广州三晶电气股份有限公司
Guangzhou Sanjing Electric Co.,Ltd.
Tel：400-159-0088 Fax：020-66608589
Web：www.saj-electric.cn / www.saj-electric.com
地址：广州高新技术产业开发区科学城荔枝山路9号三晶创新园
Add: SAJ Innovation Park, No.9, Lizhishan Road, Science City, Guangzhou High-tech Zone, Guangdong, P.R.China.

Certificate EN 50549-1:2019 with Ireland deviations

European Standard

Manufacturer	Guangzhou Sanjing Electric Co., Ltd.
Address	No.9, Lizhishan Road, Science City, Guangzhou High-tech Zone, Guangdong, P.R.China

Product Name	AC Retrofit Battery System			
Product Type	AS1-3KS-5.1	AS1-3KS-10.2	AS1-3KS-15.3	AS1-3KS-20.4
Max. AC Current [A]	13.1	13.1	13.1	13.1
Maximum Apparent Power [VA]	3000	3000	3000	3000
Generating Unit technology	Single phase isolated type multifunctions type BI-directional energy storage system.			
Type Tested	Base on requirements EN 50549-1:2019			
Test Location	Guangzhou Sanjing Electric Co., Ltd. No.9, Lizhishan Road, Science City, Guangzhou High-tech Zone, Guangdong, P.R.China			
Test Date	2021-7-14 to 2021-7-16			
Compliant to	-Requirements to Type A Generation Unit. -Commistion Regulation (EU) 2016/631 (NC RfG).			

Date: 2021.7.19 Signature:

Type Test Verification Report

Models AS1-3KS-5.1, AS1-3KS-10.2, AS1-3KS-15.3 and AS1-3KS-20.4 have the same structure, software logic and hardware structure, Except for the different model names and the number of parallel batteries, all tests are performed in AS1- 3KS-20.4.

Power Quality – Harmonics: These tests should be carried out as specified in EN 61000-3-2. The chosen test should be undertaken with a fixed source of energy at two power levels:

a) between 45 and 55%, b) at 100% of Registered Capacity.

Micro-generator rating per phase (rpp)			3	kW			
Harmonic	At 45-55% of **Registered Capacity**		100% of **Registered Capacity**				
	Measured Value MV in Amps	--	Measured Value MV in Amps		--	Limit in BS EN 61000-3-2 in Amps	Higher limit for odd harmonics 21 and above
2	0.060	--	0.113		--	1.080	
3	0.140	--	0.649		--	2.300	
4	0.006	--	0.034		--	0.430	
5	0.078	--	0.396		--	1.140	
6	0.010	--	0.040		--	0.300	
7	0.065	--	0.212		--	0.770	
8	0.007	--	0.020		--	0.230	
9	0.061	--	0.153		--	0.400	
10	0.005	--	0.012		--	0.184	
11	0.043	--	0.101		--	0.330	
12	0.005	--	0.014		--	0.153	
13	0.038	--	0.078		--	0.210	
14	0.006	--	0.006		--	0.131	
15	0.032	--	0.050		--	0.150	
16	0.002	--	0.010		--	0.115	

17	0.022	--	0.048	--	0.132	
18	0.010	--	0.012	--	0.102	
19	0.018	--	0.030	--	0.118	
20	0.019	--	0.015	--	0.092	
21	0.023	--	0.037	--	0.107	0.160
22	0.008	--	0.018	--	0.084	
23	0.012	--	0.027	--	0.098	0.147
24	0.004	--	0.008	--	0.077	
25	0.012	--	0.016	--	0.090	0.135
26	0.008	--	0.008	--	0.071	
27	0.027	--	0.008	--	0.083	0.124
28	0.008	--	0.003	--	0.066	
29	0.020	--	0.016	--	0.078	0.117
30	0.007	--	0.010	--	0.061	
31	0.019	--	0.020	--	0.073	0.109
32	0.001	--	0.014	--	0.058	
33	0.017	--	0.026	--	0.068	0.102
34	0.013	--	0.009	--	0.054	
35	0.011	--	0.016	--	0.064	0.096
36	0.011	--	0.010	--	0.051	
37	0.014	--	0.022	--	0.061	0.091
38	0.005	--	0.009	--	0.048	
39	0.013	--	0.014	--	0.058	0.087
40	0.004	--	0.010	--	0.046	

Power Quality – Voltage fluctuations and Flicker:

Element	1		
Volt Range	300 V/50Hz	Element1	Judgement Pass
Un (Set)	230.000V	Total	Judgement Pass
Freq (U1)	50.003Hz	(Element1)	
Dmin	0.10%		

	dc[%]	dmax[%]	d(t)[ms]	Pst	Plt
Limit	3.30	4.00	500 3.30%	1.00	0.65 N:12
No. 1	0.043 Pass	0.366 Pass	0.0 Pass	0.162 Pass	
2	0.043 Pass	0.388 Pass	0.0 Pass	0.171 Pass	
3	0.042 Pass	0.371 Pass	0.0 Pass	0.164 Pass	
4	0.022 Pass	0.722 Pass	0.0 Pass	0.746 Pass	
5	0.039 Pass	0.380 Pass	0.0 Pass	0.156 Pass	
6	0.029 Pass	0.400 Pass	0.0 Pass	0.162 Pass	
7	0.027 Pass	0.356 Pass	0.0 Pass	0.165 Pass	
8	0.031 Pass	0.652 Pass	0.0 Pass	0.179 Pass	
9	0.030 Pass	0.525 Pass	0.0 Pass	0.425 Pass	
10	0.032 Pass	0.367 Pass	0.0 Pass	0.155 Pass	
11	0.046 Pass	0.382 Pass	0.0 Pass	0.160 Pass	
12	0.033 Pass	0.400 Pass	0.0 Pass	0.164 Pass	
Result	Pass	Pass	Pass	Pass	0.355 Pass

Plt	0.355	Limit	0.65

Test Impedance	R	0.4	Ω	X	0.25	Ω
Standard Impedance	R	0.24 * 0.4 ^	Ω	X	0.15 * 0.25 ^	Ω
Maximum Impedance	R	--	Ω	X	--	Ω

Applies to three phase and split single phase **Micro-generators**.

^ Applies to single phase **Micro-generators** and **Micro-generators** using two phases on a three phase system.

For voltage change and flicker measurements the following formula is to be used to convert the measured values to the normalised values where the power factor of the generation output is 0.98 or above.

Normalised value = Measured value*reference source resistance/measured source resistance at test point.

Single phase units reference source resistance is 0.4 Ω

Two phase units in a three phase system reference source resistance is 0.4 Ω.

Two phase units in a split phase system reference source resistance is 0.24 Ω.

Three phase units reference source resistance is 0.24 Ω.

Where the power factor of the output is under 0.98 then the X to R ratio of the test impedance should be close to that of the Standard Impedance.

The stopping test should be a trip from full load operation.

The duration of these tests need to conform to the particular requirements set out in the testing notes for the technology under test. Dates and location of the test need to be noted below.

Power quality – DC injection:				
Test power level	20%	50%	75%	100%
Recorded value in Amps	0.016	0.013	0.018	0.031
as % of rated AC current	0.12%	0.10%	0.14%	0.23%
Limit	0.5%	0.5%	0.5%	0.5%

Power Quality – Power factor:			
	207 V	230 V	253 V
20% of **Registered Capacity**	0.998	0.999	0.999
50% of **Registered Capacity**	0.998	0.999	0.999
75% of **Registered Capacity**	0.999	0.999	0.999
100% of **Registered Capacity**	0.999	0.999	0.999
Limit	>0.95	>0.95	>0.95

Protection - Grid monitoring and reconnection time:			
	Under frequency:		
Step for trip value [Hz to Hz]:	Setting threshold +1%Fn -> decrease by max 0.02Hz steps		
Step trip time [Hz to Hz]:	Trip value +0.1Hz -> Trip value -0.1Hz		
Setting value for trip value:	48.00 Hz		
Measurement accuracy of the tripping value [Hz]:	48.01 Hz	48.01 Hz	47.98 Hz
Setting value for trip time:	500 ms		
Measurement the trip time [ms]:	498 ms	497 ms	498 ms
	Over frequency:		
Step for trip value [Hz to Hz]:	Setting threshold +1%Fn -> increase by max. 0.02Hz steps		
Step trip time [Hz to Hz]:	Trip value +0.1Hz -> Trip value -0.1Hz		
Limit [Hz]:	50.50 Hz		
Measurement accuracy of the tripping value [Hz]:	50.51 Hz	50.52 Hz	50.52 Hz
Setting value for trip time:	500ms		
Measurement the trip time [ms]:	498 ms	492 ms	495 ms

		Under voltage:		
Step for trip value [V to V]:		Setting threshold +5%Vn -> decrease by max 1V steps		
Step for trip time [V to V]:		Trip value +2%Vn -> Trip value -2%Vn		
Setting value for trip value:		207V		
Measurement accuracy of the tripping value [V]:	L1:	207.5 V	207.3 V	207.6 V
	L2:	--	--	--
	L3:	--	--	--
Setting value for trip time:		500 ms		
Measurement the trip time [ms]:	L1:	500 ms	498 ms	497 ms
	L2:	--	--	--
	L3:	--	--	--
		Over voltage:		
Step for trip value [V to V]:		Setting threshold +5%Vn -> increase by max 1V steps		
Step for trip time [V to V]:		Trip value -2%Vn -> Trip value +2%Vn		
Setting value for trip value:		253V		
Measurement accuracy of the tripping value [V]:	L1:	253.2 V	253.0 V	253.6 V
	L2:	--	--	--
	L3:	--	--	--
Setting value for trip time:		500		
Measurement the trip time [ms]:	L1:	498 ms	496 ms	497 ms
	L2:	--	--	--
	L3:	--	--	--

Note:
The above test result just for evaluation the interface protection system measure the voltage, frequency and trip time tolerance. If the product installation on the position should need confirmed the grid protection value with located DSO.
The interface protection system with voltage tolerance: ± 1%Vn.
The interface protection system with frequency tolerance: ± 0.05Hz.
The reset time shall be ≤50ms.

U [Vac] Set Value	Limit [Vac]	f [Hz] Set Value	Limits [Hz]	Input Power [%]	Connect/Reconnection Time [sec]	Active power increase gradient [%/min.]	Acceptability criteria
Start-up for UV:							
85%Un	U < 90%	50,00 Hz	48,00 Hz <F< 50,50 Hz	100 %	- - -	- - -	No connection
100%Un	90% <U< 110%	50,00 Hz	48,00 Hz <F< 50,50 Hz	100 %	62 s	--	Delay for reconnection >60 s; Gradient: No requires.
80%Un	U < 90%	50,00 Hz	48,00 Hz <F< 50,50 Hz	Disconnect			
Re-connected for UV:							
85%Un	U < 90%	50,00 Hz	48,00 Hz <F< 50,50 Hz	100 %	- - -	- - -	No connection
95%Un	90% <U< 110%	50,00 Hz	48,00 Hz <F< 50,50 Hz	100 %	62 s	8.83%	Delay for reconnection >60 s; Gradient:10%/min.
Start-up for OV:							
112%Un	U>110%	50,00 Hz	48,00 Hz <F< 50,50 Hz	100 %	- - -	- - -	No connection
108%Un	90% <U< 110%	50,00 Hz	48,00 Hz <F< 50,50 Hz	100 %	62 s	--	Delay for reconnection >60 s; Gradient: No requires.
115%Un	U>110%	50,00 Hz	48,00 Hz <F< 50,50 Hz	Disconnect			
Re-connected for OV:							
112%Un	U>110%	50,00 Hz	48,00 Hz <F< 50,50 Hz	100 %	- - -	- - -	No connection
108%Un	90% <U< 110%	50,00 Hz	48,00 Hz <F< 50,50 Hz	100 %	62 s	9.68%	Delay for reconnection >60 s; Gradient:10%/min.
Start-up for UF:							
Un	90% <U< 110%	47,50 Hz	F< 48,00Hz	100 %	- - -	- - -	No connection
Un	90% <U< 110%	49,60 Hz	48,00 Hz <F< 50,50 Hz	100 %	63 s	9.68%	Delay for reconnection >60 s; Gradient: No requires.

Un	90% <U< 110%	47,40 Hz	F< UF	Disconnect			
Re-connected for UF:							
Un	90% <U< 110%	47,50 Hz	F< 48,00Hz	100 %	- - -	- - -	No connection
Un	90% <U< 110%	49,60 Hz	48,00 Hz <F< 50,50 Hz	100 %	63 s	9.66%	Delay for reconnection >60 s; Gradient:10%/min.
Start-up for OF:							
Un	90% <U< 110%	50,80 Hz	F>50.50Hz	100 %	- - -	- - -	No connection
Un	90% <U< 110%	50,00 Hz	48,00 Hz <F< 50,50 Hz	100 %	62 s	9.78%	Delay for reconnection >60 s; Gradient: No requires.
Un	90% <U< 110%	51,00 Hz	F>50,50 Hz	Disconnect			
Re-connected for OF:							
Un	90% <U< 110%	50,60 Hz	F > 50,50 Hz	100 %	- - -	- - -	No connection
Un	90% <U< 110%	50,10 Hz	48,00 Hz <F< 50,50 Hz	100 %	65 s	9.68%	Delay for reconnection >60 s; Gradient:10%/min.

Protection – Loss of Mains test:

Test Power and imbalance	33% -5% Q Test 22	66% -5% Q Test 12	100% -5% P Test 5	33% +5% Q Test 31	66% +5% Q Test 21	100% +5% P Test 10
Trip time. Limit is 2s	0.196 s	0.218 s	0.243s	0.202 s	0.218 s	0.232 s