



Shenzhen SOFARSOLAR Co., Ltd.

Tel: +86-755-26423805 Fax: +86-755-26969476 Email: Info@sofarsolar.com

Certificate EN50549-1:2019 with Irish deviations
European Standard

Manufacturer	Shenzhen SOFARSOLAR Co., Ltd.
Address	401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, Guangdong, P.R China

Type Tested referencenumber	EN50549-1:2019
Generating Unit technology	Hybrid Inverter
Test house details	Shenzhen SOFARSOLAR Co., Ltd.
Test period	2019-12-10 to 2019-12-14

Type reference	Max. apparent AC power (VA)	Max Output Current(A)	From FW Pack
HYD 3000-ES	3000	13,7	
HYD 3600-ES	3680	16,0	
HYD 4000-ES	4000	18,2	
HYD 4600-ES	4600	21,0	
HYD 5000-ES	5000	22.8	
HYD 6000-ES	6000	27.3	

Applied rules and standards :

EN50549-1:2019, Requirements for generating plants to be connected
in parallel with distribution networks

- Compliant with COMMISSION REGULATION (EU) 2016/631 (NC RfG).
- standard EN 50549-1:2019

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Test Results

Power quality

Harmonic current emissions as per EN 61000-3-2				p
HYD 6000-ES				
THD(%)		1,14		
Test values		See below		
Harmonics	Current Magnitude (A)	% of Fundamental	Phase	Harmonic Current Limits (%)
1st	25,730	99,993	Single Phase	--
2nd	0,053	0,207	Single Phase	8,000
3rd	0,238	0,925	Single Phase	21,600
4th	0,043	0,167	Single Phase	4,000
5th	0,050	0,195	Single Phase	10,700
6th	0,037	0,145	Single Phase	2,867
7th	0,054	0,210	Single Phase	7,200
8th	0,029	0,114	Single Phase	2,000
9th	0,033	0,127	Single Phase	3,800
10th	0,020	0,077	Single Phase	1,600
11th	0,039	0,152	Single Phase	3,100
12th	0,023	0,090	Single Phase	1,333
13th	0,024	0,092	Single Phase	2,000
14th	0,022	0,085	Single Phase	N/A
15th	0,038	0,148	Single Phase	N/A
16th	0,013	0,049	Single Phase	N/A
17th	0,033	0,130	Single Phase	N/A
18th	0,015	0,060	Single Phase	N/A
19th	0,024	0,095	Single Phase	N/A
20th	0,021	0,083	Single Phase	N/A
21th	0,038	0,142	Single Phase	N/A
22th	0,011	0,041	Single Phase	N/A
23th	0,025	0,097	Single Phase	N/A
24th	0,017	0,064	Single Phase	N/A
25th	0,027	0,104	Single Phase	N/A
26th	0,035	0,137	Single Phase	N/A
27th	0,030	0,118	Single Phase	N/A
28th	0,014	0,055	Single Phase	N/A
29th	0,018	0,069	Single Phase	N/A
30th	0,011	0,043	Single Phase	N/A
31th	0,021	0,083	Single Phase	N/A
32th	0,014	0,055	Single Phase	N/A
33th	0,022	0,085	Single Phase	N/A
34th	0,009	0,035	Single Phase	N/A
35th	0,015	0,057	Single Phase	N/A
36th	0,008	0,031	Single Phase	N/A
37th	0,017	0,068	Single Phase	N/A
38th	0,011	0,042	Single Phase	N/A
39th	0,018	0,068	Single Phase	N/A
40th	0,008	0,030	Single Phase	N/A

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Test Results

Power quality

TABLE:Flicker	P
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Flicker measurement

According to EN 61000-3-3/EN 61000-3-11

HYD 3000-ES				
Normal ambient				
Output power:	Flicker limits according to:	Result:		
		Plt	Pst	dc%
33%	EN 61000-3-3	0,07	0,07	0,05
66%	EN 61000-3-3	0,09	0,10	0,09
100%*	EN 61000-3-3	0,14	0,14	0,05
HYD 6000-ES				
Normal ambient				
Output power:	Flicker limits according to:	Result:		
		Plt	Pst	dc%
33%	EN 61000-3-3	0,10	0,10	0,04
66%	EN 61000-3-3	0,18	0,18	0,07
100%*	EN 61000-3-3	0,35	0,36	1,17
Note: *The stationary deviance of dc% is bigger than the dynamic deviance of d_{max} at starting and stopping. Mains Impedance according EN 61000-3-3 / EN 61000-3-11: $R_{max} = 0,24 \Omega$; $jX_{max} = 0,15 \Omega @50Hz$ $(Z_{max} = 0,283 \Omega)$ Bei Einphasigen Invertern Zmax sowie Rn und jxn angeben $R_n = 0,16 \Omega$; $jX_n = 0,1 \Omega$ Calculation of the maximum permissible grid impedance at the point of common coupling based on dc: $Z_{max} = Z_{ref} \cdot 3,3\% / d_c(P_n)$ The tests should be based on the limits of the EN61000-3-3 for less than 16A and on EN 61000-3-11 for more than 16A. The tests had been performed on the HYD 3000-ES and HYD 6000-ES are valid for the HYD 3600-ES, HYD 4000-ES and HYD 5000-ES since it is similar in hardware and just power derated by software.				

TABLE:DC injection	P
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Model:HYD 6000-ES

Power level	DC current [A]	% of nominal current	Limit
20%	0.0153	0.0586	0.5%
50%	0.0162	0.0621	0.5%
75%	0.0201	0.0770	0.5%
100%	0.0234	0.0897	0.5%

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Protection - Grid monitoring and reconnection time

Trip Tests	EN 50549:2019		Setting		Measures Values		Verification
	Magnitude	Time	Magnitude	Time	Magnitude	Time	
Undervoltage	207V	500ms	207V	500ms	207,1V	482ms	✓
Overfrequency	253V	500ms	253V	500ms	252,6V	480ms	✓
Underfrequency	48HZ	500ms	48HZ	500ms	48,01HZ	472ms	✓
Overfrequency	50,5HZ	500ms	50,5HZ	500ms	50,49HZ	478ms	✓

Loss of mains test according to the EN 62116

Testpower/ imbalance	Time (ms)	L1 (ms)1	L2 (ms)1	L3(ms)1	L1-L2-L3(ms)12	Verification
29% / --5%Q (Test 22)	500ms	252.9ms	N/A	N/A	N/A	✓
58% / --5%Q (Test 12)	500ms	300ms	N/A	N/A	N/A	✓
100% / --5%P (Test 5)	500ms	194.5ms	N/A	N/A	N/A	✓
29% / +5%Q (Test 31)	500ms	216.9ms	N/A	N/A	N/A	✓
58% / +5%Q (Test 21)	500ms	259.2ms	N/A	N/A	N/A	✓
100% / +5%P (Test 10)	500ms	288ms	N/A	N/A	N/A	✓

1. Indicates the stop of feed in
2. only applicable for three phase inverters

Reconnection time			
Limit	Setting	MV	Verification
60s	60s	74,56s	✓