

**Appendices:**  
**13.1**

**Power Quality. Harmonics.** These tests should be carried out as specified in 61000-3-12 or 61000-3-2. Only one set of tests is required and the **Manufacturer** should decide which one to use and complete the relevant table. The chosen test should be undertaken with a fixed source of energy at two power levels a) between 45 and 55% and b) at 100% of maximum export capacity.

The test should be carried out on a single **Generating Unit**. The results need to comply with the limits of table 2 of BS EN 61000-3-12 for single phase equipment, to table 3 of BS EN 61000-3-12 for three phase equipment or to table 1 of BS EN 61000-3-2 if that standard is used.

Note that Generating Units meeting the requirements of BS EN 61000-3-2 will need no further assessment with regards to harmonics. Generating Units with emissions close to the limits laid down in BS EN 61000-3-12 may require the installation of a transformer between 2 and 4 times the rating of the **Generating Unit** in order to accept the connection to a **DNO's** network.

Generating Unit tested to BS EN 61000-3-2

SSEG rating per phase R (rpp)		11kW			NV=MV*3.68/rpp	
Harmonic	At 45-55% of rated output		100% of rated output		Limit in BS EN 61000-3-2 in Amps	Higher limit for odd harmonics 21 and above
	Measured Value (MV) (A)	Normalised Value (NV) (A)	Measured Value (MV) (A)	Normalised Value (NV) (A)		
2	0.0102	0.0034	0.1086	0.0363	1.080	
3	0.1475	0.0494	0.1908	0.0638	2.300	
4	0.0519	0.0174	0.1224	0.0409	0.430	
5	0.2282	0.0763	0.3117	0.1043	1.140	
6	0.0026	0.0009	0.0132	0.0044	0.300	
7	0.2169	0.0726	0.3981	0.1332	0.770	
8	0.0132	0.0044	0.0142	0.0048	0.230	
9	0.0650	0.0217	0.1316	0.0440	0.400	
10	0.0423	0.0142	0.0065	0.0022	0.184	
11	0.0832	0.0278	0.0685	0.0229	0.330	
12	0.0207	0.0069	0.0315	0.0105	0.153	
13	0.0625	0.0209	0.1926	0.0644	0.210	
14	0.0246	0.0082	0.0724	0.0242	0.131	
15	0.0113	0.0038	0.0203	0.0068	0.150	
16	0.0108	0.0036	0.0662	0.0221	0.115	
17	0.0477	0.0160	0.1130	0.0378	0.132	
18	0.1098	0.0367	0.0184	0.0062	0.102	
19	0.0299	0.0100	0.1091	0.0365	0.118	
20	0.0365	0.0122	0.0533	0.0178	0.092	
21	0.0204	0.0068	0.0259	0.0087	0.107	0.160
22	0.0107	0.0036	0.0212	0.0071	0.084	
23	0.0220	0.0074	0.0873	0.0292	0.098	0.147
24	0.0235	0.0078	0.0392	0.0131	0.077	
25	0.0297	0.0099	0.0815	0.0273	0.090	0.135
26	0.0144	0.0048	0.0138	0.0046	0.071	
27	0.0223	0.0075	0.0076	0.0025	0.083	0.124
28	0.0177	0.0059	0.0149	0.0050	0.066	
29	0.0152	0.0051	0.0438	0.0147	0.078	0.117
30	0.0123	0.0041	0.0086	0.0029	0.061	
31	0.0123	0.0041	0.0469	0.0157	0.073	0.109
32	0.0067	0.0022	0.0075	0.0025	0.058	
33	0.0093	0.0031	0.0071	0.0024	0.068	0.102
34	0.0065	0.0022	0.0161	0.0054	0.054	
35	0.0274	0.0092	0.0271	0.0091	0.064	0.096
36	0.0176	0.0059	0.0072	0.0024	0.051	
37	0.0469	0.0157	0.019	0.0064	0.061	0.091

38	0.0116	0.0039	0.0009	0.0003	0.048	
39	0.0285	0.0095	0.0037	0.0012	0.058	0.087
40	0.0072	0.0024	0.0069	0.0023	0.046	
Generating Unit tested to BS EN 61000-3-2						
SSEG rating per phase S (rpp)		11kW			NV=MV*3.68/rpp	
Harmonic	At 45-55% of rated output		100% of rated output		Limit in BS EN 61000-3-2 in Amps	Higher limit for odd harmonics 21 and above
	Measured Value (MV) (A)	Normalised Value (NV) (A)	Measured Value (MV) (A)	Normalised Value (NV) (A)		
2	0.0103	0.0035	0.1070	0.0358	1.080	
3	0.4502	0.1506	0.0839	0.0281	2.300	
4	0.0380	0.0127	0.1066	0.0357	0.430	
5	0.1299	0.0435	0.2560	0.0856	1.140	
6	0.0334	0.0112	0.0187	0.0063	0.300	
7	0.1006	0.0336	0.3856	0.1290	0.770	
8	0.0264	0.0088	0.0373	0.0125	0.230	
9	0.2886	0.0966	0.0411	0.0137	0.400	
10	0.0361	0.0121	0.0340	0.0114	0.184	
11	0.0432	0.0145	0.081	0.0271	0.330	
12	0.0120	0.0040	0.0403	0.0135	0.153	
13	0.1774	0.0594	0.1907	0.0638	0.210	
14	0.0325	0.0109	0.0876	0.0293	0.131	
15	0.0629	0.0210	0.0165	0.0055	0.150	
16	0.0267	0.0089	0.1010	0.0338	0.115	
17	0.0243	0.0081	0.1116	0.0373	0.132	
18	0.0320	0.0107	0.0199	0.0067	0.102	
19	0.0400	0.0134	0.1094	0.0366	0.118	
20	0.0419	0.0140	0.0396	0.0132	0.092	
21	0.0212	0.0071	0.0158	0.0053	0.107	0.160
22	0.0346	0.0116	0.0188	0.0063	0.084	
23	0.0534	0.0179	0.0821	0.0275	0.098	0.147
24	0.0226	0.0076	0.0157	0.0053	0.077	
25	0.0132	0.0044	0.0884	0.0296	0.090	0.135
26	0.0300	0.0100	0.0130	0.0043	0.071	
27	0.0284	0.0095	0.0041	0.0014	0.083	0.124
28	0.0289	0.0097	0.0115	0.0038	0.066	
29	0.0176	0.0059	0.0595	0.0199	0.078	0.117
30	0.0120	0.0040	0.0023	0.0008	0.061	
31	0.0364	0.0122	0.0500	0.0167	0.073	0.109
32	0.0555	0.0186	0.0064	0.0021	0.058	
33	0.0262	0.0088	0.0068	0.0023	0.068	0.102
34	0.0140	0.0047	0.0103	0.0034	0.054	
35	0.0172	0.0058	0.0289	0.0097	0.064	0.096
36	0.0321	0.0107	0.0073	0.0024	0.051	
37	0.0208	0.0070	0.0237	0.0079	0.061	0.091
38	0.0199	0.0066	0.0123	0.0041	0.048	
39	0.0204	0.0068	0.0088	0.0029	0.058	0.087
40	0.0458	0.0153	0.0132	0.0044	0.046	
Generating Unit tested to BS EN 61000-3-2						
SSEG rating per phase T (rpp)		11kW			NV=MV*3.68/rpp	
Harmonic	At 45-55% of rated output		100% of rated output		Limit in BS EN 61000-3-2 in Amps	Higher limit for odd harmonics 21 and above
	Measured Value (MV) (A)	Normalised Value (NV) (A)	Measured Value (MV) (A)	Normalised Value (NV) (A)		
2	0.0353	0.0118	0.1006	0.0337	1.080	
3	0.3204	0.1072	0.2576	0.0862	2.300	
4	0.0390	0.0131	0.092	0.0308	0.430	
5	0.3987	0.1334	0.2749	0.0920	1.140	

6	0.0363	0.0121	0.0113	0.0038	0.300	
7	0.2558	0.0856	0.3332	0.1115	0.770	
8	0.0443	0.0148	0.0376	0.0126	0.230	
9	0.2137	0.0715	0.1095	0.0366	0.400	
10	0.0432	0.0145	0.0273	0.0091	0.184	
11	0.0575	0.0192	0.0637	0.0213	0.330	
12	0.0544	0.0182	0.0139	0.0047	0.153	
13	0.1094	0.0366	0.1801	0.0603	0.210	
14	0.0184	0.0061	0.0602	0.0201	0.131	
15	0.0930	0.0311	0.0021	0.0007	0.150	
16	0.0322	0.0108	0.089	0.0298	0.115	
17	0.0431	0.0144	0.1181	0.0395	0.132	
18	0.0660	0.0221	0.0184	0.0062	0.102	
19	0.0321	0.0107	0.1052	0.0352	0.118	
20	0.0273	0.0091	0.0529	0.0177	0.092	
21	0.0333	0.0112	0.0091	0.0030	0.107	0.160
22	0.0111	0.0037	0.0139	0.0047	0.084	
23	0.0219	0.0073	0.0817	0.0273	0.098	0.147
24	0.0126	0.0042	0.0248	0.0083	0.077	
25	0.0432	0.0144	0.0866	0.0290	0.090	0.135
26	0.0224	0.0075	0.0257	0.0086	0.071	
27	0.0152	0.0051	0.0071	0.0024	0.083	0.124
28	0.0173	0.0058	0.0156	0.0052	0.066	
29	0.0261	0.0087	0.0621	0.0208	0.078	0.117
30	0.0106	0.0036	0.0058	0.0019	0.061	
31	0.0127	0.0043	0.0467	0.0156	0.073	0.109
32	0.0143	0.0048	0.0077	0.0026	0.058	
33	0.0121	0.0040	0.0046	0.0015	0.068	0.102
34	0.0206	0.0069	0.0069	0.0023	0.054	
35	0.0348	0.0116	0.0355	0.0119	0.064	0.096
36	0.0398	0.0133	0.0027	0.0009	0.051	
37	0.0196	0.0066	0.0273	0.0091	0.061	0.091
38	0.0297	0.0100	0.0008	0.0003	0.048	
39	0.0143	0.0048	0.0107	0.0036	0.058	0.087
40	0.0157	0.0052	0.0089	0.0030	0.046	

**Power Quality. Voltage fluctuations and Flicker.** The tests should be carried out on a single **Generating Unit.** Results should be normalised to a standard source impedance or if this results in figures above the limits set in BS EN 61000-3-11 to a suitable Maximum Impedance.

Model	SOFAR 4000TL-S2							
	Starting			Stopping			Running	
	d max	d c	d(t)	d max	d c	d(t)	P st	P It 2 hours
Measured Values at test impedance(%)	1.28	0.96	--	1.28	0.96	--	0.083	0.192
Normalised to standard impedance (%)	1.28	0.96	--	1.28	0.96	--	0.083	0.192
Normalised to required maximum impedance	--	--	--	--	--	--	--	--
Limits set under BS EN 61000-3-11	4%	3.3%	3.3%	4%	3.3%	3.3%	1.0	0.65
Model	SOFAR 3300TL-S2							
	Starting			Stopping			Running	
	d max	d c	d(t)	d max	d c	d(t)	P st	P It 2 hours
Measured	1.18	1.30	--	1.18	1.30	--	0.086	0.196