STIEE

Reference №: 24ZAS01P05D31-34082/2

中国认可
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检测
TESTING
CNASL1145

Test Report

Name of products:	Battery Energy Storage System
Type:	Power Cell X 2409
Client:	Soluna (shanghai) CO., LTD.
Kind of test:	Commission test

SHANGHAI TESTING & INSPECTION INSTITUTE FOR ELECTRICAL EQUIPMENT CO., LTD.

Name of product	Battery Energy Storage System		Trade mark	/	
Type	Power Cell X 2409				
Technical parameters	Rated Voltage：691.2VDC，Rated Capacity：100Ah；Rated Energy：69.12kWh； Charge/Discharge Current（Rated）：50A/50A； Charge/Discharge Current（Max）：100A/100A； Rated AC Input：230Vac/50Hz，5A；Ingress Protection：IP55				
Kind of test	Commission Test				
Applicant	Soluna (shanghai) CO., LTD.		Address	2nd Floor, No. 979, Yunhan Road, Lingang New Area, China (Shanghai) Pilot Free Trade Zone	
producer	DLG Energy (Shanghai) Co., Ltd		Address	No.3492 Jinqian Road, Shanghai, China	
Number of samples	1	Production serial number	/	Date of receiving samples	2024-8-5
Samples number	#02				
Test specification	IEC 62477-1：2022 《Safety requirements for power electronic converter systems and equipment - Part 1： General》 IEC 60529:2013 《Degrees of protection provided by enclosures (IP Code)》				
Reference specification	IEC 62477-1：2022 《Safety requirements for power electronic converter systems and equipment - Part 1： General》 IEC 60529:2013 《Degrees of protection provided by enclosures (IP Code)》				
Test date	2024-8-7 ~ 2024-8-8				
Test results	According to the test items summary list, there are 2 items, of which 2 are qualified and 0 are unqualified. Date of Issue: 2024-08-13				
Note	1. This report does not include all the items in the testing standards. Please refer to the test items summary list. 2. The sample contains Power Cell X 2409，Power Cell X 2408，Power Cell X 2407，Power Cell X 2406，Power Cell X 2405 and Power Cell X 2404. And the samples of 6 models share the same set of housing..				

Approved by: 黄桂香 Verified by: 孙冬 Edited by: 穆昊源

Test items summary list			
Sequence/No.	**Test items**	**Subclause**	**Test results**
1	Visual inspection	IEC 62477-1:2022/5.2.1	Pass
2	Ingress protection test （IP rating）	IEC 62477-1:2022/5.2.2.3 IEC 60529：2013	Pass
	—end		

Photos

Figure 1- Internal structure of the Sample

Figure 2-Left Side of the Sample

Photos

Figure 3- Front of the Sample

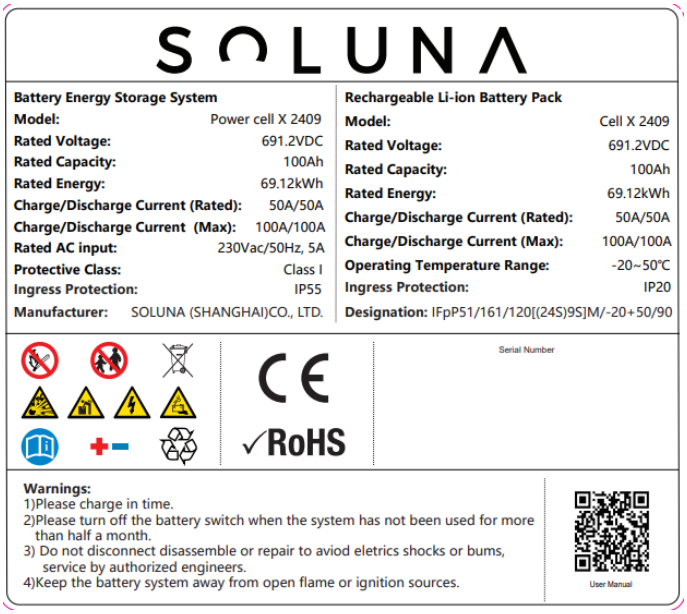

Figure 4-Nameplate of the Sample

Clause	Requirement + Test	Result - Remark #02	Verdict
IEC 62477-1:2022 /5.2.1	**Visual inspection** Visual inspections shall be made ·as routine tests, to check features such as adequacy of labelling, warnings and other safety aspects, and ·as part of type tests to verify: – the relevant design measures and data sheets as specified in 4.3 to 4.14, – the acceptance criteria of individual tests in 5.2.2 to 5.2.7, – relevant information and marking requirement as specified in 6.2 to 6.5. Routine visual inspections may be part of the production or assembly process.	Data see the photo page.	Pass
IEC 62477-1:2022 /5.2.2.3 IEC 60529：2013	**Ingress protection test （IP rating）** As required in 4.12.1, the claimed IP rating of the enclosure shall be verified. This test shall be performed as a type test of the enclosure of a PECS as specified in IEC 60529: 1989, IEC 60529:1989/AMD1:1999 and IEC 60529: 1989/AMD2: 2013 for the enclosure classification. In conjunction with IEC 60529: 1989, 11.2, the following applies. a) One representative sample shall be tested. b) The enclosure shall be mounted for test as described in 5.1.5.4. c) Testing can be done with an empty enclosure or an enclosure that does not contain all the parts that would be included in the complete product if it can be proven that the removal of these parts does not impact the test results. The manufacturer is required to provide evidence that the ingress of water or dust will not violate the acceptance criteria for the relevant characteristic numeral IP test. d) For large enclosures having a volume greater than 2 m3, if an enclosure is comprised of many identical seams (a joint between two or more pieces) with similar fastening patterns, it is permissible to test one representative joint. This would include doors, panels, shipping splits, access panels, or any mechanical structure of the enclosure that is a potential ingress point where the construction is duplicated multiple times in the same enclosure. e) The enclosures shall be tested in the applicable conditions:	As IP55, data see the Appendix 1.	Pass

Clause	Requirement + Test	Result - Remark #02	Verdict
	• energized; • not energized; • moving parts in motion; and • moving parts not in motion. Analysis can be used to show that some portion(s) of these requirements could be omitted if the worst case test condition is achieved without that test condition. Paint or paste that changes colour when exposed to water which allows the water path to be tracked or video equipment installed inside the enclosure are both allowed. There may be other acceptable methods not mentioned. It is the manufacturer's responsibility to ensure compliance is met with the removal of any test equipment. The test methods described in IEC 60529: 1989, Figure 4 and Figure 5, are allowed when performing IPX3 and IPX4 testing as referenced in IEC 60529: 1989, 14.2.3 and 14.2.4. For acceptance criteria, see 5.2.2.3.4. The atomized water test of 5.2.2.3.2 is allowed to be used in place of a dust test for IP5X and IP6X ratings if the enclosure is of category 2 in 5.2.2.3.3, except for at ventilation openings. It is not acceptable to test ventilation openings using the alternate atomized water test for first characteristic numerals 5 and 6; however, the gasket between the ventilation opening and housing may be tested using this method. NOTE The atomized water test cannot be used to determine how dust would accumulate inside the enclosure which might lead to a hazardous condition. Therefore, the more stringent requirements of IP6X are imposed. It is possible that, with the inclusion of filters, an IP5X rating is necessary for the equipment based on the qualification of the filter. See 4.12.1 for requirements of the IP rating.		
	—end		

<table>
<tr><td colspan="4">Appendix 1</td></tr>
<tr><td colspan="4">#02</td></tr>
<tr><td colspan="2">Dust test</td><td colspan="2">Sample Number：#02
Test Date：2024.8.7-2024.8.8</td></tr>
<tr><td colspan="2">Temperature:30.9～32.6℃</td><td>Humidity:48～52%RH</td><td>Atmospheric pressure:100.9kPa</td></tr>
<tr><td>Test Parameter</td><td colspan="3">IP5X：
Test for preventing from approaching dangerous parts:
Test tool: Φ1.0mm test line with baffle;
Test thrust: 1N ± 0.1N；

Place the sample in a dustproof box without negative pressure, and test for 8 hours；
Dust type: talc powder;
Particle size ≤75μm (200 mesh);
Dust quality: 2kg/m³.</td></tr>
<tr><td>Test Result</td><td colspan="3">Preventing from approaching dangerous parts: the test line with baffle did not enter any opening of the sample, and keep sufficient clearance with live parts and mechanical parts.
Preventing solid foreign matters: there is no dust inside the sample after the test.</td></tr>
<tr><td colspan="4"> 
Figure 5-During dust test</td></tr>
<tr><td colspan="2">Moisture resistance</td><td colspan="2">Sample Number：#02
Test Date：2024.8.7-2024.8.8</td></tr>
<tr><td colspan="2">Temperature:30.9～32.6℃</td><td>Humidity:48～52%RH</td><td>Atmospheric pressure:100.9kPa</td></tr>
<tr><td>Test Parameter</td><td colspan="3">IPX5:
Nozzle inner diameter: 6.3 mm;
Water flow: 12.5±0.625 L/min;
Test distance: 2.5~3 m;
Test area: area of all test surfaces;
Test time: 1 min/m^2， at least 3 min;
Nozzle water pressure: about 30 kPa.</td></tr>
</table>

Appendix 1	
Test Result	There is no obvious water drop in the sample after the test.

Figure 6-During test of moisture resistance

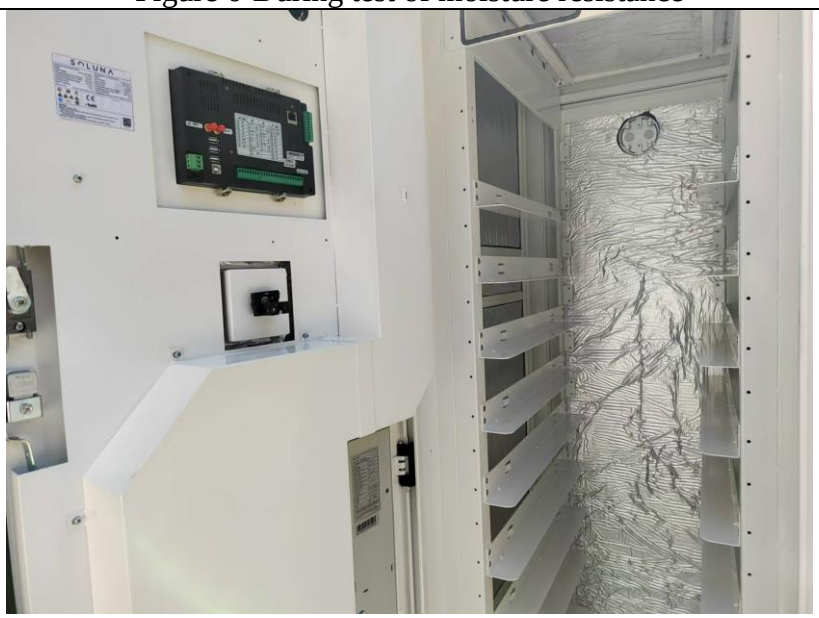

Figure 7-Internal structure after test

List of Test Instruments and Equipment

S/N	Name	Model	No.	Calibration validity
1.	Dust resistance test chamber	TMJ-9723	0441-2361	2025-03-05
2.	IP test tool -Φ1.0mm test line with baffle	QXB-1	1216-0281-6	2024-09-08
3.	Digital force gauge	HF-20	JY18081409	2024-08-17
4.	Empty Box Barometer	DYM3	JY16061423	2024-08-13
5.	Thermo hygrometer	BT-2	D-K20101204	2024-08-27
6.	Band tape	3m/1mm	C05	2025-08-04
7.	Flowmeter	LWGY-10B	0441-2351-1	2024-11-02
8.	Pressure gage	Y60/（0~2.5）bar	0441-2351-2	2024-12-18
9.	Anti-electric shock circuit device	HL-JT	JY1808013	2024-08-27
10.	IP5X spray nozzle	D6.3	0441-2351-7	2024-08-13
	—end			

—end—

STATEMENT

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3. **The test report without the signature of the preparing person, review person and approval person shall be considered as invalid.**
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