Prüfbericht-Nr.: *Test report no.*:	NN227BEW 002	**Auftrags-Nr.:** *Order no.*:	244424617	Seite 1 von 7 *Page 1 of 7*
Kunden-Referenz-Nr.: *Client reference no.*:	2427687	**Auftragsdatum:** *Order date*:	2022.05.20	
Auftraggeber: *Client*:	**VILION (SHENZHEN) NEW ENERGY TECHNOLOGY CO.,LTD** Room 811, Block A, MeiXun Digital Technology Park, 19 JinXiu Middle Road, Pingshan District, Shenzhen, China.			
Prüfgegenstand: *Test item*:	AC/DC Inverter			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	MA1000K60, MA1000K30			
Auftrags-Inhalt: *Order content*:	AK certificate			
Prüfgrundlage: *Test specification*:	G99/1-8 *Requirements for the connection of generation equipment in parallel with public distribution networks on or after 27 April 2019*			

Wareneingangsdatum: *Date of sample receipt*:	2022.05.23
Prüfmuster-Nr.: *Test sample no.*:	Engineering Sample
Prüfzeitraum: *Testing period*:	2022.05.23–2022.06.02
Ort der Prüfung: *Place of testing*:	TÜV Rheinland (Shanghai) Co., Ltd.
Prüflaboratorium: *Testing laboratory*:	TÜV Rheinland (Shanghai) Co., Ltd.
Prüfergebnis*: *Test result**:	Pass

geprüft von:
tested by: Haipeng Zheng/ Project engineer

Datum:
Date: 2022.06.02 Haipeng Zheng

Stellung / *Position* Project Engineer

genehmigt von:
authorized by: Allen Hu/ Reviewer

Ausstellungsdatum:
Issue date: 2022.06.02 Allen Hu

Stellung / *Position* Reviewer

Sonstiges / *Other*:

1) According to the client's statement the inverter's connection design as type A.
2) The model MA1000K60 were performed fully type tested to represent to other family models. The model MA1000K30 were performed partially type tested to meet the difference requirements of standards.
3) The mentioned models listed on above are identical to the original models MA1000K60, MA1000K30 in the previous section report NN227BEW 001 except for trademark and/or license holder etc. See following pages for details.

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

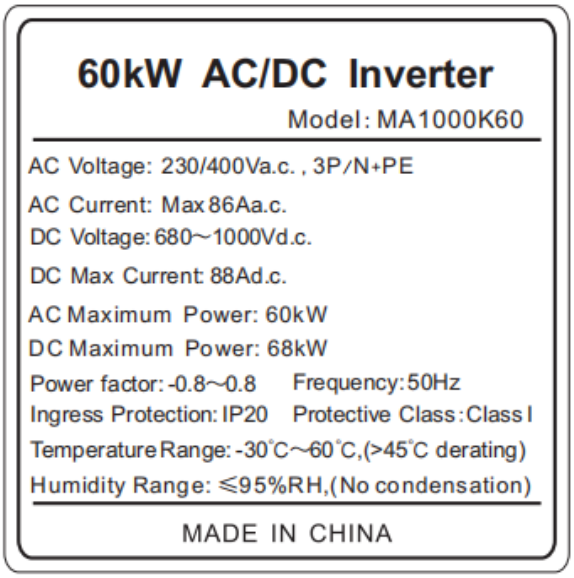
* Legende	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* *Legend:*	*P(ass) = passed a.m. test specification(s)*	*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

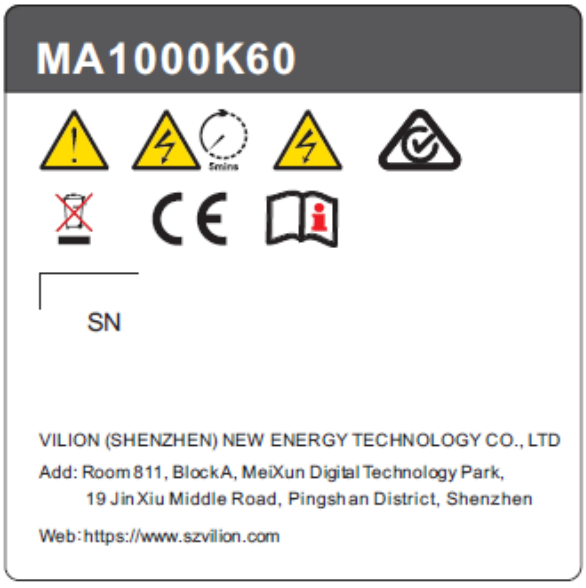
Liste der verwendeten Prüfmittel
List of used test equipment

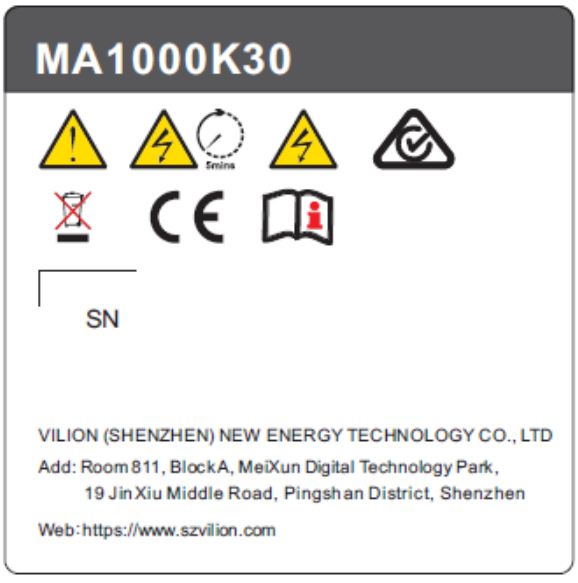
Equip.	Description	Model	Manufacturer	Last Date DD.MM.YYYY	Due Date DD.MM.YYYY
9017073	Power Analyser(DEWETRON)	DEWE2-PA7	Austria, DEWETRON	09.06.2021	09.06.2022
9017078	Programmable AC Source(61860)	61860	Chroma ATE INC.	NA*	NA*
G1819269	Harmonic impedance analog flicker system	ACLT-6150	QUNLING Energy Resources	09.12.2021	09.12.2022
G1819277	PV array simulator	62150H-1000S	Chroma Co.	NA*	NA*
G1819278	PV array simulator	62150H-1000S	Chroma Co.	NA*	NA*
G1819279	PV array simulator	62150H-1000S	Chroma Co.	NA*	NA*
G1819280	PV array simulator	62150H-1000S	Chroma Co.	NA*	NA*
G1819282	Anti-islanding Protection test Load	ACLT-3830H	INNET INTERNAT IONAL	NA*	NA*

Produktbeschreibung
Product description

Copy of marking plate:



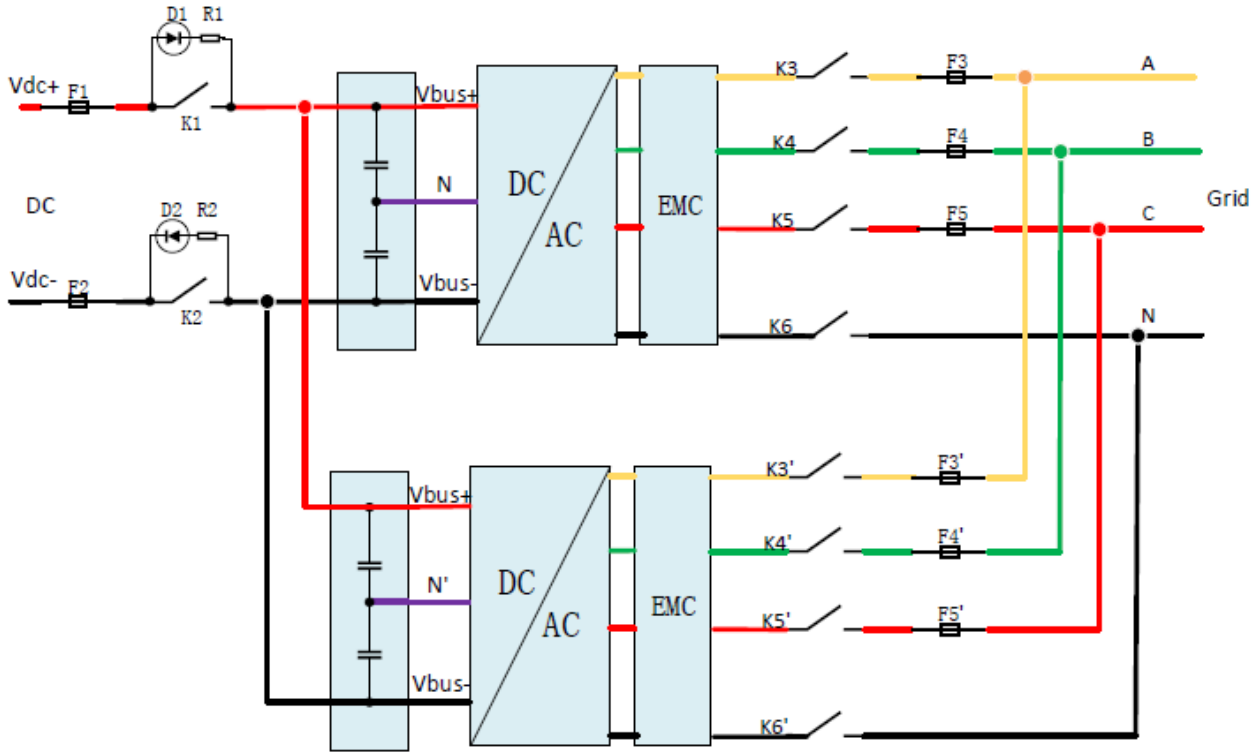




Produktbeschreibung
Product description

Breif description:

The PECs under test model are three-phase grid connected inverter for battery power, they are birdirctional converter, the power can flow from battery to grid, and can flow from grid to battery also.



Block diagram

The models of MA 1000K60 series are technical equivalent on topological schematic circuit diagram and control solution codes except for the type designation, the input/output rating.

Produktbeschreibung
Product description

Model List:

MODELS LIST		MA1000K30	MA1000K60
INPUT	Maximum voltage [Vd.c.]	1000	
	Rated voltage [Vd.c.]	800	
	Maximum power [kW]	34	68
	Maximum current [Ad.c.]	44	88
OUTPUT	Rated Output Voltage Ur [Vac]	3 / N / PE, AC 230/400	
	Rated Output Frequency F_{NETZ} [Hz]	50	
	Rated Output Power P_E [kW]	30	60
	Max. Continuous Apparent Power P_{Emax} [kVA]	30	60
	Max. Continuous Output Current Imax[A]	43	86
	Power Factor cosφ [λ]	0.8leading- 0,8lagging	
	Overvoltage Category (OVC)	III	
SYSTEM	Protective Class	I	
	Enclosure Protection (IP)	IP20	
	Operating Temperature Range [°C]	-30 to 60°C (> 45 °C derating)	
	Altitude [m]	≤2000	
	Weight [kg]	25	28
	Dimensions (W*D*H) [mm]	436*550*130	
	Firmware version	V418D39	

Absatz *Clause*	Anforderungen - Prüfungen *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
10	Protection	Considered, see appended test table for detail.	P
11	Type A Power Generating Module Technical Requirements	Considered, see appended test table for detail.	P

ANLAGE zum Prüfbericht-Nr.: NN227BEW 002
APPENDIX to Test Report No.:

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

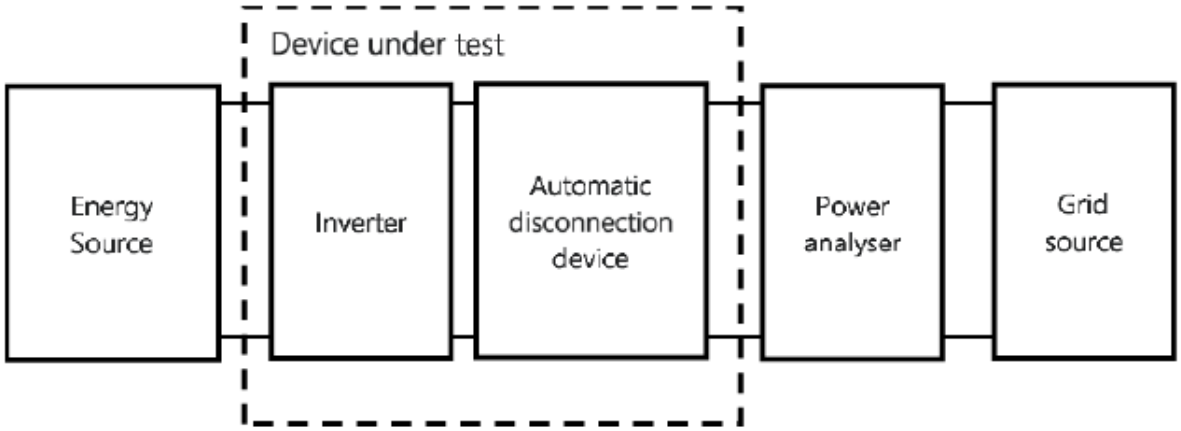
See attachment for test data.

Prüfbericht-Nr.: *Test report no.:*	**NN227BEW 002**	Seite 1 von 20 *Page 1 of 20*

Project Engineer:	Haipeng Zheng	Reviewer:	Allen Hu
Signature:	Haipeng Zheng	Signature:	Allen Hu

Testing Location:	
Name:	TÜV Rheinland (Shanghai) Co., Ltd.
Address:	TÜV Rheinland Building, No. 177, Lane 777, West Guangzhong Road, Jingan District, Shanghai 200072, P.R. China

Test bench diagram:



Notes: The automatic disconnection device is integrated in the inverter. See equipment list for detail information.

Clause	Test items	Remark
1	Normal operating range (Operation range)	
2.1	Harmonics current (THDi)	For PGU ≤ 75A, per IEC 61000-3-12
2.2	Harmonics current (Iinter & Ihigher)	Extra test than A2-3 report form, particular for PGU > 75A
3.1	Voltage fluctuations (Flicker)	For PGU ≤ 75A, per IEC 61000-3-11
3.2	Voltage fluctuations (Flicker)	Extra test than A2-3 report form, particular for PGU > 75A
4	DC Injection (Idc)	
5	Power factor	
6	Protection-Frequency tests (OF/UF)	
7	Protection-Frequency tests (OV/UV)	
8.1	Protection-Loss of mains test (Anti-islanding)	
8.2	Vector shift stability test	
8.3	RoCoF stability test (RoCoF)	
9.1	Limited Frequency Sensitive Mode-Over frequency test (LFSM-O)	
10	Protection-Reconnection timer (Reconnection)	
11	Fault level contribution	
12	Self-Monitoring solid state switching	N/A, only for solid state switching
13	Wiring functional tests	N/A, none on-site test.
14	Logic interface (input port)	
15	Cyber security	The manufacturer has provided the declaration document that the products meet the requirements

1	TABLE: Normal operating range (Operation range)				P
Test Conditions				Measurements	Limitation
U/Un	f [Hz]	cosφ	t [s]		
85%	47.0	1.00	20	No disconnect	No disconnect
85%	47.5	1.00	5400	No disconnect	No disconnect
100%	50.0	1.00	5400	No disconnect	No disconnect
110%	51.5	1.00	5400	No disconnect	No disconnect
110%	52.0	1.00	900	No disconnect	No disconnect
frequency change rate 1Hz/s				No disconnect	No disconnect

Note(s):
***** Function of interface protection and activating active power response to over/under frequency and voltage shall be disable.

2.1	TABLE: Harmonics current (THDi) **(Test performed on MA1000K30)**	P

Power Generating Module tested to BS EN 61000-3-12

Power Generationg Module rating per phase (rpp)	10	kVA	Harmonic % = Measured Value (A) × 23/rating per phase (kVA)

Harmonic	At 45-55% of Registered Capacity						Limit in BS EN 61000-3-12	
	Measured Value (MV) in Amps [A]			Measured Value (MV) in % [%]				
	L1	L2	L3	L1	L2	L3	1 phase [%]	3 phase [%]
2	0.023	0.040	0.053	0.053	0.092	0.123	8.0	8.0
3	0.760	0.763	0.705	1.748	1.755	1.621	21.6	--
4	0.024	0.105	0.086	0.055	0.241	0.198	4.0	4.0
5	0.233	0.246	0.188	0.536	0.567	0.433	10.7	10.7
6	0.025	0.109	0.086	0.058	0.251	0.197	2.67	2.67
7	0.122	0.124	0.069	0.281	0.286	0.158	7.2	7.2
8	0.028	0.032	0.023	0.065	0.074	0.053	2.0	2.0
9	0.212	0.208	0.177	0.488	0.479	0.407	3.8	--
10	0.021	0.025	0.018	0.049	0.057	0.043	1.6	1.6
11	0.172	0.180	0.159	0.397	0.414	0.366	3.1	3.1
12	0.018	0.022	0.016	0.042	0.051	0.037	1.33	1.33
13	0.189	0.192	0.169	0.434	0.442	0.389	2.0	2.0
THD[23]	--	--	--	2.038	2.100	1.879	23	13
PWHD[24]	--	--	--	1.491	1.782	1.540	23	22
Harmonic	At 100% of Registered Capacity						Limit in BS EN 61000-3-12	
	Measured Value (MV) in Amps [A]			Measured Value (MV) in % [%]				
	L1	L2	L3	L1	L2	L3	1 phase [%]	3 phase [%]
2	0.046	0.055	0.075	0.106	0.126	0.172	8.0	8.0
3	1.559	1.511	1.534	3.586	3.476	3.528	21.6	--
4	0.013	0.011	0.157	0.029	0.026	0.360	4.0	4.0
5	0.532	0.523	0.540	1.224	1.202	1.241	10.7	10.7
6	0.013	0.014	0.162	0.030	0.033	0.373	2.67	2.67
7	0.174	0.172	0.172	0.401	0.396	0.397	7.2	7.2
8	0.014	0.011	0.025	0.033	0.026	0.058	2.0	2.0
9	0.059	0.059	0.115	0.137	0.136	0.264	3.8	--
10	0.012	0.007	0.017	0.027	0.015	0.038	1.6	1.6
11	0.103	0.094	0.139	0.236	0.217	0.320	3.1	3.1
12	0.012	0.011	0.017	0.028	0.026	0.040	1.33	1.33
13	0.121	0.126	0.125	0.277	0.289	0.287	2.0	2.0
THD[25]	--	--	--	3.841	3.731	3.844	23	13
PWHD[26]	--	--	--	1.033	1.078	1.173	23	22

Note(s):

Since the nominal current of product In>75A, the following extra flicker table 2.2 has been also impelmented per BS EN 61000-4-7, as the requirement of EREC G5.

2.2	TABLE: Harmonics current (Iinter & Ihigher) per BS EN 61000-4-7 (Extra test other than form A2-3)										P
P/P_n [%]	0	10	20	30	40	50	60	70	80	90	100
Order No.	I/In [%]										
1	5.216	10.456	20.567	30.747	41.017	51.096	61.336	71.365	81.603	91.621	100.638
2	0.032	0.028	0.147	0.206	0.267	0.297	0.303	0.300	0.291	0.293	0.291
3	0.125	0.290	1.011	0.964	1.352	1.886	2.334	2.784	3.247	3.690	4.075
4	0.015	0.018	0.072	0.027	0.032	0.040	0.049	0.043	0.045	0.048	0.065
5	0.271	0.131	0.411	0.212	0.236	0.375	0.496	0.611	0.713	0.805	0.870
6	0.039	0.018	0.074	0.044	0.025	0.027	0.019	0.020	0.021	0.019	0.017
7	0.456	0.082	0.320	0.231	0.227	0.217	0.194	0.206	0.268	0.359	0.433
8	0.033	0.038	0.052	0.047	0.033	0.036	0.030	0.028	0.029	0.028	0.024
9	0.406	0.625	0.203	0.089	0.133	0.161	0.172	0.155	0.152	0.186	0.235
10	0.138	0.197	0.017	0.033	0.026	0.033	0.028	0.033	0.035	0.035	0.034
11	0.565	1.113	0.078	0.043	0.060	0.123	0.177	0.217	0.250	0.288	0.334
12	0.055	0.089	0.011	0.016	0.015	0.016	0.015	0.016	0.018	0.017	0.017
13	0.289	0.075	0.041	0.051	0.046	0.079	0.124	0.170	0.212	0.252	0.297
14	0.015	0.022	0.009	0.014	0.007	0.012	0.012	0.015	0.017	0.018	0.014
15	0.108	0.042	0.019	0.031	0.028	0.048	0.075	0.104	0.137	0.165	0.194
16	0.017	0.023	0.012	0.014	0.010	0.010	0.009	0.013	0.013	0.014	0.015
17	0.081	0.098	0.013	0.021	0.017	0.040	0.068	0.106	0.150	0.192	0.235
18	0.009	0.018	0.013	0.011	0.010	0.008	0.008	0.010	0.012	0.012	0.010
19	0.070	0.070	0.013	0.018	0.013	0.025	0.048	0.081	0.120	0.159	0.195
20	0.006	0.013	0.010	0.010	0.008	0.010	0.007	0.007	0.008	0.009	0.009
21	0.062	0.027	0.018	0.024	0.014	0.017	0.027	0.045	0.070	0.096	0.122
22	0.007	0.008	0.008	0.007	0.010	0.009	0.007	0.009	0.010	0.010	0.010
23	0.077	0.038	0.022	0.025	0.019	0.034	0.041	0.058	0.086	0.117	0.148
24	0.006	0.013	0.007	0.007	0.006	0.008	0.006	0.006	0.006	0.007	0.007
25	0.062	0.046	0.024	0.027	0.014	0.028	0.036	0.048	0.068	0.095	0.123
26	0.006	0.010	0.004	0.005	0.008	0.009	0.008	0.009	0.009	0.009	0.008
27	0.051	0.039	0.016	0.014	0.011	0.031	0.040	0.046	0.055	0.068	0.084
28	0.006	0.009	0.005	0.005	0.006	0.009	0.007	0.008	0.009	0.009	0.009
29	0.056	0.035	0.019	0.023	0.010	0.031	0.048	0.060	0.076	0.097	0.116
30	0.006	0.010	0.005	0.004	0.008	0.007	0.007	0.007	0.007	0.007	0.006
31	0.054	0.039	0.016	0.019	0.011	0.032	0.052	0.066	0.080	0.096	0.113
32	0.004	0.010	0.006	0.004	0.006	0.009	0.008	0.007	0.008	0.008	0.008
33	0.048	0.035	0.014	0.017	0.009	0.020	0.037	0.050	0.060	0.071	0.081
34	0.007	0.011	0.005	0.005	0.008	0.009	0.008	0.009	0.009	0.009	0.009
35	0.059	0.048	0.018	0.020	0.016	0.029	0.052	0.070	0.085	0.099	0.113
36	0.005	0.012	0.007	0.005	0.006	0.008	0.006	0.006	0.006	0.007	0.006
37	0.056	0.041	0.019	0.022	0.016	0.023	0.045	0.065	0.081	0.094	0.106
38	0.005	0.012	0.006	0.006	0.006	0.009	0.007	0.009	0.009	0.009	0.008
39	0.050	0.040	0.014	0.017	0.016	0.022	0.033	0.046	0.057	0.064	0.069
40	0.006	0.013	0.007	0.006	0.007	0.009	0.006	0.007	0.008	0.009	0.008
41	0.056	0.054	0.021	0.023	0.021	0.026	0.036	0.054	0.071	0.081	0.087
42	0.005	0.014	0.005	0.007	0.006	0.009	0.009	0.009	0.008	0.008	0.007
43	0.049	0.046	0.011	0.012	0.013	0.024	0.030	0.043	0.055	0.064	0.068
44	0.005	0.011	0.008	0.008	0.008	0.008	0.008	0.007	0.006	0.007	0.007
45	0.037	0.032	0.013	0.015	0.011	0.015	0.019	0.021	0.024	0.029	0.032
46	0.010	0.015	0.014	0.017	0.018	0.017	0.018	0.017	0.016	0.015	0.012
47	0.034	0.031	0.008	0.011	0.010	0.016	0.025	0.025	0.023	0.027	0.031
48	0.010	0.012	0.014	0.015	0.017	0.020	0.019	0.018	0.016	0.015	0.012
49	0.025	0.021	0.008	0.010	0.008	0.011	0.021	0.027	0.024	0.022	0.025
50	0.003	0.006	0.004	0.006	0.006	0.007	0.009	0.009	0.008	0.008	0.008

Inter-harmonics											
P/P_n [%]	0	10	20	30	40	50	60	70	80	90	100
f [Hz]	I/In [%]										
75	0.014	0.017	0.026	0.030	0.039	0.045	0.053	0.058	0.063	0.094	0.078
125	0.014	0.015	0.023	0.025	0.030	0.033	0.034	0.038	0.039	0.050	0.042
175	0.015	0.015	0.023	0.025	0.027	0.033	0.032	0.036	0.036	0.041	0.040
225	0.018	0.017	0.025	0.027	0.029	0.035	0.034	0.039	0.038	0.045	0.042
275	0.021	0.020	0.027	0.028	0.030	0.037	0.036	0.041	0.041	0.044	0.045
325	0.024	0.024	0.028	0.029	0.031	0.038	0.038	0.043	0.043	0.049	0.048
375	0.030	0.031	0.028	0.030	0.031	0.037	0.037	0.043	0.044	0.048	0.050
425	0.042	0.046	0.028	0.028	0.029	0.034	0.035	0.041	0.042	0.047	0.048
475	0.056	0.076	0.026	0.026	0.027	0.031	0.032	0.037	0.038	0.042	0.044
525	0.058	0.095	0.024	0.024	0.024	0.028	0.029	0.033	0.034	0.038	0.040
575	0.045	0.082	0.021	0.021	0.021	0.024	0.025	0.029	0.030	0.033	0.034
625	0.032	0.053	0.019	0.019	0.019	0.021	0.022	0.026	0.026	0.029	0.030
675	0.025	0.035	0.017	0.017	0.017	0.019	0.020	0.023	0.023	0.026	0.026
725	0.022	0.028	0.016	0.016	0.015	0.017	0.018	0.020	0.021	0.023	0.024
775	0.018	0.022	0.015	0.014	0.014	0.016	0.017	0.019	0.019	0.021	0.021
825	0.015	0.018	0.014	0.013	0.013	0.015	0.015	0.017	0.017	0.019	0.020
875	0.013	0.016	0.013	0.012	0.012	0.014	0.014	0.016	0.016	0.018	0.019
925	0.012	0.014	0.012	0.012	0.012	0.013	0.013	0.015	0.015	0.017	0.018
975	0.011	0.013	0.012	0.011	0.011	0.012	0.013	0.014	0.015	0.016	0.017
1025	0.010	0.013	0.011	0.011	0.011	0.012	0.012	0.014	0.014	0.015	0.016
1075	0.009	0.011	0.011	0.010	0.010	0.012	0.012	0.013	0.013	0.015	0.015
1125	0.009	0.011	0.011	0.010	0.010	0.011	0.012	0.013	0.013	0.014	0.015
1175	0.008	0.011	0.010	0.010	0.010	0.011	0.011	0.012	0.013	0.014	0.014
1225	0.008	0.010	0.010	0.010	0.010	0.011	0.011	0.012	0.012	0.013	0.014
1275	0.008	0.010	0.010	0.009	0.009	0.011	0.011	0.012	0.012	0.013	0.013
1325	0.008	0.010	0.010	0.009	0.009	0.010	0.011	0.011	0.012	0.013	0.013
1375	0.008	0.009	0.010	0.009	0.009	0.010	0.010	0.011	0.011	0.012	0.013
1425	0.008	0.009	0.010	0.009	0.010	0.010	0.010	0.011	0.011	0.012	0.013
1475	0.008	0.009	0.010	0.009	0.009	0.010	0.010	0.011	0.011	0.012	0.012
1525	0.007	0.009	0.010	0.009	0.009	0.010	0.010	0.011	0.011	0.012	0.012
1575	0.007	0.009	0.010	0.009	0.009	0.010	0.010	0.011	0.011	0.012	0.012
1625	0.008	0.009	0.010	0.010	0.009	0.010	0.010	0.011	0.011	0.012	0.012
1675	0.008	0.009	0.010	0.010	0.010	0.011	0.010	0.011	0.011	0.012	0.012
1725	0.008	0.010	0.010	0.010	0.010	0.011	0.011	0.011	0.011	0.012	0.012
1775	0.008	0.010	0.010	0.011	0.011	0.011	0.011	0.011	0.011	0.012	0.013
1825	0.008	0.010	0.011	0.011	0.011	0.012	0.012	0.012	0.012	0.012	0.013
1875	0.008	0.010	0.011	0.012	0.012	0.013	0.012	0.012	0.012	0.013	0.013
1925	0.008	0.011	0.011	0.013	0.013	0.013	0.012	0.012	0.012	0.013	0.014
1975	0.008	0.011	0.012	0.013	0.013	0.014	0.013	0.013	0.013	0.013	0.014

Higher frequency harmonics											
P/P_n [%]	0	10	20	30	40	50	60	70	80	90	100
f [kHz]	| [%]	| [%]	| [%]	| [%]	| [%]	| [%]	| [%]	| [%]	| [%]	| [%]	| [%]
2.1	0.077	0.078	0.037	0.042	0.042	0.051	0.058	0.077	0.095	0.109	0.116
2.3	0.057	0.057	0.041	0.048	0.053	0.059	0.061	0.059	0.057	0.061	0.064
2.5	0.036	0.037	0.029	0.034	0.039	0.049	0.058	0.061	0.058	0.057	0.060
2.7	0.022	0.024	0.020	0.021	0.025	0.028	0.042	0.058	0.059	0.065	0.070
2.9	0.015	0.018	0.017	0.017	0.020	0.022	0.029	0.047	0.064	0.065	0.078
3.1	0.014	0.015	0.014	0.015	0.017	0.018	0.020	0.028	0.053	0.078	0.091
3.3	0.012	0.014	0.014	0.013	0.015	0.016	0.017	0.020	0.030	0.073	0.114
3.5	0.011	0.013	0.013	0.013	0.015	0.015	0.015	0.016	0.019	0.036	0.099
3.7	0.010	0.012	0.012	0.012	0.014	0.014	0.014	0.015	0.016	0.020	0.042
3.9	0.009	0.011	0.011	0.013	0.012	0.013	0.013	0.014	0.013	0.015	0.018
4.1	0.009	0.010	0.011	0.014	0.012	0.012	0.013	0.013	0.013	0.013	0.014
4.3	0.008	0.009	0.010	0.014	0.011	0.011	0.012	0.012	0.012	0.012	0.012
4.5	0.008	0.009	0.010	0.014	0.010	0.011	0.011	0.011	0.012	0.011	0.012
4.7	0.009	0.011	0.011	0.013	0.012	0.011	0.012	0.012	0.013	0.013	0.013
4.9	0.007	0.008	0.009	0.010	0.010	0.009	0.010	0.010	0.011	0.011	0.011
5.1	0.007	0.008	0.009	0.009	0.010	0.010	0.010	0.010	0.010	0.010	0.010
5.3	0.007	0.008	0.009	0.008	0.010	0.010	0.010	0.010	0.010	0.010	0.010
5.5	0.007	0.008	0.008	0.008	0.010	0.009	0.009	0.009	0.009	0.009	0.009
5.7	0.007	0.007	0.008	0.007	0.010	0.009	0.009	0.009	0.008	0.009	0.009
5.9	0.007	0.007	0.008	0.007	0.009	0.009	0.008	0.008	0.008	0.008	0.008
6.1	0.006	0.007	0.008	0.007	0.009	0.008	0.008	0.008	0.008	0.008	0.008
6.3	0.006	0.007	0.007	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.008
6.5	0.006	0.007	0.007	0.007	0.007	0.008	0.008	0.008	0.008	0.008	0.008
6.7	0.006	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008
6.9	0.006	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008
7.1	0.006	0.007	0.008	0.007	0.007	0.008	0.008	0.008	0.008	0.008	0.008
7.3	0.006	0.006	0.007	0.006	0.007	0.008	0.007	0.007	0.007	0.007	0.007
7.5	0.006	0.006	0.007	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.007
7.7	0.005	0.006	0.007	0.006	0.006	0.007	0.007	0.007	0.007	0.007	0.007
7.9	0.005	0.005	0.006	0.006	0.006	0.007	0.006	0.006	0.006	0.007	0.007
8.1	0.005	0.005	0.006	0.005	0.006	0.006	0.006	0.006	0.006	0.006	0.006
8.3	0.005	0.005	0.005	0.005	0.005	0.006	0.005	0.006	0.006	0.006	0.006
8.5	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
8.7	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.005
8.9	0.004	0.004	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.005	0.005

Note(s): For power generation modules of registered capacity of greater than 75A per phase (ie 50kw) the installation shall be implemented per BS EN 61000-4-7, as the requirement of EREC G5.

3.1	TABLE: Voltage fluctuations (Flicker) **(Test performed on MA1000K30)**						P	
	Starting			Stooping			Running	
	d max [%]	d c [%]	d(t) [ms]	d max [%]	d c [%]	d(t) [ms]	P_{st}	P_{lt} 2 hours
Measured value at test impedance	0	0	0	0.328	0.010	0	0.036	0.036
Normalised to standard impedance	0	0	0	0.328	0.010	0	0.036	0.036
Normalised to required maximum impedance	--	--	--	--	--	--	--	--
Limits set under BS EN 61000-3-11	4.0	3.3	500	4.0	3.3	500	1.0	0.65

Test Impedance	R	0.24	Ω	Xl	0.15	Ω
Standard Impedance	R	0.24	Ω	Xl	0.15	Ω
Maximum Impedance	R	--	Ω	Xl	--	Ω

Note(s): The worst value of the three phases has been choosed.

Since the nominal current of product In>75A, the following extra flicker table 3.2 has been also impelmented per BS EN 61400-21, as the requirement of EREC P28, clause 8.8.

3.2	TABLE: Voltage fluctuations (Flicker) per BS EN 61400-21 (Extra test other than form A2-3)	P

30° impedance angle

Measurement	P/Pn [%]	Pst	Cφk
1	10	0.015	0.225
2	20	0.012	0.180
3	30	0.013	0.195
4	40	0.017	0.255
5	50	0.024	0.360
6	60	0.031	0.465
7	70	0.036	0.540
8	80	0.037	0.555
9	90	0.043	0.645
10	100	0.042	0.630
11	100	0.044	0.660
12	100	0.056	0.840

50° impedance angle

Measurement	P/Pn [%]	Pst	Cφk
1	10	0.021	0.315
2	20	0.020	0.300
3	30	0.018	0.270
4	40	0.028	0.420
5	50	0.043	0.645
6	60	0.057	0.855
7	70	0.065	0.975
8	80	0.069	1.035
9	90	0.076	1.140
10	100	0.073	1.095
11	100	0.077	1.155
12	100	0.097	1.455

70° impedance angle

Measurement	P/Pn [%]	Pst	Cφk
1	10	0.019	0.285
2	20	0.028	0.420

3	30	0.024	0.360
4	40	0.038	0.570
5	50	0.059	0.885
6	60	0.076	1.140
7	70	0.087	1.305
8	80	0.090	1.350
9	90	0.101	1.515
10	100	0.094	1.410
11	100	0.101	1.515
12	100	0.126	1.890
85° impedance angle			
Measurement	P/Pn [%]	Pst	Cφk
1	10	0.020	0.300
2	20	0.033	0.495
3	30	0.027	0.405
4	40	0.043	0.645
5	50	0.066	0.990
6	60	0.086	1.290
7	70	0.096	1.440
8	80	0.099	1.485
9	90	0.112	1.680
10	100	0.103	1.545
11	100	0.112	1.680
12	100	0.138	2.070
Note(s): For power generation modules of registered capacity of greater than 75A per phase (ie 50kw) the installation shall be implemented per BS EN 61400-4-7, as the requirement of EREC P28, clause 8.8.			

4	TABLE: DC Injection (Idc)		P
Test power level	10%	55%	100%
Recorded DC value in Amps	0.499	0.445	0.219
As % of rated AC current	0.191%	0.171%	0.840%
Limit	0.25%	0.25%	0.25%
Note(s):			

5	TABLE: Power Factor							P
Test Conditions			Measurements					Limit
P/Pn	cosφ	U/Un	P [kW]	Q [kVar]	cosφ	U [V]	I [A]	cosφ
100%	1.00	0.94	56.72	4.35	0.997	217.66	87.12	>0.95
100%	1.00	1.0	59.46	4.70	0.997	231.41	85.91	>0.95
100%	1.00	1.1	59.46	4.74	0.997	254.25	78.21	>0.95
Note(s):								

6	TABLE: Protection-Frequency tests (OF/UF)		P
Condition	Setting [Hz]	Measurement	Limitation
		Trip value [Hz]	
F>>	52.0	52.035	± 0.1% of f_n
F<	47.5	47.470	
F<<	47	46.969	
Condition	Setting [ms]	Measurement	Limitation
		Trip time	
F>>	500	509.5	490-510
F<	20000	20089.6	19600-20400
F<<	500	508.0	490-510
Condition		Measurement	limitation
F [Hz]	t [s]		
47.7	30	No trip	No trip
47.2	19.5	No trip	No trip
46.8	0.45	No trip	No trip
51.8	120	No trip	No trip
52.2	0.45	No trip	No trip
Note(s):			

7	TABLE: Protection-Voltage tests (OV/UV)					P
Condition	Setting [U/Un]	Measurement				Limitation
		Trip value [V]				
		L1	L2	L3	L123	
U>>	1.19 (1.13*)	275.184	274.963	274.734	274.960	± 1% of U_n
U>	1.14 (1.10*)	262.687	262.947	262.674	262.439	
U<<	0.80	185.469	185.442	185.677	185.529	
Condition	Setting [ms]	Measurement				Limitation
		Trip time				
		L1	L2	L3	L123	
U>>	500	507.5	505.0	502.0	502.0	490-510
U>	1000	1018.5	1017.5	1017.0	1018.0	980-1020
U<<	2500	2508.0	2512.5	2510.5	2505.0	2450-2550
Condition		Measurement				limitation
U/Un	t [s]					
0.82	5	No trip				No trip
0.78	2.45	No trip				No trip
1.12	5	No trip				No trip
1.17	0.95	No trip				No trip
1.20	0.45	No trip				No trip
Note(s):*: settings for product connect with a non-standard transformer						

8.1	TABLE: Protection-Loss of mains test	P

Power 100%

Input : Vdc

Conditions	P_R [kW]	Q_L [kVar]	Q_C [kVar]	Q_f	Trip time [ms]	Limitation [ms]
P_R: -10% Q_C: +10%	L1: 20.7	L1: 21.0	L1: 21.1	0.99	121.0	500
	L2: 21.3	L2: 21.1	L2: 21.9	0.98		
	L3: 20.9	L3: 21.2	L3: 21.9	0.99		
P_R: -10% Q_C: +5%	L1: 20.8	L1: 21.3	L1: 20.8	0.97	340.0	500
	L2: 21.6	L2: 20.5	L2: 20.3	0.93		
	L3: 21.2	L3: 21.5	L3: 20.8	0.97		
P_R: -10% Q_C: 0%	L1: 20.7	L1: 21.0	L1: 19.6	0.95	389.0	500
	L2: 21.5	L2: 20.8	L2: 19.5	0.92		
	L3: 20.7	L3: 21.5	L3: 19.9	0.96		
P_R: -10% Q_C: -5%	L1: 20.5	L1: 20.9	L1: 18.6	0.91	316.0	500
	L2: 21.6	L2: 20.8	L2: 18.5	0.90		
	L3: 20.7	L3: 21.5	L3: 18.8	0.93		
P_R: -10% Q_C: -10%	L1: 20.7	L1: 20.9	L1: 17.6	0.90	343.0	500
	L2: 21.5	L2: 20.8	L2: 17.5	0.88		
	L3: 20.7	L3: 21.5	L3: 17.8	0.91		
P_R: -5% Q_C: +10%	L1: 19.8	L1: 21.3	L1: 21.8	1.05	347.0	500
	L2: 20.3	L2: 20.7	L2: 21.4	1.02		
	L3: 19.9	L3: 21.4	L3: 21.7	1.05		
P_R: -5% Q_C: -10%	L1: 19.8	L1: 21.0	L1: 17.1	0.93	94.3	500
	L2: 19.9	L2: 21.0	L2: 18.1	0.97		
	L3: 20.4	L3: 21.1	L3: 17.9	0.92		
P_R: 0% Q_C: +10%	L1: 19.7	L1: 21.0	L1: 18.1	0.96	104.0	500
	L2: 20.2	L2: 21.1	L2: 18.9	0.97		
	L3: 20.3	L3: 21.1	L3: 18.8	0.94		
P_R: -5% Q_C: +5%	L1: 19.5	L1: 20.8	L1: 20.1	1.01	325.0	500
	L2: 20.4	L2: 20.9	L2: 20.4	1.02		
	L3: 20.1	L3: 21.0	L3: 20.9	1.01		
P_R: -5% Q_C: 0%	L1: 20.3	L1: 21.0	L1: 19.1	0.96	113.0	500
	L2: 19.9	L2: 21.2	L2: 20.0	1.01		

	L3:	20.0	L3:	21.1	L3:	19.9	0.98		
P_R: -5% Q_C: -5%	L1:	21.2	L1:	23.8	L1:	20.3	10.06	385.4	500
	L2:	21.2	L2:	24.0	L2:	20.5	10.17		
	L3:	21.3	L3:	23.8	L3:	20.3	0.99		
P_R: 0% Q_C: +5%	L1:	19.3	L1:	19.5	L1:	20.0	1.00	333.6	500
	L2:	19.2	L2:	19.7	L2:	20.2	1.02		
	L3:	19.4	L3:	19.5	L3:	20.1	0.98		
P_R: 0% Q_C: 0%	L1:	19.2	L1:	20.8	L1:	19.2	1.01	421.2	500
	L2:	19.4	L2:	20.9	L2:	19.3	1.02		
	L3:	19.3	L3:	20.8	L3:	19.2	0.99		
P_R: 0% Q_C: -5%	L1:	19.4	L1:	21.2	L1:	18.8	1.00	359.0	500
	L2:	19.5	L2:	21.4	L2:	18.9	1.01		
	L3:	19.4	L3:	21.3	L3:	18.9	0.99		
P_R: +5% Q_C: +5%	L1:	18.4	L1:	19.2	L1:	19.0	1.02	413.3	500
	L2:	18.2	L2:	19.4	L2:	19.0	1.03		
	L3:	18.8	L3:	19.2	L3:	18.9	0.97		
P_R: +5% Q_C: 0%	L1:	18.4	L1:	19.5	L1:	18.3	1.01	425.8	500
	L2:	18.3	L2:	19.7	L2:	18.3	1.02		
	L3:	18.4	L3:	19.6	L3:	18.2	0.98		
P_R: +5% Q_C: -5%	L1:	18.4	L1:	20.0	L1:	17.6	0.99	449.9	500
	L2:	18.3	L2:	20.1	L2:	17.7	1.01		
	L3:	18.4	L3:	20.0	L3:	17.6	0.98		
P_R: 0% Q_C: -10%	L1:	19.4	L1:	21.6	L1:	18.3	1.00	375.1	500
	L2:	19.2	L2:	21.8	L2:	18.4	1.02		
	L3:	19.3	L3:	21.7	L3:	18.3	0.99		
P_R: +5% Q_C: +10%	L1:	18.3	L1:	18.7	L1:	19.3	1.02	372.6	500
	L2:	18.6	L2:	18.8	L2:	19.4	1.01		
	L3:	18.4	L3:	18.8	L3:	19.3	0.99		
P_R: +5% Q_C: -10%	L1:	18.3	L1:	20.6	L1:	17.3	1.01	327.7	500
	L2:	18.6	L2:	20.7	L2:	17.3	1.00		
	L3:	18.4	L3:	20.6	L3:	17.2	0.98		
P_R: +10% Q_C: +10%	L1:	17.3	L1:	17.6	L1:	18.3	1.01	462.7	500
	L2:	17.3	L2:	17.8	L2:	18.3	1.02		
	L3:	17.8	L3:	17.6	L3:	18.2	0.97		
P_R: +10% Q_C: +5%	L1:	17.3	L1:	17.9	L1:	17.5	1.01	404.7	500
	L2:	17.4	L2:	18.0	L2:	17.5	1.00		

	L3:	17.8	L3:	18.4	L3:	17.9	0.98		
P_R: +10% Q_C: 0%	L1:	17.4	L1:	18.5	L1:	17.2	1.01	411.7	500
	L2:	17.4	L2:	18.7	L2:	17.3	1.01		
	L3:	17.5	L3:	19.1	L3:	17.6	1.00		
P_R: +10% Q_C: -5%	L1:	17.4	L1:	18.5	L1:	17.2	1.01	413.7	500
	L2:	17.4	L2:	18.7	L2:	17.3	1.01		
	L3:	17.5	L3:	19.1	L3:	17.6	1.00		
P_R: +10% Q_C: -10%	L1:	17.3	L1:	19.7	L1:	16.3	1.01	327.2	500
	L2:	17.2	L2:	19.8	L2:	16.4	1.02		
	L3:	17.8	L3:	19.7	L3:	16.8	0.96		

Power 66%									
Input : Vdc									
Conditions	P_R [kW]		Q_L [kVar]		Q_C [kVar]		Q_f	Trip time [ms]	Limitation [ms]
P_R: 0% Q_C: -5%	L1:	12.4	L1:	13.9	L1:	12.1	1.02	144.2	500
	L2:	12.4	L2:	13.8	L2:	12.3	1.01		
	L3:	12.5	L3:	13.9	L3:	12.4	1.01		
P_R: 0% Q_C: -4%	L1:	12.9	L1:	14.1	L1:	12.5	0.99	205.2	500
	L2:	12,8	L2:	14.0	L2:	12.6	1.00		
	L3:	12.9	L3:	14.1	L3:	12.7	1.00		
P_R: 0% Q_C: -3%	L1:	12.9	L1:	14.1	L1:	12.6	1.00	210.5	500
	L2:	12.9	L2:	14.0	L2:	12.7	1.00		
	L3:	13.0	L3:	14.2	L3:	12.8	1.00		
P_R: 0% Q_C: -2%	L1:	12.9	L1:	14.1	L1:	12.6	0.99	244.6	500
	L2:	12.8	L2:	14.0	L2:	12.8	1.01		
	L3:	12.9	L3:	14.1	L3:	12.9	1.01		
P_R: 0% Q_C: -1%	L1:	12.9	L1:	14.1	L1:	12.8	1.00	293.6	500
	L2:	12.9	L2:	14.1	L2:	13.0	1.01		
	L3:	13.0	L3:	14.2	L3:	13.1	1.01		
P_R: 0% Q_C: 0%	L1:	12.9	L1:	14.1	L1:	13.1	1.01	420.6	500
	L2:	12.8	L2:	14.1	L2:	13.2	1.02		
	L3:	12.9	L3:	14.2	L3:	13.2	1.02		
P_R: 0% Q_C: +1%	L1:	12.9	L1:	14.0	L1:	13.0	1.00	311.5	500
	L2:	12.9	L2:	13.9	L2:	13.1	1.01		
	L3:	13.0	L3:	14.0	L3:	13.2	1.01		

P_R: 0% Q_C: +2%	L1:	12.9	L1:	13.7	L1:	12.9	0.99	246.4	500
	L2:	12.8	L2:	13.7	L2:	13.1	1.01		
	L3:	12.9	L3:	13.8	L3:	13.2	1.01		
P_R: 0% Q_C: +3%	L1:	12.9	L1:	13.7	L1:	13.1	0.99	222.8	500
	L2:	12.8	L2:	13.7	L2:	13.2	1.01		
	L3:	12.9	L3:	13.8	L3:	13.3	1.01		
P_R: 0% Q_C: +4%	L1:	12.8	L1:	13.7	L1:	13.1	1.00	215.7	500
	L2:	12.8	L2:	13.7	L2:	13.2	1.00		
	L3:	12.9	L3:	13.8	L3:	13.4	1.02		
P_R: 0% Q_C: +5%	L1:	12.8	L1:	13.7	L1:	13.1	1.00	155.1	500
	L2:	12.8	L2:	13.7	L2:	13.2	1.00		
	L3:	12.9	L3:	13.8	L3:	13.4	1.02		

Power 33%								
Input : Vdc								
Conditions	P_R [kW]		Q_L [kVar]		Q_C [kVar]		Q_f	Trip time [ms]	Limitation [ms]
P_R: 0% Q_C: -5%	L1:	6.46	L1:	7.25	L1:	6.34	1.00	152.5	500
	L2:	6.54	L2:	7.28	L2:	6.32	0.99		
	L3:	6.56	L3:	7.24	L3:	6.33	0.98		
P_R: 0% Q_C: -4%	L1:	6.46	L1:	7.25	L1:	6.38	1.00	209.3	500
	L2:	6.54	L2:	7.29	L2:	6.35	1.00		
	L3:	6.55	L3:	7.25	L3:	6.37	0.99		
P_R: 0% Q_C: -3%	L1:	6.47	L1:	7.24	L1:	6.46	1.00	209.1	500
	L2:	6.55	L2:	7.28	L2:	6.43	1.00		
	L3:	6.56	L3:	7.24	L3:	6.45	0.98		
P_R: 0% Q_C: -2%	L1:	6.46	L1:	7.25	L1:	6.50	1.02	223.1	500
	L2:	6.54	L2:	7.28	L2:	6.47	1.00		
	L3:	6.55	L3:	7.23	L3:	6.49	0.99		
P_R: 0% Q_C: -1%	L1:	6.47	L1:	7.25	L1:	6.60	1.02	250.5	500
	L2:	6.55	L2:	7.28	L2:	6.57	1.01		
	L3:	6.56	L3:	7.24	L3:	6.59	1.00		
P_R: 0% Q_C: 0%	L1:	6.47	L1:	7.25	L1:	6.67	1.02	265.1	500
	L2:	6.55	L2:	7.29	L2:	6.64	1.02		
	L3:	6.56	L3:	7.24	L3:	6.66	1.00		
	L1:	6.46	L1:	7.05	L1:	6.54	1.01	231.7	

P_R: 0% Q_C: +1%	L2:	6.54	L2:	7.06	L2:	6.51	0.98		500
	L3:	6.55	L3:	7.04	L3:	6.52	0.98		
P_R: 0% Q_C: +2%	L1:	6.47	L1:	7.05	L1:	6.61	1.00	216.2	500
	L2:	6.54	L2:	7.08	L2:	6.58	1.00		
	L3:	6.55	L3:	7.04	L3:	6.66	0.99		
P_R: 0% Q_C: +3%	L1:	6.46	L1:	7.05	L1:	6.63	1.02	208.2	500
	L2:	6.54	L2:	7.06	L2:	6.61	0.99		
	L3:	6.55	L3:	7.04	L3:	6.63	0.99		
P_R: 0% Q_C: +4%	L1:	6.46	L1:	7.06	L1:	6.74	1.02	192.8	500
	L2:	6.54	L2:	7.07	L2:	6.72	1.00		
	L3:	6.56	L3:	7.04	L3:	6.74	1.00		
P_R: 0% Q_C: +5%	L1:	6.47	L1:	6.95	L1:	6.70	1.00	155.2	500
	L2:	6.54	L2:	6.98	L2:	6.68	1.00		
	L3:	6.56	L3:	6.94	L3:	6.70	0.99		
Note(s):									

8.2	TABLE: Vector shift stability test	P
Test Condition	Measurement	Limit
49.5Hz, +50degree	No trip	No trip
50.5Hz, -50degree	No trip	No trip

8.3	TABLE: RoCoF stability test		P
Ramp range	Test frequency ramp:	Test duration	Confirm no trip
49.0 Hz->51.0 Hz	+ 0.95 Hz/s	2.1s	No trip
51.0 Hz->49.0 Hz	- 0.95 Hz/s	2.1s	No trip

9.1	TABLE: Limitest frequency sensitive mode-over frequency (LFSM-O)	P

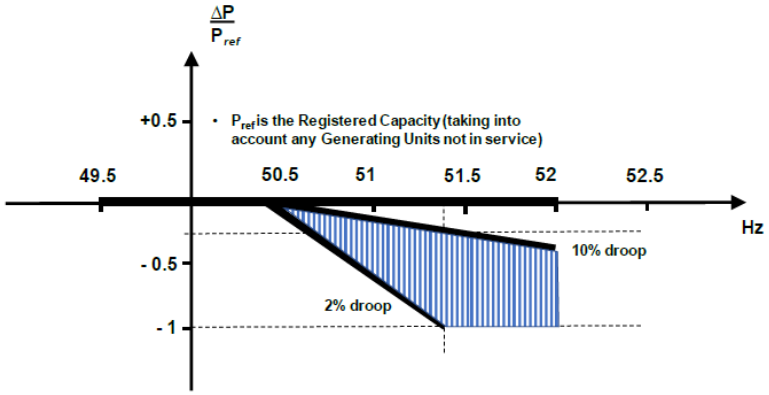
Test No. 1

Test Conditions	Measurements					Target value	Δ	Limitation		
f [Hz]	P/Pn	f [Hz]	T_{rise} [s]	$T_{settling}$ [s]	Tv [s]	P/Pn	Δ P/Pn	Δ P/Pn	T_{rise} [s]	Tv [s]
a) 50	98.9%	50.001	--	--	--	100%	-1.1%	≤± 10%	≤10	≤2
b) 50.45	98.8%	50.450	0.2	0.6	0.0	99%	-0.2%			
c) 50.7	93.8%	50.700	0.3	0.7	0.0	94%	-0.2%			
d) 51.15	84.6%	51.150	0.3	0.6	0.0	85%	-0.4%			
e) 50.7	93.8%	50.700	0.2	0.6	0.0	94%	-0.2%			
f) 50.45	98.8%	50.450	0.2	0.7	0.0	99%	-0.2%			
g) 50	98.9%	50.000	0.2	0.7	0.0	100%	-1.1%			

Test No. 2

Test Conditions	Measurements					Target value	Δ	Limitation		
f [Hz]	P/Pn	f [Hz]	T_{rise} [s]	$T_{settling}$ [s]	Tv [s]	P/Pn	Δ P/Pn	Δ P/Pn	T_{rise} [s]	Tv [s]
a) 50	50.2%	50.000	--	--	--	50%	0.2%	≤± 10%	≤10	≤2
b) 50.45	49.2%	50.450	0.2	0.5	0.0	49%	0.2%			
c) 50.7	44.2%	50.700	0.2	0.6	0.0	44%	0.2%			
d) 51.15	35.1%	51.150	0.2	0.5	0.0	35%	0.1%			
e) 50.7	44.2%	50.700	0.3	0.7	0.0	44%	0.2%			
f) 50.45	49.2%	50.450	0.2	0.6	0.0	49%	0.2%			
g) 50	50.3%	50.000	0.2	0.5	0.0	50%	0.3%			

Note(s):
P(f) curve setting for test: f1: 50.4Hz; fstop: 50.4Hz (Deactivated); Droop: 10%

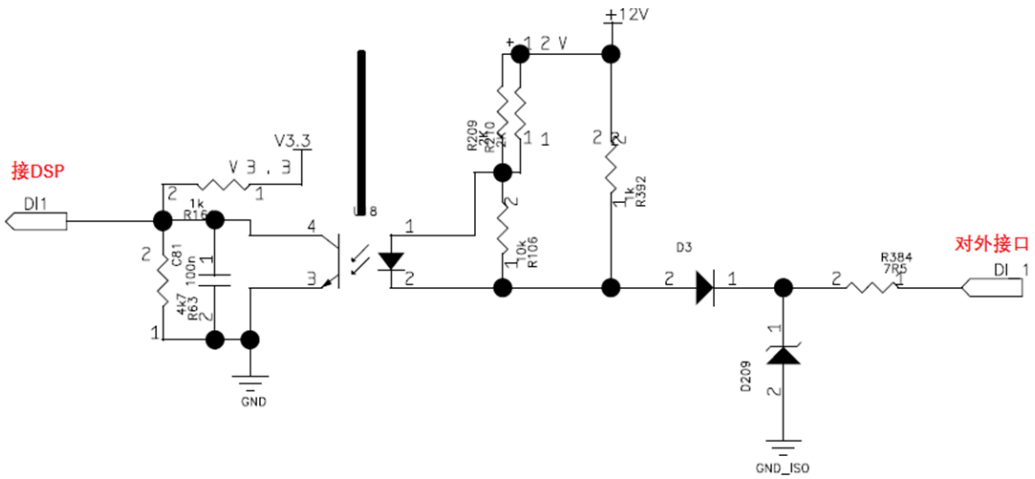


10	TABLE: Protection-Reconnection timer (Reconnection)			P
Condition	Measurement		Limitation	
	Delay time [s]	Power Gradient [per mimute]	Delay time [s]	Power Gradient
Reonnection:				
1.12Un	33.8	--	20	--
0.82Un	34.0	--		
47.6Hz	34.1	--		
51.9Hz	33.7	--		
No reonnection:				
1.16Un	No reconnection	--	No reconnection	--
0.78Un	No reconnection	--		
47.4Hz	No reconnection	--		
52.1Hz	No reconnection	--		
Note(s): For “1.12Un”, “0.82Un”, “47.6Hz”, “51.9Hz” are the reconnection value.				

11	TABLE: Fault level contribution		P
Test Condition	Measurement		
	U [V]	I [A]	
20ms after fault	50.03	0.204	
100ms after fault	50.02	0.204	
250ms after fault	50.02	0.203	
500ms after fault	50.01	0.203	
Trip time [ms]	19.4		

12	TABLE: Self-Monitoring solid state switching	N/A
It has been verified that in the event of the solid state switching device failing to disconnect the Power Park Module, the voltage on the output side of the switching device is reduced to a value below 50 volts within 0.5 s.		N/A

13	TABLE: Wiring functional tests	N/A
Confirm that the relevant test schedule is attached (tests to be undertaken at time of commissioning)		N/A

14	TABLE: Logic interface (input port).	P
Confirm that an input port is provided and can be used to shut down the module.		P
Detail description of logic interface: 		

15	TABLE: Cyber security	P
Confirm that the power generating module has been designed to comply with cyber security requirements, as detailed in 9.1.7.		P
Additional comments:		
The manufacturer has provided the declaration document that the products meet the requirements.		

TÜVRheinland®

PHOTO DOCUMENTATION

NN227BEW 002

for

AC/DC Inverter

MA1000K60, MA1000K30

Vilion (Shenzhen) new energy technology Co., Ltd.

This documentation consists of 4 pages (excluding this cover page)

Figure 1. Overview

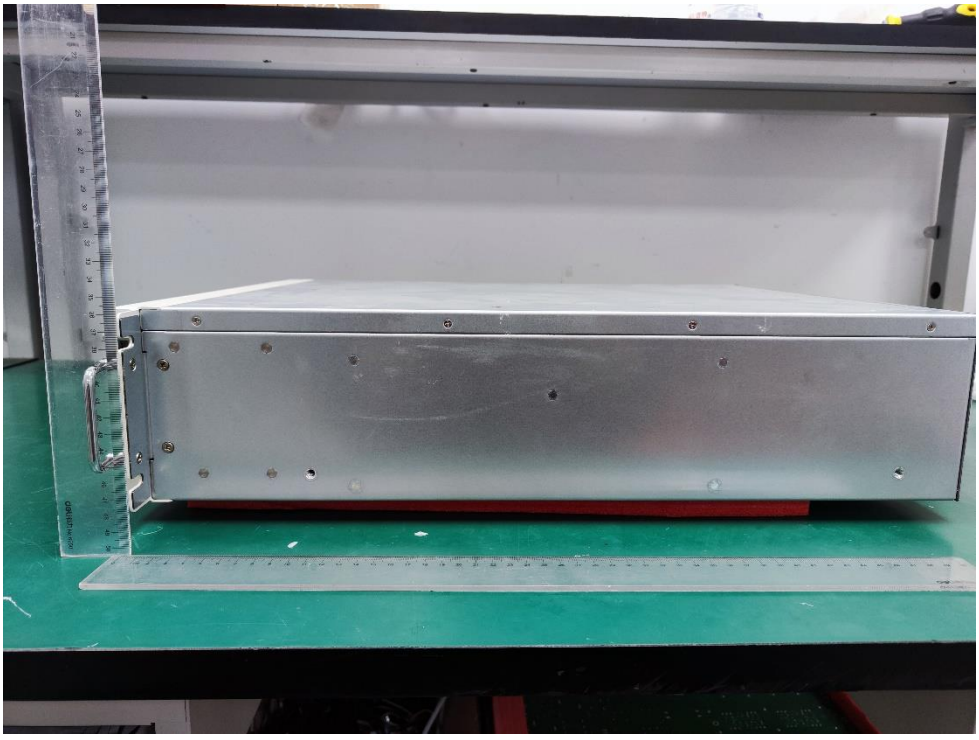


Figure 2. Right side view

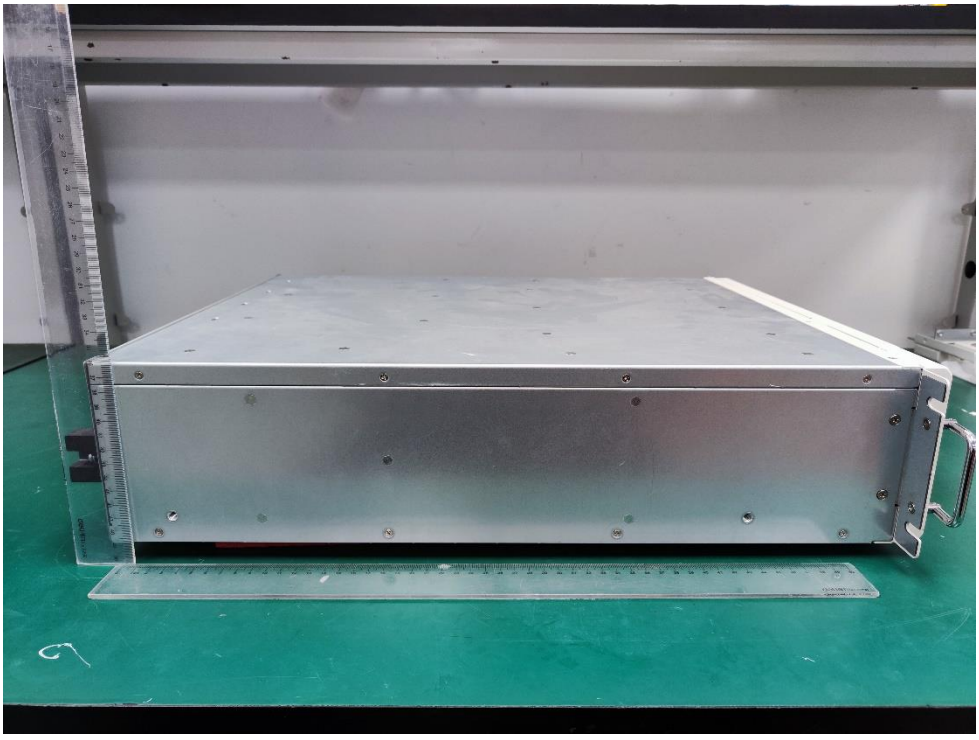


Figure 3.Left side view

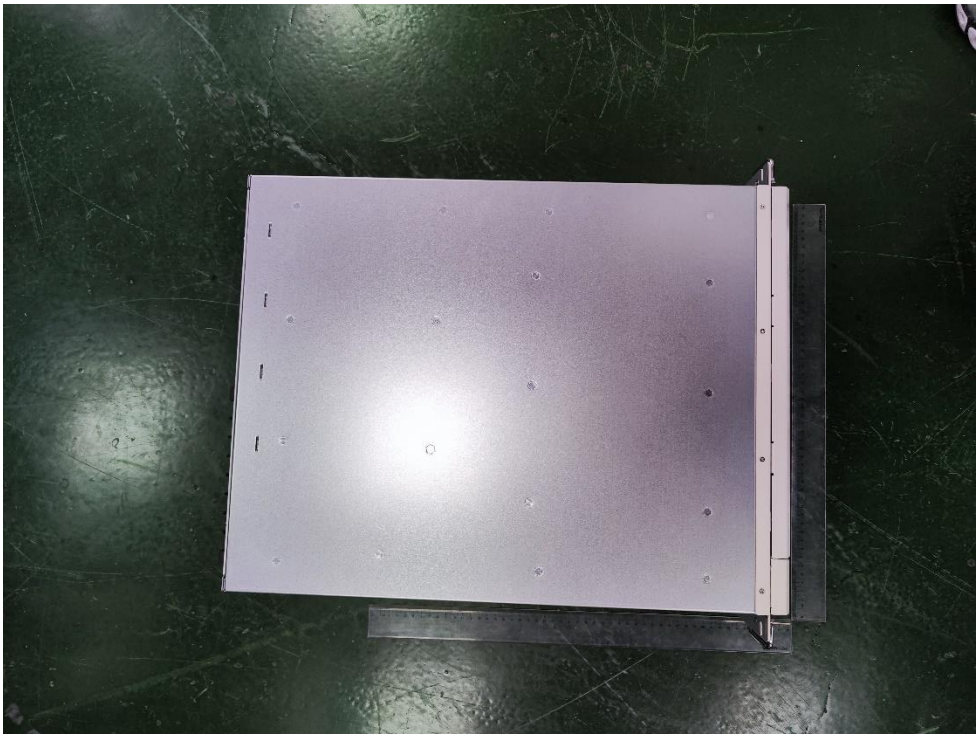


Figure 4.Top side view

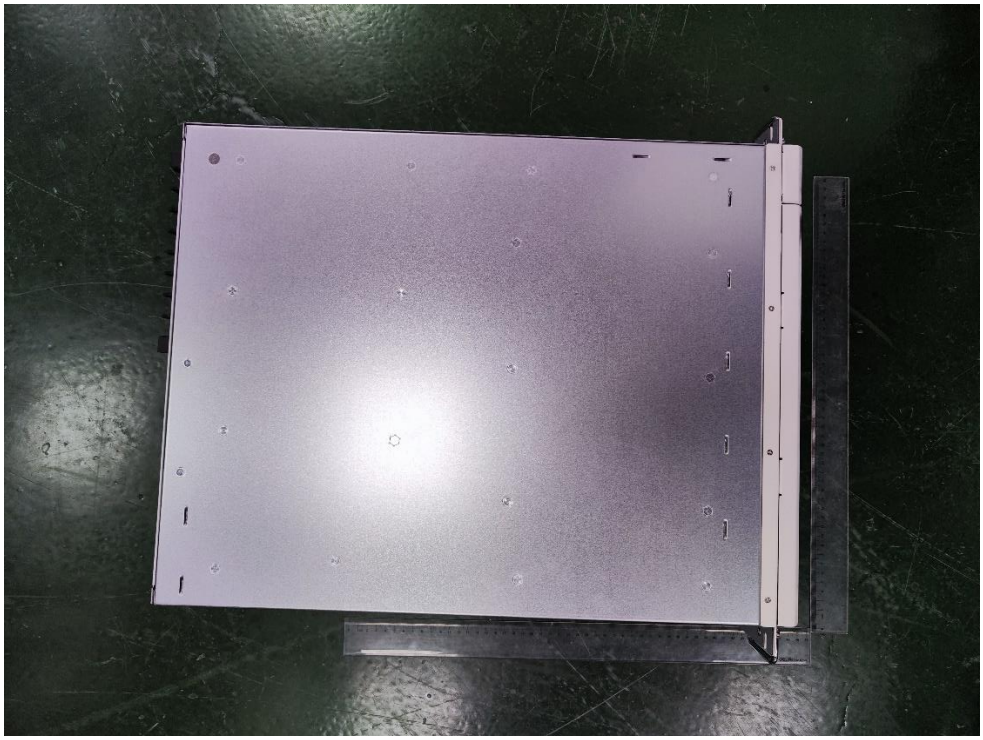


Figure 5. Bottom side view

Figure 6. Rear view

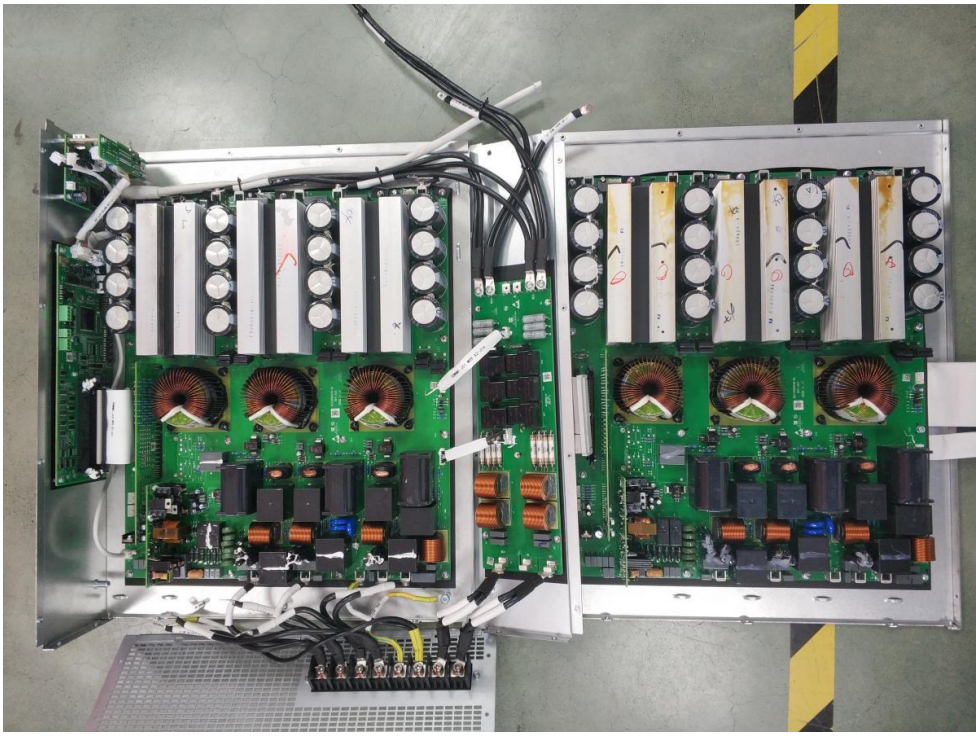


Figure 7. Internal view without cover