

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

CB TEST CERTIFICATE

Product

Lithium Ion Battery

Name and address of the applicant

Shanghai Dowell Technology Co., Ltd.
Room 607, Building 1, No. 55, Aona Road, China (Shanghai) Pilot Free Trade Zone, Shanghai
China

Name and address of the manufacturer

Shanghai Dowell Technology Co., Ltd.
Room 607, Building 1, No. 55, Aona Road, China (Shanghai) Pilot Free Trade Zone, Shanghai
China

Name and address of the factory

Note: When more than one factory, please report on page 2

☐ Additional information on page 2

Shanghai Dowell Technology Co., Ltd.
Room 607, Building 1, No. 55, Aona Road, China (Shanghai) Pilot Free Trade
Zone, Shanghai China

Ratings and principal characteristics

51,2 Vdc,
Total Capacity: 64 Ah
Rated Capacity: 58,6 Ah

Trademark (if any)



Customer's Testing Facility (CTF) Stage used

CTF Stage 1

Model / Type Ref.

WB 3.3, iPack C3.3

Additional information (if necessary may also be reported on page 2)

☐ Additional information on page 2

This CB Test Certificate is an addition to CB NL-73471 with Test Report Number 4375366.50 dated 2021-05-21 due to updated applicant.

A sample of the product was tested and found to be in conformity with

IEC 62619:2017

As shown in the Test Report Ref. No. which forms part of this Certificate

4377045.50

This CB Test Certificate is issued by the National Certification Body

DEKRA Certification B.V.
Meander 1051, NL-6825 MJ Arnhem, Netherlands





Test Report issued under the responsibility of:



TEST REPORT

IEC 62619

Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications

Report Number..... : 4377045.50

Date of issue..... : 2021-05-19

Total number of pages 46 pages

Name of Testing Laboratory preparing the Report DEKRA Testing and Certification (Shanghai) Ltd., Guangzhou Branch

Applicant's name Shanghai Dowell Technology Co., Ltd.

Address Room 607, Building 1, No. 55, Aona Road, China (Shanghai)
Pilot Free Trade Zone, Shanghai, China

Test specification:

Standard : IEC 62619: 2017

Test procedure : CB Scheme

Non-standard test method : N/A

Test Report Form No. : IEC62619A

Test Report Form(s) Originator : UL(Demko)

Master TRF : Dated 2018-06-07

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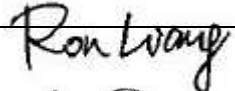
If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

The test results presented in this report relate only to the object tested.





This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description	Lithium Ion Battery	
Trade Mark		
Manufacturer	Shanghai Dowell Technology Co., Ltd. Room 607, Building 1, No. 55, Aona Road, China (Shanghai) Pilot Free Trade Zone, Shanghai China	
Model/Type reference	WB 3.3, iPack C3.3	
Ratings	51,2 Vdc, Total Capacity: 64 Ah Rated Capacity: 58,6 Ah	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch
Testing location/ address		No.3, Qiyun Road, Huangpu District, Guangzhou, Guangdong, China
Tested by (name, function, signature)		Ron Liang 
Approved by (name, function, signature) ..		Alger Yang 
Testing procedure: CTF Stage 1:		
Testing location/ address		
Tested by (name, function, signature)		
Approved by (name, function, signature) ..		
Testing procedure: CTF Stage 2:		
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name, function, signature) . :		
Approved by (name, function, signature) .. :		
Testing procedure: CTF Stage 3:		
Testing procedure: CTF Stage 4:		
Testing location/ address		
Tested by (name, function, signature)		
Witnessed by (name, function, signature) . :		
Approved by (name, function, signature) .. :		
Supervised by (name, function, signature) :		

List of Attachments (including a total number of pages in each attachment): Attachment 1: Photos and illustrations (20 pages)	
Summary of testing:	
Tests performed (name of test and test clause): Battery model Y6102-20EA09-000L with plastic separator was subjected to full tests as far as applicable. Battery model ML33RTA with two channels dry contact exposed was subjected to the tests of clause 7.2.3 and clause 7.3.3. (for report 4357518.50)	Testing location: Shanghai Dowell Technology Co., Ltd. Room 607, Building 1, No. 55, Aona Road, China (Shanghai) Pilot Free Trade Zone, Shanghai China
No additional test was conducted. (for report 4370157.50)	--
Battery model WB 3.3 with two channels dry contact exposed was subjected to the tests of clause 8.2.2 and clause 8.2.3. (for report 4375366.50)	DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch No.3, Qiyun Road, Huangpu District, Guangzhou, Guangdong, China
No additional test was conducted. (for report 4377045.50)	--
Summary of compliance with National Differences (List of countries addressed): N/A	

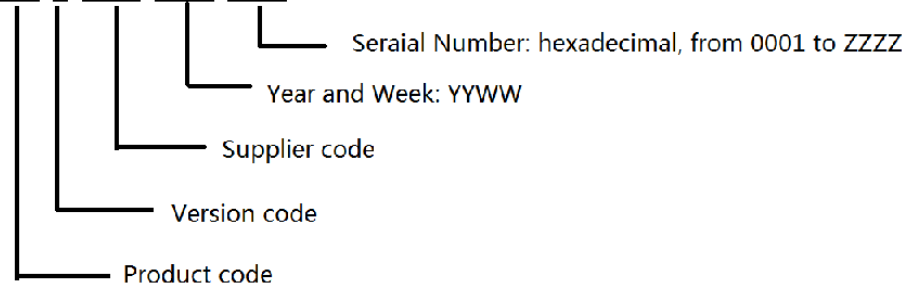
Copy of marking plate:

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.

 Lithium Ion Battery IFpP16/122/360/[16S]M/-10+50/90	
Model	iPack C3.3
Nominal Voltage	51.2V
Total/Rated Capacity	64Ah/58.6Ah
Total/Rated Energy	3.3kWh/3.0kWh
Ingress Protection	IP20
Operating Ambient Temperature	-10°C~50°C
Max Short Current and Duration	1700A, 2ms
Shanghai Dowell Technology Co.,Ltd. Web: http://www.dowellelectronic.com Email: sales@dowellelectronic.com	
   Made in China	

**S/N Coding rule:**

S/N : XXX X XXXX XXXX XXXX





S/N Coding rule:

S/N : XXX X XXXX XXXX XXXX











Seraial Number: hexadecimal, from 0001 to ZZZZ

Year and Week: YYWW

Supplier code

Version code

Product code

 WARNING AVERTISSEMENT		
1. Do not disassemble or alter the battery in any way. Ne démontez ni modifiez la batterie en aucune façon.		
2. Do not use the battery for purposes not described in its documentation. N'utilisez pas la batterie à des fins non décrites dans sa documentation.		
3. Do not drop, strike, puncture, or step on the battery. Ne laissez pas tomber, ne heurtez pas, ne percez pas et ne marchez pas sur la batterie.		
4. In case of electrolyte leakage, keep leaked electrolyte away from contact with eyes or skin, immediately clean with water and seek help from a doctor. En cas de fuite d'électrolyte, évitez tout contact de l'électrolyte qui fuit avec les yeux ou la peau, nettoyez immédiatement avec de l'eau et demandez de l'aide à un médecin.		
5. Do not put the battery into a fire. Do not use it or leave it in a place near fire, heaters, or high temperature sources. Ne mettez pas la batterie au feu. Ne l'utilisez pas et ne la laissez pas à proximité de feux, de radiateurs, ou de sources de températures élevées.		
6. Do not submerge the battery in water, or expose it to moisture. Ne plongez pas la batterie dans l'eau et ne l'exposez pas à l'humidité.		
7. Do not allow the terminals to contact exposed wire or metal. Ne laissez pas les bornes entrer en contact avec du fil ou du métal exposé.		
8. The battery is heavy and can cause injury if not handled safely. La batterie est lourde et peut provoquer des blessures si elle n'est pas manipulée en toute sécurité.		
9. Keep out of reach of children or animals. Tenir hors de portée des enfants ou des animaux.		

Test item particulars: Lithium Ion Battery	
Classification of installation and use: Stationary	
Supply Connection: N/A	
.....:	
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: 2021-04-23	
Date (s) of performance of tests: 2021-04-24 to 2021-05-10	
General remarks:	
<p>"(See Enclosure #)" refers to additional information appended to the report.</p> <p>"(See appended table)" refers to a table appended to the report.</p> <p>This report is not intended to use for CMA application.</p> <p>The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to calculate the uncertainty associated with the measurement result.</p> <p>Throughout this report a <input checked="" type="checkbox"/> comma / <input type="checkbox"/> point is used as the decimal separator.</p> <p>The sample has been tested and found compliant with the requirement of the safety standards listed below:</p> <p>IEC 62619:2017</p> <p>EN 62619:2017</p>	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 62619:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies): Shanghai Dowell Technology Co., Ltd. Room 607, Building 1, No. 55, Aona Road, China (Shanghai) Pilot Free Trade Zone, Shanghai China	

General product information and other remarks:

The battery system tested in this report was a Rechargeable Lithium Ion Battery, including 16 cells connected in series and protection circuit (BMS).

The total capacity: 64 Ah is not used for the tests of the standard, but for the control in manufacture process.

The cell model G0C24A was tested according to IEC 62619:2017 in TÜV SÜD Certification and Testing (China) Co., Ltd., CB report No. 211-281806461-100 issued on 2020-01-07 and CB certificate SG PSB-BT-01261M1 issued on 2020-01-10, issued by TÜV SÜD PSB Pte Ltd.

Model No.	Nominal Voltage, V dc	Rated Capacity, Ah	Maximum Charging Voltage, V dc	Maximum Charging Current, A	Maximum discharge Current, A	Dis-charge Cutoff Voltage, Vdc	Module Config xS/yP
WB 3.3, iPack C3.3	51,2	58,6	57,6	62,4	62,4	48	16S1P

Protection Parameters Provided by BMS		
Model	Overvoltage Protection	Under-voltage Protection, Vdc
WB 3.3, iPack C3.3	3,68 – 3,70 V/cell	2,95 – 3,00 V/cell
	Over temperature Protection for Charging	Over temperature Protection for Discharging
	55 – 56 °C	55 – 56 °C
	Overcurrent Protection for Charging	Overcurrent Protection for Discharging
	71,76 – 73,632 A	71,76 – 73,632 A

Model WB 3.3 and iPack C3.3 are identical each other except for the model name, and dry contact has two features. Attached photos for details.

Model No.	Enclosure	Separator between BMS and core pack	Dry contact
WB 3.3, iPack C3.3	Aluminium alloy enclosure	/	Two channels dry contact exposed, one or two is interconnected to RJ45 socket
			Two channels dry contact not exposed, and both are interconnected to RJ45 socket

Amendment report 4370157.50:

The report 4370157.50 was based on the CB report 4357518.50, issued by DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch, issued on 2020-03-30, and CB certificate No.: NL-64685 issued by DEKRA Certification B.V., issued on 2020-03-31. It was issued due to below modifications:

1. Alternative IC (U8) model SPC5743PFK1AMLQ9.
2. Alternative IC (U4) model SN6505BDBVR.
3. Updated BMS view, refer to photos for detail.
4. Updated address of applicant, Manufacturer and factory.
5. Updated warning label.
6. Updated functional safety report according to ISO 13849-1 in DEKRA report 4370962.50.

Based on the functional safety report 4370962.50, the BMS under test is RD5PPESS1901-1 V2.01, and a discrete components circuit for auxiliary power IC(U4) is added as alternative solution. After technical review, based on the modification risk analysis and verification report, the modification is compliant with the PLr.

After technical review, no tests were considered in this report; see the “summary of tests”.

Amendment report 4375366.50:

The report 4375366.50 was based on the CB report 4370157.50, issued by DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch, issued on 2021-04-09, and CB certificate No.: NL-72557 issued by DEKRA Certification B.V., issued on 2021-04-09. It was issued due to below modifications:

1. Changed model name to WB 3.3, iPack C3.3, and model WB 3.3, iPack C3.3 are identical to model in report 4370157.50 except model name and charge and discharge current.
2. Updated maximum charging current from 32 A to 62,4 A, and updated Overcurrent Protection for Charging from 38,4 – 41,6 A to 71,76 – 73,632 A.
3. Updated maximum discharging current from 42,5 A to 62,4 A, and updated Overcurrent Protection for Charging from 51,0 – 55,25 A to 71,76 – 73,632 A.
4. Updated functional safety report according to ISO 13849-1 in DEKRA report 4375368.50.

After technical review, the partial tests were considered; see the “summary of testing”.

Amendment report 4377045.50:

The report 4377045.50 was based on the CB report 4375366.50, issued by DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch, issued on 2021-05-19, and CB certificate No.: NL-73471 issued by DEKRA Certification B.V., issued on 2021-05-21.

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
4	PARAMETER MEASUREMENT TOLERANCES		
	Parameter measurement tolerances		P
5	GENERAL SAFETY CONSIDERATIONS		
5.1	General		P
	Cells and batteries are safe under conditions of both intended use and reasonably foreseeable misuse...	See also table 5.1 for Critical components information	P
5.2	Insulation and wiring		P
	Voltage, current, altitude, and humidity requirements		P
	Adequate clearances and creepage distances between connectors		P
	The mechanical integrity of internal connections		P
5.3	Venting		P
	Pressure relief function		P
	Encapsulation used to support cells within an outer casing		P
5.4	Temperature/voltage/current management		P
	The design prevents abnormal temperature-rise		P
	Voltage, current, and temperature limits of the cells		P
	Specifications and charging instructions for equipment manufacturers		P
5.5	Terminal contacts of the battery pack and/or battery system		P
	Polarity marking(s)		P
	Capability to carry the maximum anticipated current		P
	External terminal contact surfaces		P
	Terminal contacts are arranged to minimize the risk of short circuits		P
5.6	Assembly of cells, modules, or battery packs into battery systems		P
5.6.1	General		P
	Independent control and protection method(s)		P
	Recommendations of cell operating limits by the cell manufacturer		P
	Batteries designed for the selective discharge of a portion of their series connected cells		N/A
	Protective circuit component(s) and consideration to the end-device application		P
5.6.2	Battery system design		P

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	The voltage control function		P
	The voltage control for series-connected batteries		P
5.7	Operating region of lithium cells and battery systems for safe use		P
	The cell operating region..... :	Max. charging current: 64 A -10 to 55 °C for charge and discharge	P
	Designation of battery system to comply with the cell operating region		P
5.8	Quality plan		P
	Manufacturing quality plan (for example: ISO9001, etc.) prepared and implemented..... :	ISO 9001: 2015 certificate (No. CN19/32000) issued by SGS, valid until 2022-12-08.	P
	The process capabilities and the process controls		P
6	TYPE TEST CONDITIONS		
6.1	General		P
6.2	Test items		P
	Cells or batteries that are not more than six months old (See Table 1 of IEC62619)		P
	Capacity confirmation of the cells or batteries		P
	Default ambient temperature of test, 25 °C ± 5 °C		P
7	SPECIFIC REQUIREMENTS AND TESTS		
7.1	Charging procedure for test purposes		P
	The battery discharged to a specified final voltage prior to charging		P
	The cells or batteries charged using the method specified by the manufacturer..... :	Battery system: 0,2C CC (constant current) charge to 57,6 V, then CV (constant voltage 57,6 V) charge till charge current decline to 1 A.	P
7.2	Reasonably foreseeable misuse		P
7.2.1	External short-circuit test (cell or cell block)		P
	Short circuit with total resistance of 30 mΩ ± 10 mΩ at 25 °C ± 5 °C		P
	Results: no fire, no explosion	Refer to cell CB report No. 211-281806461-100	P
7.2.2	Impact test (cell or cell block)		P
	Cylindrical cell, longitudinal axis impact		N/A

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	Prismatic cell, longitudinal axis and lateral axis impact		P
	Results: no fire, no explosion.	Refer to cell CB report No. 211-281806461-100	P
7.2.3	Drop test (cell or cell block, and battery system)		P
7.2.3.1	General		P
7.2.3.2	Whole drop test (cell or cell block, and battery system)		P
	Description of the Test Unit..... :	Cell: Refer to cell CB report No. 211-281806461-100	—
	Mass of the test unit (kg)..... :	Refer to cell CB report No. 211-281806461-100	—
	Height of drop (m)..... :	Refer to cell CB report No. 211-281806461-100	—
	Results: no fire, no explosion	Refer to cell CB report No. 211-281806461-100	P
7.2.3.3	Edge and corner drop test (cell or cell block, and battery system)		P
	Description of the Test Unit..... :	Battery system Model Y6102-20EA09-000L with plastic separator and Model ML33RTA	—
	Mass of the test unit (kg)..... :	Approx. 31,42 kg for battery system of model Y6102-20EA09-000L with plastic separator Approx. 29,8 kg for battery system of model ML33RTA	—
	Height of drop (m)..... :	10,0 cm	—
	Results: no fire, no explosion		P
7.2.4	Thermal abuse test (cell or cell block)		P
	Results: no fire, no explosion	Refer to cell CB report No. 211-281806461-100	P
7.2.5	Overcharge test (cell or cell block)	This test was waived as battery system was provided with two independent protections.	N/A
	For those battery systems that are provided with only a single protection for the charging voltage control		—
	Results: no fire, no explosion..... :		N/A

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
7.2.6	Forced discharge test (cell or cell block)	Battery system was provided with two independent protections.	P
	Upper limit charge voltage of the cell..... :	3,6 V	P
	Cells connected in series in the battery system :	Battery system was provided with two independent protections.	N/A
	Redundant or single protection for discharge voltage control provided in battery system :	Battery system was provided with two independent protections.	P
	Target Voltage :	-3,6 V	P
	Maximum discharge current of the cell, I_m :	64 A	P
	Discharge current for forced discharge, 1.0 I_t :	62,4 A	P
	Discharging time, $t = (1 I_t / I_m) \times 90$ (min.) :	The maximum discharging current of the cell is not less than 1,0 I_t A.	N/A
	Results: no fire, no explosion :	Refer to cell CB report No. 211-281806461-100	P
7.3	Considerations for internal short-circuit – Design evaluation		P
7.3.1	General		P
7.3.2	Internal short-circuit test (cell)		P
	Samples preparation procedure: a), in accordance with 8.3.9 of IEC62133:2012; or b), the nickel particle inserted before charging, or c), the nickel particle was inserted before electrolyte filling :	Refer to cell CB report No. 211-281806461-100	P
	Tested according to Cl. 8.3.9 of IEC 62133:2012 test method, except all tests were carried out in an ambient temperature of $25\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.		P
	The appearance of the short-circuit location recorded by photograph or other means :	Refer to cell CB report No. 211-281806461-100	—
	The pressing was stopped - When a voltage drop of 50 mV was detected; or		N/A
	- The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) was reached	400 N	P
	Results: no fire, no explosion :	Refer to cell CB report No. 211-281806461-100	P
7.3.3	Propagation test (battery system)	Battery system Model Y6102-20EA09-000L with plastic separator and Model ML33RTA	P

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	Method to create a thermal runaway in one cell ... :	Heating plate on cell surface	P
	Results: No external fire from the battery system or no battery case rupture	See results in Table 7.3.3	P
8	BATTERY SYSTEM SAFETY (CONSIDERING FUNCTIONAL SAFETY)		
8.1	General requirements		P
	Functional safety analysis for critical controls	The functional safety of battery system was evaluated according to ISO 13849-1 in DEKRA report 4375368.50.	P
	Conduct of a process hazard, risk assessment and mitigation of the battery system		P
8.2	Battery management system (or battery management unit)		P
8.2.1	Requirements for the BMS		P
	The safety integrity level (SIL) target of the BMS		P
	The charge control evaluated by tests in clauses 8.2.2 to 8.2.4		P
8.2.2	Overcharge control of voltage (battery system)		P
	The exceeded charging voltage applied to the whole battery system		P
	The exceeded charging voltage applied to only a part of the battery system, such as the cell(s)		N/A
	Results: no fire, no explosion	See Table 8.2.2.	P
	The BMS interrupted the overcharging before reaching 110% of the upper limit charging voltage		P
8.2.3	Overcharge control of current (battery system)		P
	Results: no fire, no explosion	See Table 8.2.3	P
	The BMS detected the overcharging current and controlled the charging to a level below the maximum charging current		P
8.2.4	Overheating control (battery system)		P
	The cooling system, if provided, was disconnected		P
	Elevated temperature for charging, 5 °C above maximum operating temperature	60 °C	P
	Results: no fire, no explosion	See Table 9.2.5	P
	The BMS detected the overheat temperature and terminated charging		P
	The battery system operated as designed during test		P

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

9	INFORMATION FOR SAFETY		
	The cell manufacturer provides information about current, voltage and temperature limits of their products		P
	The battery system manufacturer provides information regarding how to mitigate hazards to equipment manufacturers or end-users.		P

10	MARKING AND DESIGNATION (REFER TO CLAUSE 5 OF IEC 62620)		
	The marking items shown in Table 1 in IEC 62620 indicated on the cell, battery system or instruction manual.		P
	Cell or battery system has clear and durable markings		P
	Cell designation		P
	Battery designation		P
	Battery structure formulation		P

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX A	OPERATING REGION OF CELLS FOR SAFE USE		
A.1	General		P
A.2	Charging conditions for safe use		P
A.3	Consideration on charging voltage		P
A.4	Consideration on temperature		P
A.5	High temperature range		P
A.6	Low temperature range		P
A.7	Discharging conditions for safe use		P
A.8	Example of operating region		P

ANNEX B	PROCEDURE OF 7.3.3 PROPAGATION TEST		
B.1	General		P
B.2	Test conditions:		P
	– The battery fully charged according to the manufacturer recommended conditions	Battery system: 0,2C CC (constant current) charge to 57,6 V, then CV (constant voltage 57,6 V) charge till charge current decline to 1 A.	—
	– Target cell forced into thermal runaway	Target cell is the eighth cell from top to bottom	—
	– A specially prepared sample (e.g. a heater or a hole for nail penetration provided) used for ease of testing.....	Heating plate on cell surface	—
B.3	Method used for initiating the thermal runaway. 1) Heater (Heater, Burner, Laser, Inductive heating 2) Overcharge 3) Nail penetration of the cell 4) Combination of above methods 5) Other methods.....	Heating plate on cell surface	—

ANNEX C	PACKAGING		
	The materials and pack design chosen in such a way as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants		P

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

5.1	TABLE: Critical components information					P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity ¹⁾	
Cell	Ningde Amperex Technology Limited	G0C24A	3,2 Vdc, 62,4 Ah	IEC 62619: 2017	CB Cert: SG PSB-BT- 01261M1 CB Report: 211- 281806461- 100	
Front panel (plastic)	KINGFA SCI & TECH (USA), INC	JH860 (ddd) (f1)	PC, V-0, 120 °C	UL 94, UL 746C	UL E484599	
Terminal panel (plastic)	LG CHEM LTD	LUPOY GN- 5001RF(T)	PC+ABS, 5VA, 80 °C	UL 94, UL 746C	UL E67171	
Copper bar holder (plastic)	LG CHEM LTD	LUPOY GN- 5001RF(T)	PC+ABS, 5VA, 80 °C	UL 94, UL 746C	UL E67171	
Cells holder (plastic)	LG CHEM LTD	LUPOY GN- 5001RF(T)	PC+ABS, 5VA, 80 °C	UL 94, UL 746C	UL E67171	
Internal foam material	Interchangeable	Interchangea ble	Min. HF-1 or V-1, min. 65 °C	UL 94, UL 746C	UL	
Network cable port (J10, J11, J12)	DONGGUAN NANJU POLYMER MATERIAL CO LTD	NJ-352H-60	V-0, 150 °C	UL 94, UL 746C	UL E346848	
Network cable port (J10, J11, J12), alternative	Interchangeable	Interchangea ble	Min. V-1, min. 80 °C	UL 94, UL 746C	UL	
Internal wire (B+, B-)	Interchangeable	Interchangea ble	Min. 6 mm ² , min. 125 °C, min. 1500 V, VW-1	UL 758	UL	
Internal wire (other than B+, B-)	Interchangeable	Interchangea ble	Min. 22 AWG, min. 105 °C, min. 300 V, VW-1	UL 758	UL	
Main fuse	ASTM	A182501- 100F	150 Vdc, 100 A, -50 to +100 °C	UL 248-1	UL E470032	
Main fuse, alternative	VICFUSE	VBS1727	150 Vdc, 100 A, -50 to +100 °C	UL 248-1	UL E356490	
Fuse (F1)	Littelfuse	453	125 Vdc, 3 A, -55 to +125 °C	UL 248-1	UL E10480	

IEC 62619					
Clause	Requirement + Test			Result - Remark	Verdict
PCB	SHEN ZHEN SUN & LYNN CIRCUITS CO LTD	SL-M	V-0, 130 °C	UL 796	UL E234156
PCB, alternative	VICTORY GIANT TECHNOLOGY (HUIZHOU) CO LTD	SH	V-0, 130 °C	UL 796	UL E248779
PCB, alternative	Interchangeable	Interchangeable	V-0, 130 °C	UL 796	UL
Sampling resistor (R383, R382)	--	--	0,5 mΩ, 9 W	--	--
IC (U7)	TI	BQ76PL455A PFCT	60 V, 20 mA	IEC 62619: 2017	Tested in appliance
IC (U8)	NXP	SPC5744PFK 1AMLQ9	3,3 V + 1,25 V, 600 mA	IEC 62619: 2017	Tested in appliance
IC (U8), alternative	NXP	SPC5743PFK 1AMLQ9	3,3 V + 1,25 V, 600 mA	IEC 62619: 2017	Tested in appliance
Inductor (L2)	WURTH	744822120	2 x 20 mH, 0,5 A, -40 to +125 °C	IEC 62619: 2017	Tested in appliance
Inductor (L6)	TDK	SLF12565T- 220M3R5-PF	22 μH, 3,8 A, -40 to +105 °C	IEC 62619: 2017	Tested in appliance
Inductor (L6), alternative	WURTH	744771122	22 μH, 3,8 A, -40 to +105 °C	IEC 62619: 2017	Tested in appliance
Capacitor (C10)	--	--	35 V, 270 μF	--	--
Capacitor (C22)	--	--	160 V, 33 μF	--	--
MOSFET (Q39)	Infineon	IRF5210SPb F	VDS: -100 V ID: -38 A TJ: -55 to +150 °C	IEC 62619: 2017	Tested in appliance
MOSFET (Q34, Q36, Q38)	Infineon	IPT015N10N 5	VDS: 100 V ID: 300 A TJ: -55 to +175 °C	IEC 62619: 2017	Tested in appliance
MOSFET (Q40, Q42, Q44)	Infineon	IPT015N10N 5	VDS: 100 V ID: 300 A TJ: -55 to +175 °C	IEC 62619: 2017	Tested in appliance
NTC (RT1-RT8)	TDK	NTCG163JF1 03FT1	R25: 10 kΩ, -40 to +125 °C	UL 1434	UL E250289
Optocoupler (U24)	TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION	TLP241AF(T P4,F241A(r)*	40 V, 2,0 A, -40 to +85 °C, 5000 Vac	UL 1577	UL E67349

IEC 62619					
Clause	Requirement + Test		Result - Remark		Verdict
Isolation IC (U12, U13, U25, U26, U27, U28)	TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION	TLP385(GR-TPL,EP385(j))	80 V, 50 mA, -55 to +110 °C, 5000 Vac	UL 1577	UL E67349
IC (U4)	ZLG	ZY1215FKS-1W	Input: 12 V, Output: 15 V, Power: 1 W, -40 to +85 °C, 3000 Vdc	IEC 62619: 2017	Tested in appliance
IC (U4), alternative	TI	SN6505BDB VR	--	IEC 62619: 2017	Tested in appliance
IC (U20)	TI	ISO5451DW R	Input: 3,3 V, Output: 15 V, -40 to +150 °C, 5700 Vac	UL 1577	UL E181974
IC (U22, U23)	TI	ISO1050DUB R	Input: 3,3 V, Output: 5 V, -55 to +150 °C, 2500 Vac	UL 1577	UL E181974
IC (UF1)	ZLG	ZY1205IFS-1W	Input: 12 V, Output: 5 V, Power: 1 W, -40 to +85 °C, 3000 Vdc	IEC 62619: 2017	Tested in appliance
IC (U1)	Microchip	MIC28514T-E/PHA	Input: 75 V, Output: 5 A, -40 to 125 °C	IEC 62619: 2017	Tested in appliance
Capacitor (C1)	--	--	275 V, 0,22 µF	--	--
IC (U21)	TI	ISO3082DW R	Input: 3,3 V, Output: 5 V, -40 to +150 °C, 2500 Vac	UL 1577	UL E181974
Optocoupler (U11, U30, U31)	COSMO	KAQY216A+	600 V, 0,12 A, -40 to +85 °C, 5000 Vac	UL 1577	UL E169586
Optocoupler (U11, U30, U31), alternative	TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION	TLP240J*	600 V, 0,09 A, -40 to +85 °C, 5000 Vac	UL 1577	UL E67349
Supplementary information: ¹⁾ Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

7.2.1	TABLE: External short-circuit test (cell or cell block)					P
Sample No.	Ambient (at 25°C ± 5°C)	OCV at start of test (V dc)	Resistance of Circuit (mΩ)	Maximum Case Temperature Rise ΔT (°C)	Results	
Supplementary information: A - No fire or Explosion B - Fire C - Explosion D - The test was completed after 6 h E - The test was completed after the cell casing cooled to 20% of the maximum temperature rise F - Other (Please explain): ____ Remark: Refer to cell CB report No. 211-281806461-100.						

7.2.5	TABLE: Overcharge test (cell or cell block)					N/A
Sample No.	OCV at start of test (V dc)	OCV at end of test (V dc)	Measured Maximum Charging Current (A)	Measured Maximum Charging Voltage (V dc)	Max. Cell Case Temperature, (°C)	Results
Supplementary information: Results: A - No fire or Explosion B - Fire C - Explosion D - Test concluded when temperature reached a steady state condition E - Test concluded when temperature returned to ambient F - Other (Please explain): ____						

7.2.6	TABLE: Forced discharge test (cell or cell block)					P
Sample No.	OCV before applying reverse charge, (V dc)	Target Voltage (V dc)	Measured Reverse Charge Current It, (A)	Total Time for Reversed Charge Application (min)	Results	
Supplementary information: Results: A - No fire or Explosion B - Fire C - Explosion D - Other (Please explain): ____ Remark: Refer to cell CB report No. 211-281806461-100.						

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.2	TABLE: Internal short-circuit test (cell)				P
Sample No.	OCV at start of test, (V dc)	Particle location ¹⁾	Maximum applied pressure, (N)	Results	
Supplementary information: ¹⁾ Identify one of the following: 1: Nickel particle inserted between positive and negative (active material) coated area. 2: Nickel particle inserted between positive aluminium foil and negative active material coated area. Results: A - No fire or explosion B – Fire C - Explosion D – Test concluded when 50 mV voltage drop occurred prior to reaching force limit E – Test concluded when 800/400 N pressure was reached and 50 mV voltage drop was not achieved F – Test was concluded when fire or explosion occurred G - Other (Please explain): ____ Remark: Refer to cell CB report No. 211-281806461-100.					

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.3		TABLE: Propagation test (battery system)				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	
4357518/B03 (Black metal enclosure)	53,50	3,34	423,1	94,8	A	
Method of cell failure ¹⁾		Location of target cell		Area for fire protection (m ²)		
Heating plate on cell surface		The eighth cell from top to bottom		N/A		
Supplementary information:						
1) Cell can be failed through 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): __						

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.3	TABLE: Propagation test (battery system)					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	
4357518/B05 (Silver aluminum alloy enclosure)	53,61	3,35	441,6	376,5	A	
Method of cell failure ¹⁾		Location of target cell		Area for fire protection (m ²)		
Heating plate on cell surface		The eighth cell from top to bottom		N/A		
Supplementary information:						
1) Cell can be failed through 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): ____						

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

8.2.2	TABLE: Overcharge control of voltage (battery system)				P
Sample No.	OCV at start of test for Cell/Cell Blocks, (V dc)	Maximum Charging Current, (A)	Max. Charging Voltage, (V dc)	Max. Voltage of Cell/Cell Blocks, (V dc)	Results
4357518/B02	51,12	32	63,36	3,70	A, D, F
			Charge Voltage Applied Battery System: 1)		
			Whole	Part	
			63,36	--	
Supplementary information: 1. The exceeded voltage can be applied to only a part of the system such as the cell(s) in the battery system per Figure 6 of IEC 62619, if it is difficult to do it in using the whole battery system. Results: A - No Fire or Explosion B - Fire C - Explosion D - The voltage of the measured cells or cell blocks did not exceed the upper limit charging voltage E - The voltage of the measured cells or cell blocks did exceed the upper limit charging voltage F - All function of battery system did operate as intended during the test. G - All function of battery system did not operate as intended during the test. H - Other (Please explain): ____					

8.2.2	TABLE: Overcharge control of voltage (battery system)				P
Sample No.	OCV at start of test for Cell/Cell Blocks, (V dc)	Maximum Charging Current, (A)	Max. Charging Voltage, (V dc)	Max. Voltage of Cell/Cell Blocks, (V dc)	Results
4375366/B01	51,14	62,4	63,36	3,70	A, D, F
			Charge Voltage Applied Battery System: 1)		
			Whole	Part	
			63,36	--	
Supplementary information: 1. The exceeded voltage can be applied to only a part of the system such as the cell(s) in the battery system per Figure 6 of IEC 62619, if it is difficult to do it in using the whole battery system. Results: A - No Fire or Explosion B - Fire C - Explosion D - The voltage of the measured cells or cell blocks did not exceed the upper limit charging voltage E - The voltage of the measured cells or cell blocks did exceed the upper limit charging voltage F - All function of battery system did operate as intended during the test. G - All function of battery system did not operate as intended during the test. H - Other (Please explain): ____					

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

8.2.3	TABLE: Overcharge control of current (battery system)			P
Sample No.	OCV at start of test, (V dc)	Max. Charging Current, (A)	Max. Charging Voltage, (V dc)	Results
4357518/B02	51,49	38,4	57,6	A, D, F
Supplementary information: Results: A – No fire or Explosion B – Fire C – Explosion D - Overcurrent sensing function of BMU did operate and then charging stopped E - Overcurrent sensing function of BMU did not operate and then charging stopped F - All function of battery system did operate as intended during the test. G - All function of battery system did not operate as intended during the test. H - Other (Please explain): ____				

8.2.3	TABLE: Overcharge control of current (battery system)			P
Sample No.	OCV at start of test, (V dc)	Max. Charging Current, (A)	Max. Charging Voltage, (V dc)	Results
4375366/B02	51,31	74,88	57,6	A, D, F
Supplementary information: Results: A – No fire or Explosion B – Fire C – Explosion D - Overcurrent sensing function of BMU did operate and then charging stopped E - Overcurrent sensing function of BMU did not operate and then charging stopped F - All function of battery system did operate as intended during the test. G - All function of battery system did not operate as intended during the test. H - Other (Please explain): ____				

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

8.2.4	TABLE: Overheating control (battery system)			P
Sample No.	OCV at start(SOC 50%) of test, V dc	Maximum Charging Current, A	Maximum Charging Voltage, V dc	
4357518/B04	52,80	5	57,6	
Maximum Specified Temperature of Battery System, °C		Maximum Measured Cell Case Temperature, °C	Results	
55,0		55,7	A, D ,F	
Supplementary information:				
Results:				
A – No fire or Explosion				
B – Fire				
C – Explosion				
D - Temperature sensing function of BMU did operate and then charging stopped				
E - Temperature sensing function of BMU did not operate and then charging stopped				
F - All function of battery system did operate as intended during the test.				
G - All function of battery system did not operate as intended during the test.				
H - Other (Please explain): _____				

Attachment 1 : Photos and illustrations

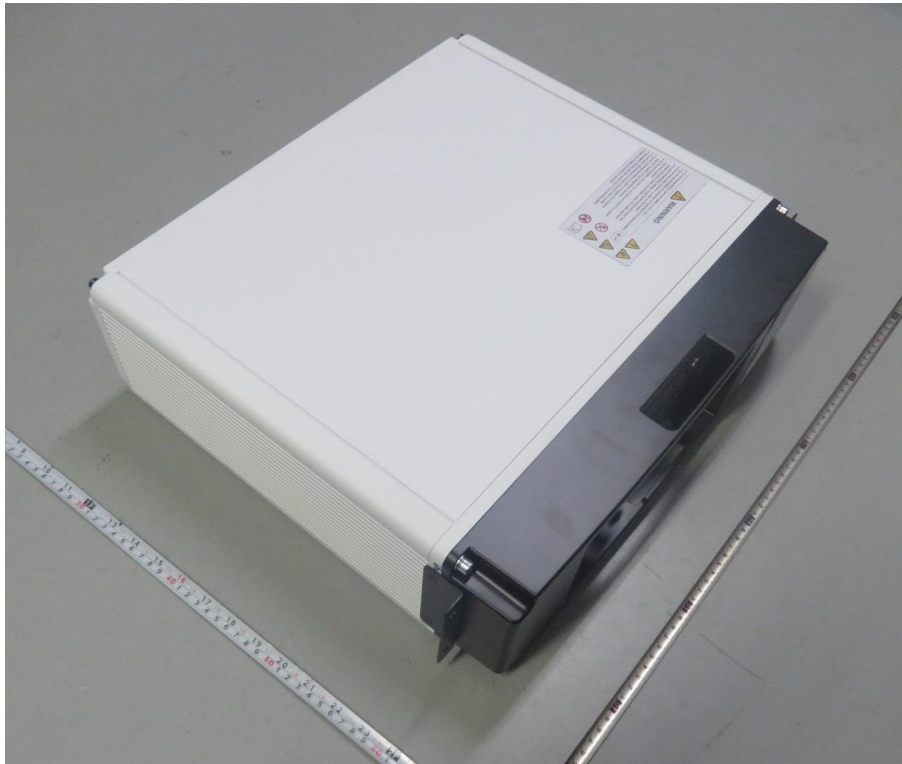


Overview (two channels dry contact exposed)

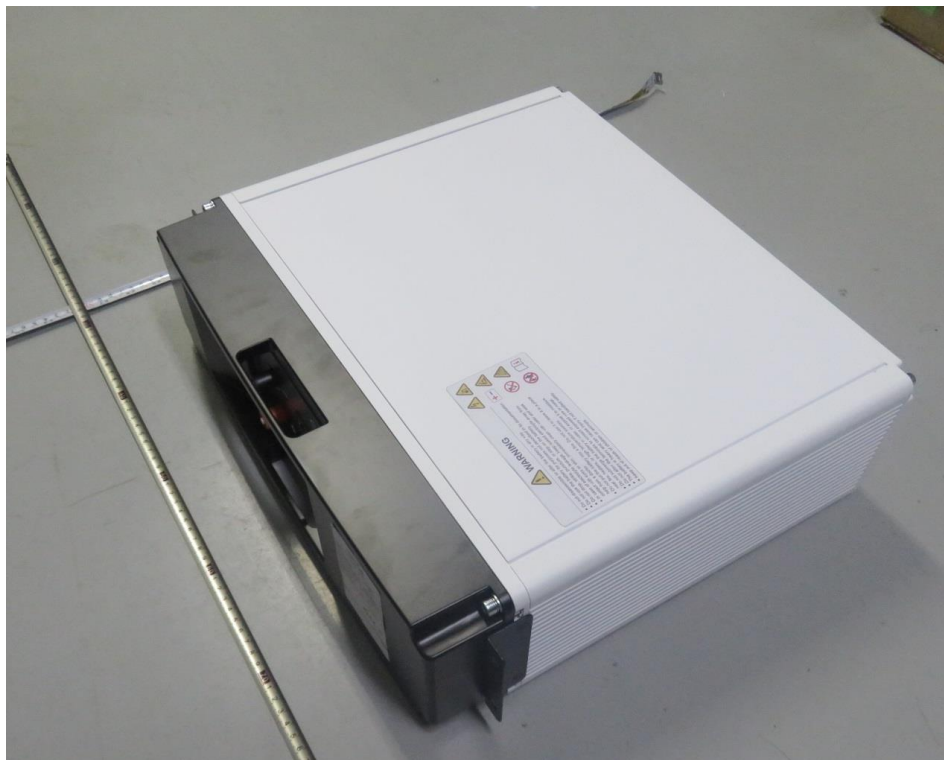


Overview (two channels dry contact exposed)

Attachment 1 : Photos and illustrations

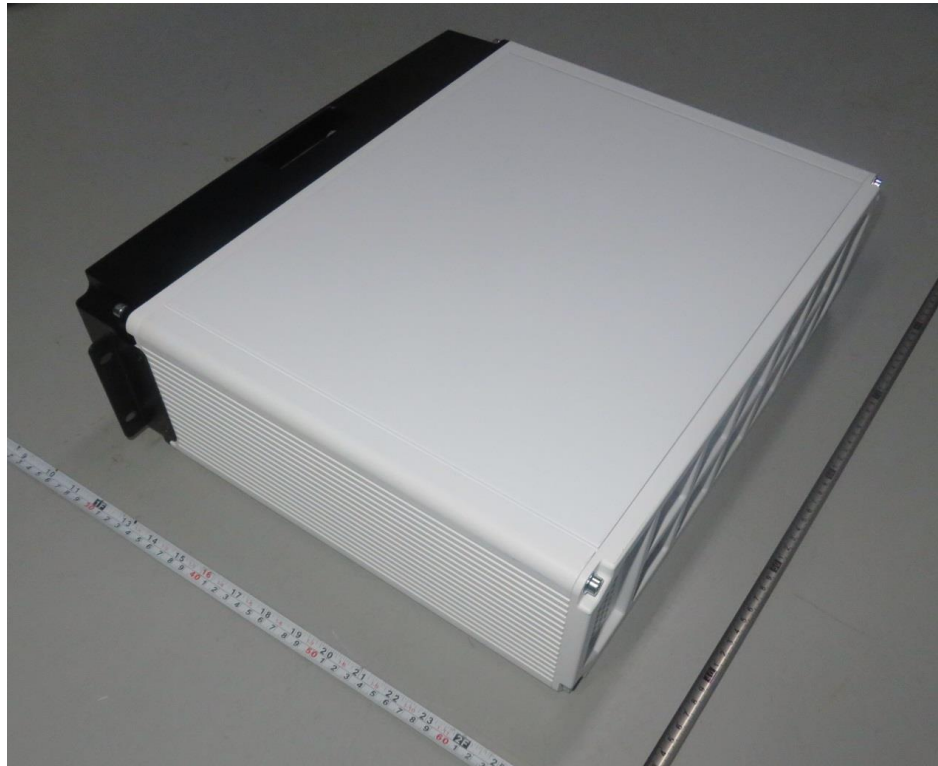


Overview (two channels dry contact exposed)

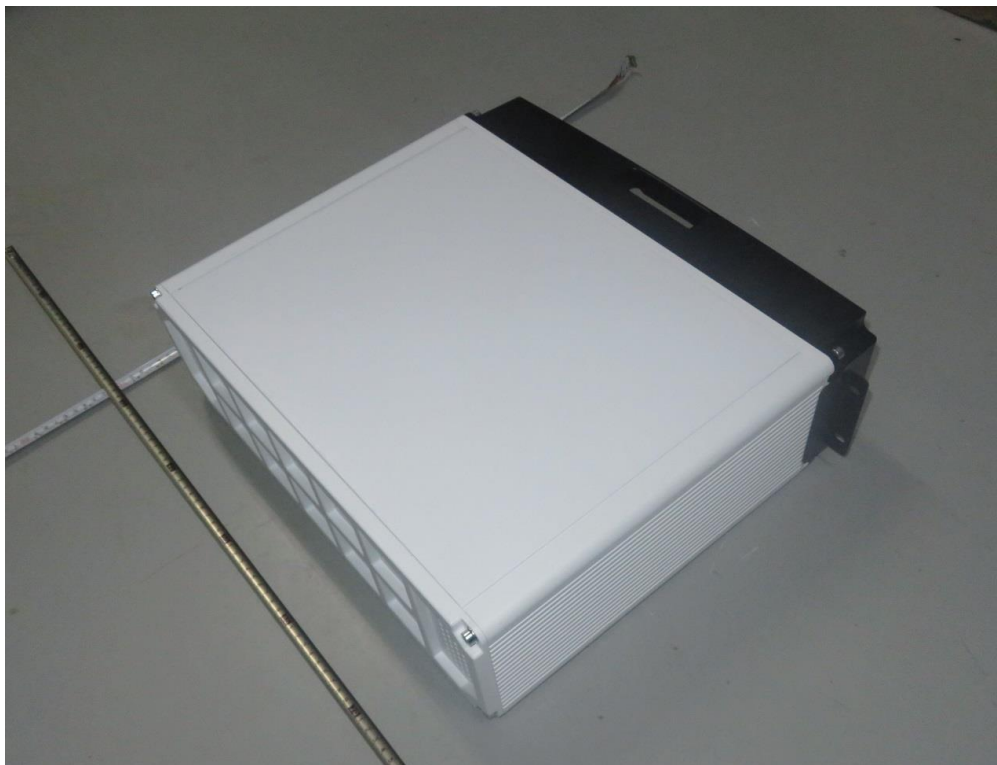


Overview (two channels dry contact exposed)

Attachment 1 : Photos and illustrations

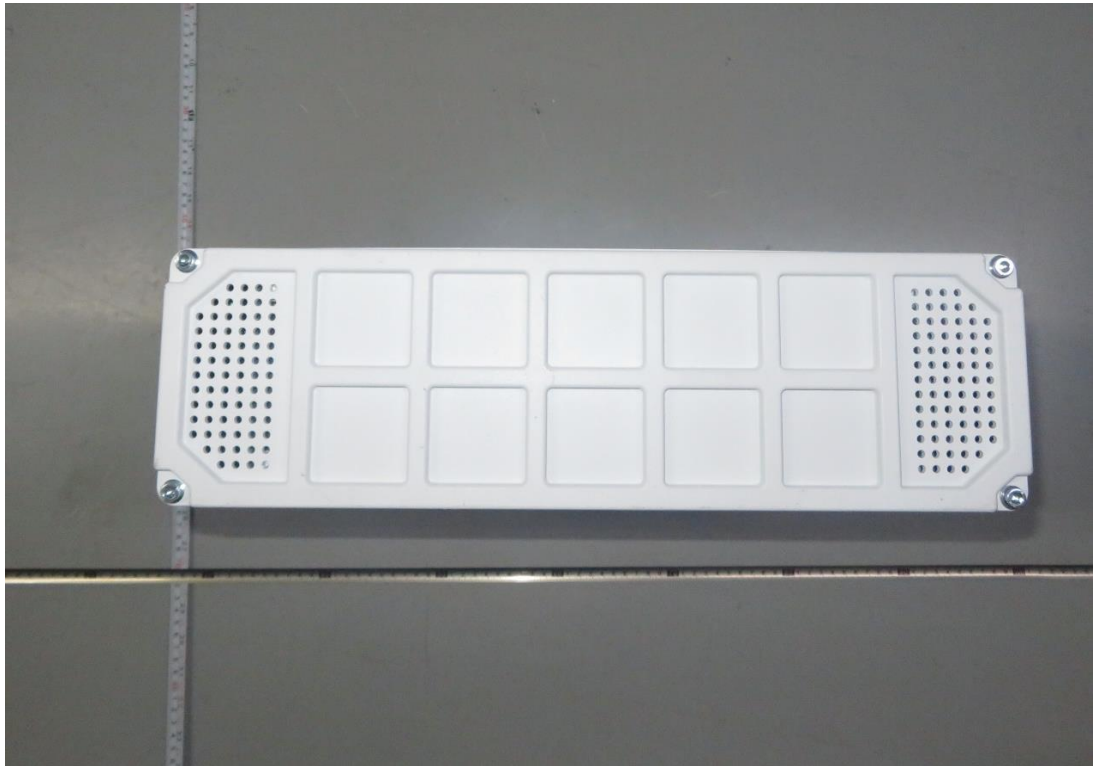


Overview (two channels dry contact exposed)



Overview (two channels dry contact exposed)

Attachment 1 : Photos and illustrations



Overview (two channels dry contact exposed)

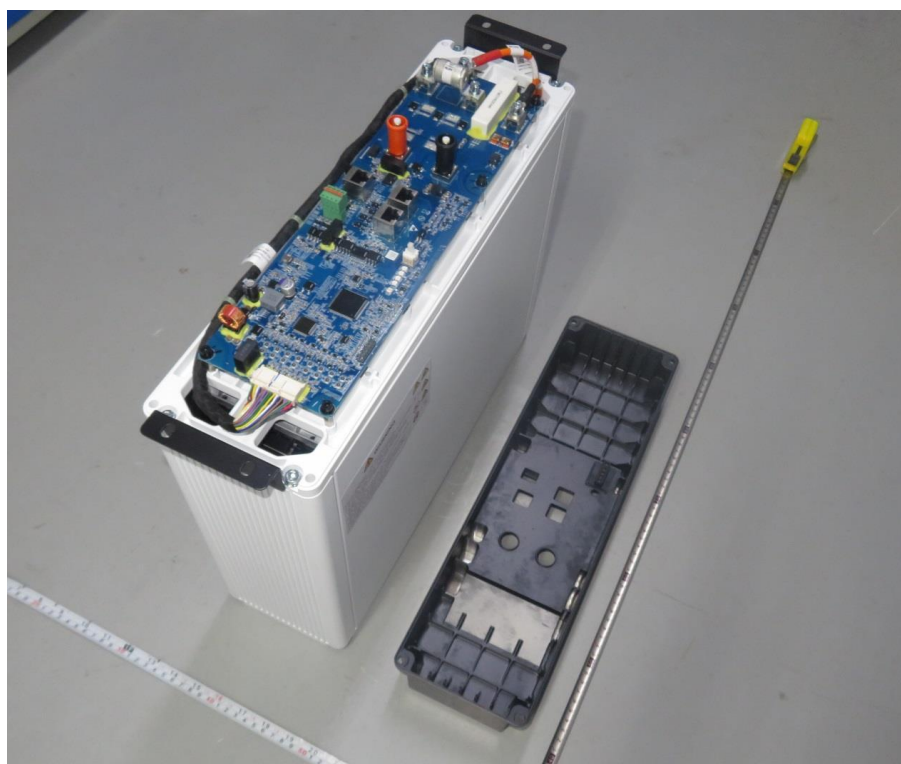


Overview (two channels dry contact exposed)

Attachment 1 : Photos and illustrations

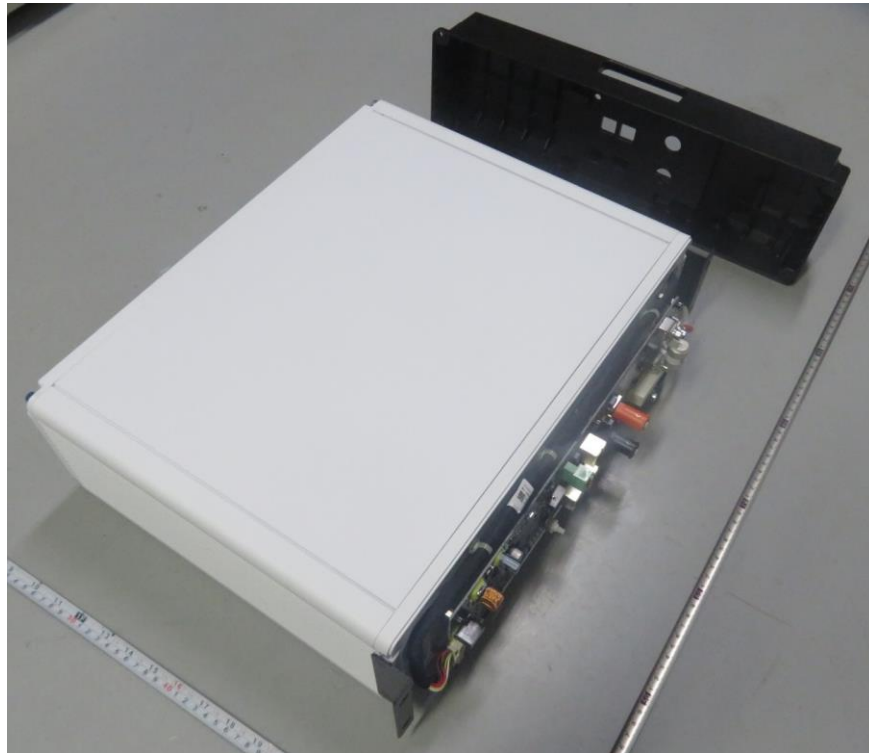


Internal view (two channels dry contact exposed)

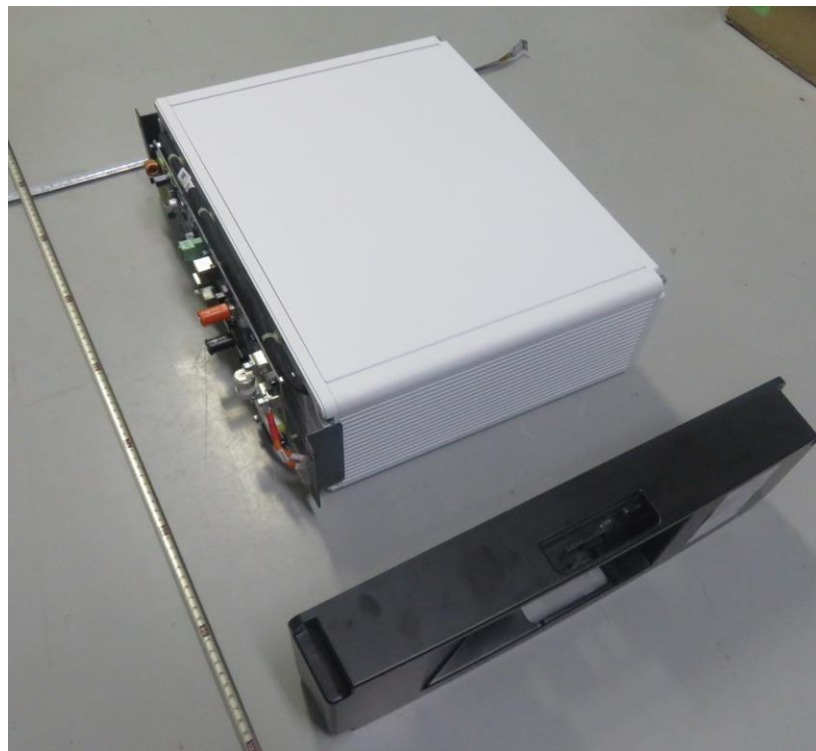


Internal view (two channels dry contact exposed)

Attachment 1 : Photos and illustrations



Internal view (two channels dry contact exposed)

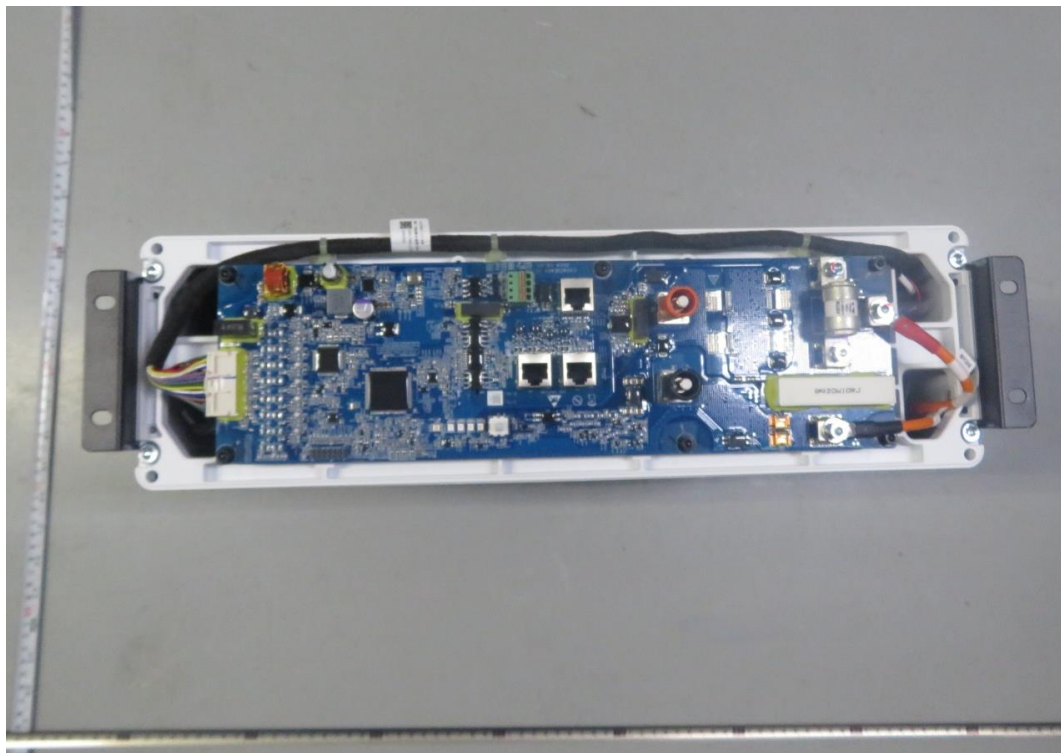


Internal view (two channels dry contact exposed)

Attachment 1 : Photos and illustrations



Internal view (two channels dry contact exposed)

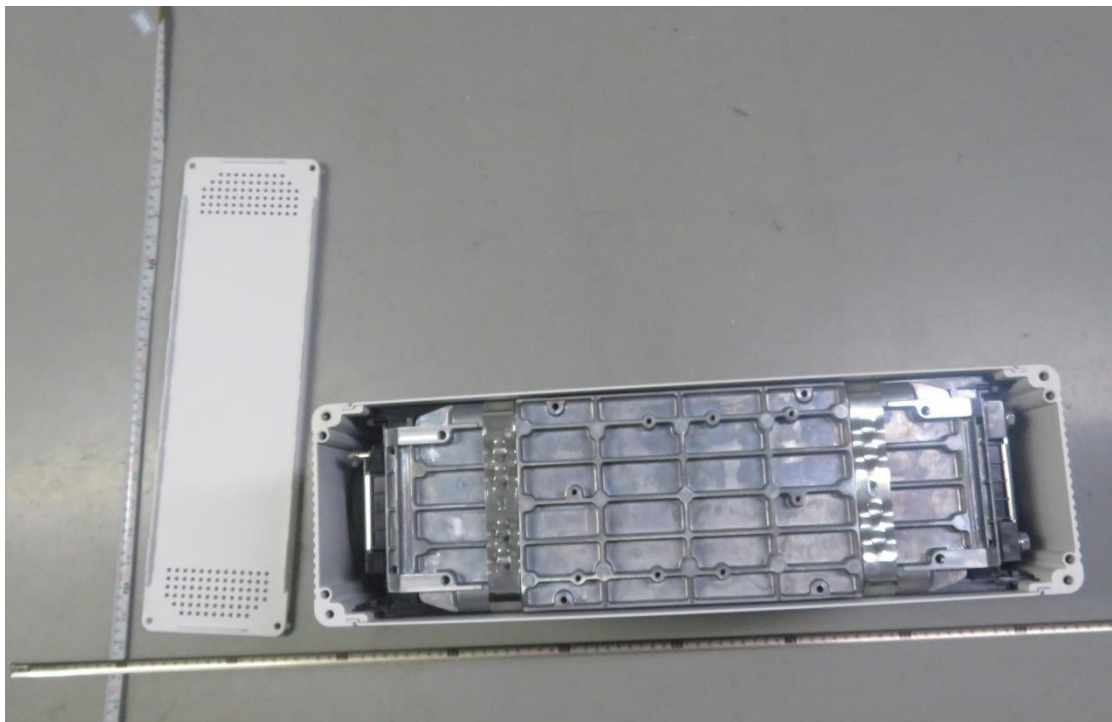


Internal view (two channels dry contact exposed)

Attachment 1 : Photos and illustrations

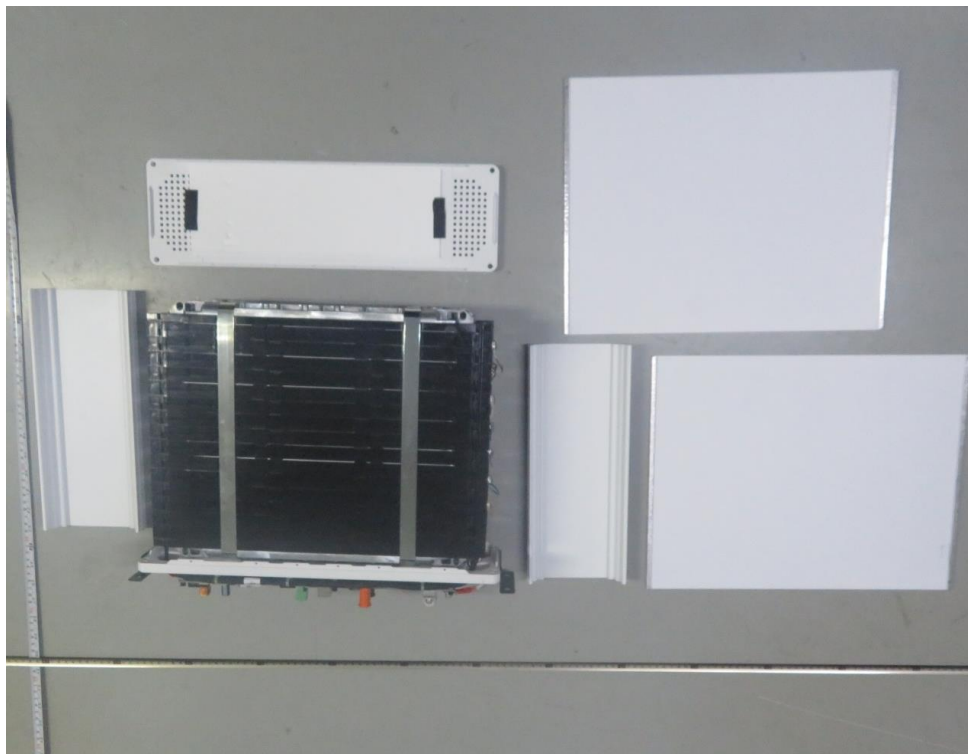


Internal view (two channels dry contact exposed)



Internal view (two channels dry contact exposed)

Attachment 1 : Photos and illustrations



Internal view (two channels dry contact exposed)



Internal view (two channels dry contact exposed)

Attachment 1 : Photos and illustrations

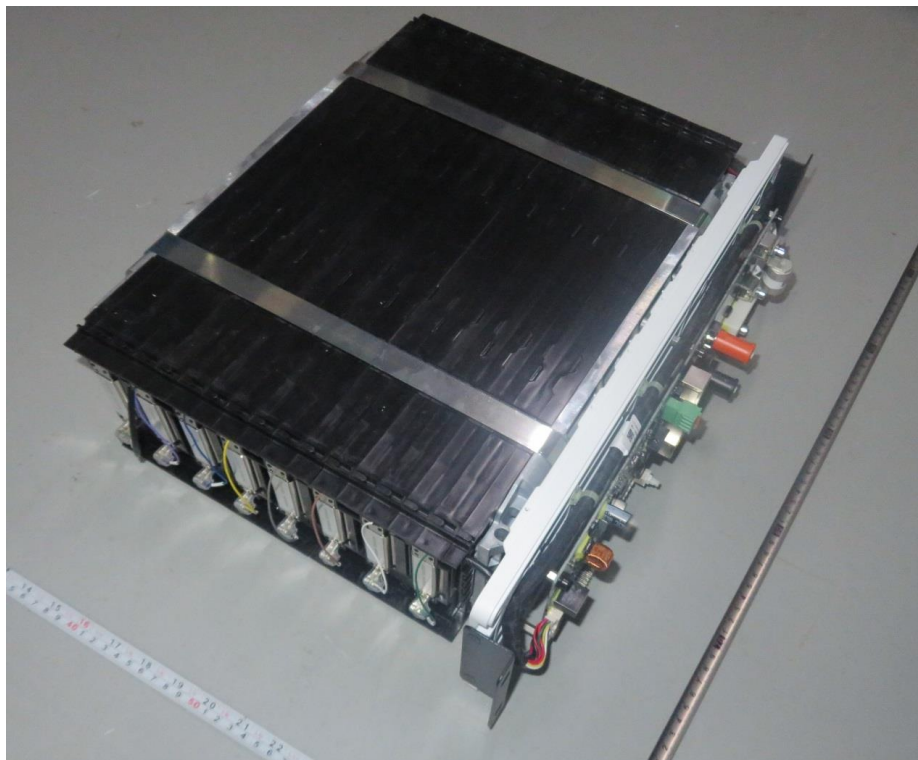


Internal view (two channels dry contact exposed)

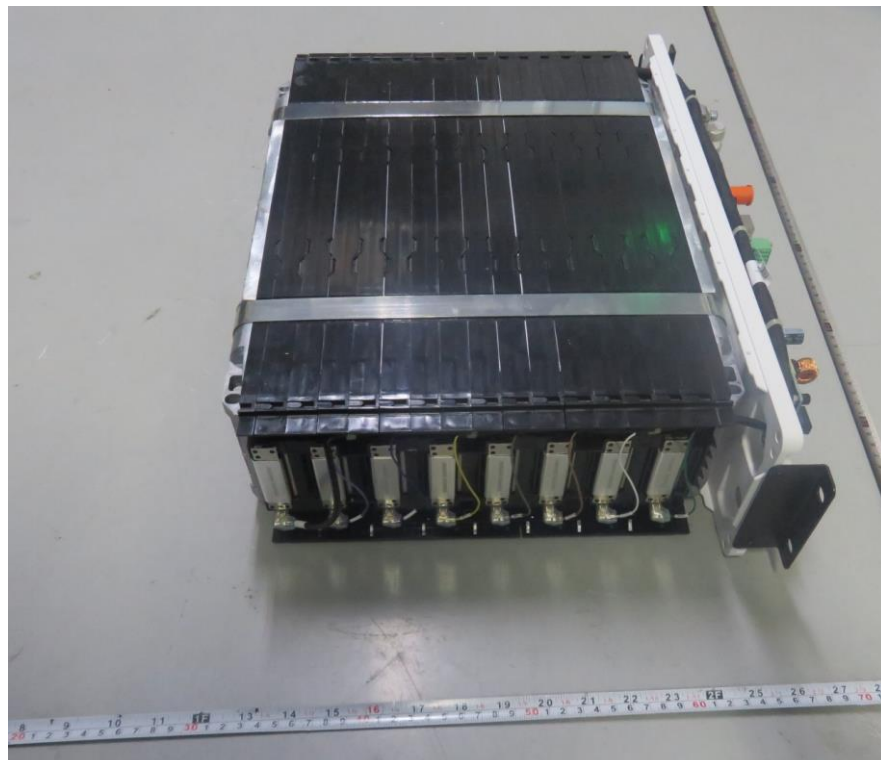


Internal view (two channels dry contact exposed)

Attachment 1 : Photos and illustrations



Internal view (two channels dry contact exposed)

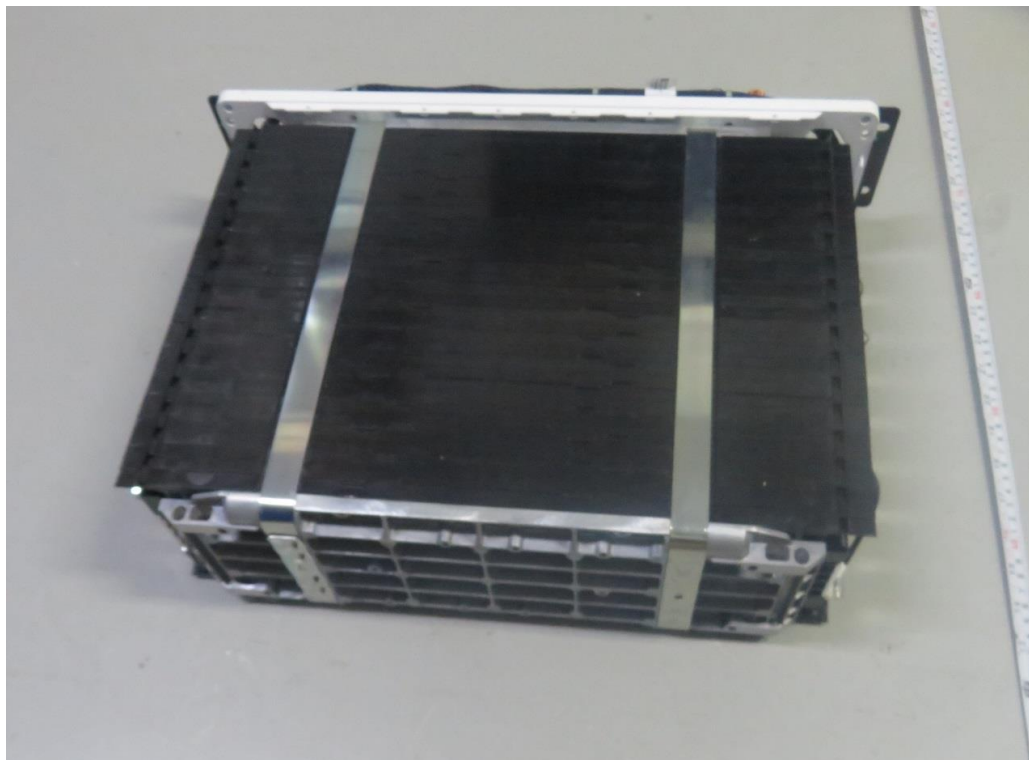


Internal view (two channels dry contact exposed)

Attachment 1 : Photos and illustrations



Internal view (two channels dry contact exposed)

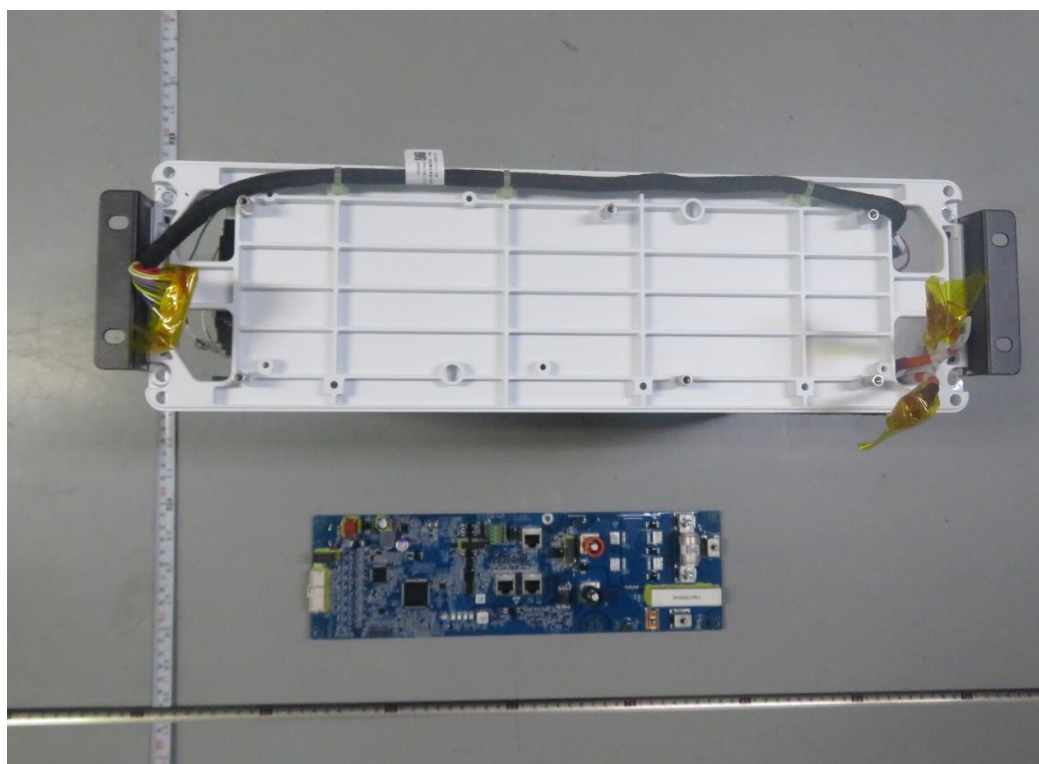


Internal view (two channels dry contact exposed)

Attachment 1 : Photos and illustrations



Internal view (two channels dry contact exposed)



Internal view (two channels dry contact exposed)

Attachment 1 : Photos and illustrations

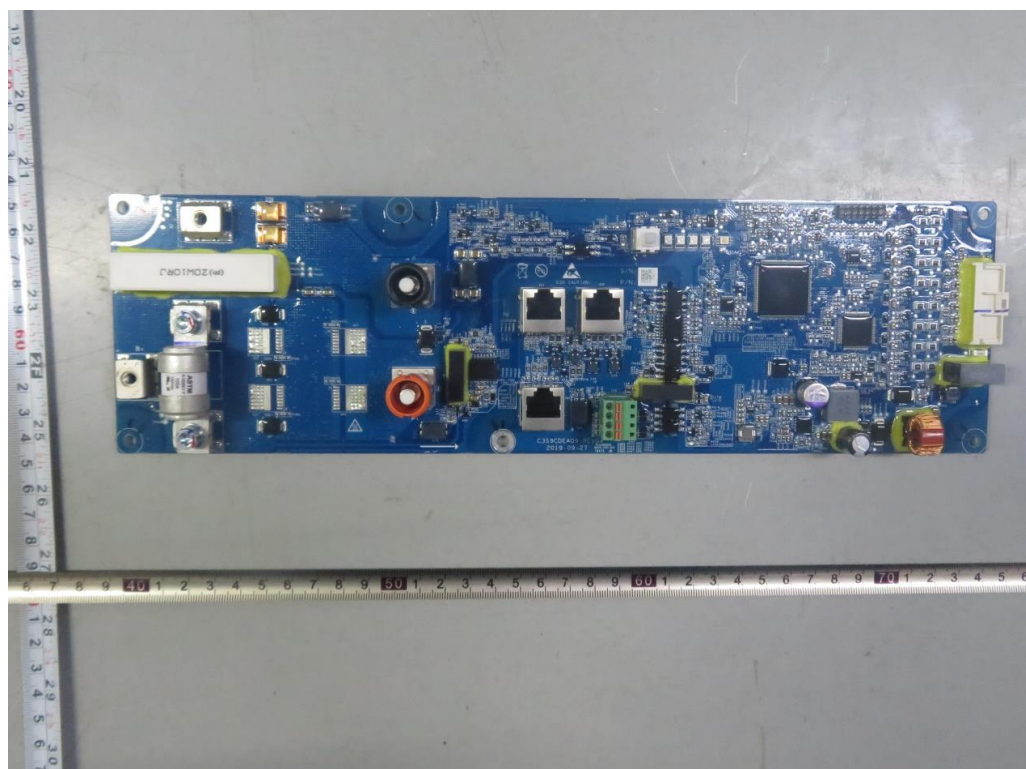


Internal view (two channels dry contact exposed)

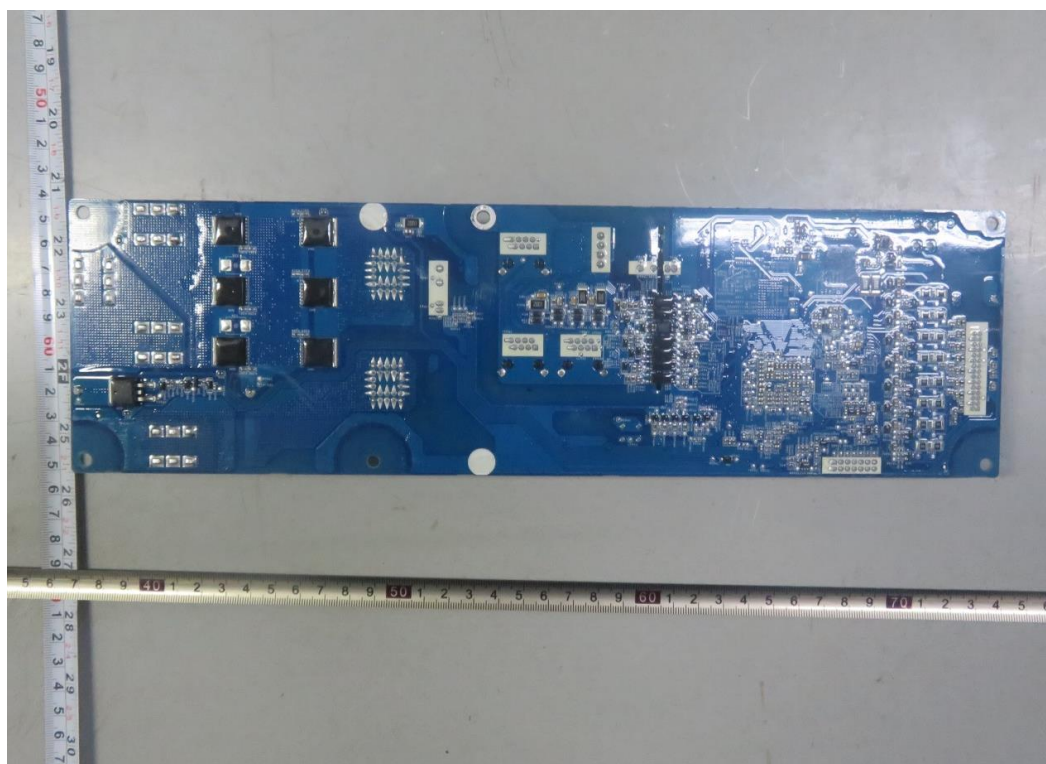


Internal view (two channels dry contact exposed)

Attachment 1 : Photos and illustrations



BMS view (two channels dry contact exposed)

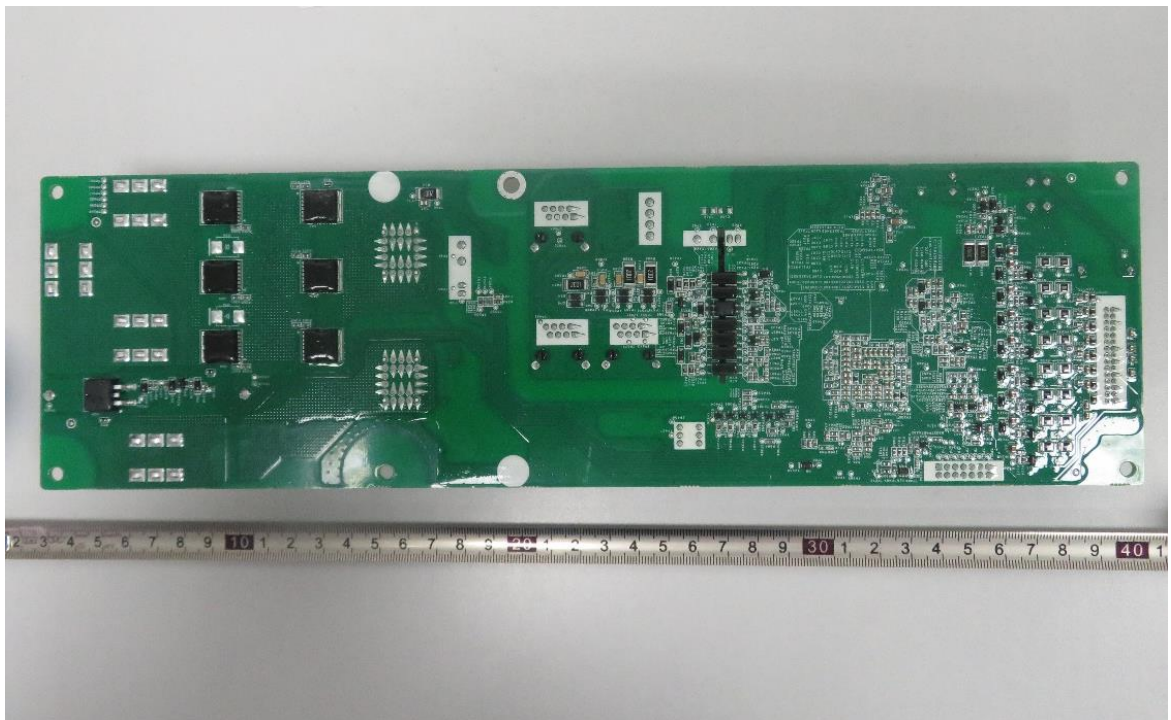


BMS view (two channels dry contact exposed)

Attachment 1 : Photos and illustrations



BMS view (two channels dry contact exposed), for alternative Network cable port (J10, J11, J12)

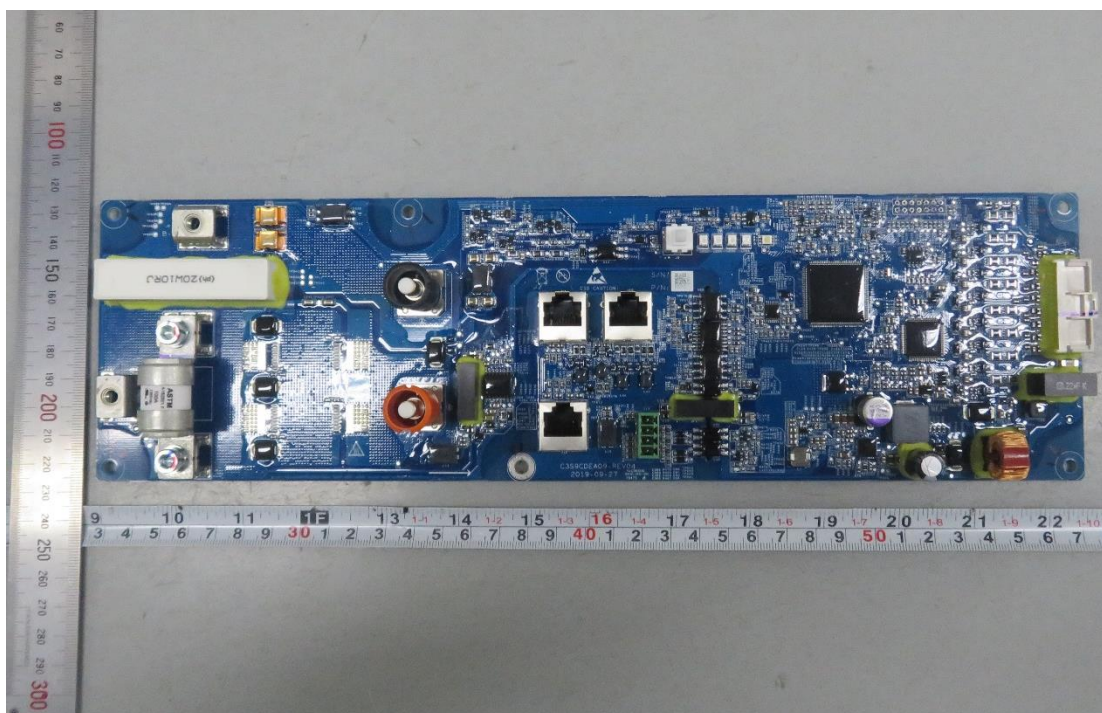


BMS view (two channels dry contact exposed), for alternative Network cable port (J10, J11, J12)

Attachment 1 : Photos and illustrations

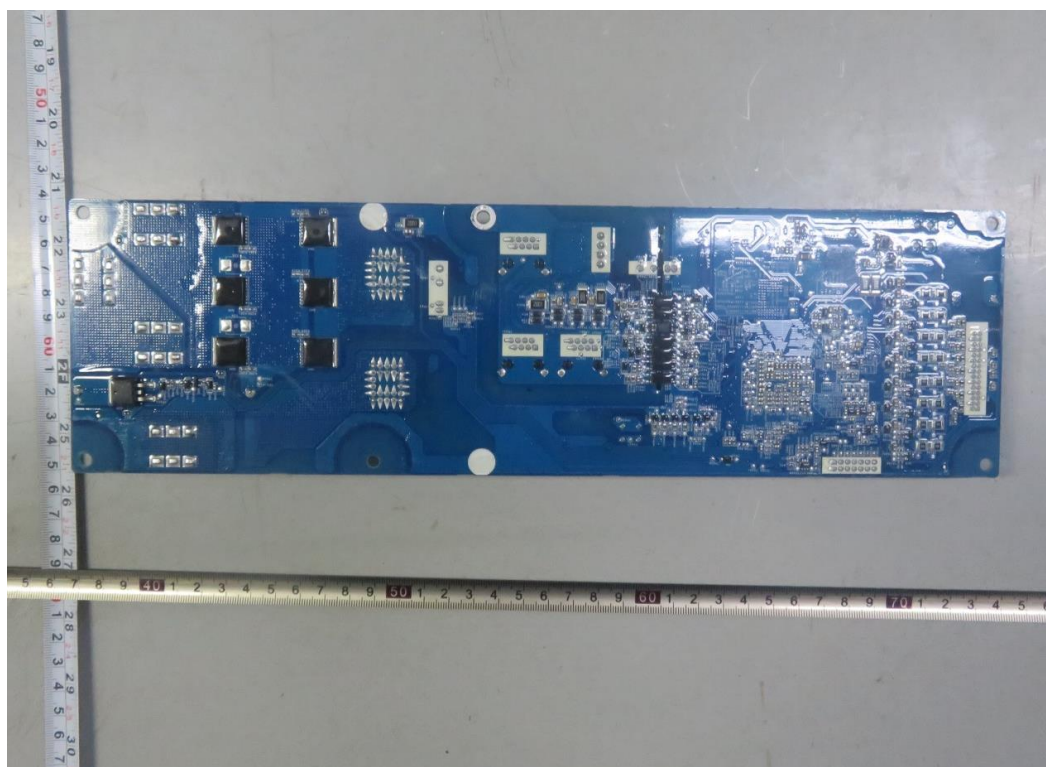


Overview (two channels dry contact not exposed)

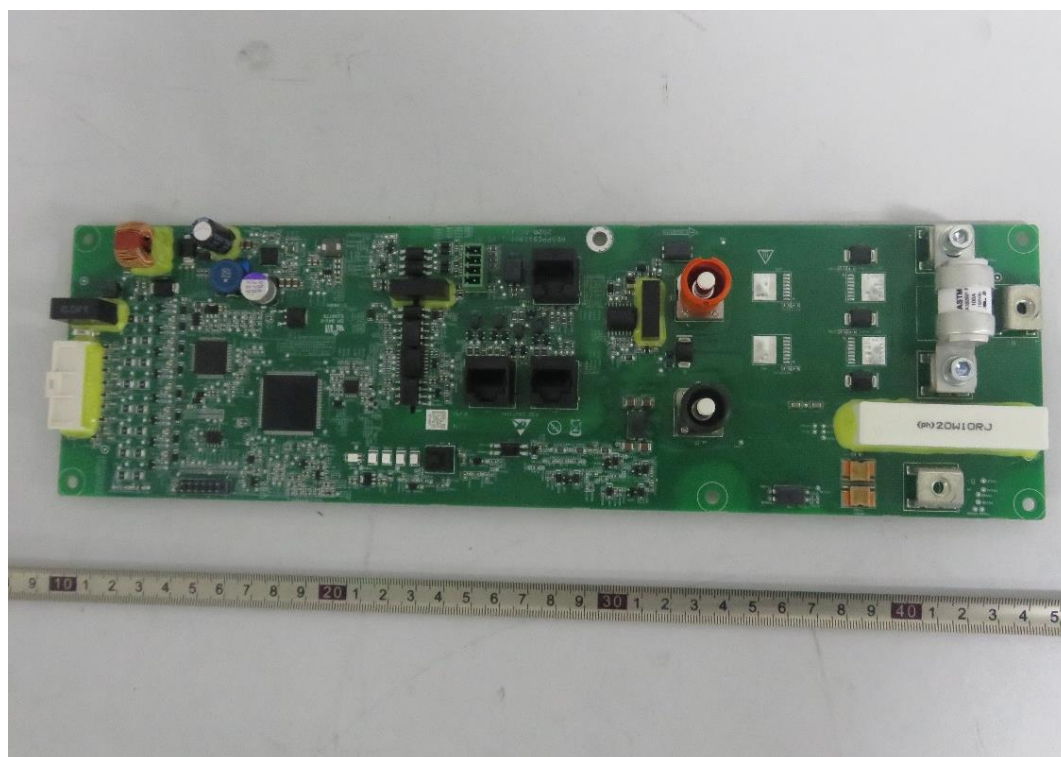


BMS view (two channels dry contact not exposed)

Attachment 1 : Photos and illustrations

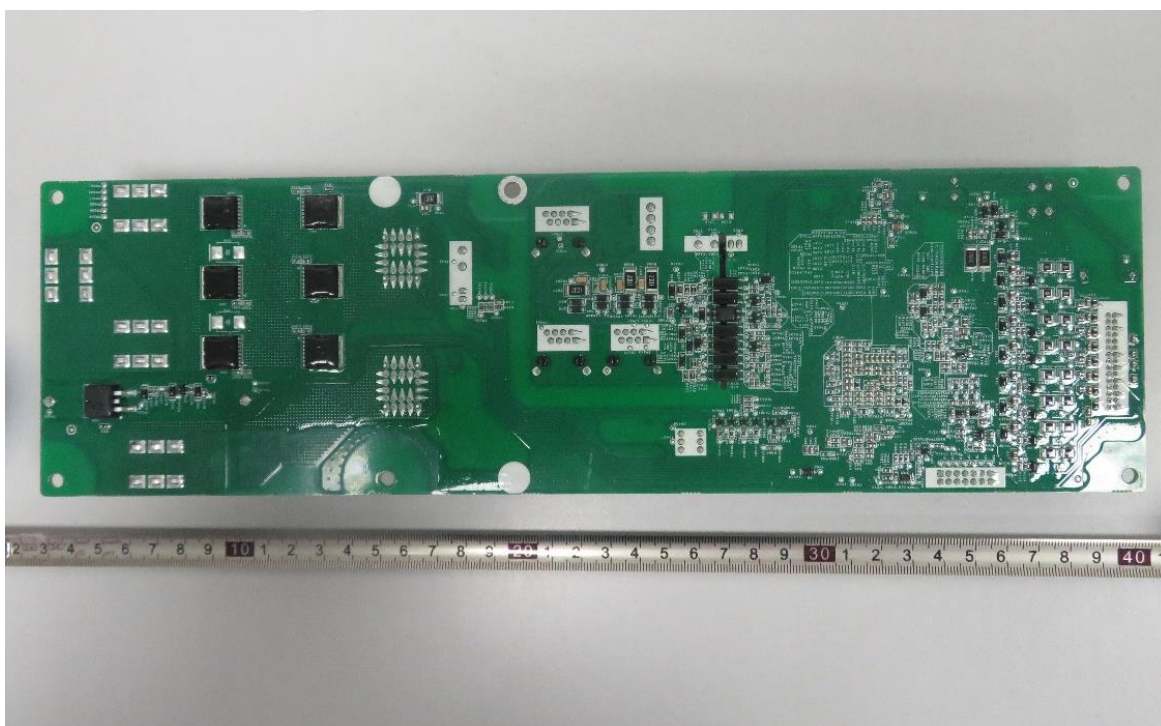


BMS view (two channels dry contact not exposed)

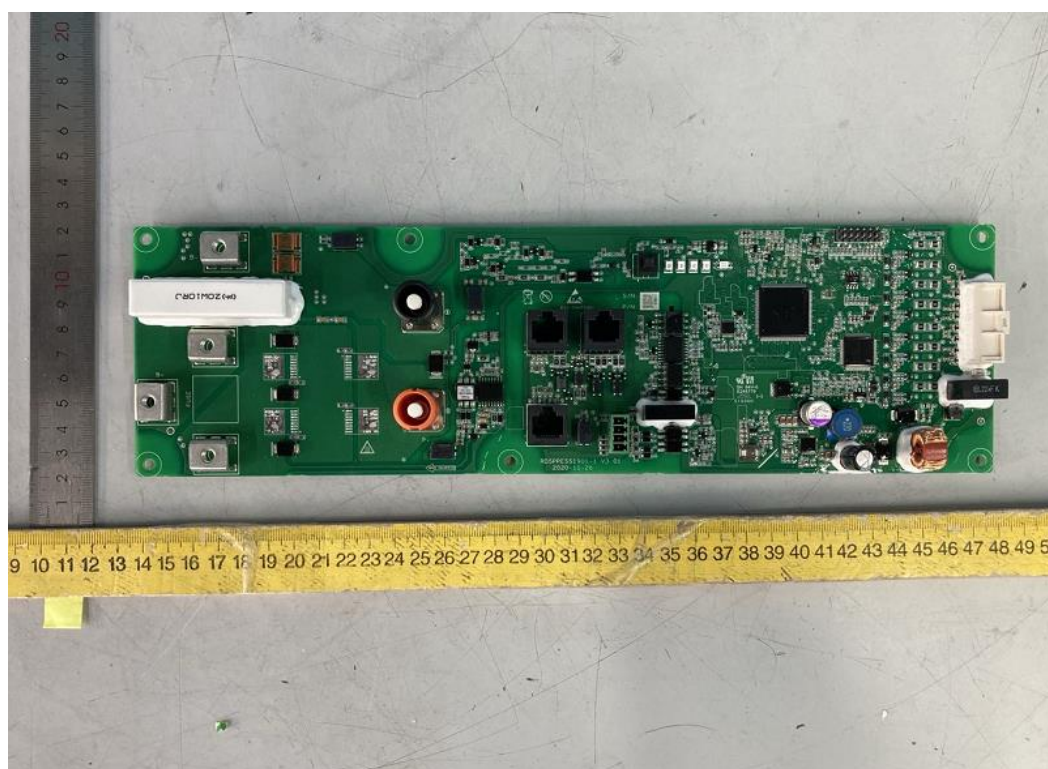


BMS view (two channels dry contact not exposed), for alternative Network cable port (J10, J11, J12)

Attachment 1 : Photos and illustrations

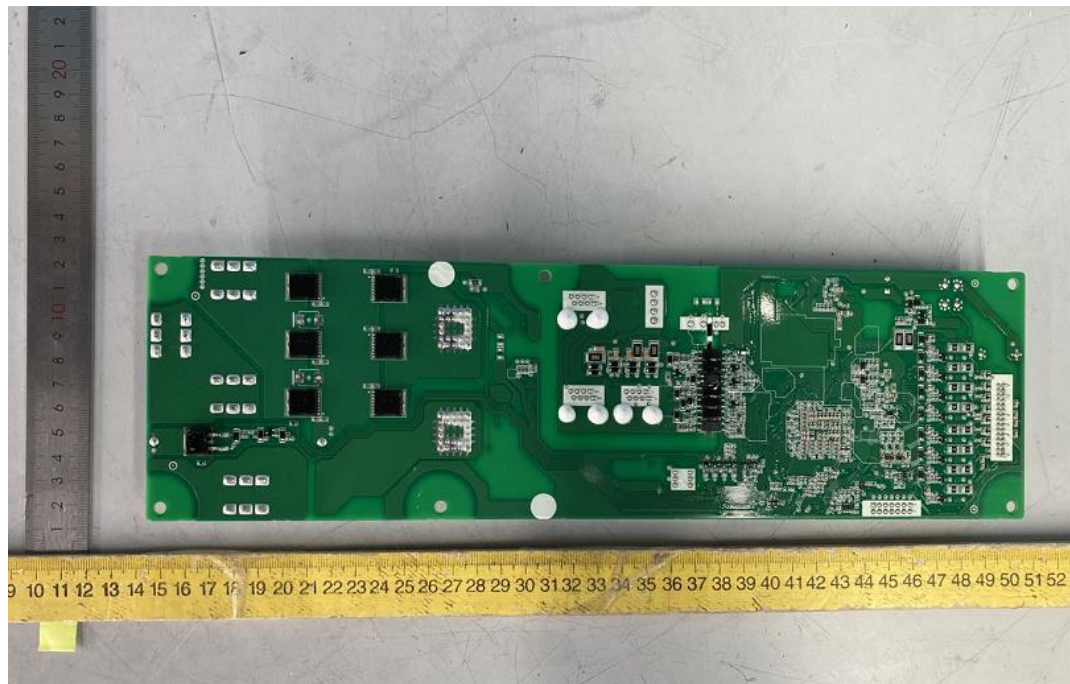


BMS view (two channels dry contact not exposed), for alternative Network cable port (J10, J11, J12)



BMS view (for report 4370157.50)

Attachment 1 : Photos and illustrations



BMS view (for report 4370157.50)

-END-