub> ]	3P+N+PE, 230/400				
Rated input frequency [Hz]	50				
Maximum continuous input current from grid to battery [A <sub>AC</sub> ]	19.1	21.7	21.7	21.7	21.7
Maximum continuous input current [A <sub>AC</sub> ]	19.1	21.7	21.7	21.7	21.7
Maximum continuous input power from grid to battery [W]	13200	15000	15000	15000	15000
Maximum continuous input active power [W]	13200	15000	15000	15000	15000
Maximum continuous input apparent power [VA]	13200	15000	15000	15000	15000
<b>Grid output terminal parameters</b>					
Rated output voltage [V <sub>AC</sub> ]	3P+N+PE, 230/400				
Rated output frequency [Hz]	50				
Rated output current [A <sub>AC</sub> ]	17.3	21.7	24.5	28.9	36.1
Maximum continuous output current [A <sub>AC</sub> ]	20.2	25.2	28.6	33.6	42.0
Rated output active power [W]	12000	15000	17000	20000	25000
Maximum output active power P <sub>Emax</sub> [W]	13200	16500	18700	22000	27500
Maximum output apparent power S <sub>Emax</sub> [VA]	13200	16500	18700	22000	27500
Power factor range	0.8 under-excited to 0.8 over-excited				

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Model	SUN5000-17K-MB0	SUN5000-25K-MB0
<b>PV terminal parameters</b>		
Maximum PV voltage [V <sub>DC</sub> ]	1100	
Rated voltage [V <sub>DC</sub> ]	600	
MPPT voltage range [V <sub>DC</sub> ]	200 - 1000	
MPPT voltage range (full load) [V <sub>DC</sub> ]	440 - 800	530 - 800
Maximum input current [A <sub>DC</sub> ]	30/30	
Isc PV [A <sub>DC</sub> ]	40/40	
MPPT tracker number	2	
Maximum input power [W]	25500	37500
<b>Battery input/output parameters</b>		
Battery type	Lithium-ion	
Maximum voltage [V <sub>DC</sub> ]	980	
Battery rated voltage [V <sub>DC</sub> ]	600	
Battery voltage range [V <sub>DC</sub> ]	600 - 980	
Maximum charge power [W]	25000	25000
Maximum discharge power [W]	18700	25000
Maximum charge current [A <sub>DC</sub> ]	26.25/26.25	
Maximum discharge current [A <sub>DC</sub> ]	26.25/26.25	
Maximum charge power from grid to battery [W]	15000	
<b>Grid terminal input parameters</b>		
Rated input voltage [V <sub>AC</sub> ]	3P+N+PE, 230/400	
Rated input frequency [Hz]	50	
Maximum continuous input current from grid to battery [A <sub>AC</sub> ]	21.7	
Maximum continuous input current [A <sub>AC</sub> ]	21.7	
Maximum continuous input power from grid to battery [W]	15000	
Maximum continuous input active power [W]	15000	
Maximum continuous input apparent power [VA]	15000	
<b>Grid terminal output parameters</b>		
Rated output voltage [V <sub>AC</sub> ]	3P+N+PE, 230/400	
Rated output frequency [Hz]	50	
Rated output current [A <sub>AC</sub> ]	24.5	36.1
Maximum continuous output current [A <sub>AC</sub> ]	28.6	42.0
Rated output active power [W]	17000	25000
Maximum output active power P <sub>Emax</sub> [W]	18700	27500
Maximum output apparent power S <sub>Emax</sub> [VA]	18700	27500
Power factor range	0.8 under-excited to 0.8 over-excited	

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## E.4 Unit certificate

Unit certificate		
<b>Manufacturer</b>	Huawei Digital Power Technologies Co., Ltd.	
<b>Power generation unit type</b>	<p>[PV Inverter &amp; Hybrid Inverter]:</p> <p>PV Inverter models:  <u>SUN2000-12KTL-M5, SUN2000-15KTL-M5, SUN2000-17KTL-M5, SUN2000-20KTL-M5, SUN2000-25KTL-M5</u></p> <p>Hybrid Inverter models:  <u>SUN2000-12K-MB0, SUN2000-15K- MB0, SUN2000-17K- MB0, SUN2000-20K- MB0, SUN2000-25K- MB0, SUN5000-17K-MB0, SUN5000-25K-MB0</u></p> <p>Remark: certified on representative model <u>SUN2000-25KTL-M5</u> of family design products, results of the measurement of <u>SUN2000-25KTL-M5</u> can be transferred to other models based on transferability rule of measurements in DIN VDE V 0124-100 (VDE V 0124-100):2020-06.</p>	
<b>Assessment values</b>	max. active power $P_{E_{max}}$	<u>27500 W (SUN2000-25KTL-M5)</u>
	max. apparent power $S_{E_{max}}$	<u>27500 VA SUN2000-25KTL-M5)</u>
	Rated voltage	<u>230/400 V<sub>AC</sub>, 3W+N+PE.</u>
	Rated current (AC) $I_r$	<u>36.1 A (SUN2000-25KTL-M5)</u>
	Initial short-circuit AC current $I''_k$	<u>42.0 A (SUN2000-25KTL-M5)</u>
<b>Network connection rule</b>	<p><b>VDE-AR-N 4105:2018-11 “Generators connected to the low-voltage distribution network”</b></p> <p>Technical minimum requirements for connection and parallel operation of power generation systems connected to the low-voltage network</p>	
<b>Test requirement</b>	<p><b>DIN VDE V 0124-100 (VDE V 0124-100):2020-06 “Network integration of power generation systems – Low voltage”</b></p> <p>Test requirements for power generation units intended for connection to and parallel operation on the low-voltage network</p>	
<b>Test report</b>	<u>64.290.22.30602.03 from 2024-06-04</u>	
The above designated power generation unit meets the requirements of VDE-AR-N 4105:2018-11.		

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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:	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 or hybrid inverter for PV systems
	Max. active power $P_{E_{max}}$	13200 W (SUN2000-12KTL-M5, SUN2000-12K- MB0)
		16500 W (SUN2000-15KTL-M5, SUN2000-15K- MB0)
		18700 W (SUN2000-17KTL-M5, SUN2000-17K- MB0, SUN5000-17K- MB0)
22000 W (SUN2000-20KTL-M5, SUN2000-20K- MB0)		
	27500 W (SUN2000-25KTL-M5, SUN2000-25K- MB0, SUN5000-25K- MB0)	
	Rated voltage	230/400 V <sub>AC</sub> , 3W+N+PE.
Measurement period:	From 2022-08-01 to 2023-01-12, 2023-05-11 to 2023-05-15, 2024- 06-03 to 2024-06-04	

Rapid voltage changes	
Model	SUN2000-25KTL-M5
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)	$K_i=1.00$
Disconnection at rated power	$K_i=1.00$
Worst value of all switching operations	$K_{i_{max}}=1.00$

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Flicker (SUN2000-25KTL-M5)					
Network impedance angle $\Psi_k$	30°	50°	70°	85°	32°
Initial flicker coefficient $c\Psi$ at Max. active power $P_{E_{max}}$					
L1	--	--	--	--	0.6996
L2	--	--	--	--	0.6732
L3	--	--	--	--	0.6963

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Harmonics-DIN EN 61000-3-12(>16 A and ≤75 A) (SUN2000-25KTL-M5)												
Phase L1-N												
Power P/Pn[%]	0	10	20	30	40	50	60	70	80	90	100	Limit value
Ordinal number	Ih/Iref[%]											[%]
2	0.055	0.085	0.192	0.248	0.268	0.307	0.465	0.242	0.187	0.303	0.368	8.0
3	0.037	0.038	0.033	0.030	0.059	0.095	0.050	0.093	0.122	0.097	0.094	-
4	0.041	0.035	0.059	0.067	0.057	0.047	0.096	0.152	0.185	0.196	0.200	4.0
5	0.073	0.075	0.094	0.117	0.143	0.180	0.178	0.462	0.532	0.539	0.556	10.7
6	0.026	0.019	0.020	0.018	0.020	0.020	0.029	0.042	0.043	0.056	0.048	2.67
7	0.079	0.131	0.071	0.089	0.096	0.101	0.098	0.130	0.124	0.105	0.097	7.2
8	0.031	0.025	0.026	0.036	0.044	0.057	0.066	0.095	0.099	0.108	0.105	2.0
9	0.024	0.024	0.020	0.016	0.017	0.018	0.022	0.040	0.039	0.042	0.039	-
10	0.027	0.024	0.021	0.028	0.035	0.051	0.054	0.045	0.054	0.053	0.054	1.6
11	0.102	0.098	0.143	0.154	0.218	0.276	0.231	0.080	0.122	0.165	0.169	3.1
12	0.020	0.016	0.015	0.014	0.016	0.015	0.023	0.035	0.035	0.044	0.034	1.33
13	0.053	0.085	0.110	0.085	0.145	0.195	0.168	0.307	0.347	0.314	0.230	2.0
14	0.025	0.022	0.020	0.025	0.033	0.044	0.046	0.046	0.053	0.062	0.057	-
15	0.021	0.014	0.014	0.013	0.013	0.016	0.018	0.034	0.035	0.037	0.035	-
16	0.024	0.019	0.018	0.023	0.027	0.038	0.036	0.044	0.053	0.054	0.050	-
17	0.036	0.077	0.064	0.053	0.087	0.165	0.127	0.152	0.153	0.108	0.099	-
18	0.019	0.013	0.014	0.013	0.014	0.014	0.017	0.031	0.031	0.046	0.038	-
19	0.037	0.079	0.045	0.061	0.059	0.107	0.105	0.090	0.144	0.174	0.182	-
20	0.023	0.017	0.017	0.024	0.029	0.036	0.033	0.043	0.041	0.047	0.041	-
21	0.020	0.015	0.014	0.013	0.014	0.015	0.014	0.031	0.030	0.034	0.030	-
22	0.023	0.017	0.017	0.020	0.027	0.036	0.031	0.042	0.043	0.054	0.050	-
23	0.066	0.031	0.044	0.044	0.033	0.032	0.037	0.118	0.111	0.073	0.092	-
24	0.017	0.013	0.013	0.012	0.013	0.013	0.013	0.026	0.029	0.035	0.032	-
25	0.083	0.049	0.037	0.038	0.026	0.035	0.029	0.234	0.235	0.149	0.056	-
26	0.023	0.017	0.016	0.022	0.026	0.031	0.029	0.044	0.043	0.055	0.047	-
27	0.018	0.011	0.012	0.012	0.012	0.013	0.012	0.029	0.027	0.033	0.031	-
28	0.023	0.017	0.016	0.021	0.025	0.031	0.032	0.048	0.046	0.058	0.043	-
29	0.102	0.062	0.039	0.036	0.035	0.038	0.035	0.092	0.089	0.073	0.076	-
30	0.015	0.012	0.012	0.012	0.012	0.012	0.013	0.025	0.027	0.035	0.031	-
31	0.112	0.056	0.053	0.038	0.050	0.052	0.038	0.272	0.353	0.305	0.187	-
32	0.021	0.015	0.017	0.022	0.021	0.026	0.030	0.033	0.040	0.044	0.046	-
33	0.017	0.012	0.012	0.012	0.012	0.013	0.012	0.029	0.027	0.035	0.031	-
34	0.021	0.014	0.020	0.024	0.023	0.027	0.033	0.036	0.055	0.069	0.053	-
35	0.110	0.083	0.059	0.041	0.053	0.063	0.040	0.190	0.179	0.124	0.067	-
36	0.013	0.013	0.014	0.012	0.012	0.012	0.012	0.025	0.024	0.041	0.030	-
37	0.115	0.059	0.060	0.050	0.060	0.078	0.054	0.099	0.223	0.286	0.279	-
38	0.019	0.021	0.022	0.023	0.019	0.022	0.028	0.049	0.040	0.045	0.045	-
39	0.014	0.012	0.011	0.012	0.012	0.010	0.010	0.024	0.022	0.032	0.029	-
40	0.019	0.031	0.032	0.028	0.023	0.024	0.032	0.043	0.039	0.052	0.075	-
THC/Iref	0.322	0.300	0.341	0.382	0.460	0.580	0.640	0.831	0.943	0.946	0.904	13
PWHC/Iref	1.455	1.014	0.855	0.786	0.884	1.228	1.050	2.661	3.199	3.027	2.519	22



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Inter-harmonics											
Power P/Pn[%]	0	10	20	30	40	50	60	70	80	90	100
f[Hz]	Ih/Iref[%]										
75	0.038	0.038	0.025	0.038	0.050	0.075	0.104	0.120	0.116	0.151	0.169
125	0.039	0.039	0.025	0.039	0.047	0.069	0.096	0.108	0.128	0.142	0.165
175	0.039	0.039	0.023	0.039	0.022	0.025	0.027	0.043	0.043	0.049	0.055
225	0.032	0.032	0.020	0.032	0.020	0.022	0.021	0.035	0.036	0.042	0.041
275	0.033	0.033	0.025	0.033	0.023	0.024	0.024	0.047	0.048	0.053	0.052
325	0.025	0.025	0.019	0.025	0.017	0.019	0.018	0.033	0.032	0.035	0.034
375	0.025	0.025	0.019	0.025	0.020	0.022	0.023	0.042	0.039	0.044	0.042
425	0.026	0.026	0.017	0.026	0.016	0.019	0.018	0.031	0.031	0.035	0.034
475	0.024	0.024	0.019	0.024	0.017	0.019	0.019	0.034	0.030	0.038	0.037
525	0.024	0.024	0.017	0.024	0.016	0.018	0.017	0.034	0.032	0.038	0.037
575	0.024	0.024	0.016	0.024	0.017	0.020	0.021	0.035	0.035	0.041	0.037
625	0.022	0.022	0.016	0.022	0.016	0.018	0.020	0.032	0.030	0.036	0.034
675	0.021	0.021	0.016	0.021	0.015	0.016	0.019	0.033	0.033	0.038	0.036
725	0.023	0.023	0.016	0.023	0.015	0.017	0.018	0.032	0.032	0.036	0.034
775	0.022	0.022	0.016	0.022	0.015	0.015	0.015	0.029	0.028	0.034	0.033
825	0.021	0.021	0.014	0.021	0.014	0.014	0.014	0.030	0.029	0.035	0.032
875	0.021	0.021	0.015	0.021	0.015	0.016	0.016	0.030	0.031	0.037	0.033
925	0.020	0.020	0.015	0.020	0.015	0.016	0.016	0.029	0.027	0.035	0.031
975	0.018	0.018	0.015	0.018	0.014	0.015	0.016	0.028	0.027	0.035	0.032
1025	0.021	0.021	0.016	0.021	0.018	0.018	0.019	0.030	0.029	0.036	0.032
1075	0.024	0.024	0.082	0.024	0.123	0.133	0.127	0.073	0.071	0.073	0.069
1125	0.019	0.019	0.014	0.019	0.016	0.016	0.017	0.026	0.025	0.033	0.030
1175	0.020	0.020	0.014	0.020	0.014	0.015	0.016	0.028	0.028	0.033	0.030
1225	0.019	0.019	0.013	0.019	0.014	0.015	0.015	0.026	0.026	0.031	0.029
1275	0.017	0.017	0.013	0.017	0.012	0.013	0.015	0.025	0.025	0.032	0.029
1325	0.019	0.019	0.013	0.019	0.013	0.014	0.015	0.026	0.027	0.033	0.031
1375	0.020	0.020	0.015	0.020	0.013	0.014	0.013	0.025	0.023	0.031	0.029
1425	0.018	0.018	0.012	0.018	0.011	0.012	0.013	0.023	0.022	0.031	0.029
1475	0.019	0.019	0.013	0.019	0.013	0.013	0.015	0.025	0.026	0.032	0.030
1525	0.017	0.017	0.012	0.017	0.012	0.013	0.014	0.024	0.024	0.030	0.028
1575	0.016	0.016	0.012	0.016	0.011	0.012	0.013	0.024	0.023	0.030	0.029
1625	0.018	0.018	0.012	0.018	0.012	0.012	0.014	0.024	0.025	0.031	0.030
1675	0.018	0.018	0.014	0.018	0.012	0.012	0.012	0.021	0.022	0.028	0.028
1725	0.016	0.016	0.011	0.016	0.011	0.011	0.012	0.022	0.022	0.031	0.028
1775	0.017	0.017	0.011	0.017	0.011	0.011	0.012	0.022	0.023	0.032	0.028
1825	0.015	0.015	0.011	0.015	0.011	0.011	0.012	0.022	0.021	0.031	0.027
1875	0.014	0.014	0.011	0.014	0.010	0.010	0.011	0.022	0.021	0.030	0.026
1925	0.015	0.015	0.011	0.015	0.010	0.011	0.012	0.022	0.022	0.030	0.026
1975	0.015	0.015	0.012	0.015	0.011	0.010	0.010	0.019	0.018	0.026	0.025

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Higher frequency components											
Power P/Pn[%]	0	10	20	30	40	50	60	70	80	90	100
f[kHz]	Ih/Iref[%]										
2.1	0.141	0.105	0.097	0.089	0.086	0.113	0.106	0.233	0.249	0.252	0.314
2.3	0.085	0.086	0.069	0.061	0.062	0.073	0.075	0.110	0.159	0.200	0.157
2.5	0.084	0.066	0.064	0.058	0.061	0.066	0.082	0.088	0.132	0.116	0.252
2.7	0.105	0.103	0.076	0.068	0.069	0.075	0.083	0.103	0.112	0.151	0.250
2.9	0.084	0.066	0.054	0.049	0.047	0.050	0.057	0.100	0.107	0.094	0.192
3.1	0.089	0.083	0.052	0.049	0.047	0.047	0.054	0.099	0.095	0.098	0.172
3.3	0.140	0.109	0.075	0.071	0.070	0.065	0.068	0.093	0.106	0.137	0.195
3.5	0.138	0.074	0.065	0.059	0.058	0.056	0.057	0.082	0.078	0.109	0.139
3.7	0.185	0.121	0.075	0.067	0.069	0.066	0.070	0.140	0.097	0.103	0.154
3.9	0.194	0.177	0.164	0.136	0.141	0.143	0.133	0.203	0.209	0.201	0.244
4.1	0.058	0.090	0.140	0.123	0.149	0.150	0.160	0.490	0.224	0.407	0.245
4.3	0.044	0.074	0.091	0.086	0.085	0.098	0.102	0.346	0.402	0.748	0.340
4.5	0.034	0.038	0.043	0.044	0.044	0.047	0.047	0.104	0.147	0.194	0.211
4.7	0.024	0.029	0.030	0.032	0.031	0.032	0.033	0.041	0.048	0.062	0.071
4.9	0.014	0.013	0.015	0.017	0.018	0.017	0.025	0.026	0.026	0.032	0.031
5.1	0.012	0.012	0.012	0.014	0.014	0.015	0.015	0.024	0.024	0.027	0.027
5.3	0.010	0.010	0.009	0.010	0.010	0.010	0.012	0.020	0.020	0.021	0.021
5.5	0.010	0.009	0.008	0.009	0.010	0.011	0.012	0.017	0.017	0.018	0.022
5.7	0.012	0.010	0.009	0.009	0.009	0.010	0.013	0.023	0.023	0.023	0.026
5.9	0.010	0.008	0.008	0.008	0.008	0.008	0.011	0.020	0.019	0.019	0.023
6.1	0.011	0.009	0.009	0.009	0.009	0.010	0.012	0.017	0.017	0.019	0.021
6.3	0.010	0.009	0.008	0.008	0.008	0.009	0.012	0.020	0.021	0.022	0.023
6.5	0.008	0.007	0.007	0.007	0.007	0.008	0.012	0.017	0.017	0.019	0.018
6.7	0.007	0.007	0.007	0.007	0.008	0.008	0.015	0.017	0.017	0.016	0.021
6.9	0.007	0.008	0.007	0.007	0.007	0.008	0.011	0.020	0.018	0.018	0.019
7.1	0.009	0.010	0.009	0.010	0.010	0.010	0.015	0.018	0.016	0.017	0.021
7.3	0.008	0.014	0.014	0.014	0.014	0.015	0.019	0.018	0.018	0.018	0.022
7.5	0.011	0.012	0.013	0.013	0.013	0.014	0.017	0.018	0.017	0.017	0.021
7.7	0.007	0.010	0.009	0.010	0.009	0.009	0.011	0.016	0.015	0.016	0.017
7.9	0.006	0.008	0.007	0.012	0.008	0.008	0.009	0.011	0.010	0.011	0.015
8.1	0.007	0.010	0.008	0.009	0.008	0.008	0.011	0.014	0.013	0.014	0.016
8.3	0.008	0.011	0.009	0.026	0.008	0.007	0.009	0.013	0.011	0.013	0.015
8.5	0.008	0.010	0.009	0.019	0.008	0.008	0.008	0.011	0.011	0.012	0.013
8.7	0.009	0.010	0.010	0.009	0.008	0.007	0.008	0.013	0.013	0.014	0.014
8.9	0.009	0.009	0.009	0.009	0.007	0.006	0.008	0.012	0.012	0.013	0.014

# Certificate of Conformity

No. ESY 114387 0056 Rev. 03

Harmonics												
Phase L2-N												
Power P/Pn[%]	0	10	20	30	40	50	60	70	80	90	100	Limit value
Ordinal number	Ih/Iref[%]											[%]
2	0.072	0.078	0.192	0.241	0.268	0.287	0.442	0.188	0.150	0.256	0.383	8.0
3	0.037	0.043	0.032	0.030	0.060	0.095	0.049	0.096	0.121	0.096	0.091	-
4	0.050	0.035	0.051	0.059	0.057	0.048	0.095	0.154	0.177	0.205	0.179	4.0
5	0.078	0.077	0.095	0.118	0.146	0.181	0.179	0.462	0.529	0.536	0.555	10.7
6	0.024	0.020	0.020	0.018	0.019	0.020	0.025	0.043	0.041	0.047	0.046	2.67
7	0.084	0.131	0.062	0.093	0.100	0.103	0.102	0.130	0.128	0.110	0.103	7.2
8	0.031	0.024	0.022	0.037	0.046	0.058	0.060	0.098	0.099	0.109	0.100	2.0
9	0.024	0.017	0.016	0.015	0.017	0.019	0.019	0.039	0.040	0.040	0.040	-
10	0.028	0.022	0.019	0.026	0.036	0.048	0.049	0.046	0.055	0.058	0.056	1.6
11	0.102	0.097	0.132	0.152	0.213	0.272	0.226	0.076	0.120	0.159	0.166	3.1
12	0.020	0.015	0.015	0.015	0.015	0.016	0.021	0.037	0.034	0.038	0.037	1.33
13	0.053	0.097	0.111	0.081	0.147	0.193	0.166	0.313	0.353	0.319	0.231	2.0
14	0.026	0.020	0.019	0.023	0.032	0.043	0.043	0.046	0.053	0.066	0.056	-
15	0.021	0.014	0.014	0.013	0.014	0.016	0.016	0.034	0.036	0.040	0.038	-
16	0.024	0.017	0.016	0.022	0.027	0.034	0.033	0.044	0.052	0.060	0.051	-
17	0.033	0.079	0.064	0.050	0.082	0.165	0.126	0.154	0.156	0.117	0.100	-
18	0.018	0.013	0.014	0.014	0.014	0.016	0.016	0.034	0.029	0.038	0.033	-
19	0.037	0.081	0.045	0.061	0.060	0.108	0.107	0.091	0.142	0.171	0.181	-
20	0.023	0.016	0.015	0.022	0.030	0.034	0.032	0.043	0.043	0.044	0.043	-
21	0.018	0.013	0.013	0.013	0.013	0.016	0.014	0.030	0.033	0.033	0.032	-
22	0.021	0.016	0.015	0.021	0.029	0.035	0.031	0.041	0.039	0.060	0.050	-
23	0.065	0.028	0.039	0.039	0.030	0.032	0.036	0.114	0.105	0.073	0.092	-
24	0.016	0.012	0.013	0.013	0.014	0.015	0.016	0.031	0.029	0.036	0.030	-
25	0.085	0.052	0.040	0.038	0.026	0.036	0.027	0.234	0.239	0.150	0.051	-
26	0.022	0.016	0.015	0.021	0.026	0.029	0.029	0.043	0.046	0.052	0.045	-
27	0.017	0.012	0.012	0.012	0.012	0.013	0.013	0.027	0.029	0.031	0.032	-
28	0.021	0.015	0.015	0.022	0.026	0.031	0.032	0.049	0.046	0.063	0.043	-
29	0.103	0.064	0.039	0.035	0.033	0.037	0.035	0.090	0.085	0.068	0.077	-
30	0.015	0.012	0.013	0.014	0.014	0.015	0.015	0.027	0.028	0.035	0.031	-
31	0.112	0.059	0.051	0.038	0.047	0.051	0.037	0.272	0.356	0.304	0.185	-
32	0.020	0.014	0.015	0.022	0.022	0.024	0.029	0.032	0.038	0.045	0.046	-
33	0.015	0.011	0.011	0.012	0.011	0.012	0.013	0.027	0.027	0.034	0.031	-
34	0.020	0.014	0.020	0.023	0.024	0.026	0.031	0.037	0.055	0.070	0.051	-
35	0.110	0.084	0.058	0.040	0.053	0.061	0.039	0.195	0.183	0.126	0.066	-
36	0.013	0.013	0.018	0.017	0.015	0.015	0.015	0.027	0.026	0.036	0.031	-
37	0.114	0.059	0.061	0.050	0.058	0.078	0.053	0.097	0.223	0.284	0.278	-
38	0.019	0.016	0.020	0.023	0.020	0.021	0.028	0.052	0.040	0.046	0.041	-
39	0.013	0.011	0.011	0.010	0.011	0.010	0.011	0.024	0.024	0.032	0.029	-
40	0.018	0.034	0.030	0.027	0.023	0.023	0.031	0.044	0.037	0.055	0.071	-
THC/Iref	0.329	0.304	0.332	0.374	0.459	0.567	0.619	0.821	0.938	0.933	0.903	13
PWHC/Iref	1.449	1.028	0.842	0.773	0.869	1.219	1.040	2.672	3.218	3.026	2.498	22

# Certificate of Conformity

No. ESY 114387 0056 Rev. 03

Inter-harmonics											
Phase L2-N											
Power P/Pn[%]	0	10	20	30	40	50	60	70	80	90	100
f[Hz]	Ih/Iref[%]										
75	0.037	0.037	0.025	0.037	0.045	0.072	0.093	0.116	0.130	0.140	0.183
125	0.038	0.038	0.026	0.038	0.049	0.067	0.103	0.107	0.127	0.151	0.157
175	0.038	0.038	0.023	0.038	0.021	0.023	0.024	0.042	0.046	0.046	0.048
225	0.032	0.032	0.020	0.032	0.019	0.021	0.020	0.036	0.038	0.040	0.040
275	0.032	0.032	0.026	0.032	0.024	0.026	0.024	0.048	0.048	0.053	0.048
325	0.024	0.024	0.020	0.024	0.018	0.019	0.018	0.032	0.032	0.036	0.034
375	0.025	0.025	0.020	0.025	0.020	0.023	0.022	0.042	0.038	0.044	0.042
425	0.025	0.025	0.018	0.025	0.018	0.020	0.020	0.031	0.030	0.038	0.033
475	0.024	0.024	0.019	0.024	0.017	0.018	0.018	0.034	0.031	0.038	0.037
525	0.024	0.024	0.017	0.024	0.015	0.016	0.016	0.033	0.032	0.039	0.037
575	0.024	0.024	0.017	0.024	0.018	0.020	0.021	0.035	0.035	0.042	0.037
625	0.022	0.022	0.017	0.022	0.016	0.018	0.019	0.032	0.031	0.036	0.034
675	0.021	0.021	0.016	0.021	0.015	0.017	0.017	0.034	0.033	0.037	0.035
725	0.023	0.023	0.016	0.023	0.016	0.017	0.020	0.032	0.032	0.038	0.033
775	0.023	0.023	0.016	0.023	0.014	0.015	0.014	0.029	0.029	0.033	0.033
825	0.021	0.021	0.014	0.021	0.014	0.014	0.014	0.030	0.029	0.034	0.032
875	0.021	0.021	0.015	0.021	0.015	0.016	0.016	0.030	0.029	0.037	0.033
925	0.020	0.020	0.015	0.020	0.014	0.016	0.016	0.029	0.028	0.035	0.031
975	0.018	0.018	0.014	0.018	0.014	0.015	0.015	0.029	0.028	0.034	0.032
1025	0.020	0.020	0.016	0.020	0.017	0.017	0.019	0.031	0.029	0.037	0.032
1075	0.025	0.025	0.064	0.025	0.097	0.105	0.103	0.065	0.063	0.058	0.053
1125	0.019	0.019	0.013	0.019	0.015	0.014	0.015	0.027	0.025	0.032	0.030
1175	0.020	0.020	0.014	0.020	0.014	0.015	0.016	0.029	0.029	0.034	0.031
1225	0.018	0.018	0.013	0.018	0.013	0.014	0.015	0.026	0.027	0.032	0.029
1275	0.017	0.017	0.013	0.017	0.012	0.013	0.014	0.025	0.026	0.031	0.029
1325	0.018	0.018	0.013	0.018	0.013	0.015	0.016	0.028	0.028	0.036	0.031
1375	0.019	0.019	0.014	0.019	0.013	0.013	0.013	0.025	0.023	0.030	0.030
1425	0.018	0.018	0.012	0.018	0.011	0.012	0.013	0.024	0.023	0.030	0.029
1475	0.019	0.019	0.013	0.019	0.013	0.014	0.015	0.026	0.026	0.035	0.031
1525	0.017	0.017	0.012	0.017	0.011	0.013	0.014	0.025	0.025	0.031	0.029
1575	0.015	0.015	0.012	0.015	0.011	0.011	0.013	0.024	0.024	0.030	0.029
1625	0.017	0.017	0.013	0.017	0.012	0.013	0.015	0.025	0.025	0.033	0.030
1675	0.017	0.017	0.013	0.017	0.011	0.011	0.012	0.022	0.022	0.028	0.027
1725	0.016	0.016	0.011	0.016	0.010	0.010	0.011	0.022	0.022	0.030	0.027
1775	0.017	0.017	0.012	0.017	0.012	0.011	0.013	0.023	0.023	0.033	0.029
1825	0.015	0.015	0.011	0.015	0.010	0.011	0.012	0.022	0.022	0.031	0.027
1875	0.014	0.014	0.011	0.014	0.010	0.010	0.011	0.022	0.021	0.030	0.026
1925	0.015	0.015	0.011	0.015	0.010	0.011	0.013	0.023	0.022	0.031	0.027
1975	0.015	0.015	0.011	0.015	0.010	0.010	0.010	0.020	0.018	0.026	0.025

# Certificate of Conformity

No. ESY 114387 0056 Rev. 03

Higher frequency components											
Phase L2-N											
Power P/Pn[%]	0	10	20	30	40	50	60	70	80	90	100
f[kHz]	Ih/Iref[%]										
2.1	0.141	0.105	0.097	0.094	0.095	0.121	0.116	0.252	0.268	0.269	0.300
2.3	0.085	0.086	0.069	0.060	0.061	0.069	0.078	0.119	0.174	0.221	0.161
2.5	0.081	0.067	0.063	0.056	0.058	0.065	0.079	0.084	0.126	0.116	0.237
2.7	0.104	0.108	0.075	0.069	0.069	0.076	0.087	0.109	0.115	0.153	0.254
2.9	0.085	0.071	0.054	0.048	0.047	0.051	0.058	0.105	0.116	0.098	0.213
3.1	0.087	0.084	0.052	0.047	0.046	0.047	0.054	0.100	0.098	0.096	0.167
3.3	0.141	0.110	0.074	0.071	0.070	0.067	0.072	0.099	0.116	0.148	0.208
3.5	0.144	0.081	0.065	0.060	0.059	0.058	0.058	0.089	0.083	0.112	0.148
3.7	0.197	0.114	0.076	0.066	0.067	0.065	0.070	0.128	0.095	0.111	0.144
3.9	0.186	0.172	0.165	0.138	0.144	0.145	0.137	0.207	0.193	0.208	0.255
4.1	0.059	0.093	0.152	0.136	0.171	0.169	0.179	0.597	0.241	0.476	0.280
4.3	0.042	0.069	0.091	0.084	0.082	0.100	0.102	0.366	0.403	0.825	0.365
4.5	0.034	0.037	0.044	0.044	0.047	0.051	0.054	0.116	0.168	0.223	0.241
4.7	0.024	0.029	0.030	0.032	0.032	0.033	0.036	0.044	0.052	0.070	0.075
4.9	0.013	0.013	0.015	0.017	0.020	0.021	0.025	0.028	0.027	0.036	0.032
5.1	0.011	0.012	0.012	0.014	0.018	0.021	0.025	0.026	0.024	0.028	0.028
5.3	0.009	0.010	0.009	0.010	0.012	0.013	0.017	0.021	0.022	0.022	0.023
5.5	0.009	0.009	0.008	0.010	0.014	0.017	0.018	0.019	0.017	0.020	0.022
5.7	0.012	0.010	0.009	0.010	0.015	0.018	0.022	0.024	0.022	0.023	0.025
5.9	0.010	0.008	0.008	0.009	0.010	0.010	0.016	0.021	0.019	0.019	0.024
6.1	0.010	0.009	0.009	0.011	0.015	0.017	0.018	0.019	0.017	0.020	0.022
6.3	0.010	0.009	0.008	0.010	0.014	0.017	0.020	0.019	0.020	0.020	0.022
6.5	0.007	0.007	0.007	0.008	0.009	0.010	0.016	0.017	0.017	0.018	0.020
6.7	0.007	0.007	0.007	0.009	0.014	0.016	0.017	0.018	0.017	0.017	0.021
6.9	0.007	0.008	0.007	0.009	0.014	0.017	0.019	0.018	0.016	0.018	0.017
7.1	0.009	0.010	0.009	0.010	0.012	0.012	0.017	0.018	0.017	0.017	0.020
7.3	0.008	0.014	0.014	0.015	0.018	0.020	0.021	0.019	0.018	0.018	0.023
7.5	0.010	0.013	0.013	0.014	0.018	0.020	0.022	0.017	0.016	0.016	0.021
7.7	0.007	0.010	0.009	0.010	0.011	0.012	0.015	0.017	0.017	0.017	0.019
7.9	0.006	0.009	0.007	0.009	0.013	0.014	0.013	0.013	0.011	0.013	0.018
8.1	0.008	0.010	0.009	0.009	0.013	0.014	0.016	0.014	0.011	0.014	0.016
8.3	0.009	0.017	0.010	0.011	0.010	0.012	0.013	0.016	0.019	0.018	0.018
8.5	0.009	0.012	0.009	0.010	0.013	0.013	0.012	0.012	0.012	0.014	0.016
8.7	0.010	0.011	0.011	0.009	0.013	0.013	0.013	0.012	0.011	0.014	0.014
8.9	0.009	0.009	0.009	0.009	0.009	0.009	0.011	0.013	0.013	0.014	0.017

# Certificate of Conformity

No. ESY 114387 0056 Rev. 03

Harmonics												
Phase L3-N												
Power P/Pn[%]	0	10	20	30	40	50	60	70	80	90	100	Limit value
Ordinal number	Ih/Iref[%]											[%]
2	0.068	0.066	0.176	0.233	0.249	0.273	0.441	0.217	0.161	0.317	0.398	8.0
3	0.036	0.051	0.029	0.028	0.055	0.096	0.044	0.096	0.118	0.092	0.096	-
4	0.048	0.030	0.058	0.067	0.065	0.053	0.091	0.162	0.188	0.201	0.175	4.0
5	0.060	0.057	0.095	0.117	0.144	0.176	0.179	0.464	0.525	0.536	0.557	10.7
6	0.026	0.020	0.020	0.018	0.020	0.023	0.023	0.038	0.039	0.049	0.047	2.67
7	0.085	0.122	0.070	0.093	0.093	0.100	0.091	0.129	0.120	0.110	0.096	7.2
8	0.031	0.023	0.025	0.034	0.046	0.058	0.059	0.092	0.096	0.108	0.103	2.0
9	0.024	0.024	0.019	0.017	0.018	0.020	0.019	0.040	0.045	0.043	0.042	-
10	0.028	0.022	0.020	0.023	0.038	0.049	0.051	0.044	0.058	0.053	0.057	1.6
11	0.094	0.092	0.139	0.150	0.213	0.273	0.222	0.082	0.123	0.170	0.168	3.1
12	0.022	0.016	0.016	0.015	0.017	0.015	0.021	0.038	0.038	0.046	0.036	1.33
13	0.056	0.087	0.109	0.087	0.148	0.195	0.165	0.305	0.347	0.315	0.225	2.0
14	0.025	0.020	0.020	0.022	0.032	0.045	0.042	0.045	0.048	0.062	0.056	-
15	0.021	0.015	0.015	0.014	0.014	0.016	0.018	0.037	0.036	0.044	0.039	-
16	0.023	0.018	0.018	0.022	0.029	0.034	0.034	0.045	0.055	0.055	0.048	-
17	0.032	0.067	0.063	0.049	0.083	0.161	0.122	0.151	0.152	0.109	0.104	-
18	0.019	0.014	0.014	0.014	0.014	0.015	0.016	0.030	0.029	0.040	0.035	-
19	0.036	0.076	0.047	0.062	0.059	0.110	0.105	0.092	0.143	0.174	0.178	-
20	0.023	0.018	0.016	0.020	0.029	0.035	0.032	0.040	0.044	0.050	0.043	-
21	0.019	0.015	0.014	0.014	0.014	0.015	0.014	0.031	0.030	0.035	0.033	-
22	0.022	0.015	0.016	0.019	0.029	0.033	0.029	0.039	0.040	0.056	0.047	-
23	0.072	0.030	0.044	0.041	0.027	0.031	0.037	0.114	0.102	0.068	0.096	-
24	0.018	0.012	0.012	0.012	0.014	0.014	0.014	0.027	0.030	0.035	0.034	-
25	0.084	0.045	0.037	0.037	0.024	0.033	0.028	0.234	0.237	0.148	0.054	-
26	0.023	0.017	0.017	0.019	0.025	0.032	0.030	0.039	0.046	0.052	0.048	-
27	0.017	0.012	0.012	0.013	0.012	0.013	0.013	0.030	0.028	0.033	0.032	-
28	0.022	0.015	0.017	0.020	0.025	0.029	0.032	0.046	0.046	0.060	0.041	-
29	0.106	0.064	0.039	0.038	0.036	0.038	0.036	0.094	0.088	0.068	0.080	-
30	0.016	0.012	0.013	0.012	0.012	0.013	0.014	0.026	0.028	0.033	0.033	-
31	0.112	0.057	0.050	0.040	0.049	0.049	0.037	0.268	0.354	0.303	0.189	-
32	0.020	0.014	0.019	0.021	0.023	0.027	0.030	0.031	0.039	0.043	0.048	-
33	0.015	0.012	0.012	0.013	0.011	0.012	0.012	0.028	0.027	0.036	0.031	-
34	0.021	0.013	0.018	0.021	0.023	0.024	0.031	0.033	0.056	0.066	0.052	-
35	0.113	0.085	0.062	0.042	0.057	0.064	0.041	0.197	0.182	0.127	0.068	-
36	0.014	0.013	0.013	0.013	0.012	0.012	0.012	0.025	0.024	0.039	0.031	-
37	0.113	0.059	0.060	0.050	0.059	0.075	0.052	0.094	0.223	0.289	0.283	-
38	0.018	0.023	0.028	0.024	0.022	0.023	0.030	0.052	0.044	0.047	0.043	-
39	0.014	0.012	0.011	0.012	0.011	0.010	0.011	0.025	0.023	0.033	0.029	-
40	0.018	0.021	0.023	0.021	0.020	0.021	0.029	0.039	0.039	0.050	0.072	-
THC/Iref	0.325	0.283	0.330	0.370	0.448	0.558	0.613	0.825	0.934	0.951	0.912	13
PWHC/Iref	1.469	0.992	0.853	0.770	0.879	1.206	1.029	2.652	3.206	3.027	2.542	22

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Inter-harmonics											
Phase L3-N											
Power P/Pn[%]	0	10	20	30	40	50	60	70	80	90	100
f[Hz]	Ih/Iref[%]										
75	0.038	0.036	0.025	0.036	0.049	0.065	0.106	0.105	0.139	0.161	0.161
125	0.039	0.037	0.025	0.037	0.048	0.072	0.100	0.114	0.120	0.146	0.167
175	0.039	0.039	0.023	0.039	0.021	0.023	0.025	0.042	0.044	0.048	0.047
225	0.032	0.032	0.020	0.032	0.019	0.020	0.021	0.035	0.036	0.043	0.038
275	0.033	0.033	0.026	0.033	0.024	0.025	0.023	0.047	0.046	0.053	0.048
325	0.025	0.024	0.019	0.024	0.018	0.019	0.019	0.032	0.031	0.035	0.033
375	0.025	0.025	0.019	0.025	0.019	0.021	0.022	0.041	0.039	0.044	0.040
425	0.026	0.026	0.017	0.026	0.017	0.019	0.019	0.032	0.030	0.036	0.033
475	0.024	0.026	0.018	0.026	0.017	0.018	0.018	0.033	0.030	0.038	0.037
525	0.024	0.024	0.017	0.024	0.016	0.017	0.017	0.033	0.032	0.039	0.037
575	0.024	0.024	0.017	0.024	0.017	0.020	0.021	0.035	0.034	0.040	0.038
625	0.022	0.022	0.016	0.022	0.016	0.018	0.020	0.031	0.031	0.036	0.034
675	0.021	0.020	0.015	0.020	0.014	0.016	0.018	0.032	0.033	0.037	0.034
725	0.023	0.022	0.016	0.022	0.015	0.017	0.019	0.032	0.032	0.036	0.034
775	0.022	0.023	0.015	0.023	0.014	0.015	0.015	0.029	0.028	0.034	0.033
825	0.021	0.021	0.014	0.021	0.013	0.014	0.014	0.029	0.030	0.034	0.032
875	0.021	0.020	0.015	0.020	0.015	0.016	0.016	0.031	0.029	0.036	0.033
925	0.020	0.019	0.014	0.019	0.015	0.016	0.017	0.028	0.028	0.034	0.030
975	0.018	0.018	0.014	0.018	0.014	0.014	0.015	0.028	0.028	0.035	0.031
1025	0.021	0.020	0.014	0.020	0.015	0.016	0.017	0.030	0.028	0.035	0.032
1075	0.024	0.022	0.046	0.022	0.065	0.070	0.064	0.067	0.063	0.056	0.054
1125	0.019	0.020	0.013	0.020	0.013	0.013	0.014	0.026	0.026	0.032	0.030
1175	0.020	0.020	0.013	0.020	0.014	0.015	0.015	0.028	0.027	0.033	0.030
1225	0.019	0.019	0.013	0.019	0.013	0.014	0.015	0.025	0.027	0.030	0.028
1275	0.017	0.017	0.012	0.017	0.013	0.013	0.015	0.025	0.025	0.031	0.029
1325	0.019	0.019	0.013	0.019	0.012	0.014	0.015	0.026	0.027	0.033	0.031
1375	0.020	0.020	0.013	0.020	0.013	0.013	0.014	0.024	0.023	0.031	0.029
1425	0.018	0.019	0.012	0.019	0.011	0.012	0.013	0.023	0.022	0.030	0.028
1475	0.019	0.019	0.013	0.019	0.013	0.014	0.015	0.025	0.025	0.033	0.030
1525	0.017	0.017	0.012	0.017	0.012	0.012	0.015	0.025	0.025	0.029	0.027
1575	0.016	0.015	0.011	0.015	0.011	0.012	0.013	0.024	0.024	0.030	0.029
1625	0.018	0.017	0.012	0.017	0.011	0.012	0.014	0.024	0.024	0.030	0.030
1675	0.018	0.018	0.012	0.018	0.011	0.011	0.012	0.022	0.022	0.028	0.028
1725	0.016	0.017	0.011	0.017	0.010	0.010	0.012	0.021	0.022	0.030	0.027
1775	0.017	0.017	0.011	0.017	0.011	0.011	0.012	0.022	0.022	0.032	0.028
1825	0.015	0.015	0.011	0.015	0.010	0.011	0.012	0.022	0.023	0.030	0.026
1875	0.014	0.013	0.010	0.013	0.010	0.010	0.012	0.022	0.022	0.030	0.025
1925	0.015	0.015	0.011	0.015	0.010	0.010	0.012	0.021	0.021	0.028	0.027
1975	0.015	0.016	0.010	0.016	0.010	0.010	0.010	0.020	0.018	0.025	0.026



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Higher frequency components											
Phase L3-N											
Power P/Pn[%]	0	10	20	30	40	50	60	70	80	90	100
f[kHz]	Ih/Iref[%]										
2.1	0.140	0.106	0.094	0.087	0.084	0.112	0.106	0.242	0.256	0.263	0.311
2.3	0.084	0.087	0.071	0.061	0.063	0.072	0.080	0.107	0.163	0.210	0.164
2.5	0.081	0.067	0.062	0.056	0.059	0.065	0.079	0.083	0.128	0.115	0.244
2.7	0.103	0.102	0.073	0.068	0.071	0.078	0.087	0.102	0.111	0.153	0.255
2.9	0.084	0.065	0.055	0.048	0.049	0.053	0.061	0.101	0.109	0.093	0.209
3.1	0.088	0.078	0.052	0.046	0.047	0.048	0.056	0.098	0.094	0.092	0.166
3.3	0.139	0.104	0.072	0.070	0.071	0.067	0.073	0.092	0.108	0.140	0.206
3.5	0.145	0.078	0.066	0.059	0.061	0.058	0.060	0.082	0.077	0.108	0.144
3.7	0.191	0.110	0.073	0.066	0.067	0.065	0.071	0.133	0.094	0.105	0.155
3.9	0.181	0.171	0.160	0.135	0.142	0.141	0.133	0.198	0.201	0.204	0.246
4.1	0.058	0.095	0.148	0.130	0.162	0.155	0.166	0.518	0.223	0.429	0.250
4.3	0.041	0.068	0.087	0.081	0.081	0.096	0.102	0.355	0.398	0.762	0.350
4.5	0.034	0.039	0.044	0.044	0.049	0.052	0.054	0.110	0.163	0.220	0.216
4.7	0.023	0.029	0.031	0.033	0.033	0.035	0.037	0.041	0.050	0.066	0.072
4.9	0.013	0.013	0.015	0.018	0.022	0.024	0.030	0.028	0.028	0.034	0.034
5.1	0.011	0.012	0.012	0.015	0.021	0.024	0.026	0.023	0.022	0.025	0.025
5.3	0.009	0.010	0.009	0.012	0.015	0.017	0.019	0.016	0.017	0.017	0.018
5.5	0.009	0.009	0.009	0.011	0.017	0.020	0.025	0.019	0.018	0.021	0.023
5.7	0.011	0.010	0.009	0.011	0.018	0.020	0.022	0.022	0.021	0.021	0.023
5.9	0.009	0.008	0.008	0.010	0.013	0.015	0.016	0.017	0.015	0.016	0.021
6.1	0.010	0.009	0.009	0.011	0.017	0.019	0.024	0.019	0.018	0.021	0.022
6.3	0.010	0.009	0.008	0.010	0.017	0.019	0.019	0.018	0.019	0.019	0.021
6.5	0.007	0.007	0.007	0.009	0.012	0.013	0.015	0.014	0.015	0.016	0.017
6.7	0.006	0.007	0.007	0.010	0.016	0.018	0.021	0.018	0.018	0.018	0.022
6.9	0.006	0.008	0.008	0.009	0.016	0.017	0.016	0.018	0.016	0.017	0.017
7.1	0.008	0.010	0.010	0.011	0.013	0.014	0.016	0.016	0.015	0.016	0.019
7.3	0.007	0.014	0.014	0.015	0.019	0.020	0.023	0.019	0.018	0.019	0.023
7.5	0.011	0.013	0.013	0.014	0.019	0.019	0.020	0.016	0.016	0.016	0.020
7.7	0.008	0.010	0.009	0.011	0.013	0.013	0.015	0.016	0.016	0.017	0.018
7.9	0.006	0.008	0.007	0.010	0.014	0.016	0.017	0.013	0.012	0.013	0.017
8.1	0.007	0.010	0.009	0.009	0.014	0.015	0.012	0.013	0.011	0.012	0.014
8.3	0.008	0.011	0.009	0.015	0.011	0.011	0.013	0.012	0.011	0.012	0.014
8.5	0.008	0.010	0.009	0.013	0.015	0.015	0.016	0.013	0.013	0.014	0.014
8.7	0.009	0.010	0.010	0.010	0.014	0.014	0.010	0.012	0.011	0.012	0.012
8.9	0.009	0.009	0.009	0.010	0.011	0.010	0.013	0.011	0.011	0.012	0.013

Supplementary information:  
Iref=36.1A



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## E.6 Certificate of the network and system protection

Certificate of NS protection	
<b>Manufacturer</b>	Huawei Digital Power Technologies Co.,Ltd
<b>Type of NS protection</b>	Integrated NS protection
<b>Central NS protection</b>	<input type="checkbox"/>
<b>Integrated NS protection</b>	<input checked="" type="checkbox"/> Assigned to power generation unit of type: <u>SUN2000-12KTL-M5, SUN2000-15KTL-M5,</u> <u>SUN2000-17KTL-M5, SUN2000-20KTL-M5,</u> <u>SUN2000-25KTL-M5, SUN2000-12K-MB0, SUN2000-</u> <u>15K- MB0, SUN2000-17K- MB0, SUN2000-20K- MB0,</u> <u>SUN2000-25K- MB0, SUN5000-17K-MB0, SUN5000-</u> <u>25K-MB0</u>
<b>Network connection rule</b>	<b>VDE-AR-N 4105:2018-11 “Generators connected to the low-voltage distribution network”</b>  Technical minimum requirements for connection and parallel operation of power generation systems connected to the low-voltage network
<b>Test requirement</b>	<b>DIN VDE V 0124-100 (VDE V 0124-100):2020-06 “Network integration of power generation systems – Low voltage”</b>  Test requirements for power generation units intended for connection to and parallel operation on the low-voltage network
<b>Test report</b>	<u>64.290.22.30602.03</u> from <u>2023-06-04</u>
The network and system protection designated above meets the requirements of VDE-AR-N 4105:2018-11.	

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## E.7 Requirement for the test report for the NS protection

<b>Extract from test report for NS protection</b>			
"Determination of electrical properties"			
<b>NS protection test report</b>			
<b>Type of NS system:</b>	Integrated NS protection	<b>Other Manufacturer indications</b>	
<b>Software version:</b>	V200R023		
<b>Manufacturer:</b>	<u>Huawei Digital Power Technologies Co.,Ltd.</u> Office 01, 39th Floor, Block A Antuoshan Headquarters Towers 33 Antuoshan 6th Road, Futian District 518043 Shenzhen PEOPLE'S REPUBLIC OF CHINA		
<b>Measuring period:</b>	From 2022-08-01 to 2023-01-12, 2023-05-11 to 2023-05-15, 2024-06-03 to 2024-06-04		
		<b>Inverter</b>	
<b>Protection function</b>	<b>Setting value</b>	<b>Tripping value</b>	<b>Tripping time NS protection*</b>
Rise-in-voltage protection $U >>$	$1.25 * U_n$	L1-N/L2-N/L3-N: 287.9V/287.9V/287.7V; L1-N: 289.0 V; L2-N: 288.9 V; L3-N: 288.9 V;	L1-N/L2-N/L3-N: 118.9 ms; L1-N: 133.4 ms; L2-N: 131.4 ms; L3-N: 131.8 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/L2-N/L3-N: 183.4V/183.4V/183.3V; L1-N: 182.4 V; L2-N: 182.3 V; L3-N: 182.3 V;	L1-N/L2-N/L3-N: 3080.0 ms; L1-N: 3080.0 ms; L2-N: 3080.0 ms; L3-N: 3070.0 ms;
Voltage drop protection $U <<$	$0.45 * U_n$	L1-N/L2-N/L3-N: 102.6V/102.6V/102.6V; L1-N: 105.6 V; L2-N: 105.6 V; L3-N: 101.3 V;	L1-N/L2-N/L3-N: 320.4 ms; L1-N: 330.1 ms; L2-N: 331.1 ms; L3-N: 327.0 ms;
Frequency decrease protection $f <$	47.5 Hz	47.5 Hz	109.7 ms
Frequency increase protection $f >$	51.5 Hz	51.5 Hz	115.5 ms

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<p>*: The tripping time includes the period from the limit value violation <math>U/f</math> until the tripping signal to the interface switch.</p> <p>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.</p> <p>The disconnection time (sum of tripping time of the NS protection plus response time of the interface switch) shall not exceed 200 ms.</p>	
<p>**: Verification disconnection time of moving 10-min-average value.</p> <p>Disconnecting time as below:</p> <p>487.0s (L1-N&amp;L2-N&amp;L3-N from 600s@<math>U_n</math> to 112%<math>U_n</math>)</p> <p>Continuous operation (L1-N&amp;L2-N&amp;L3-N from 600s@<math>U_n</math> to 108%<math>U_n</math>)</p> <p>300.0s (L1-N&amp;L2-N&amp;L3-N from 600s@106%<math>U_n</math> to 114%<math>U_n</math>)</p>	
<p><input checked="" type="checkbox"/> as integrated NS protection</p>	
<p>Assigned to power generation unit type</p>	<p><u>SUN2000-12KTL-M5,</u>  <u>SUN2000-15KTL-M5,</u>  <u>SUN2000-17KTL-M5,</u>  <u>SUN2000-20KTL-M5,</u>  <u>SUN2000-25KTL-M5,</u>  <u>SUN2000-12K-MB0,</u>  <u>SUN2000-15K- MB0,</u>  <u>SUN2000-17K- MB0,</u>  <u>SUN2000-20K- MB0,</u>  <u>SUN2000-25K- MB0,</u>  <u>SUN5000-17K-MB0,</u>  <u>SUN5000-25K-MB0</u></p>
<p>Integrated interface switch type</p>	<p>Series-connected relays for all phase conductors each</p> <p>Relay type: HF161F</p>
<p>Response time of interface switch for integrated NS protection</p>	<p>Release time: Max. 10 ms</p>
<p>Verification of the entire functional chain "integrated NS protection – interface switch" has resulted in successful disconnection.</p>	<p><input checked="" type="checkbox"/></p>