



Test Report: ES-HSI-6K

6000W Single Phase Energy Storage Inverter

- **DESIGN VERIFY TEST**

- Output Function Test

- Input Function Test

- Protection Function Test

- Control Function Test

- APPLICATION Test

- Component Stress Test

- **SAFETY & E.M.C. TEST**

- Safety Test

- E.M.C. Test

- **RELIABILITY TEST**

- ENVIRONMENT TEST

DESIGN VERIFY TEST

GRID CONNECTION OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RATED POWER	6000W	BATTERY INPUT IP: 48VDC Ta:25°C	<u>6000</u> W
			PV INPUT IP: 360VDC Ta:25°C	<u>6000</u> W
2	AC VOLTAGE	FOLLOW THE GRID VOLTAGE	BATTERY INPUT IP: 48VDC OP: TESTING LOAD Ta:25°C	<u>234.7</u> V
			PV INPUT IP: 360VDC OP: TESTING LOAD Ta:25°C	<u>234.9</u> V
3	FREQUENCY	FOLLOW THE GRID VOLTAGE	BATTERY INPUT IP: 48VDC OP: FULL LOAD Ta:25°C	50HZ: <u>50.06</u> HZ 60HZ: <u>59.89</u> HZ
			PV INPUT IP: 360VDC OP: FULL LOAD Ta:25°C	50HZ: <u>50.06</u> HZ 60HZ: <u>59.89</u> HZ
4	WAVEFORM	True sine wave (THD<3%)	BATTERY INPUT IP: 48VDC OP: 230VAC/6000W Ta:25°C	<u>1.89</u> % /6000W
			PV INPUT IP: 360VDC OP: 230VAC/6000W Ta:25°C	<u>1.85</u> % /6000W
5	AC OUT CURRENT	26A	BATTERY INPUT IP: 48VDC OP: FULL LOAD Ta:25°C	<u>25.5</u> A
			PV INPUT IP: 360VDC OP: FULL LOAD Ta:25°C	<u>25.6</u> A

OFF-GRID CONNECTION OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
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1	RATED POWER	6000W	BATTERY INPUT IP: 48VDC Ta:25°C	<u>6000</u> W
			PV INPUT IP: 360VDC Ta:25°C	<u>6000</u> W
2	AC VOLTAGE	230Vac	BATTERY INPUT IP: 48VDC OP:TESTING LOAD Ta:25°C	<u>230.7</u> V
			PV INPUT IP: 360VDC OP:TESTING LOAD Ta:25°C	<u>230.9</u> V
3	FREQUENCY	50HZ	BATTERY INPUT IP: 48VDC OP: FULL LOAD Ta:25°C	50HZ: <u>50.03</u> HZ
			PV INPUT IP: 360VDC OP: FULL LOAD Ta:25°C	50HZ: <u>50.03</u> HZ
4	WAVEFORM	True sine wave (THD<3%)	BATTERY INPUT IP: 48VDC OP: 230VAC/6000W Ta:25°C	<u>1.53</u> % / 6000W
			PV INPUT IP: 360VDC OP: 230VAC/6000W (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	<u>1.52</u> % / 6000W
5	AC OUT CURRENT	26A	BATTERY INPUT IP: 48VDC OP: FULL LOAD Ta:25°C	<u>25.8</u> A
			PV INPUT IP: 360VDC OP: FULL LOAD Ta:25°C	<u>26.2</u> A

BATTERY INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	40VDC~60VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25°C	<u>38</u> VDC~ <u>61</u> VDC/NO LOAD <u>39</u> VDC~ <u>61</u> VDC/FULL LOAD
2	DC CURRENT (TYP)	135A	IP: 48VDC OP:FULL LOAD Ta:25°C	<u>138.8</u> A
3	EFFICIENCY(TYP)	6000W /93%	IP:48VDC OP: Po=6000W Ta:25°C	<u>93.6</u> %
4	NO LOAD DISSIPATION		IP:48VDC OP:NO LOAD Ta:25°C	<u>62</u> W @ Inverter mode
5	STANDBY POWER LOSS		IP:48VDC OP:NO LOAD Ta:25°C	<u>24</u> W @ Inverter mode

PV INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	120VDC~500VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25°C	<u>110</u> VDC~ <u>510</u> VDC/NO LOAD <u>110</u> VDC~ <u>505</u> VDC/FULL LOAD
2	DC CURRENT (TYP)	2*21A	IP: 360VDC OP:FULL LOAD Ta:25°C	<u>17.6</u> A
3	EFFICIENCY(TYP)	6000W /95%	IP:360VDC OP: Po=6000W Ta:25°C	<u>95.4</u> %
4	NO LOAD DISSIPATION		IP:360VDC OP:NO LOAD Ta:25°C	<u>48</u> W @ Grid mode
	STANDBY POWER LOSS		IP:360VDC OP:NO LOAD Ta:25°C	<u>21</u> W @ Grid mode

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT. POLARITY	By internal fuse open	IP: BAT +/- (Reverse) OP: FULL LOAD Ta:25°C	TEST: <u>OK</u>
2	PV. POLARITY	By internal fuse open	IP: BAT +/- (Reverse) OP: FULL LOAD Ta:25°C	TEST: <u>OK</u>

3	OVER TEMPERATURE	Shut down o/p voltage	IP: HI LINE/LOW-LINE OP: FULL LOAD SW:ON Ta:25°C	Shut down o/p voltage
4	OUTPUT SHORT	Shut down o/p voltage	IP:230VAC OP: TESTING SW:ON Ta:25°C	Shut down o/p voltage
			IP:BAT 48VDC OP: TESTING SW:ON Ta:25°C	Shut down o/p voltage
			IP:PV 500VDC OP: TESTING SW:ON Ta:25°C	Shut down o/p voltage

APPLICATION TEST

NO	TEST ITEM	TEST CONDITION	RESULT
1	APP CONNECTION	Use the WIFI function to connect	TEST: <u>OK</u>
2	APP SHOWS	Display the data of solar, wind and thermal power generation and electricity consumption for each day, month and year.	TEST: <u>OK</u>
3	OUTPUT PARAMETER SETTINGS	Set the parameters and send them to the inverter.	TEST: <u>OK</u>
4	BATTERY PARAMETER SETTINGS	Set the parameters and send them to the inverter.	TEST: <u>OK</u>
5	GRID PARAMETER SETTINGS	Set the parameters and send them to the inverter.	TEST: <u>OK</u>

SAFETY & EMC TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	AC I/P-AC O/P: 3 KVAC/min BAT I/P-AC I/P: 3 KVAC/min AC O/P-FG: 1.5 KVAC/min	I/P-AC O/P 3.6 KVAC/min I/P-AC I/P: 3.6 KVAC/min AC O/P-FG:1.8 KVAC/min Ta:25°C	NO DAMAGE

2	TOUCH CURRENT MEASUREMENT	< 3.5 mA	(1) Metal enclosure to earth (2) LCD panel with metal foil to earth (3) USB terminal on COMM board to earth Ta:25°C	(1) Measured: <u>0.06</u> mA (2) Measured: <u>0.005</u> mA (3) Measured: <u>0.12</u> mA
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E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONDUCTION	CE CLASS A	I/P: DC 48 V+PV 400V O/P: Grid mode Ta:25°C	PASS
2	RADIATION	CE CLASS A	I/P: DC 48 V+PV 400V O/P: Grid mode Ta:25°C	PASS
3	HARMONIC	EN 62920 CLASS A	I/P: DC 48 V+PV 400V O/P: FULL LOAD Ta:25°C	PASS
4	E.S.D	EN 62920 AIR : 8KV / Contact : 4KV	I/P: DC 48 V+PV 400V O/P: FULL LOAD Ta:25°C	CRITERIA A
5	E.F.T	EN 62920 INPUT: 1KV	I/P: DC 48 V+PV 400V O/P: FULL LOAD Ta:25°C	CRITERIA A
6	SURGE	EN 62920 L-N :1KV L,N-PE:2KV	I/P: DC 48 V+PV 400V O/P: FULL LOAD Ta:25°C	CRITERIA A
7	Test by certified Lab & Test Report Prepare Any contradictions of the test results, please refer to the latest EMC test report			

Reliability Test

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																				
1	TEMPERATURE RISE TEST	MODEL : ES-HSI-6K 1. MINIMUM PV VOLTAGE INPUT : 2 HRS I/P : PV 120VDC O/P : FULL LOAD Ta= 50 °C 2. MAXIMUM PV VOLTAGE INPUT : 2 HRS I/P : PV 120VDC O/P : FULL LOAD Ta= 50 °C																						
		<table><tr><th>NO</th><th>Position</th><th>PV=120VDC Ta= 50 °C</th><th>PV=500VDC Ta= 50 °C</th></tr><tr><td>1</td><td>C34</td><td>75.4°C</td><td>64.3°C</td></tr><tr><td>2</td><td>C58</td><td>65°C</td><td>64.5°C</td></tr><tr><td>3</td><td>CT1 coil</td><td>90.5°C</td><td>91.6°C</td></tr><tr><td>4</td><td>CT2 coil</td><td>84.5°C</td><td>84.6°C</td></tr></table>	NO	Position	PV=120VDC Ta= 50 °C	PV=500VDC Ta= 50 °C	1	C34	75.4°C	64.3°C	2	C58	65°C	64.5°C	3	CT1 coil	90.5°C	91.6°C	4	CT2 coil	84.5°C	84.6°C		
NO	Position	PV=120VDC Ta= 50 °C	PV=500VDC Ta= 50 °C																					
1	C34	75.4°C	64.3°C																					
2	C58	65°C	64.5°C																					
3	CT1 coil	90.5°C	91.6°C																					
4	CT2 coil	84.5°C	84.6°C																					

		5	L5 coil	127.5°C	82.3°C
		6	TX1 coil	74.2°C	69.7°C
		7	TX2 coil	74.9°C	74.2°C
		8	U16	74.2°C	73°C
		9	TX1 core	64.2°C	64.9°C
		10	U6	63.4°C	63.7°C
		11	C6	66.4°C	66.7°C
		12	LCD panel	58.1°C	59.5°C
		13	Mounting surface	50.8°C	52.6°C
		14	AC input terminal	65.6°C	66°C
		15	AC output terminal	65.7°C	65.8°C
		16	PV terminal	69.8°C	62.6°C
		17	PCB near battery (+)	61.5°C	61.6°C
		20	PV wire	82.7°C	67.4°C
		21	MOV3	68.3°C	68.5°C
		22	C68	68.9°C	81.6°C
		23	C129	86.4°C	74.1°C
		24	RY3 body	97.9°C	102.2°C
		25	L3 coil	101.6°C	107.3°C
		26	C138	94.5°C	96.8°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)		I/P : 48VDC O/P : 102%LOAD Ta : 25°C	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P : 48VDC O/P : 100%LOAD Ta= -10 °C	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE		I/P : 60VDC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	JinKj		Chenhm

2020.10.1 TAG-QA-009