TEST REPORT

IEC 62933-5-2

Electrical energy storage (EES) systems –Part 5-2: Safety requirements for grid integrated EES systems –Electrochemical-based systems

Report reference number ..... :	CNDQ-ESH-P25110217
Date of issue..... ……:	2025-12-13
Total number of pages ..... ……:	74 pages
Testing laboratory name ..... :	**BUREAU VERITAS LCIE CHINA COMPANY LIMITED**
Address ..... :	Building 4, No. 518, Xinzhuan Road, Caohejing Songjiang High-Tech Park, Shanghai, P.R. China (201612)
Applicant's name ..... :	**BSL NEW ENERGY TECHNOLOGY CO.，LTD**
Address ..... :	8F, Building D-2-3,1F, Building D-2-3, 8F, Building D-2-2, No. 6, Xingyuan North Road, Starting AreaChina-Korea Huizhou Industrial Park, Zhongkai District, Huizhou City, Guangdong, P.R. China
Test specification	
Standard..... :	IEC 62933-5-2:2020
Test procedure..... :	**Certificate of compliance**
Test report form number, ... :	IEC 62933-5-2
Master TRF ..... :	BUREAU VERITAS LCIE CHINA COMPANY LIMITED
Test item description..... :	**Air-cooled Integrated Energy Storage Systems**
Trademark..... :	BSLBATT®
Model / Type..... :	241C-10/500, 241C-9/500, 241C-8/500, 241C-7/500, 241C-6/500, 241C-5/500, 241C-4/500, 241C-3/500, 241C-2/500, 241C-1/500, 225C-10/500, 225C-9/500, 225C-8/500, 225C-7/500, 225C-6/500, 225C-5/500, 225C-4/500, 225C-3/500, 225C-2/500, 225C-1/500, 208C-10/500, 208C-9/500, 208C-8/500, 208C-7/500, 208C-6/500, 208C-5/500, 208C-4/500, 208C-3/500, 208C-2/500, 208C-1/500
Ratings ..... :	See tables on page 3 to page 8

Testing Location ..... :	**BUREAU VERITAS LCIE CHINA COMPANY LIMITED**	
Address ..... :	Building 4, No. 518, Xinzhuan Road, Caohejing Songjiang High-Tech Park, Shanghai, P.R. China (201612)	
Tested by (name and signature)..... :	Amy Dong Project Manager	
Approved by (name and signature)..... :	Robin Wu Project Reviewer	
Manufacturer's name..... :	BSL NEW ENERGY TECHNOLOGY CO., LTD	
Manufacturer's address..... :	8F, Building D-2-3,1F, Building D-2-3, 8F, Building D-2-2, No. 6, Xingyuan North Road, Starting AreaChina-Korea Huizhou Industrial Park, Zhongkai District, Huizhou City, Guangdong, P.R. China	
Factory name ..... :	BSL NEW ENERGY TECHNOLOGY CO., LTD	
Factory address ..... :	8F, Building D-2-3,1F, Building D-2-3, 8F, Building D-2-2, No. 6, Xingyuan North Road, Starting AreaChina-Korea Huizhou Industrial Park, Zhongkai District, Huizhou City, Guangdong, P.R. China	

Document History			
Date	**Internal reference**	**Modification / Change / Status**	**Revision**
2025-12-13	Amy Dong	This is an original report	0
Supplementary information:			

Model list:					
Model ..... :	241C-10/500	241C-9/500	241C-8/500	241C-7/500	241C-6/500
Battery Type ..... :	LiFePO4				
Battery Voltage Range (Vd.c.) .... :	768	768	768	768	768
Battery Rated Voltage (Vd.c.) ..... :	672-852	672-852	672-852	672-852	672-852
Nominal Capacity (MWh) ..... :	2.41MWh	2.169MWh	1.928MWh	1.687MWh	1.446MWh
Max. Charging/Discharging Current (Ad.c.) ..... :	80A*10	88A*9	100A*8	114A*7	133A*6
Grid Side Parameters:					
Grid Rated Power ..... :	500kW	500kW	500kW	500kW	500kW
Grid Rated Voltage ..... :	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.
Grid Rated Current ..... :	720A	720A	720A	720A	720A
Grid Frequency..... :	50Hz	50Hz	50Hz	50Hz	50Hz
Load Output Side Parameters:					
Load Output Rated Power :	500kW	500kW	500kW	500kW	500kW
Load Output Rated Voltage :	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.
Load Output Rated Current..... :	720A	720A	720A	720A	720A
Load Output Frequency ..... :	50Hz	50Hz	50Hz	50Hz	50Hz
PV Side Parameters:					
Rate PV Power..... :	500kW	500kW	500kW	500kW	500kW
Operating Voltage Range..... :	312-850V	312-850V	312-850V	312-850V	312-850V
Maximum PV Current..... :	160A*10	160A*10	160A*10	160A*10	160A*10
Number Of PV MPPT Circuits .... :	10	10	10	10	10
Isc PV (absolute max.):	180A*10	180A*10	180A*10	180A*10	180A*10
General parameters:					
Operating temperature range..... :	-25℃-+60℃				
Protection Degree..... :	Class I				
Overvoltage category..... :	DC: OVC II / AC: OVC III				
Ingress Protection (IP) ..... :	IP55				
Power Factor	-1Leading-+1Lagging				

Model list:					
Model.....:	241C-5/500	241C-4/500	241C-3/500	241C-2/500	241C-1/500
Battery Type .....:	LiFePO4				
Battery Voltage Range (Vd.c.) ....:	768	768	768	768	768
Battery Rated Voltage (Vd.c.) .....:	672-852	672-852	672-852	672-852	672-852
Nominal Capacity (Wh) .....:	1.205MWh	964kWh	723kWh	482kWh	241kWh
Max. Charging/Discharging Current (Ad.c.) .....:	160A*5	200A*4	250A	250A	250A
Grid Input/Output Side Parameters:					
Grid Input/Output Rated Power ...:	500kW	500kW	500kW	500kW	500kW
Grid Input/Output Rated Voltage .:	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.
Grid Output Rated Current .....:	720A	720A	720A	720A	720A
Output/ Input Frequency.....:	50Hz	50Hz	50Hz	50Hz	50Hz
Load Output Side Parameters:					
Load Output Rated Power :	500kW	500kW	500kW	500kW	500kW
Load Output Rated Voltage :	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.
Load Output Rated Current.....:	720A	720A	720A	720A	720A
Load Output Frequency .....:	50Hz	50Hz	50Hz	50Hz	50Hz
PV Side Parameters:					
Rate PV Power .....:	500kW	500kW	500kW	500kW	500kW
Operating Voltage Range.....:	312-850V	312-850V	312-850V	312-850V	312-850V
Maximum PV Current.....:	160A*10	160A*10	160A*10	160A*10	160A*10
Number Of PV MPPT Circuits ....:	10	10	10	10	10
Isc PV (absolute max.):	180A*10	180A*10	180A*10	180A*10	180A*10
General parameters:					
Operating temperature range .....:	-25℃-+60℃				
Protection Degree.....:	Class I				
Overvoltage category.....:	DC: OVC II / AC: OVC III				
Ingress Protection (IP) .....:	IP55				
Power Factor	-1Leading-+1Lagging				

Model list:					
Model.....:	225C-10/500	225C-9/500	225C-8/500	225C-7/500	225C-6/500
Battery Type .....:	LiFePO4				
Battery Voltage Range (Vd.c.) ....:	716.8	716.8	716.8	716.8	716.8
Battery Rated Voltage (Vd.c.) .....:	672.2-795.2	672.2-795.2	672.2-795.2	672.2-795.2	672.2-795.2
Nominal Capacity (MWh) .....:	2.25MWh	2.025MWh	1.8MWh	1.575MWh	1.35MWh
Max. Charging/Discharging Current (Ad.c.) .....:	80A*10	88A*9	100A*8	114A*7	133A*6
Grid Side Parameters:					
Grid Rated Power .....:	500kW	500kW	500kW	500kW	500kW
Grid Rated Voltage .....:	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.
Grid Rated Current.....:	720A	720A	720A	720A	720A
Grid Frequency.....:	50Hz	50Hz	50Hz	50Hz	50Hz
Load Output Side Parameters:					
Load Output Rated Power :	500kW	500kW	500kW	500kW	500kW
Load Output Rated Voltage :	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.
Load Output Rated Current.....:	720A	720A	720A	720A	720A
Load Output Frequency .....:	50Hz	50Hz	50Hz	50Hz	50Hz
PV Side Parameters:					
Rate PV Power .....:	500kW	500kW	500kW	500kW	500kW
Operating Voltage Range.....:	312-850V	312-850V	312-850V	312-850V	312-850V
Maximum PV Current.....:	160A*10	160A*10	160A*10	160A*10	160A*10
Number Of PV MPPT Circuits ....:	10	10	10	10	10
Isc PV (absolute max.):	180A*10	180A*10	180A*10	180A*10	180A*10
General parameters:					
Operating temperature range .....:	-25℃-+60℃				
Protection Degree.....:	Class I				
Overvoltage category.....:	DC: OVC II / AC: OVC III				
Ingress Protection (IP) .....:	IP55				
Power Factor	-1Leading-+1Lagging				

Model list:					
Model.....:	225C-5/500	225C-4/500	225C-3/500	225C-2/500	225C-1/500
Battery Type .....:	LiFePO4				
Battery Voltage Range (Vd.c.) ....:	716.8	716.8	716.8	716.8	716.8
Battery Rated Voltage (Vd.c.) .....:	672.2-795.2	672.2-795.2	672.2-795.2	672.2-795.2	672.2-795.2
Nominal Capacity (MWh) .....:	1.125MWh	900kWh	675kWh	450kWh	225kWh
Max. Charging/Discharging Current (Ad.c.) .....:	160A*5	200A*4	250A	250A	250A
Grid Input/Output Side Parameters:					
Grid Input/Output Rated Power ...:	500kW	500kW	500kW	500kW	500kW
Grid Input/Output Rated Voltage .:	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.
Grid Output Rated Current .....:	720A	720A	720A	720A	720A
Output/ Input Frequency.....:	50Hz	50Hz	50Hz	50Hz	50Hz
Load Output Side Parameters:					
Load Output Rated Power :	500kW	500kW	500kW	500kW	500kW
Load Output Rated Voltage :	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.
Load Output Rated Current.....:	720A	720A	720A	720A	720A
Load Output Frequency .....:	50Hz	50Hz	50Hz	50Hz	50Hz
PV Side Parameters:					
Rate PV Power .....:	500kW	500kW	500kW	500kW	500kW
Operating Voltage Range.....:	312-850V	312-850V	312-850V	312-850V	312-850V
Maximum PV Current.....:	160A*10	160A*10	160A*10	160A*10	160A*10
Number Of PV MPPT Circuits ....:	10	10	10	10	10
Isc PV (absolute max.):	180A*10	180A*10	180A*10	180A*10	180A*10
General parameters:					
Operating temperature range .....:	-25℃-+60℃				
Protection Degree.....:	Class I				
Overvoltage category.....:	DC: OVC II / AC: OVC III				
Ingress Protection (IP) .....:	IP55				
Power Factor	-1Leading-+1Lagging				

Model list:					
Model..... :	208C-10/500	208C-9/500	208C-8/500	208C-7/500	208C-6/500
Battery Type ..... :	LiFePO4				
Battery Voltage Range (Vd.c.) ..... :	665.6	665.6	665.6	665.6	665.6
Battery Rated Voltage (Vd.c.) ..... :	582.4-738.4	582.4-738.4	582.4-738.4	582.4-738.4	582.4-738.4
Nominal Capacity (MWh) ..... :	2.08MWh	1.872MWh	1.664MWH	1.456MWH	1.248MWH
Max. Charging/Discharging Current (Ad.c.) ..... :	80A*10	88A*9	100A*8	114A*7	133A*6
Grid Side Parameters:					
Grid Rated Power ..... :	500kW	500kW	500kW	500kW	500kW
Grid Rated Voltage ..... :	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.
Grid Rated Current..... :	720A	720A	720A	720A	720A
Grid Frequency ..... :	50Hz	50Hz	50Hz	50Hz	50Hz
Load Output Side Parameters:					
Load Output Rated Power :	500kW	500kW	500kW	500kW	500kW
Load Output Rated Voltage :	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.
Load Output Rated Current..... :	720A	720A	720A	720A	720A
Load Output Frequency ..... :	50Hz	50Hz	50Hz	50Hz	50Hz
PV Side Parameters:					
Rate PV Power ..... :	500kW	500kW	500kW	500kW	500kW
Operating Voltage Range..... :	312-850V	312-850V	312-850V	312-850V	312-850V
Maximum PV Current..... :	160A*10	160A*10	160A*10	160A*10	160A*10
Number Of PV MPPT Circuits ..... :	10	10	10	10	10
Isc PV (absolute max.):	180A*10	180A*10	180A*10	180A*10	180A*10
General parameters:					
Operating temperature range ..... :	-25℃-+60℃				
Protection Degree ..... :	Class I				
Overvoltage category..... :	DC: OVC II / AC: OVC III				
Ingress Protection (IP) ..... :	IP55				
Power Factor	-1Leading-+1Lagging				

Model list:					
Model.....:	208C-5/500	208C-4/500	208C-3/500	208C-2/500	208C-1/500
Battery Type .....:	LiFePO4				
Battery Voltage Range (Vd.c.) .....:	665.6	665.6	665.6	665.6	665.6
Battery Rated Voltage (Vd.c.) .....:	582.4-738.4	582.4-738.4	582.4-738.4	582.4-738.4	582.4-738.4
Nominal Capacity (MWh) .....:	1.04MWh	832kWh	624kWh	416kWh	208kWh
Max. Charging/Discharging Current (Ad.c.) .....:	160A*5	200A*4	250A	250A	250A
Grid Input/Output Side Parameters:					
Grid Input/Output Rated Power .....:	500kW	500kW	500kW	500kW	500kW
Grid Input/Output Rated Voltage .....:	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.
Grid Output Rated Current .....:	720A	720A	720A	720A	720A
Output/ Input Frequency.....:	50Hz	50Hz	50Hz	50Hz	50Hz
Load Output Side Parameters:					
Load Output Rated Power :	500kW	500kW	500kW	500kW	500kW
Load Output Rated Voltage :	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.	3L/N/PE 400a.c.
Load Output Rated Current.....:	720A	720A	720A	720A	720A
Load Output Frequency .....:	50Hz	50Hz	50Hz	50Hz	50Hz
PV Side Parameters:					
Rate PV Power .....:	500kW	500kW	500kW	500kW	500kW
Operating Voltage Range.....:	312-850V	312-850V	312-850V	312-850V	312-850V
Maximum PV Current.....:	160A*10	160A*10	160A*10	160A*10	160A*10
Number Of PV MPPT Circuits .....:	10	10	10	10	10
Isc PV (absolute max.):	180A*10	180A*10	180A*10	180A*10	180A*10
General parameters:					
Operating temperature range .....:	-25℃-+60℃				
Protection Degree .....:	Class I				
Overvoltage category.....:	DC: OVC II / AC: OVC III				
Ingress Protection (IP) .....:	IP55				
Power Factor	-1Leading-+1Lagging				

Test item particulars	
Equipment mobility ..... :	☐ movable ☐ hand-held ☒ stationary ☐ fixed ☐ transportable ☐ for building-in
Connection to the mains ..... :	☐ pluggable equipment ☐ direct plug-in ☒ permanent/lockable connection ☐ for building-in
Connection to DC ..... :	☐ pluggable equipment ☐ direct plug-in ☒ permanent/lockable connection ☐ for building-in
Environmental category ..... :	☒ outdoor ☐ indoor unconditional ☐ indoor conditional
Over voltage category Mains..... :	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV
Over voltage category DC..... :	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Operating condition ..... :	☒ Continuous ☐ Short-time
Mains supply tolerance (%)..... :	3L/N/PE 400a.c.
Tested for IT power systems ..... :	N/A
IT testing, phase-phase voltage (V) ..... :	N/A
Class of equipment ..... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg) ..... :	Max. 26550kg
Pollution degree ..... :	PD2
Protection against ingress of water ..... :	IP55 according to IEC 60529
Possible test case verdicts	
- test case does not apply to the test object .. :	N/A
- test object does meet the requirement..... :	P (Pass)
- test object does not meet the requirement .. :	F (Fail)
Testing	
Date of receipt of test item ..... :	2025-11-04
Date (s) of performance of tests ..... :	2025-11-04~ 2025-11-28

General remarks

The test results presented in this report relate only to the object tested,
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory,
"(see Enclosure #)" refers to additional information appended to the report,
"(see appended table)" refers to a table appended to the report,

Throughout this report a ☐ comma / ☒ point is used as the decimal separator,

Conformity statements are decided in accordance with IEC GUIDE 115:2021 Procedure 2 (accuracy method), unless otherwise normatively specified or contractually agreed,

This Test Report consists of the following documents and/or enclosures:

Copy of marking plate (Representative)

The artwork below may be only a draft, The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

Air-cooled Integrated Energy Storage Systems

BSLBATT®

Modol No.	**241C-10/500**
Ingress Protection	IP55
Nominal capacity	2.41MWh
Operating temperature range	-25℃ - +55℃
Over Voltage Category	III(AC)//II(DC)
Power Factor	-1Leading - +1Lagging
Protection Class	I
Grid Side Parameters:	
Grid Rated Power	500kW
Grid Rated Voltage	3L/N/PE 400a.c.
Grid Rated Current	a.c. 720A
Grid Frequency	50Hz
Load Output Side Parameters:	
Load Output Rated Power	500kW
Load Output Rated Voltage	3L/N/PE 400a.c.
Load Output Rated Current	a.c. 720A
Load Output Frequency	50Hz
PV Side Parameters:	
Rated Power	500kW
MPPT Operating Voltage Range	d.c. 312-850V
Maximum MPPT Current	d.c. 160A*10
Number of MPPT Circuits	10
Isc PV (absolute max.):	d.c. 180A*10
Battery Side Parameters:	
Battery Type	LiFePO4
Battery Rated Voltage	d.c. 768V
Battery Voltage Range	d.c. 672-852V
Max. Charging/Discharging Current	d.c. 80A*10

DISPOSAL OF BATTERIES SHOULD FOLLOW LOCAL REGULATIONS

5min RoHS COMPLIANT

MFD: YYMMDD

MADE IN CHINA

BSL NEW ENERGY TECHNOLOGY CO., LTD
www.bsl-battery.com

Air-cooled Integrated Energy Storage Systems

BSLBATT®

Modol No.	**241C-1/500**
Ingress Protection	IP55
Nominal capacity	241kWh
Operating temperature range	-25℃ - +55℃
Over Voltage Category	III(AC)//II(DC)
Power Factor	-1Leading - +1Lagging
Protection Class	I
Grid Side Parameters:	
Grid Rated Power	500kW
Grid Rated Voltage	3L/N/PE 400a.c.
Grid Rated Current	a.c. 720A
Grid Frequency	50Hz
Load Output Side Parameters:	
Load Output Rated Power	500kW
Load Output Rated Voltage	3L/N/PE 400a.c.
Load Output Rated Current	a.c. 720A
Load Output Frequency	50Hz
PV Side Parameters:	
Rated Power	500kW
MPPT Operating Voltage Range	d.c. 312-850V
Maximum MPPT Current	d.c. 160A*10
Number of MPPT Circuits	10
Isc PV (absolute max.):	d.c. 180A*10
Battery Side Parameters:	
Battery Type	LiFePO4
Battery Rated Voltage	d.c. 768V
Battery Voltage Range	d.c. 672-852V
Max. Charging/Discharging Current	d.c. 250A

DISPOSAL OF BATTERIES SHOULD FOLLOW LOCAL REGULATIONS

5min RoHS COMPLIANT

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www.bsl-battery.com

Air-cooled Integrated Energy Storage Systems

BSL BATT

Modol No.	**225C-10/500**
Ingress Protection	IP55
Nominal capacity	2.25MWh
Operating temperature range	-25℃ - +55℃
Over Voltage Category	III(AC)//II(DC)
Power Factor	-1Leading - +1Lagging
Protection Class	I
Grid Side Parameters:	
Grid Rated Power	500kW
Grid Rated Voltage	3L/N/PE 400a.c.
Grid Rated Current	a.c. 720A
Grid Frequency	50Hz
Load Output Side Parameters:	
Load Output Rated Power	500kW
Load Output Rated Voltage	3L/N/PE 400a.c.
Load Output Rated Current	a.c. 720A
Load Output Frequency	50Hz
PV Side Parameters:	
Rated Power	500kW
MPPT Operating Voltage Range	d.c. 312-850V
Maximum MPPT Current	d.c. 160A*10
Number of MPPT Circuits	10
Isc PV (absolute max.):	d.c. 180A*10
Battery Side Parameters:	
Battery Type	LiFePO4
Battery Rated Voltage	d.c. 716.8V
Battery Voltage Range	d.c. 672.2-795.2V
Max. Charging/Discharging Current	d.c. 80A*10

DISPOSAL OF BATTERIES SHOULD FOLLOW LOCAL REGULATIONS

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Air-cooled Integrated Energy Storage Systems

BSL BATT

Modol No.	**225C-1/500**
Ingress Protection	IP55
Nominal capacity	225kWh
Operating temperature range	-25℃ - +55℃
Over Voltage Category	III(AC)//II(DC)
Power Factor	-1Leading - +1Lagging
Protection Class	I
Grid Side Parameters:	
Grid Rated Power	500kW
Grid Rated Voltage	3L/N/PE 400a.c.
Grid Rated Current	a.c. 720A
Grid Frequency	50Hz
Load Output Side Parameters:	
Load Output Rated Power	500kW
Load Output Rated Voltage	3L/N/PE 400a.c.
Load Output Rated Current	a.c. 720A
Load Output Frequency	50Hz
PV Side Parameters:	
Rated Power	500kW
MPPT Operating Voltage Range	d.c. 312-850V
Maximum MPPT Current	d.c. 160A*10
Number of MPPT Circuits	10
Isc PV (absolute max.):	d.c. 180A*10
Battery Side Parameters:	
Battery Type	LiFePO4
Battery Rated Voltage	d.c. 716.8V
Battery Voltage Range	d.c. 672.2-795.2V
Max. Charging/Discharging Current	d.c. 250A

DISPOSAL OF BATTERIES SHOULD FOLLOW LOCAL REGULATIONS

5min RoHS COMPLIANT

MFD: YYMMDD

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www.bsl-battery.com

Air-cooled Integrated Energy Storage Systems

Modol No.	208C-10/500
Ingress Protection	IP55
Nominal capacity	2.08MWh
Operating temperature range	-25℃ - +55℃
Over Voltage Category	III(AC)//II(DC)
Power Factor	-1Leading - +1Lagging
Protection Class	I
Grid Side Parameters:	
Grid Rated Power	500kW
Grid Rated Voltage	3L/N/PE 400a.c.
Grid Rated Current	a.c. 720A
Grid Frequency	50Hz
Load Output Side Parameters:	
Load Output Rated Power	500kW
Load Output Rated Voltage	3L/N/PE 400a.c.
Load Output Rated Current	a.c. 720A
Load Output Frequency	50Hz
PV Side Parameters:	
Rated Power	500kW
MPPT Operating Voltage Range	d.c. 312-850V
Maximum MPPT Current	d.c. 160A*10
Number of MPPT Circuits	10
Isc PV (absolute max.):	d.c. 180A*10
Battery Side Parameters:	
Battery Type	LiFePO4
Battery Rated Voltage	d.c. 665.6V
Battery Voltage Range	d.c. 582.4-738.4V
Max. Charging/Discharging Current	d.c. 80A*10

DISPOSAL OF BATTERIES SHOULD FOLLOW LOCAL REGULATIONS

5min RoHS COMPLIANT

MFD: YYMMDD

MADE IN CHINA

BSL NEW ENERGY TECHNOLOGY CO., LTD
www.bsl-battery.com

Air-cooled Integrated Energy Storage Systems

Modol No.	208C-1/500
Ingress Protection	IP55
Nominal capacity	208kWh
Operating temperature range	-25℃ - +55℃
Over Voltage Category	III(AC)//II(DC)
Power Factor	-1Leading - +1Lagging
Protection Class	I
Grid Side Parameters:	
Grid Rated Power	500kW
Grid Rated Voltage	3L/N/PE 400a.c.
Grid Rated Current	a.c. 720A
Grid Frequency	50Hz
Load Output Side Parameters:	
Load Output Rated Power	500kW
Load Output Rated Voltage	3L/N/PE 400a.c.
Load Output Rated Current	a.c. 720A
Load Output Frequency	50Hz
PV Side Parameters:	
Rated Power	500kW
MPPT Operating Voltage Range	d.c. 312-850V
Maximum MPPT Current	d.c. 160A*10
Number of MPPT Circuits	10
Isc PV (absolute max.):	d.c. 180A*10
Battery Side Parameters:	
Battery Type	LiFePO4
Battery Rated Voltage	d.c. 665.6V
Battery Voltage Range	d.c. 582.4-738.4V
Max. Charging/Discharging Current	d.c. 250A

DISPOSAL OF BATTERIES SHOULD FOLLOW LOCAL REGULATIONS

5min RoHS COMPLIANT

MFD: YYMMDD

MADE IN CHINA

BSL NEW ENERGY TECHNOLOGY CO., LTD
www.bsl-battery.com

Manufacture date code: YYMMDD

The MFD date: YYMMDD, code rule shows below:

1) The “YY” digits represent the year, means final 2 numbers of year, eg “25” is 2025 year;

2) The “MM” digits represent the month, eg “11” is November;

3) The “DD” digits represent the day, eg “15” is 15th day.

Remark:

1. The above markings are the minimum requirements by the safety standard. For the final production samples, additional markings which do not give rise to misunderstanding may be added.

2. The height of WEEE mark at least 7mm, height of other marks at least 5mm, height of letters and numerals at least 2mm.

3. Manufacturer information (name/registered trademark/registered trade name and postal address) and importer information for manufacturer outside of the EU (name/registered trademark/registered trade name and postal address) should be pasted on product when sell the product to the EU market.

Description of sample classification

Features for categorization	Category denominations		Remark
"POC voltage" where BESS is connected	V-L	☒	Rated voltage: Grid side: 400Vac PV side: 312-850Vdc Battery side: 672-852Vdc
	V-H	☐	
"Energy capacity" of BESS	E-S	☐	Energy capacity: 2.41MWh Max.
	E-L	☒	
"Site occupancy" in relation to electrochemical accumulation subsystem	S-O	☐	
	S-U	☒	
"Chemistry" of electrochemical accumulation subsystem	C-A	☒	Li-ion Battery
	C-B	☐	
	C-C	☐	
	C-D	☐	
	C-Z	☐	

Technical Data

More details see page 2 to page 7

General product information:

1. The products covered by this report are “Air-cooled Integrated Energy storage systems”. which includes max. ten lithium-ion battery energy storage cabinets, one AC energy storage converter and one DC energy storage converter.
2. Lithium-ion Battery Energy Storage Cabinet (model ESS-BATT 241C, ESS-BATT 225C, ESS-BATT 208C) complied with IEC 62619:2022 and IEC 62477-1:2022, EN 62477-1:2012+A11:2014+A1:2017 +A12:2021.
3. AC energy storage converter (model ESS-GRID P500E) complied with IEC 62477-1:2022, EN 62477-1:2012+A11:2014+A1:2017+A12:2021.
4. DC energy storage converter (model ESS-GRID P500L) complied with IEC 62109-1:2010, EN 62109-1:2010.

Model differences:

All series models are same as the construction, hardware and software, except the number of Lithium-ion Battery Energy Storage Cabinets, AC energy storage converters, DC energy storage converter. Details see below table.

The tested model 241C-10/500 is representatives of all models.

Model / Name Difference	241C-10/500	241C-9/500	241C-8/500	241C-7/500	241C-6/500
Number of Lithium-ion Battery Energy Storage Cabinet (ESS-BATT 241C)	10	9	8	7	6
Number of AC energy storage converter (model ESS-GRID P500E)	1	1	1	1	1
Number of DC energy storage converter (model ESS-GRID P500L)	1	1	1	1	1
Model / Name Difference	241C-5/500	241C-4/500	241C-3/500	241C-2/500	241C-1/500
Number of Lithium-ion Battery Energy Storage Cabinet (ESS-BATT 241C)	5	4	3	2	1
Number of AC energy storage converter (model ESS-GRID P500E)	1	1	1	1	1

Number of DC energy storage converter (model ESS-GRID P500L)	1	1	1	1	1
Model / Name / Difference	225C-10/500	225C-9/500	225C-8/500	225C-7/500	225C-6/500
Number of Lithium-ion Battery Energy Storage Cabinet (ESS-BATT 225C)	10	9	8	7	6
Number of AC energy storage converter (model ESS-GRID P500E)	1	1	1	1	1
Number of DC energy storage converter (model ESS-GRID P500L)	1	1	1	1	1
Model / Name / Difference	225C-5/500	225C-4/500	225C-3/500	225C-2/500	225C-1/500
Number of Lithium-ion Battery Energy Storage Cabinet (ESS-BATT 225C)	5	4	3	2	1
Number of AC energy storage converter (model ESS-GRID P500E)	1	1	1	1	1
Number of DC energy storage converter (model ESS-GRID P500L)	1	1	1	1	1
Model / Name / Difference	208C-10/500	208C-9/500	208C-8/500	208C-7/500	208C-6/500
Number of Lithium-ion Battery Energy Storage Cabinet (ESS-BATT 208C)	10	9	8	7	6

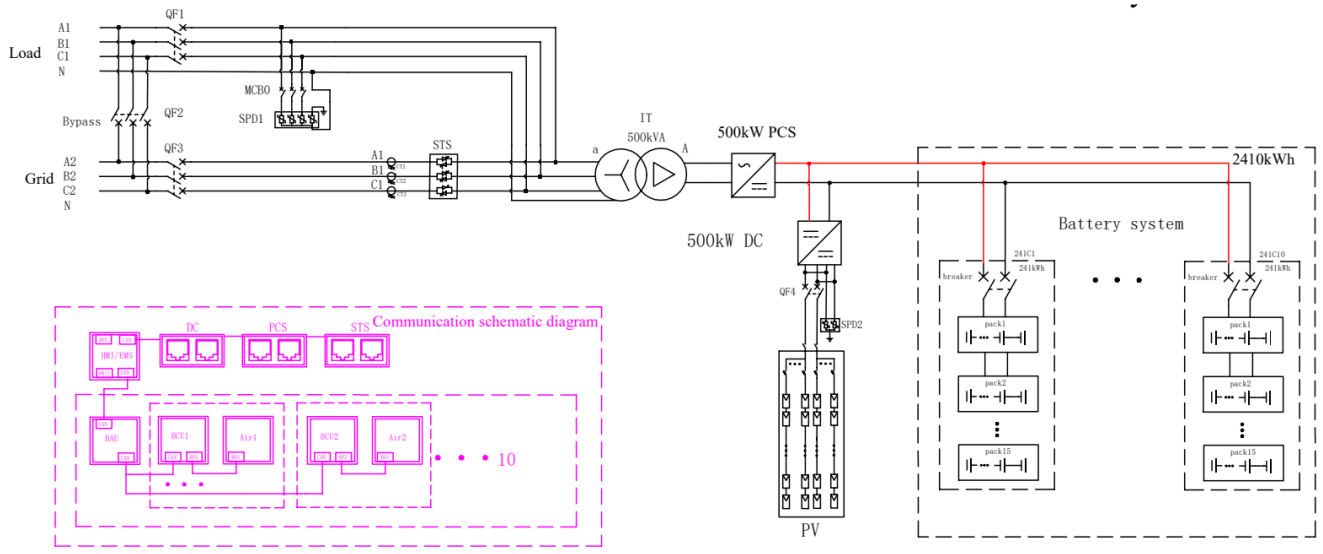
Number of AC energy storage converter (model ESS-GRID P500E)	1	1	1	1	1
Number of DC energy storage converter (model ESS-GRID P500L)	1	1	1	1	1
Model / Name Difference	208C-5/500	208C-4/500	208C-3/500	208C-2/500	208C-1/500
Number of Lithium-ion Battery Energy Storage Cabinet (ESS-BATT 208C)	5	4	3	2	1
Number of AC energy storage converter (model ESS-GRID P500E)	1	1	1	1	1
Number of DC energy storage converter (model ESS-GRID P500L)	1	1	1	1	1

The product was tested on:

The Software version: V1.0

The Hardware version: V1.2

Block diagram of diagram of the system:



Information for Production testing to be done by the manufacturer:

None

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
4	**Basic guidelines for safety of BESS**		**P**
4.1	**General**		P
	An assessment and reduction of the risk associated with the BESS as manufactured and as intended to be installed shall be conducted according to the sequence shown in Figure 1.		P
4.2	**Approach to BESS safety**		P
	The design of the BESS and its intended installation and integration with the built environment shall accommodate the specific risks that arise during each phase of the BESS life cycle. These life cycle phases typically include, but are not limited to:		P
	manufacturing/final assembly and factory acceptance testing (see 7.10, 7.11, and 8.2);		P
	transport (see 7.10, 7.11, and 8.2);	UN38.3 approved	P
	installation, commissioning and site acceptance testing (see 7.10, 7.11, 7.12 and 8.2);		P
	operation (see 7.13);		P
	maintenance and repair (see 7.13);		P
	repurposing or decommissioning (see 7.13).		P
4.3	**BESS changes in ownership, control or use**		N/A
	In all cases where a transfer of ownership or operational responsibility occurs, the monitoring log information should be transferred to the new owner as part of the system documentation, including measures for complying with the requirements in 7.13.2 and 7.13.3. When it is necessary to control identified BESS risks, there should be clarification on the roles and responsibilities for managing and controlling any existing or new safety risks arising out of the changes that are planned or have taken place.		N/A
5	**Hazard considerations**		**P**
	The general hazard considerations for EESS in IEC TS 62933-5-1:2017, Clause 5, are applicable	considered	P
6	**BESS system risk assessment**		P
6.1	**BESS structure**		P
6.1.1	**General characteristics**		P
6.1.2	**Specific characteristics**		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	The main types of BESS that have been previously categorized according to 4.2 can differ not only in the chemistry of the electrochemical accumulation subsystem but also according to the type of auxiliary subsystems as given below:		P
	• specific auxiliary subsystem of category "C-C"– electrochemical accumulation subsystem heating circuit (BESS using high temperature battery)		N/A
	specific auxiliary subsystem of category "C-D" (BESS using flow battery) – heat exchanger – fluid management system (pump, tank, piping, valve. etc)		N/A
6.2	**Description of BESS conditions**		P
	The basic description of BESS conditions shall be categorized in accordance with Table 1 (see 4.2). The more detailed description in accordance with IEC TS 62933-5-1:2017, 6.2, is applicable to BESS.	considered	P
6.3	**Risk analysis**		P
6.3.1	**General**		P
	A risk analysis (hazard identification and risk estimation) of the BESS shall be carried out in accordance with 4.1, 4.2, 6.3.2, 6.3.3 and 6.3.4.		P
6.3.2	**Hazard identification specific to BESS**		P
	The scenario, as a result of BESS risk assessment, shall include specific subsystem failure modes (identified hazards specific to BESS) as starting points for the analysis.	Evaluated according to IEC 60730-1 Annex H. Detrail see report No. SHFS240900040771 issued by SGS on February. 14th, 2025	P
6.3.3	**Risk consideration**		P
	BESS risk scenarios shall include all interactions between subsystems. Examples of scenarios include but are not limited to:	Cell level according to IEC 62619 clause 7.3.2 internal short-circuit test, see TUV Rheinland CB report No. CN23DD2Z 001, dated on 2023-11-15	P
	• propagation from electrochemical accumulation subsystem(s) to others;	See table 8.2.5	P
	• propagation from non-accumulation subsystems;		P
	• simultaneous failures/faults of multiple subsystems;		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	• loss of subsystem function related to safety.		P
6.3.4	**System level risk analysis**		P
	The system level BESS risk shall be assessed at a component, module and final system level. A suitable analysis shall be performed to demonstrate that suitable risk analysis has been carried out at a component, module and final system level.		P
	The system level BESS risk analysis shall be performed based on the risk (BESS size/severity) and complexity of the system using one of the following techniques or an equivalent one:		P
	•bottom-up first principles risk analysis (e.g. failure mode and effect analysis (FMEA): see IEC 60812);	FMEA has been provided	P
	• top-down analysis (e.g. fault tree analysis (FTA): see IEC 61025);		N/A
	• combined and/or integrated analysis (e.g. hazard and operability study (HAZOP): see IEC 61882, STAMP (systems theoretic accident model and processes)).		N/A
6.4	**System level risk assessment**		**N/A**
	All risks shall be assessed for their impact on operators, users and neighbours who may occupy the site of BESS, and graded as tolerable or not.		N/A
	If some risks are not tolerable, appropriate measures shall be taken, according to the requirements in Clauses 7 and 8. Documentation attached to the assessment and reduction of risk of the BESS shall be available and shall comprise all requirements specified in Clause 6.		N/A
7	**Requirements necessary to reduce risks**		**P**
7.1	**General measures to reduce risks**		P
	The general safety considerations for an EESS are described in IEC TS 62933-5-1:2017, 7.1. The priority of risk reduction approaches (from ISO/IEC Guide 51:2014, 6.3.5) shall be: a) inherently safe design; b) guards and protective devices; c) information for end users.	considered	P
7.2	**Preventive measures against damage to neighboring inhabitants**		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	The general safety considerations of EESS described in IEC TS 62933-5-1:2017, 7.2, are applicable.	considered	P
7.3	**Preventive measures against physical injury or damage to the health of workers and residents**		P
	The general safety considerations of EESS described in IEC TS 62933-5-1:2017, 7.3, are applicable.	considered	P
7.4	**Overcurrent protection design**		P
	The general safety considerations of EESS described in IEC TS 62933-5-1:2017, 7.4, are applicable.	considered	P
7.5	**BESS disconnection and shutdown**		P
	The general safety considerations of EESS described in IEC TS 62933-5-1:2017, 7.5, are applicable. Additional safety requirements necessary to reduce risks of BESS during disconnection and shutdown are described in 7.11.2.	considered	P
7.6	**Operation and maintenance**		P
	The general safety considerations of EESS described in IEC TS 62933-5-1:2017, 7.6.	considered	P
7.7	**Staff training**		P
	The general safety considerations of EESS described in IEC TS 62933-5-1:2017, 7.7, are applicable.	considered	P
7.8	**Safety design**		P
	The general safety considerations of EESS described in IEC TS 62933-5-1:2017, 7.8, are applicable. Additional safety requirements necessary to reduce the risks of BESS through safety design are described in 7.10, 7.11.1, 7.11.3, and 7.12.	considered	P
7.9	**General requirements for BESS safety**		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	Any failure or fault with a subsystem should not be spread outside of the subsystem itself. Any subsystem that develops a fault which could affect the safe operation of the BESS should be capable of being isolated from other subsystems. The safety functions of subsystems shall not be affected by such isolation and shall operate independently. The BESS design should minimize noise, vibration and extreme temperatures generated from the BESS. The architecture of subsystems within the BESS should not prevent operators from recognizing hazardous parts, sections and conditions. Additionally, for category "V-H" BESS, measures shall be taken for preventing any remote dangerous operations if no evidence can be obtained that no worker is at risk at the site. Ergonomic principles specified in an appropriate standard (e.g. ISO 9241 (all parts)) should be taken into account in designing machinery so as to reduce the mental or physical stress of, and strain on, the operator. These principles should be considered when allocating functions to operator and machine (degree of automation) in the basic design.	considered	P
7.10	**Inherently safe design of BESS**		P
7.10.1	**Protection from electrical hazards**		P
	The electrical installation of category "V-L" BESS shall be in accordance with appropriate parts of the IEC 60364 series		P
	The electrical installation of category "V-H" BESS shall be in accordance with IEC 61936-1 and IEC 60364 (all parts).		N/A
	The electrical protection for any DC subsystem shall be safe in accordance with IEC 61660-1 and IEC 61660-2.		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	The live parts of subsystems and the components of BESS that have hazardous voltage (above extra-low voltage (ELV)) circuits shall not be accessible to unauthorized people. The parts of BESS which are likely to cause electric shock shall be securely covered. The conductive parts of BESS which people are likely to touch shall not be connected to any parts at hazardous voltage. The protection can be achieved by one of the following methods: -preventing a current from passing through the body of any person or any livestock; -limiting the current which can pass through a body to a non-hazardous value		P
	The electric wires and insulation shall each be rated for the maximum current, voltage and temperature.		P
	All conductive parts of a BESS which can come in contact with a hazardous voltage through a single insulation fault shall be connected to earth in accordance with appropriate standards, manufacturer instructions and local regulations.		P
	The physical spacing of circuits, including securing leads and terminals, etc., shall be sufficient to prevent inadvertent short-circuits and/or the potential for arc flash.		P
	Connection points of bare conductors shall be appropriately spaced and of suitable structure to prevent inadvertent short-circuits between electrochemical accumulation subsystems.		P
	A risk assessment in accordance with the procedures contained in IEC 62305-2 shall be made to evaluate if lightning protection is needed. If the assessment indicates that protection against lightning is required, then it shall be provided.	UL approved lightning protection used	P
	The voltage measurement systems associated with the BESS should use a voltage reference.		P
	Safety-related components (for example, certain sensors) of known reliability shall be used.		P
	Protective devices, such as guards, shall be designed to be effective, as their failure can expose persons to hazards, and also because a reduction in their effectiveness could encourage attempts to defeat them.		P
	The touch current and discharge energy shall be limited in accordance with IEC 62477-1:2012, 4.4.3.4.		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	The BESS shall be provided with an overcurrent protection function at the electrochemical accumulation subsystem connection.		P
	Duplication (or redundancy) of components may be used so that, if one component fails, another component or components continue to perform the respective function(s), thereby ensuring that the safety function remains available.		P
	Testing shall be conducted, and compliance shall be assessed in accordance with 8.2.1.3, 8.2.1.4, 8.2.1.5, and 8.2.1.6.		P
7.10.2	**Protection from mechanical hazards**		P
	The components which people are likely to touch shall not have sharp edges.		P
	Where edges or corners could be hazardous to personnel depending on the location or application in the equipment, they shall be rounded or smoothed.		P
	Hazardous moving parts of the equipment (which means moving parts that have the potential to cause injury) shall be so arranged, enclosed or guarded as to reduce the risk of injury to persons.		P
	The structure of the BESS shall have adequate protection and reduce the risk of subsystems and components dropping during operating conditions, transportation, assembly, installation and disassembly.		P
	The BESS shall be designed to keep operators and workers safe in normal operation.		P
	The location and structure of the BESS shall be such as to not cause risks to workers in the event of component malfunction.		P
	Failure of interconnections between BESS subsystems shall not lead to a hazardous situation.		P
	The BESS shall be designed and installed to allow the installation and removal of battery modules using appropriate lifting equipment, unless the weight of the individual modules is low enough to be safely handled by at most two people.		P
	Validation shall be conducted, and compliance shall be assessed, in accordance 8.2.2.1, 8.2.2.2 and 8.2.2.3.		P
7.10.3	**Protection from explosion**		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	Flammable materials shall not be placed in the path of gas or heat exhaust from electrochemical accumulation subsystems.		P
	Control subsystems and those components placed in any explosive atmospheres shall be provided with a suitable gas purging system in accordance with appropriate standards, manufacturer instructions and local regulations.		P
	A BESS enclosure or compartment shall not vent any flammable gases into any enclosed spaces where arc-producing elements are located.		P
	Testing shall be conducted, and compliance shall be assessed, in accordance with 8.2.3.1, 8.2.3.2 and 8.2.3.3.		P
7.10.4	**Protection from hazards arising from electric, magnetic, and electromagnetic fields**		P
	Safety functions of safety-related subsystems of BESS shall not be disturbed by electric, magnetic, and electromagnetic fields.		P
	Where expected electric, magnetic, and electromagnetic noise levels could have an adverse impact on the operation of the BESS, the BESS shall be adequately protected to reduce those noise levels within the system manufacturer's instructions.		P
	Testing shall be conducted, and compliance shall be assessed, in accordance with 8.2.4.		P
7.10.5	**Protection from fire hazards**		P
	Only non-combustible materials shall be used in the construction of the BESS enclosure or supporting structures and assemblies.		P
	Integration of electrochemical accumulation subsystems and their surroundings shall be designed to prevent chains of thermochemical reactions or fire propagation (e.g. separating into a battery section, charging equipment section and a section which includes a DC conductor, circuit breaker and discharge circuit). Where applicable, both fire and thermal risks that are adjacent to the BESS shall also be considered.		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	Compliance shall be reviewed by conducting safety design checks in accordance with the result of system level risk assessments (see Clause 6). Fire-load calculations on the BESS, or the experimental fire characteristics recommended in 8.2.5 with details in Annex C are applicable for the process of system risk assessment.		P
	The inside of the BESS shall be separated into a battery section, charging equipment section and a section which includes a circuit breaker and discharge circuit, using fire-proof partitions (e.g. metal plates, non-flammable boards, etc.).		P
	Testing shall be conducted, and compliance shall be assessed, in accordance with 8.2.5.		P
7.10.6	**Protection from temperature hazards**		P
	The components that have the potential to be at high temperature shall not be accessible to operators or any other personnel. The parts which are likely to cause burns shall be securely covered.		P
	Thermal partition such as a metal plate or appropriate physical spacing shall be provided between the electrochemical accumulation subsystems and the control subsystem.		P
7.10.7	**Protection from chemical effects**		P
	The choice of materials used in enclosures and wires of the BESS shall consider degradation, corrosion, wear (due to long-term use) and toxicity in accordance with the system risk analysis performed and local regulations.		P
	Consideration shall be given to adverse long-term changes in electrical and mechanical properties of certain insulating materials.		P
	The effects of electrolyte spillage from the battery shall be prevented. This requirement does not apply to batteries with sealed structures.		P
	The structure of the BESS shall be designed to prevent the scattering of hazardous fluid from electrodes or electrolytes in electrochemical accumulation subsystems in accordance with local regulations.		P
7.10.8	**Protection from hazards arising from auxiliary, control and communication system malfunctions**		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	Equipment shall be so designed that the risk of fire or electric shock due to mechanical or electrical overload or failure, or due to an abnormal operation or careless use, is limited as far as practicable. After an abnormal operation or a single fault, the equipment shall remain safe for an operator within the meaning of this document, but it is not required that the equipment still be in full working order. It is permitted to use fusible links, thermal cut-outs, overcurrent protection or similar devices as long as they are able to provide adequate protection.		P
	BESS shall be designed to prevent a hazardous condition even if the energy supply (from both a primary POC and an auxiliary POC) is interrupted or has fluctuated.		P
	When a safety critical component fails or operates abnormally, the system shall enter a safe state automatically.		P
	Testing shall be conducted, and compliance shall be assessed, in accordance with 8.2.8.		P
	Guidance on conducting single fault conditions on control and other circuits can be found in IEC 62368-1.		P
	Operator safety after an abnormal operation or a single fault should be checked by system testing with suitable simulated signals in accordance with IEC 62368-1.		P
7.10.9	**Protection from hazards arising from environments**		P
7.10.9.1	**General**		P
	The BESS shall be designed to prevent a hazardous condition even if the BESS is exposed to conditions as given in 7.10.9.2 and 7.10.9.3.		P
7.10.9.2	**Exposure to moisture ingress**		P
	The BESS shall be designed to prevent the effect from moisture ingress.		P
	Testing shall be conducted, and compliance shall be assessed, in accordance with 8.2.9.2.		P
	For category “S-U” BESS, a minimum IP code of IPX4 shall be determined in accordance with IEC 60529.	IP55	P
7.10.9.3	**Exposure to marine environments**		N/A

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	In case of installation in marine environments, the BESS shall be designed so as not to result in hazardous events during or after exposure to marine environments (e.g. salt fog).	No installation in marine environments	N/A
	Testing shall be conducted, and compliance shall be assessed, in accordance with 8.2.9.3.		N/A
7.11	**Guards and protective measures**		P
7.11.1	**General**		P
	In addition to the inherently safe design of the BESS which is described in 7.10, guards and protective measures shall be used in a BESS. The minimum requirements of the guards and protective measures are given in 7.11.		P
	Access control is integral to safe operation of a BESS, and appropriate locks and restriction to unauthorized personnel access shall be included in the system design. A safety interlock shall be provided where hazards within the context of this document are normally present and operator access involves areas normally presenting hazards within the context of this document.		P
	The battery management system in any electrochemical accumulation subsystem shall monitor all relevant safety parameters of the battery as required in the applicable standards and report those parameters to the control subsystem.		P
	For those BESS located where there is the potential for direct contact by untrained persons, a minimum IP code of IP2X shall be determined in accordance with IEC 60529.		P
7.11.2	**BESS disconnection and shutdown**		P
7.11.2.1	**General**		P
	In addition to the operational states that are defined in IEC TS 62933-5-1:2017, 7.5, a nonoperational condition (the isolated condition for maintenance) is defined in this document. The isolated condition for maintenance is a system condition that allows for safe working on the DC power circuitry and electrochemical accumulation subsystem.		P
7.11.2.2	**Grid disconnected state**		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	The general requirements that are described in IEC TS 62933-5-1 shall apply. Additionally, isolating devices shall be used to allow local manual operation to override remote operation. The isolating devices shall be lockable in the disconnected state.		
7.11.2.3	**Stopped state**		P
	In the stopped state, the system has performed a shutdown sequence which includes the disconnection of the electrochemical accumulation subsystem from the power conversion subsystem, and the disconnection of the power conversion subsystem from the primary connection terminal. The stopped state can result from a regular command, or an emergency shutdown event command. Auxiliary power is still present to facilitate an automatic power-up sequence, or to power monitoring systems. This state is typically achieved using contactors or motorized circuit breakers. During their installation, the possibility of automatic re-energization or insufficient isolation should be minimized for workers on the site.		P
7.11.2.4	**Isolated condition for maintenance**		P
	In the isolated condition for maintenance, it should be safe to work on at least the DC power circuit and storage component of the system. The whole isolation of the BESS (see Figure 3) or the partial isolation around the DC side of the BESS may be selected in accordance with the area that should be maintained. The BESS shall be capable of being locked in the isolated condition locally or via a removable disconnection tool so that it can only be connected by authorized personnel after the maintenance procedure. In order to bring the system to an isolated condition, the BESS shall first be brought to the stopped state as defined above. It shall then be capable of being brought and locked into a grid disconnected state, and then it shall be safely isolated (including keeping any power supply for safety-related subsystems of the BESS active). Consideration may be given to providing visible isolation with the lockable isolation device as is required in some jurisdictions.		P
7.11.3	**Other guards and protective functions of BESS**		P
7.11.3.1	**Protection from electrical hazards**		P
	Protective devices and electric circuits shall be properly rated to protect electric circuits against short-circuits.		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	Electrochemical accumulation subsystems (within the energy storage) shall be provided with a protective function to stop or limit short-circuit currents.		P
	Earth fault protection shall be kept within both the AC and the DC sides of the power conversion subsystem. Detection of an earth fault shall be reported to operators. This protection is mandatory if the AC and DC side are electrically isolated from a distribution grid. DC side protection is not necessary for safety extra-low voltage (SELV) battery voltage.		P
	The BESS shall protect the batteries against overcharge and impulse voltage, including under a single fault condition within the charger. Protection can be accomplished by turning off the charger, or by interrupting the charging current or varistor. If an overcharge happens, it shall be reported (to operators) by both audible alerts and visual signals.		P
	The complete rating of a replaceable fuse should be marked on the fuse holder or adjacent to the fuse holder so that the rating of a fuse is obvious even if the fuse is removed. Other necessary information such as I2t time delay or breaking capacity shall be indicated with the rating. The fuse replacement procedure shall be described in the BESS information described by the safety design and functions set out in 7.12.		P
	Overcurrent conditions in electrochemical accumulation subsystems shall be reported to operators.		P
	Limited current circuits shall be so designed that the limits are not exceeded under normal operating conditions and in the event of a single failure within the equipment. If an overcurrent happens, it shall be reported to operators.		P
	Unintentional islanding of BESS should be considered in accordance with IEC TS 62933-5- 1:2017, 6.2.8.		P
	Testing shall be conducted, and compliance shall be assessed, in accordance with 8.2.1.1 and 8.2.1.2.		P
7.11.3.2	**Protection from mechanical hazards**		P
	BESS enclosures that provide protection from access to hazardous parts shall be sufficiently robust to prevent mechanical damage due to possible mechanical abuse.		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	Testing shall be conducted, and compliance shall be assessed, in accordance with 8.2.2.1 and 8.2.2.2.		P
7.11.3.3	**Protection from explosion**		P
	In conditions of category "V-L/S-O/C-A, C-B, C-D and C-Z", detection systems for flammable gases generated by the electrochemical accumulation subsystems shall be provided at the site where the BESS is located. When a flammable gas is detected, it shall be reported (to operators) by both audible alerts and visual signals. It is a requirement of this document that the BESS cannot be installed in the site without any detection systems for flammable gases and that this requirement shall be contained in the installation manuals.		N/A
	Category "V-L/S-U/C-A, C-B, C-D and C-Z" BESS shall have appropriate signage to identify restricted areas. The sign shall specify that flammable gases can be released from the BESS.		P
	Category "V-H/S-O/C-A, C-B, C-D and C-Z" BESS themselves shall be provided with detection systems for flammable gases generated by electrochemical accumulation subsystems. An incident of flammable gas detection shall be reported (to operators) by both audible alerts and visual signals. The handling procedure of the detection systems shall be described in the system documentation as described in 7.12.		N/A
	In category "V-H/S-U/C-A, C-B, C-D and C-Z" BESS, the path of exhausted flammable gases shall be identified and documented in the installation manual. Appropriate signage to identify a restricted area shall be provided around any flammable gas outlet. Information of the path of the exhausted flammable gases shall be provided by the supplier to the owner.		N/A
	In category "C-A, C-B, C-D and C-Z" BESS, electrochemical accumulation subsystems can exhaust hydrogen. To prevent explosion or fire, the BESS shall not have any ignition sources where the density of hydrogen can be over 4 % (lower explosion limit of hydrogen) at the time of any incidents.		P
	For category "V-H/C-A, C-B, C-D and C-Z" BESS, appropriate reliable and/or redundant means to avoid flammable gas build-up inside the BESS shall be implemented.		N/A

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	Category "V-L/S-O/C-A, C-B, C-D and C-Z" BESS shall be located in the site with appropriate ventilation systems.		P
	Category "V-H/S-O/C-A, C-B, C-D and C-Z" BESS shall be installed with appropriate ventilation systems as provided for in the following: – the ventilation systems shall be able to keep an appropriate temperature within the enclosure, – forced ventilation systems shall be provided where there is insufficient natural ventilation, – the ventilation openings shall be designed and installed to prevent the spread of fires and water ingress.		N/A
	Testing shall be conducted, and compliance shall be assessed, in accordance with 8.2.3.1, 8.2.3.2 and 8.2.3.3.		P
7.11.3.4	**Protection from fire hazards**		P
	A risk of fire can result from excessive temperatures either under normal operating conditions or due to overload, component failure, insulation breakdown or loose connections. Fires originating within the equipment should not spread beyond the immediate vicinity of the source of the fire, nor cause damage to the surroundings or the equipment		P
	Category "S-O" BESS shall have a fire detection system, fire alarms deploying both audible alerts and visual signals, and fire extinguishers within the BESS location.		N/A
	For category "S-O" BESS, if the electrochemical accumulation subsystems of the BESS have doors, the doors shall be fire-protecting doors.		N/A
	Category "S-U" BESS shall have a fire detection system, fire alarms deploying both audible alerts and visual signals, and fire extinguishers within a safe and easily accessible location.		P
	A signal of fire detection sent from the fire detection system shall be transmitted to the fire alarms with location data via a communication network and fire suppression system, or via secure relays and receivers where applicable.		P
	If a fire incident is detected, the fire suppression system, if any, shall automatically operate and the fire alarms shall be automatically started.		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	Testing shall be conducted, and compliance shall be assessed, in accordance with 8.2.5.		P
7.11.3.5	**Protection from temperature hazards**		P
	The BESS can have one or more critical temperatures which should be identified. According to the identified critical temperatures (e.g. touchable surface temperatures, power electronic component temperatures, and electrochemical accumulation subsystem temperatures), safety provisions shall be implemented to prevent these temperatures from being reached within the BESS.		P
	Safety-related components (for example, certain sensors) of known reliability shall be used.		P
	It shall be possible for operators to monitor the temperatures of the internal atmosphere of a system enclosure.		P
	It shall be possible for operators to monitor the temperatures of subsystems in the BESS.		P
	It shall be possible for operators to monitor operating conditions of ventilation subsystems, and detection of abnormal conditions shall be reported to operators.		P
	When the monitored temperature(s) exceed(s) the(those) limit(s) provided by the manufacturer, it shall be reported to operators.		P
	Testing shall be conducted, and compliance shall be assessed, in accordance with 8.2.6.1, 8.2.6.2 and 8.2.6.3.		P
7.11.3.6	**Protection from chemical effects**		P
	Containment and/or neutralization of spilt hazardous fluids shall be provided. Methods utilized for containment shall be sufficient to hold the maximum quantity of fluids that could occur and if located outdoors designed to prevent inadvertent filling with rain. Instructions regarding the provision of suitable spill containment and neutralization shall be provided by the system manufacturer with the installation instructions.		P
	For category "C-D" BESS, an automatic leak detection to indicate the release of hazardous fluids shall be provided.		N/A

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	For category "E-S/S-O" BESS, a detection system for toxic gases generated by electrochemical accumulation subsystems shall be provided on the BESS site. An incident of toxic gas detection shall be reported (to operators) by both audible alerts and visual signals. Installation manuals shall include a statement that the BESS cannot be installed in the site without toxic gases detection systems.		N/A
	For category "E-S/S-U" BESS, appropriate signage to indicate a restricted area shall be provided at the site where the BESS is located or on the BESS itself. The sign shall specify that toxic gases can be released from the BESS.		N/A
	For category "E-L/S-O" BESS, a detection system for toxic gases generated by electrochemical accumulation subsystems shall be provided in the BESS. An incident of toxic gas detection shall be reported (to operators) by suitable alerts and signals (e.g. audible and visual). Installation manuals shall include information on how to handle the detection system for toxic gases.		N/A
	For category "E-L/S-U" BESS, the path of exhausted toxic gases shall be identified and documented in the installation manual. Appropriate signage to identify a restricted area shall be provided around an outlet. Information of the path of exhausted toxic gases shall be provided by the supplier to the owner.		**P**
	For category "S-O" BESS, gas concentration reduction measures shall be provided in order to protect the work space from the high density of toxic gases from electrochemical accumulation subsystems in the BESS.		P
	Category “E-S/S-O” BESS shall be located in the sites that have protective measures against the hazards above such as, but not limited to: – elimination of the generation of hazardous chemicals, – dilution of hazardous chemicals, – collection of hazardous chemicals (e.g. by a scrubber for hazardous gases), – limitation of human access.		N/A

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	Category “E-L / S-O” BESS shall be installed with the protective measures described above. Testing shall be conducted, and compliance shall be assessed, in accordance with 8.2.7.1, 8.2.7.2, and 8.2.7.3.		N/A
7.12	**Information for end users**		P
	Safety information as listed below should be available for end users:		P
	Warning signs and signals (including any limitation of available environments, confirmed by the validation and testing specified in 8.2.9).		P
	On-site signage and labelling which show any hazardous part of the BESS clearly		P
	Warning devices (audible alerts and visual signals), or others.		P
	A sequence diagram of safety designs shall be described via methods as specified in an appropriate international standard (an example of a reference document is IEC 60617 (all parts)).		P
	All the BESS information about the safety design and functions shall be kept accessible and available to all applicable BESS stakeholders.		P
	For rooms of electrochemical accumulation subsystems, appropriate information on the required flow of air shall be provided in the installation instructions where the electrochemical accumulation subsystem installation is supplied with the BESS. See Annex F for good practice for warning signs regarding BESS safety		P
	Any other necessary information shall be provided in accordance with local regulations.		P
7.13	**Life cycle safety management**		P
7.13.1	**Operation and maintenance**		P
7.13.1.1	**General**		P
	Any party which has responsibility for operations and maintenance should be mindful of their own safety when they work near the BESS. Incorrect operation and inadequate or neglected maintenance can cause harm by fire, gas poisoning and electric shock. It is necessary for all stakeholders to protect themselves from such risks.		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
7.13.1.2	**Operation and maintenance plan**		P
	An emergency response plan for safety shall be prepared, which shall include the requirements of 7.13.1.2.		P
	A safety manual shall include at least descriptions of methods to communicate BESS problems, warnings to local firefighting agencies, workers and the surrounding residents, and the correct use of insulated tools.		P
	When adjusting with a screwdriver or a similar tool while under applied voltage, protection against electric shock or energy hazard caused by inadvertent touch to the applied voltage sections shall be provided. Measures shall be taken to ensure that possibility of inadvertent touch to incorrect parts with the tool is considered in the protection design.		P
	An operation and maintenance manual shall be provided to the BESS owner or their designated agent and include but not be limited to:		P
	a) how to maintain safety during maintenance (including safety instructions and specification of required personal protective equipment (PPE) for the various maintenance operations),		P
	b) methods to detect, manage and control fire, explosion and toxic gas retention, etc., including possibilities for venting gases outside in an emergency situation		P
	c) prohibited operating processes, for example, – prohibition of overcharge – prohibition of over discharge (to avoid polarity inversion) – prohibition of charge or discharge in operating temperature exceeding the limit provided by the manufacturer		P
	d) emergency contact number(s),		P
	e) safety issues to be disclosed in public (e.g. restricted area around the BESS),		P
	f) how to use safety subsystems,		P
	g) how to use protection subsystems,		P
	h) locking and unlocking procedures of all the protection subsystems,		P
	i) the identification and specification of hazardous parts of the BESS.,		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	Information concerning the design and the installation processes shall always be accessible and checked during maintenance processes which might include following:		P
	The BESS components that are operated frequently under automatic and/or remote control.		P
	Failure and/or malfunctions can be caused by the ingress of soil, overgrowth of plants, filter or clogging up of filter or pipe, etc.		P
	Cleaning and consumable replacement schedules should be included in the operation and maintenance plan.		P
	The nature and content of the design or construction safety information that is to be provided to users by the supplier or manufacturer. This shall include but may not be limited to: – all subsystem parameters related to safety, – combination of subsystems and software that may impact on system safety for equivalent (replacement) devices, – past trouble instances, issues and quality problems associated with replacement of devices that may be deemed equivalent, – measurement accuracy and the condition of installation of sensors, – sensitivity and the condition of installation of gas sensors.		P
	Information concerning the necessity to ensure that the equipment is unlikely to present a azard within the meaning of this document during the operation specified by the supplier shall be provided to the user.		P
	If it is necessary to take special precautions to avoid the introduction of hazards when operating, installing, servicing, transporting or storing equipment, the necessary instructions shall be made available.		P
7.13.1.3	**Preventive maintenance**		P
	A periodic maintenance schedule shall be developed by the manufacturer or system integrator. The periodic maintenance schedule should include consideration of frequency of use, time elapsed, and ambient environment. Maintenance should include the overall system, each subsystem and subsystem devices.		P
7.13.1.4	**Measuring and monitoring of system condition**		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	Measuring and monitoring of system soundness are essential for preventive and reactive maintenance. Items that form part of the measuring and monitoring of the system soundness test should be based on knowledge gained from past incidents and risk analysis utilizing FTA, FMEA, etc. The detection of malfunctions and performance degradations should be considered. In most cases the BESS are likely to be operated remotely without trained operators. In such cases, the BESS soundness should be remotely monitored.		P
7.13.1.5	**Staff training**		P
	For category "E-S" BESS, any requirement of 7.13.1.5 shall apply to the staff training for the service staff of BESS suppliers.		N/A
	For category "E-L" BESS, any requirement of 7.13.1.5 shall apply to the staff training for the staff of both the BESS suppliers and operators in accordance with the result of the risk assessment process (see Clause 6).		P
	The manufacturer shall provide guidance on the competence and and authorization level requirements for personnel who operate devices or safety systems. The guidance shall be taken into account for the requirements operators training or authorization to enter restricted areas.		P
7.13.2	**Partial system change**		P
	When the system is partially changed, it is essential that the compatibility and conformity of the parts be checked. Validation of compatibility and conformity of the parts to the system should be considered. Any changes that can degrade the safety level of the BESS should be considered. In addition, the case of BESS relocation also could be considered as similar to the features above.		P
	BESS safety shall be reassessed in the following situations:		P
7.13.3	**Design revision**		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	The BESS is expected to be in operation for many years. During its lifetime, the system will experience changes due to component obsolescence, upgrades or new technology, environmental changes, market changes or regulation changes. Whenever changes take place, the measures for human safety from a system perspective should be revised accordingly. Thus, a review of the safety design shall be conducted not only at the initial design stage, but whenever the design is changed. Risk analysis shall be a core part of the initial safety design and of any redesign.		P
	For a safety plan and program redesign the risk analysis and FMEA should be repeated. However, depending on the level of the changes, only FMEA can need to be conducted on that part of the system where the changes were made and areas on the whole system that are affected.		P
	Specifications of ventilation, air conditioning and fire suppression subsystems should be determined considering the fully clarified surrounding environmental difference with respect to relocations.		P
	BESS relocation shall be performed using the same process as that used during initial construction or installation.		P
7.13.4	**End of service life management**		P
	The BESS should be designed to be safely dismantled into separate subsystems or into separate components at the end of its life. Dismantled subsystems or components should be andled according to appropriate standards, manufacturer instructions and local regulations.		P
7.13.5	**Measures for validating life cycle safety management**		P
	Compliance of 7.13.1 to 7.13.4 shall be confirmed by appropriate validations. Annex E gives information on good practice for these validations.		P
8	**System validation and testing**		**P**
8.1	**General**		P
8.2	**Validation and testing of BESS**		P
8.2.1	**Electrical hazards**		P
8.2.1.1	**High current discharge (short-circuit) protection**	See table 8.2.1.1	P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	The DC circuits of the BESS shall be protected from short-circuits (or be short-circuit proof) on both the AC and DC sides. Each electrochemical accumulation subsystem shall be protected from short-circuit. Each power conversion subsystem shall be protected from short-circuit. Upon application of the suitable simulated signals, the short-circuit protection shall operate to prevent damage to the BESS that can result in a hazardous condition. The short-circuit protection shall operate as designed.		P
8.2.1.2	**Overcharge, high current charge and earth fault protection**	See table 8.2.1.2	P
	Upon installation, the BESS shall be tested with suitable simulated signals to determine whether the charging circuit is disconnected as designed when a state of overcharging, high current charge in electrochemical accumulation subsystems or earth fault in the whole BESS is detected.		P
8.2.1.3	**Impulse withstands voltage protection**	See table 8.2.1.3	P
	This test is a type test as it can result in damage to the BESS under test. The impulse voltage test is to verify the capability of the solid insulation to withstand the rated impulse voltage. The voltage waveforms used for this test should simulate the overvoltage of atmospheric origin and cover overvoltage due to switching of low-voltage equipment.		P
8.2.1.4	**Dielectric test**	See table 8.2.1.4	P
	The AC dielectric test should verify the capability of the solid insulation to withstand: – the short-term temporary overvoltage; – the highest steady-state voltage; – the recurring peak voltage. If the peak value of the AC dielectric test voltage is equal to or higher than the rated impulse voltage, the impulse voltage test in 8.2.1.3 is covered by the AC dielectric test.		P
8.2.1.5	**Insulation resistance**	See table 8.2.1.5	P
	An insulation resistance test should be conducted in accordance with IEC 60364-6:2016, .4.3.3 and 6.4.3.4.		P
8.2.1.6	**Earthing system check**	See table 8.2.1.6	P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	The earthing system of a BESS shall be confirmed in accordance with the methods noted below. The measurements shall be made between any two locations of the earthing system.		P
	For category "V-L", the earthing system of the BESS shall be validated by measurement of the resistance of the earth electrode according to IEC 60364-6:2016, 6.4.3.7.2, or the measurement of the earth fault loop impedance according to IEC 60364-6:2016, 6.4.3.7.3.		P
	For category "V-H", the earthing system of the BESS shall be validated in accordance with IEC 61936-1:2010 and IEC 61936-1:2010/AMD1:2014, Clause 10.		N/A
8.2.1.7	**Anti-islanding**	See table 8.2.1.7	P
	Any anti-islanding function of the BESS shall be validated or tested in an appropriate way to confirm the requirements in 7.11.3.1.		P
8.2.2	**Mechanical hazards**		P
8.2.2.1	**Enclosure strength against impact**	See table 8.2.2.1	P
	For category "E-S" BESS, enclosures shall be subjected to an impact test in accordance with IEC 62477-1:2012, 5.2.2.4.3. As a result of this impact test, there shall be no damage that would result in access to hazardous parts in accordance with 8.2.10. After this test the BESS shall not show any electrical shock hazard as determined in accordance with the dielectric test in 8.2.1.4.		N/A
	For category "E-L", the enclosure of the subsystems of the BESS shall be subjected to the impact tests as above.		P
8.2.2.2	**Enclosure strength against static force**	See table 8.2.2.2	P
	For category "E-S" BESS, enclosures shall be subjected to the test in IEC 62477-1:2012, 5.2.2.4.2.3. As a result of the force tests, there shall be no damage that would result in access to hazardous parts in accordance with 8.2.10. After this test the BESS shall not show any electrical shock hazard as determined in accordance with the dielectric test in 8.2.1.4.		N/A
	For category "E-L", the enclosures of the subsystems of the BESS shall be subjected to the force tests as above.		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
8.2.2.3	**Impact and vibration during transportation and seismic events (e.g. earthquakes)**		P
	The safety design level against impact and vibration during transportation and seismic events (e.g. earthquakes) generally depends on local regulations and the installation environment. However, the safety level itself should be confirmed on site in accordance with the result of a system risk assessment (see Clause 6). At least the states in the list below shall be verified as SAT in accordance with the standards, manufacturer instructions and local regulations: – each subsystem and whole system should be securely fixed to structure, foundation or land; – the power circuits and connection points between subsystems should remain functional after seismic events; – the control, monitoring and earthing circuits should remain functional after seismic events.	UN 38.3 was provided by manufacturer	P
8.2.3	**Explosion**		P
8.2.3.1	**Specification of flammable gas**		P
	Flammable gas which needs to be detected shall be specified during the appropriate system design process.		P
8.2.3.2	**Gas detection / off-gas detection**		P
	Gassing from BESS potentially resulting as a consequence from type tests shall be qualified in terms of flammability characteristics and related risks of explosive atmosphere by appropriate technical means.		P
	Refer to IEC 60079-29 (all parts) for guidance on flammable gas detectors.		P
8.2.3.3	**Ventilation**		P
	The ventilation systems provided at the site where the BESS has been located or provided within the BESS itself shall be tested. The type test for individual components shall be done. The SAT for the BESS with ventilation systems shall also be done. As a result of the tests conducted, the ventilation systems shall automatically operate as designed.		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	For category "V-H/S-O/C-A, C-B, C-D and C-Z" BESS, and if a forced ventilation system is provided, the SAT for the forced ventilation system shall also be performed with suitable simulated signals which would be sent upon detection of a combustible concentration of flammable gases. As a result of that, the ventilation systems shall automatically operate as designed.		N/A
	Refer to IEC 60079-7:2015, 6.6.4, for a method to evaluate battery compartment ventilation, or IEC 60079-13.		P
8.2.4	**Hazards arising from electric, magnetic, and electromagnetic fields**	EMC report provided.	P
	The safety functions of the safety-related subsystems of BESS shall comply with IEC 61000-6-7, or functional safety shall be considered with regard to electromagnetic phenomena according to IEC 61000-1-2, if applicable.		P
	Protective measures from disturbance-induced malfunctions of the subsystems of BESS shall be validated with the method given in IEC 60364-4-44.		P
	For category "V-L", compliance with the requirements above shall be confirmed by a type test with a representative BESS.		P
	For category "V-H", compliance with the requirements above shall be confirmed by type tests with individual safety-related BESS subsystems and on-site validation of BESS control subsystems.		N/A
8.2.5	**Fire hazards (propagation)**		P
	Category "C-A" electrochemical accumulation subsystems shall be tested and validated in accordance with the requirements of IEC 62619:2017, 7.3.3.		P
	Upon installation, measures below shall be checked: – for category "S-O" BESS, that fire alarms and fire suppression subsystems are installed and commissioned at the BESS location; – for category "S-U" BESS, that any fire alarms and fire suppression subsystems are provided within the vicinity; – in the case of both, if a fire alarm detects a fire hazard, that fire suppression subsystems automatically operate.	See table 8.2.5	P
8.2.6	**Temperature hazards**		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
8.2.6.1	**Verification of thermal control operation**	See table 8.2.6.1	P
	BESS shall be subjected to the following validation or testing:		P
	– Electrochemical accumulation subsystems with battery temperature measurement shall be checked by subjecting them to a suitable simulated signal indicating an over-temperature condition in order to verify the system response.		P
	When the temperature of the BESS is above specified values, the thermal controls shall stop or otherwise control the charging and discharging to keep the specified operation conditions.		P
	If not previously conducted as part of the type testing, upon installation, the BESS shall be checked to ascertain if the charging and discharging are stopped when the temperature of electrochemical accumulation subsystems exceeds the temperature limit which is indicated by the manufacturer.		P
	In the case that a current limiting device is equipped outside the electrochemical accumulation subsystems, the function of the current limiting device shall be checked by system validation or by testing with suitable simulated signals of overcharging or temperature rise.		P
	For category "V-H" BESS, the SAT for the whole BESS installation with a combination of detection systems, audible alerts and visual signals shall be conducted.		N/A
	All the functions above shall operate as designed.		P
8.2.6.2	**Abnormal operation of subsystems for ventilation**	See table 8.2.6.2	P
	This test is conducted on BESS with ventilation systems or ventilation openings in the BESS enclosure. The ventilation system of the BESS is to be blocked or disconnected. The BESS is then to be subjected to any internal heat sources (i.e. discharge/charge cycle of electrochemical accumulation subsystems) to see if the controls detect the faulted ventilation system and if they end up charging and discharging before the BESS overheats. The test may be conducted with the ventilation system operating and any ventilation openings or ducts blocked.		P
8.2.6.3	**Temperature under normal operation tests**	See table 8.2.6.3	P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	When operated at maximum operating loads and parameters, temperatures on temperature sensitive components of the BESS shall be within their specified ratings. The operating parameters for electrochemical accumulation subsystems shall be within their specified operating parameters for voltage, current and temperatures.		P
8.2.7	**Chemical effects**		N/A
8.2.7.1	**Specification of hazardous fluids**		N/A
	The hazardous fluids which need to be detected shall be first identified and specified during the appropriate system design process.		N/A
8.2.7.2	**Fluids detection**		N/A
	Upon installation, any functions of the detection systems, audible alerts and visual signals for reporting an incident of hazardous fluids shall be tested in accordance with appropriate standards, manufacturer instructions and local regulations to confirm that their functions automatically operate when the concentration or leakage of hazardous fluids occurs. Their functions shall operate as designed. The SAT for individual components of detection systems, audible alerts and visual signals shall be conducted with suitable simulated signals for the events to be detected.		N/A
8.2.7.3	**Protective measures against hazardous fluid**		N/A
	Any functions of protective measures against hazardous fluid required in 7.11.3.1 shall be validated or tested in accordance with appropriate standards, manufacturer instructions and local regulations. Their functions shall operate as designed.		N/A
8.2.8	**Hazards arising from auxiliary, control and communication system malfunctions**		P
	The tests to determine if hazards result from an auxiliary system malfunction, control system malfunction, internal communication system malfunction and external communication system malfunction of the BESS are to be conducted in accordance with IEC TS 62933-5-1. Analysis of the system shall provide guidance on possible faults to these subsystems of the BESS.	FMEA was provided. Evaluated according to IEC 60730-1 Annex H.	P
8.2.9	**Hazards arising from environments**		P
8.2.9.1	**General**		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	The tests noted below apply to those BESS that have environmental ratings or intend to be installed where environmental conditions can affect their safety.		P
8.2.9.2	**Exposure to moisture ingress**		P
	The BESS shall be confirmed by a system design check in accordance with the result of the system level risk assessment (see Clause 6) or by a complete testing of its claimed ingress protection (IP) (environmental) rating in accordance with IEC 60529.	IP55 according to IEC 60529. Details see report GDGT-H/R-2025-04014(Issue date 2025-05-08), GDGT-H/R-2025-04015 (Issue date 2025-05-08), GDGT-H/R-2024-12088-XG (Issue date: May 15,2015) issued by Guangdong Sushi Guangbo Testing Technology Co., Ltd. on;	P
	If the BESS are to be tested for the ingress of moisture, the BESS shall not exhibit signs of fire or explosion, and there shall be no damage to the enclosure that would result in access to hazardous parts in accordance with 8.2.10. The protective subsystems shall remain functional. The BESS shall not pose an electrical shock hazard as determined by compliance to the dielectric voltage withstand test of 8.2.1.4.		P
	BESS that are intended to be installed in locations that can be subject to flooding shall be subject to a water immersion exposure test using salt water that has a weight of 5 % NaCl in H_2O. The BESS shall be completely immersed or portions of the BESS that would be impacted by water immersion are to be immersed for 2 h or until reactions appear to have stopped. As a result of the immersion, there shall be no fire or explosion.	Not intended to be installed in locations that can be subject to flooding	N/A
8.2.9.3	**Exposure to marine environments (salt fog)**		N/A
	BESS intended for installation in or around a marine environment (e.g. near seashores, on docks, etc.) shall be confirmed by a system design check in accordance with the result of the system risk assessment (see Clause 6) or wholly subjected to the exposure test method 1 or 2 specified in IEC 60068-2-52.	Not used in marine environments	N/A
8.2.10	**IP rating of BESS enclosure and protective guards**		P

IEC 62933-5-2			
Clause	**Requirement + Test**		**Verdict**
	The BESS enclosure and protective guards shall comply with their IP rating for access to hazardous parts (e.g. hazardous moving parts, uninsulated electrical parts at hazardous voltage) in accordance with IEC 60529.	IP55	P
9	**Guidelines and manuals**		**P**
	In addition to the requirements in 7.12, and 7.13.1.1 to 7.13.1.4, the considerations in IEC TS 62933-5-1:2017, Clause 9, are applicable.		P

TEST RESULTS

8.2.1.1 **8.2.1.2**	**TABLE: High current discharge (short-circuit) protection** **TABLE: Overcharge, high current charge and earth fault protection**	P
	ambient temperature (°C) ..... : 25	—

No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
AC charge condition：							
1	AC terminal –Phase C	Loss of phase	400Vac (3/N/PE)	10 mins	--	--	No error messages. EUT disconnected from grid immediately, cannot charge, No damage, no hazard.
2	AC terminal –Phase N	Loss of phase	400Vac (3/N/PE)	10 mins	--	--	No error messages. EUT disconnected from grid immediately, cannot charge, No damage, no hazard.
3	AC terminal –Phase A & Phase B	Miss wiring before start up	400Vac (3/N/PE)	10 mins	--	--	Error message: “Grid Missphase”. EUT can’t start up. No damage, no hazard.
4	DC output to battery	SC	400Vac (3/N/PE)	10 mins	--	--	Fault message: “Output Short circuit”. No damage, No hazard.
5	AC Fan motor	Fan locked	400Vac (3/N/PE)	10 mins	--	--	Error message: “Fan faulty”. EUT continues to operate until overtemperature protection. No damage, no hazard.
PV charge condition：							
6	PV input	Reverse polarity	PV Input: 850Vdc	10 mins	--	--	The PCE reports error message. EUT disconnected immediately, No damage, no hazard.
7	DC Output (+ to -)	SC	PV Input: 850Vdc	10 mins	--	--	The PCE reports error message. EUT disconnected immediately, No damage, no hazard.
8	DC Fan	Locked	PV Input: 850Vdc	10 mins	--	--	The PCE reports error message: “Fan faulty”. EUT continues to operate until overtemperature protection. No damage, no hazard.
Discharge condition(on Grid)：							
9	AC Output	SC	Supplied by fully charged battery	10 mins	--	--	Fault message: “Output Shortcircuit”. EUT disconnected from grid immediately. No damage, No hazard.
10	AC terminal –Phase A	Loss of phase	Supplied by fully charged battery	10 mins	--	--	No error messages. EUT disconnected from grid immediately, cannot discharge, No damage, no hazard.

11	AC terminal –Phase N	Loss of phase	Supplied by fully charged battery	10 mins	--	--	No error messages. EUT disconnected from grid immediately, cannot discharge, No damage, no hazard.
12	AC terminal –Phase B & Phase C	Miss wiring before start up	Supplied by fully charged battery	10 mins	--	--	Error message: “Grid Missphase”. EUT can’t start up. No damage, no hazard.
Note:							

8.2.1.3	TABLE: Impulse withstand voltage protection	P

Test voltage applied between:	Test potential applied (V)	Breakdown / flashover (Yes/No)
AC input terminal to metal enclosure (BI)	6000	No
AC input terminal to communication output port (RI)	8000	No
AC mains circuits to LCD Panel (RI)	8000	No
PV input terminal to metal enclosure (BI)	4000	No
PV input terminal to communication port (RI)	6000	No
Battery Energy Storage Cabinet:		
DC input connector to earthed enclosure (BI)	4000	No
DC input connector to communication port (RI)	6000	No

Supplementary information:
FI=functional insulation, BI=basic insulation, SI=supplementary insulation, RI=reinforced insulation.

8.2.1.4	TABLE: Dielectric Tests	P

Test voltage applied between:	Test potential applied (V)	Breakdown / flashover (Yes/No)
AC input terminal to metal enclosure (BI)	1800Vac	No
AC input terminal to communication output port (RI)	3600Vac	No
AC mains circuits to LCD Panel (RI)	3600Vac	No
PV input terminal to metal enclosure (BI)	2050Vac	No
PV input terminal to communication port (RI)	4100Vac	No
Battery Energy Storage Cabinet:		
DC input connector to earthed enclosure (BI)	1800Vac	No
DC input connector to communication port (RI)	3600Vac	No

Supplementary information:
FI=functional insulation, BI=basic insulation, SI=supplementary insulation, RI=reinforced insulation.

8.2.1.5	Insulation Resistance			P
Test Location	Test Voltage (Vdc)	Test Duration (min)	Measured Resistance (MΩ)	Comment
AC input terminal to metal enclosure	500	1min	>100MΩ	--
AC input terminal to communication output port	500	1min	>100MΩ	--
AC mains circuits to LCD Panel	500	1min	>100MΩ	--
PV input terminal to metal enclosure (BI)	1000	1min	>100MΩ	--
PV input terminal to communication port (RI)	1000	1min	>100MΩ	--
Battery Energy Storage Cabinet:				
DC input connector to earthed enclosure (BI)	1000	1min	>100MΩ	--
DC input connector to communication port (RI)	1000	1min	>100MΩ	--
Note:				

8.2.1.6	Earthing System Check			P
Test Location	Test Current (A)	Test Duration (min)	Grounding system resistance (Ω)	Comment
Earth terminal to Farthest metal enclosure	60	2	72m Ω	Limited:100 mΩ
Note:				

8.2.1.7 Anti-islanding

Test circuit and parameters

Parameter	Symbol	Units
EUT DC Input		
DC voltage	V_{DC}	V
DC Current	I_{DC}	A
DC Power	P_{DC}	W
EUT AC output		
AC voltage	V_{EUT}	V
AC current	I_{EUT}	A
Real power	P_{EUT}	W
Reactive power	Q_{EUT}	VAr
Test Load		
Resistive load current	I_R	A
Inductive load current	I_L	A
Capacitive load current	I_C	A
AC (utility) power source		
Utility real power	P_{AC}	W
Utility reactive power	Q_{AC}	VAr
Utility current	I_{AC}	A

Block diagram test circuit IEC 62116:2014

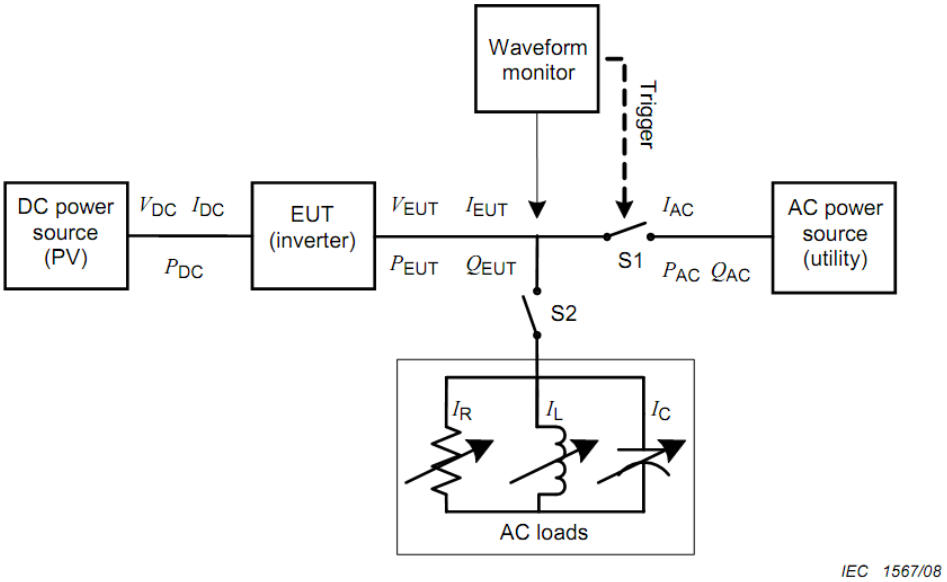


Figure 1 – Test circuit for islanding detection function in a power conditioner (inverter)

8.2.1.7 Anti-islanding **Load imbalance (real, reactive load) for test condition A (EUT ouput = 100%)**	**P**
Test conditions	Frequency: 50+/-0,1Hz U_N=230+/-3Vac Distortion factor of chokes < 2% Quality = 1
Disconnection limit	2s (IEC 62116)

Model: 241C-10/500

No	P_{EUT} 1) [% of EUT rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} 2) [% of nominal]	Q_{AC} 3) [% of nominal]	I_{AC} 4) [A]	P_{EUT} [kW]	V_{DC} [V]	Q_f [1]	Run on Time [ms]	Remarks5)
1	100	100	0	0	--	500	920	1.00	350	BL
2	100	100	-10	-10	--	--	--	--	--	IB
3	100	100	-10	-5	--	--	--	--	--	IB
4	100	100	-10	0	--	--	--	--	--	IB
5	100	100	-10	+5	--	--	--	--	--	IB
6	100	100	-10	+10	--	--	--	--	--	IB
7	100	100	-5	-10	--	--	--	--	--	IB
8	100	100	-5	-5	--	500	920	0.95	160	IB
9	100	100	-5	0	--	500	920	1.00	245	IB
10	100	100	-5	+5	--	500	920	1.05	213	IB
11	100	100	-5	+10	--	--	--	--	--	IB
12	100	100	0	-10	--	--	--	--	--	IB
13	100	100	0	-5	--	500	920	0.95	163	IB
14	100	100	0	+5	--	500	920	1.05	194	IB
15	100	100	0	+10	--	--	--	--	--	IB
16	100	100	+5	-10	--	--	--	--	--	IB
17	100	100	+5	-5	--	500	920	0.95	134	IB
18	100	100	+5	0	--	500	920	1.00	331	IB
19	100	100	+5	+5	--	500	920	1.05	216	IB
20	100	100	+5	+10	--	--	--	--	--	IB
21	100	100	+10	-10	--	--	--	--	--	IB
22	100	100	+10	-5	--	--	--	--	--	IB
23	100	100	+10	0	--	--	--	--	--	IB
24	100	100	+10	+5	--	--	--	--	--	IB

25	100	100	+10	+10	--	--	--	--	--	IB

Parameter at 0% per phase	L= 0.34 mH	R= 0.11 Ω	C= 30101.26 µF

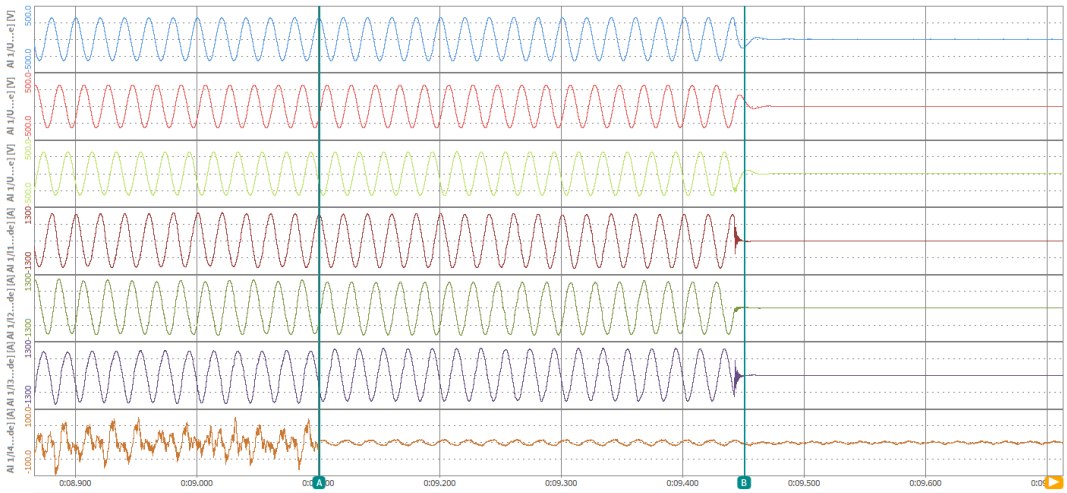
Note:
RLC is adjusted to min. +/-1% of the inverter rated output power
[1] P_{EUT}: EUT output power
[2] P_{AC}: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
[3] Q_{AC}: Reactive power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
[4] Fundamental of I_{AC} when RLC is adjusted
[5] BL: Balance condition, IB: Imbalance condition.

Condition A:
EUT output power PEUT = Maximum [6]
EUT input voltage [6] = >75% of rated input voltage range

[6] Maximum EUT output power condition should be achieved using the maximum allowable input power. Actual output power may exceed nominal rated output.
[7] Based on EUT rated input operating range. For example, If range is between X volts and Y volts, 90 % of range =X + 0,75 × (Y – X). Y shall not exceed 0,8 × EUT maximum system voltage (i.e., maximum allowable array open circuit voltage). In any case, the EUT should not be operated outside of its allowable input voltage range.

Scope pictures of the disconnection time

Disconnection at No. 1



	A	B	Delta	Max
Time [s]	9.1011949	9.4509834	0.3497885	
AI 1/U1@[RemoteNode] [V]	324.0032	-127.4166	-451.4199	331.1398
AI 1/U2@[RemoteNode] [V]	-149.0400	91.09474	240.1347	325.4490
AI 1/U3@[RemoteNode] [V]	-174.5017	36.10444	210.6061	331.8413
AI 1/I1@[RemoteNode] [A]	1033.545	-20.71381	-1054.258	1084.199
AI 1/I2@[RemoteNode] [A]	-451.4742	23.61536	475.0896	1086.578
AI 1/I3@[RemoteNode] [A]	-508.4658	-16.10279	492.3630	1069.911
AI 1/I4@[RemoteNode] [A]	-7.724762	-4.014969	3.709793	9.641648

Note:
Yellow: EUT output voltage signal

Green: EUT output current signal

Purple: Grid current trigger signal

Load imbalance (reactive load) for test condition B (EUT output = 50 % – 66 %)	**P**

Test conditions	Frequency: 50+/-0,1Hz U_N=230+/-3Vac Distortion factor of chokes < 2% Quality =1
Disconnection limit	2s (IEC 62116)

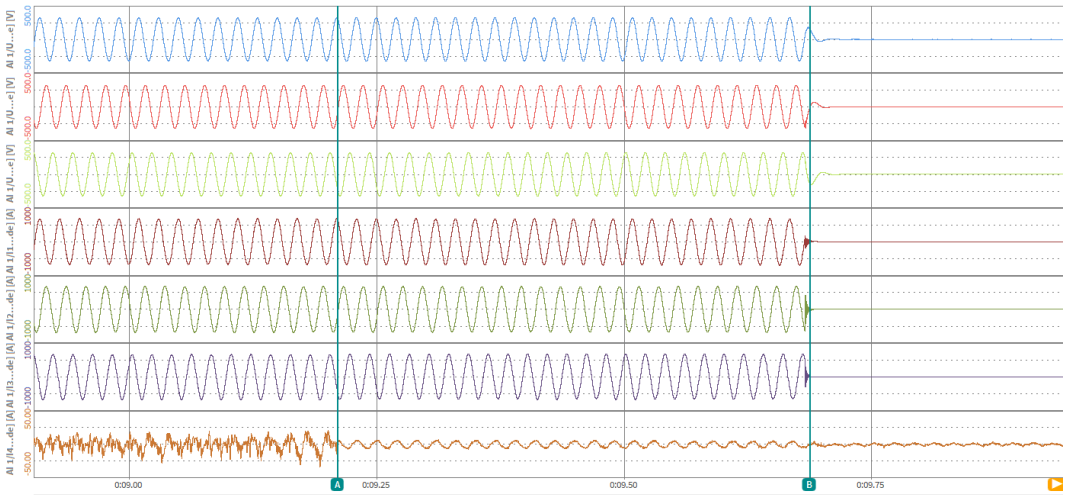
Model: 241C-10/500

No	P_{EUT} [1] [% of EUT rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} [2] [% of nominal]	Q_{AC} [3] [% of nominal]	I_{AC} [4] [A]	P_{EUT} [kW]	V_{DC} [V]	Q_f [1]	Run on Time [s]	Remarks [5]
1	66	66	0	-5	--	330	840	0.95	129	IB
2	66	66	0	-4	--	330	840	0.96	229	IB
3	66	66	0	-3	--	330	840	0.97	245	IB
4	66	66	0	-2	--	330	840	0.98	274	IB
5	66	66	0	-1	--	330	840	0.99	295	IB
6	66	66	0	0	--	330	840	1.00	477	BL
7	66	66	0	1	--	330	840	1.01	295	IB
8	66	66	0	2	--	330	840	1.02	282	IB
9	66	66	0	3	--	330	840	1.03	188	IB
10	66	66	0	4	--	330	840	1.04	149	IB
11	66	66	0	5	--	330	840	1.05	126	IB

Parameter at 0% per phase	L= 0.51mH	R=0.16 Ω	C= 19866.83 µF

Note:
RLC is adjusted to min. +/-1% of the inverter rated output power
[1] P_{EUT}: EUT output power
[2] P_{AC}: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
[3] Q_{AC}: Reactive power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
[4] Fundamental of I_{AC} when RLC is adjusted
[5] BL: Balance condition, IB: Imbalance condition.
Condition B:
EUT output power P_{EUT} = 50 % – 66 % of maximum
EUT input voltage [6] = 50 % of rated input voltage range, ±10 %
[6] Based on EUT rated input operating range. For example, If range is between X volts and Y volts, 50 % of range =X + 0,5 × (Y – X). Y shall not exceed 0,8 × EUT maximum system voltage (i.e., maximum allowable array open circuit voltage). In any case, the EUT should not be operated outside of its allowable input voltage range.

Scope pictures of the disconnection time
Disconnection at No. 6



	A	B	Delta	Max
Time [s]	9.2106389	9.6872872	0.4766483	
AI 1/U1@[RemoteNode] [V]	302.9995	165.7899	-137.2097	328.7764
AI 1/U2@[RemoteNode] [V]	-44.15989	-25.72131	18.43858	325.5303
AI 1/U3@[RemoteNode] [V]	-255.6324	-138.9549	116.6775	328.6784
AI 1/I1@[RemoteNode] [A]	640.4162	-11.44409	-651.8603	704.6128
AI 1/I2@[RemoteNode] [A]	-82.33667	10.51188	92.84854	698.0300
AI 1/I3@[RemoteNode] [A]	-531.2026	3.778935	534.9815	691.9849
AI 1/I4@[RemoteNode] [A]	4.665852	-0.715256	-5.381108	7.026196

Note:
Yellow: EUT output voltage signal

Green: EUT output current signal

Purple: Grid current trigger signal

Load imbalance (reactive load) for test condition C (EUT output = 25 % – 33 %)	**P**
Test conditions	Frequency: 50+/-0,1Hz U_N=230+/-3Vac Distortion factor of chokes < 2% Quality =1
Disconnection limit	2s (IEC 62116)

Model: 241C-10/500

No	P_{EUT} 1) [% of EUT rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} 2) [% of nominal]	Q_{AC} 3) [% of nominal]	I_{AC} 4) [A]	P_{EUT} [kW]	V_{DC} [V]	Q_f [1]	Run on Time [s]	Remarks 5)
1	33	33	0	-5	--	165	712	0.95	144	IB
2	33	33	0	-4	--	165	712	0.96	145	IB
3	33	33	0	-3	--	165	712	0.97	164	IB
4	33	33	0	-2	--	165	712	0.98	236	IB
5	33	33	0	-1	--	165	712	0.99	258	IB
6	33	33	0	0	--	165	712	1.00	436	BL
7	33	33	0	1	--	165	712	1.01	361	IB
8	33	33	0	2	--	165	712	1.02	251	IB

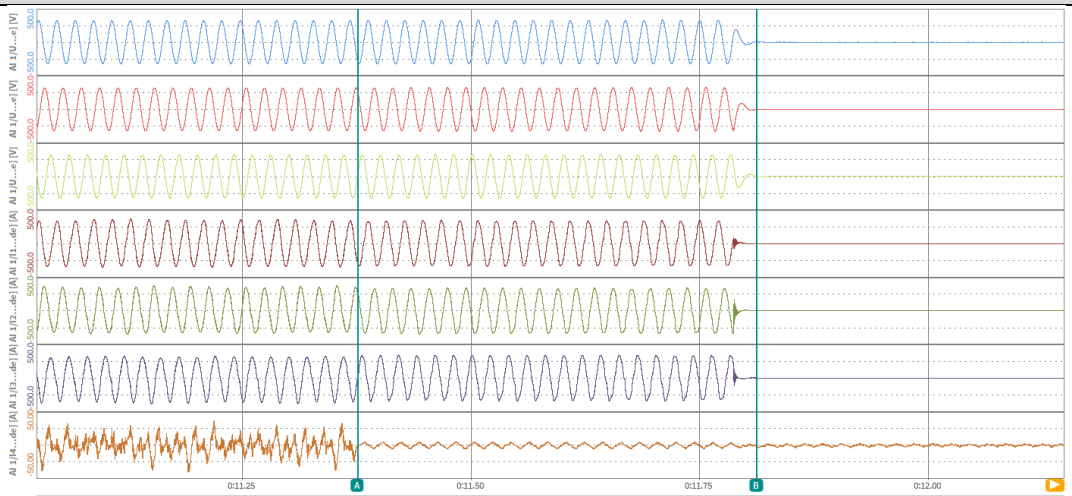
9	33	33	0	3	--	165	712	1.03	223	IB
10	33	33	0	4	--	165	712	1.04	222	IB
11	33	33	0	5	--	165	712	1.05	188	IB

Parameter at 0% per phase	L= 1.02mH	R= 0.32 Ω	C= 9933.42 μF

Note:
RLC is adjusted to min. +/-1% of the inverter rated output power
[1] P_{EUT}: EUT output power
[2] P_{AC}: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
[3] Q_{AC}: Reactive power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
[4] Fundamental of I_{AC} when RLC is adjusted
[5] BL: Balance condition, IB: Imbalance condition.
Condition B:
EUT output power PEUT = 25 % – 33 % [6] of maximum
EUT input voltage [7] = <20 % of rated input voltage range
[6] Or minimum allowable EUT output level if greater than 33 %.
[7] Based on EUT rated input operating range. For example, If range is between X volts and Y volts, 10 % of range =X + 0,2 × (Y – X). Y shall not exceed 0,8 × EUT maximum system voltage (i.e., maximum allowable array open circuit voltage). In any case, the EUT should not be operated outside of its allowable input voltage range.

Scope pictures of the disconnection time

Disconnection at No. 6



	A	B	Delta	Max
Time [s]	0:11.3764364	0:11.8124691	0.4360328	
AI 1/U1@[RemoteNode] [V]	-267.0901	7.137299	274.2274	335.4190
AI 1/U2@[RemoteNode] [V]	292.8410	-8.543253	-301.3842	330.3359
AI 1/U3@[RemoteNode] [V]	-22.66407	1.589298	24.25337	332.6171
AI 1/I1@[RemoteNode] [A]	-274.7655	-0.780821	273.9847	358.0165
AI 1/I2@[RemoteNode] [A]	291.2677	-1.790524	-293.0582	346.7870
AI 1/I3@[RemoteNode] [A]	-8.963347	1.150370	10.11372	347.9004
AI 1/I4@[RemoteNode] [A]	-3.145933	-1.686812	1.459122	5.148650

Note:
Yellow: EUT output voltage signal

Green: EUT output current signal

Purple: Grid current trigger signal

8.2.2.1	Enclosure strength against impact	P
Test parts:	Result	
EES top of enclosure	Enclosures show no cracks or openings which could cause a hazard, Clearances are not less than their minimum requirement.	
EES front side of enclosure	Enclosures show no cracks or openings which could cause a hazard, Clearances are not less than their minimum requirement.	
EES left side of enclosure	Enclosures show no cracks or openings which could cause a hazard, Clearances are not less than their minimum requirement.	
EES right side of enclosure	Enclosures show no cracks or openings which could cause a hazard, Clearances are not less than their minimum requirement.	
EES rear side of enclosure	Enclosures show no cracks or openings which could cause a hazard, Clearances are not less than their minimum requirement.	
Note:		

8.2.2.2	Enclosure strength against static force	P
Test parts:	Result	
EES top of enclosure	Enclosures show no cracks or openings which could cause a hazard, Clearances are not less than their minimum requirement.	
EES front side of enclosure	Enclosures show no cracks or openings which could cause a hazard, Clearances are not less than their minimum requirement.	
EES left side of enclosure	Enclosures show no cracks or openings which could cause a hazard, Clearances are not less than their minimum requirement.	
EES right side of enclosure	Enclosures show no cracks or openings which could cause a hazard, Clearances are not less than their minimum requirement.	
EES rear side of enclosure	Enclosures show no cracks or openings which could cause a hazard, Clearances are not less than their minimum requirement.	
Note:		

8.2.5	TABLE: Fire hazards (propagation)				P
Sample No.	**OCV of Battery System Before Test, (V dc)**	**OCV of Target Cell Before Test, (V dc)**	**Maximum Cell Case Temperature, (°C)**	**Maximum DUT Enclosure Temperature, (°C)**	**Results**
DUT1	53.44	3.34	319.4	68.8	A

Method of cell failure [1)]	**Location of target cell**	**Area for fire protection (m^2)**
Heat the battery cell using two 500w heating films	reference picture	--

Supplementary information:

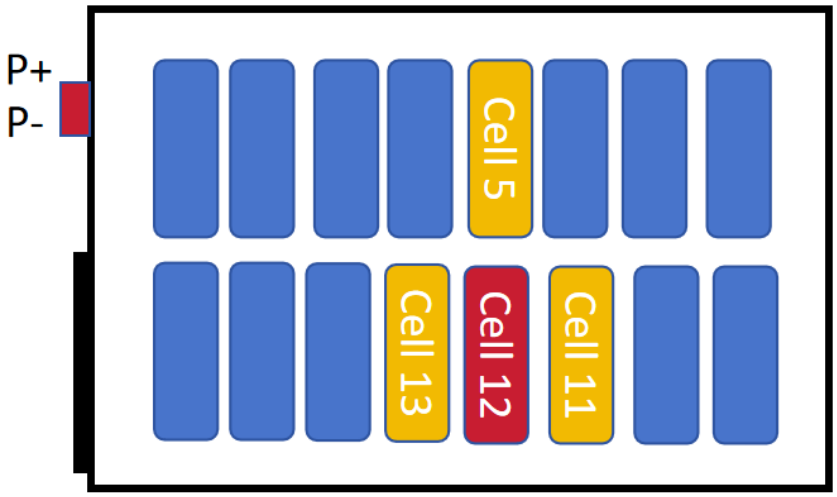
1) Cell can be failed through laser exposure, applied heat, overcharge, nail penetration or combinations of these failures or other acceptable methods. See supporting documentation for details on cell failure method

2) If the battery system has no outer covering, the manufacturer is required to specify the area for fire protection.

Results:
A – No fire external to DUT enclosure or area for fire protection or no battery case rupture
B – Fire external to DUT enclosure or area for fire protection
C – Explosion
D – Battery case rupture
E – Other (Please explain): __

Note1: Location of target cell:

Note2: The test was subcontracted to KSIGN(Guangdong) Testing Co., Ltd.
Address: KSIGN Testing Park, Building C, Zone A Jiujiu Industrial Park, Minzhu Village, Xihuan Road, Shajing Street, Bao'an District, Shenzhen City, Guangdong Province, P. R. China



8.2.6.1	Verification of thermal control operation
State	**Results**
Charging	The product stopped charging when the temperature of the BESS is above 56℃.
Discharging	The product stopped discharging when the temperature of the BESS is above 56℃.
Note:	

8.2.6.2	Abnormal operations of subsystems for ventilation
State	**Results**
Ventilation system disconnecting	The product operated normally.
Ventilation system operating, but any ventilation openings or ducts blocked	The product operated normally.
Note:	

8.2.6.3	TABLE: Temperature under normal operation tests				P
	Test voltage (V) ..... :	400Vac, 3W+PE+N	850Vdc	Fully charged battery	—
	tamb1 (°C) ..... :	See below	See below	See below	—
	tamb2 (°C) ..... :	See below	See below	See below	—
maximum temperature T of part/at:		T (°C)			Tmax (°C)
		1	2	3	
AC Energy Storage Converter (model ESS-GRID P500E):					
AC input/output wire		80.6	59.4	82.4	180
Front enclosure		65.1	59.5	66.6	70
Side of enclosure		64.3	58.3	62.0	70
DC wire link to Battery Energy Storage Cabinet 1		74.3	75.7	72.9	180
DC wire link to Battery Energy Storage Cabinet 6		74.7	75.5	71.4	180
DC wire link to Battery Energy Storage Cabinet 10		73.7	76.2	73.6	180
DC Energy Storage Converter (model ESS-GRID P500L):					
PV input wire		60.1	80.8	59.3	180
PV output wire link to Battery Energy Storage Cabinet 1		60.7	74.6	59.0	180
PV output wire link to Battery Energy Storage Cabinet 6		59.1	75.0	60.7	180
PV output wire link to Battery Energy Storage Cabinet 10		57.8	76.5	58.2	180
Front enclosure		61.3	66.0	58.1	70
Side of enclosure		62.1	64.7	61.4	70
Battery Energy Storage Cabinet:					
Front enclosure (Battery Energy Storage Cabinet 1)		61.3	65.0	63.7	70

Side of enclosure (Battery Energy Storage Cabinet 1)	64.1	64.8	63.1	70
Front enclosure (Battery Energy Storage Cabinet 10)	65.1	66.0	64.8	70
Side of enclosure (Battery Energy Storage Cabinet 10)	64.2	64.4	63.8	70
Ambient	55.0	55.0	55.0	--
Supplementary information:				
Tested on model 241C-10/500 Test conditions: 1. Charging state (empty battery): AC 400V charge the empty battery energy Storage Cabinet at condition of 55°C ambient temperature until steady condition established. 2. Charging state (empty battery): PV 850Vdc charge the empty battery energy Storage Cabinet at condition of 55°C ambient temperature until steady condition established. 3. Discharge state (full-charged battery): Run the EUT at full load condition of 55°C ambient temperature until steady condition established, AC output 400Vac, 500kW.				

	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Lithium-ion Battery Energy Storage Cabinet	BSL NEW ENERGY TECHNOLOGY CO., LTD	ESS-BATT 241C	768V, 314Ah, 241kWh	IEC 62619:2022	CB Cert. No.: FR_720641/ M1, report No.: CNDQ-ESH-P24111058-A1
		ESS-BATT 225C	716.8V, 314Ah, 225kWh		
		ESS-BATT 208C	665.6V, 314Ah, 208kWh		
Lithium-ion Battery Energy Storage Cabinet	BSL NEW ENERGY TECHNOLOGY CO., LTD	ESS-BATT 241C	768V, 314Ah, 241kWh	IEC 62477-1:2022, EN 62477-1:2012+A11:2014+A1:2017 +A12:2021	Report No: CNDQ-ESH-P24111057
		ESS-BATT 225C	716.8V, 314Ah, 225kWh		
		ESS-BATT 208C	665.6V, 314Ah, 208kWh		
Energy Storage Converter	BSL NEW ENERGY TECHNOLOGY CO.，LTD	ESS-GRID P500L	DC Side: 500kW, 500-950Vdc, 110A*10 PV side: 500kW, 312V-850Vdc, 160A*10	IEC 62109-1:2010, EN 62109-1:2010	Report No: CNDQ-ESH-P24111056
Energy Storage Converter	BSL NEW ENERGY TECHNOLOGY CO.，LTD	ESS-GRID P500E	DC Input: 680-1000V, 800A max. On-grid / AC Load side: 500kW, 400Vac, 3W+PE+N, 792A, 50Hz	IEC 62477-1:2022, EN 62477-1:2012+A11:2014+A1:2017 +A12:2021	Report No: CNDQ-ESH-P24111055
DC/AC cable	SHENZHEN MYSUN INSULATION MATERIALS CO LTD	3640	2AWG, 1100V, 180°C	UL758	UL E239689
DC/AC cable	Interchangeable	3640	2AWG, 1100V, 180°C	UL758	UL E239689
Supplementary information: [1)] Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

ANNEX NO, 1

PICTURES OF THE UNIT

Figure 1 External view

Figure 2 External view

Figure 3 External view

Figure 4 External view of Lithium-ion Battery Energy Storage Cabinet

Figure 5 External view of Lithium-ion Battery Energy Storage Cabinet

Figure 6 Internal view of Lithium-ion Battery Energy Storage Cabinet

Figure 7 External view of Energy Storage Converter (model ESS-GRID P500E)

Figure 8 External view of Energy Storage Converter (model ESS-GRID P500E)

Figure 9 Internal view of Energy Storage Converter (model ESS-GRID P500E)

Figure 10 External view of Energy Storage Converter (model ESS-GRID P500L)

Figure 11 External view of Energy Storage Converter (model ESS-GRID P500L)

Figure 12 Internal view of Energy Storage Converter (model ESS-GRID P500L)

ANNEX NO, 2

TEST EQUIPMENT LIST

No,	Equipment	Internal No,	Type/characteristics	Manufacturer	Last Calibration	Due Data
1	Oscilloscope	A4089036SH	DL850	YOKOGAWA	7-May-25	6-May-26
2	Current probe	A4089064SH	CPL2000	CYBERTEK	5-June-25	4-Jun-26
3	Current probe	A4089065SH	CPL2000	CYBERTEK	5-June-25	4-Jun-26
4	Current probe	A4089061SH	CPL8100A	CYBERTEK	5-June-25	4-Jun-26
5	Bidirectional AC power source	A7040135SH	AGS-40-7006	ACTION	Monitored by Power Analyzer	
6	Bidirectional DC power source	A7040136SH	ABS-E40-2006	ACTION		
7	Power Analyzer	A1240096SH	WT3000	YOKOGAWA	20-Aug-25	19-Aug-26
8	Power Analyzer	A1240132SH	DEWE2-A4	DEWETRON	9-May-25	8-May-26
9	Anti-isolating test stystem	A7150074SH	ACTL-380SH	qunling	-	-
10	temperature & humidity meter	A7440037SH	G820	GRAPHIEC	20-Aug-25	19-Aug-26
11	Temperature & humidity meter	B4200079SH	314	center	10-May-25	9-May-26
12	Load cabinet (for flicker)	A7150090SH	200Ω， 250V;1200W	shanghai wen shun	-	-
13	Variable resistor	A7150076SH	BX8-67	LingOu	-	-
14	walk-in chamber	D1080023SH	MHK-1872AK	TERCHY	20-Aug-25	19-Aug-26
15	RH chamber	D1080055SH	SMTH3600-40W	Shanghai Shimian	11-Jun-25	10-Jun-26
16	Anti-isolating test stystem	A7150074SH	ACTL-380SH	qunling	--	--
17	Voltage probe	A4089059SH	DP6150A	CYBERTEK	11-Jun-24	10-Jun-25
18	Oscilloscope	A4089036SH	DL850	YOKOGAWA	26-May-25	25-May-26
19	Voltage probe	A4089026SH	P5200A	Tektronix	18-Dec-24	17-Dec-25
20	Current probe	A4089037SH	960 30	YOKOGAWA	23-Aug-25	22-Aug-26
21	Current probe	A4089038SH	960 30	YOKOGAWA	23-Aug-25	22-Aug-26
22	Current probe	A4089039SH	960 30	YOKOGAWA	23-Aug-25	22-Aug-26
23	AC power supply	A7040071SH	61512	Chroma	Monitored by Power Analyzer	
24	AC power supply	A7040077SH	MX-30	AMETEK		
25	Programmable DC source	A7040058SH	62150H-1000S	Chroma		
26	Programmable DC source	A7040059SH	62150H-1000S	Chroma		
27	Programmable DC source	A7040069SH	62150H-1000S	Chroma		
28	Programmable DC source	A7040074SH	62150H-1000S	Chroma		
29	Programmable DC source	A7040075SH	62150H-1000S	Chroma		
30	Programmable DC source	A7040076SH	62150H-1000S	Chroma		
31	Programmable DC source	A7040070SH	62150H-1000S	Chroma		

32	Power Analyzer	A1240096SH	WT3000	YOKOGAWA	23-Aug-25	22-Aug-26
33	Power Analyzer	A1240097SH	WT3000	YOKOGAWA	26-May-25	25-May-26
34	Temperature & humidity meter	B4200046SH	polyma	W302M2A	17-Dec-24	16-Dec-25
35	Temperature & humidity meter	B4200078SH	314	center	31-May-25	30-May-26
36	Power Analyzer	A1240132SH	DEWE2-A4	DEWETRON	26-May-25	25-May-26

END OF TEST REPORT