Korea Laboratory Accreditation Scheme

CERTIFICATE OF ACCREDITATION

NCT Co., Ltd.

Accreditation No. : KT689

Corporation Registration No. : 134511-0245404

Address of Laboratory : (Branch site) 211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Republic of Korea
(Satellite facilities-1) 370-26, Wonam-ro, Namsa-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic of Korea
(Satellite facilities-2) 10-26, Dongtansandan 5-gil, Hwaseong-si, Gyeonggi-do, Republic of Korea
(Satellite facilities-3) 44, Gongdan 12-ro, Jinryang-eup, Gyeongsan-si, Gyeongsangbuk-do, Republic of Korea

Date of Initial Accreditation : January 21, 2016

Validity of Accreditation : January 21, 2024 ~ January 20, 2028

Scope of Accreditation : Attached Annex

Date of issue : August 12, 2026

This testing laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to Joint ISO-ILAC-IAF Communiqué).

Kim daejin

Head
Korea Laboratory Accreditation Scheme

Korea Laboratory Accreditation Scheme(KOLAS) is a signatory to the ILAC Mutual Recognition Arrangement

03. Electrical Testing

03.004 Electrical materials and components

Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 62660-3:2022	Electrical materials and components	Secondary lithium-ion cells for the propulsion of electric road vehicles – Part 3: Safety requirements (Exception) 6.4.4 Internal short circuit test Annex C Alternative internal short-circuit test(6.4.4.2.2)	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
UL 2054:2011	Electrical materials and components	Household and Commercial Batteries	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
EN 62133-1:2017	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications - Part 1: Nickel systems	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
EN 62660-2:2019	Electrical materials and components	Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 2: Reliability and abuse testing	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
EN IEC 62619:2022	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications (Exception) 7.3.2 Internal short-circuit test (cell)	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
KS C IEC 62619:2022	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes — Safety requirements for secondary Lithium cells and batteries, for use in industrial applications (Exception) 7.3.2 Internal short-circuit test (cell)	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
KS C IEC 61960-3:2017	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for portable applications - Part 3: Prismatic and cylindrical lithium secondary cells and batteries made from them	Voltage: DC (0 ~ 80) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 62660-1:2010	Electrical materials and components	Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 1: Performance testing	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
IEC 62620:2014	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for use in industrial applications	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
EN IEC 62660-3:2022	Electrical materials and components	Secondary lithium-ion cells for the propulsion of electric road vehicles – Part 3: Safety requirements (Exception) 6.4.4 Internal short circuit test Annex C Alternative internal short-circuit test(6.4.4.2.2)	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

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Test method	Materials Products	Standard designation	Test range	Site	Field testing
ANSI/CAN/UL-1973:2022	Electrical materials and components	Batteries for Use in Stationary and Motive Auxiliary Power Applications (Exception) 27. Electromagnetic Immunity Tests 30. Crush Test (LER Motive and VAP Applications) 36. Pressure Release Test 37. Start-To-Discharge Test 39. Resistance to Moisture Test 40. Salt Fog Test 41. External Fire Exposure for Projectile Hazards Test	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

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Test method	Materials Products	Standard designation	Test range	Site	Field testing
ANSI/CAN/UL-1973:2022	Electrical materials and components	Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications (Exception) 27. Electromagnetic Immunity Tests 28. Vibration Test (LER Motive and VAP Applications) 29. Shock Test (LER Motive and VAP Applications) 30. Crush Test (LER Motive and VAP Applications) 36. Pressure Release Test 37. Start-To-Discharge Test 38. Thermal Cycling Test (LER Motive and VAP Applications) 39. Resistance to Moisture Test 40. Salt Fog Test 41. External Fire Exposure for Projectile Hazards Test Annex B (Normative) Test program for sodium-beta battery cells Annex E (Normative) Cell Test Program	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
UL 2580:2022	Electrical materials and components	Batteries for Use In Electric Vehicles (Exception) 34 Rotation Test 38 Crush Test 40 Salt Spray Test 42 External Fire Exposure Test	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
UL 2580:2022	Electrical materials and components	Batteries for Use In Electric Vehicles (Exception) 34 Rotation Test 38 Crush Test 40 Salt Spray Test 42 External Fire Exposure Test ANNEX B (NORMATIVE) Test Program for Secondary Lithium Cells ANNEX D (NORMATIVE) Alternative Test Program for Secondary Lithium Cells	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N
UL 1642:2022	Electrical materials and components	Lithium Batteries	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
JIS C 62133-2:2020	Electrical materials and components	Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications-Part 2: Lithium systems (Exception) 7.3.9 Design evaluation – Forced internal short-circuit (cells)	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
UL 2054:2021	Electrical materials and components	Household and Commercial Batteries	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
EN 60695-10-2: 2014	Electrical materials and components	Fire hazard testing - Part 10-2: Abnormal heat - Ball pressure test method	Radius: 2.5 mm, Force: 20 N, Temperature: (50 ~ 200) °C	BS	N
IEC 60695-10-2: 2014	Electrical materials and components	Fire hazard testing - Part 10-2: Abnormal heat - Ball pressure test method	Radius: 2.5 mm, Force: 20 N, Temperature: (50 ~ 200) °C	BS	N
DNV-RU-SHIP Pt.6 Ch.2. Edition July 2021	Electrical materials and components	Part 6 Additional class notations Chapter 2 Propulsion, power generation and auxiliary systems (Exception) Section 2~13 Section 1 pressure test of coolant piping/hoses 5 Electrochemical capacitor system and installations	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
EN IEC 63056:2020	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries for use in electrical energy storage systems (Exception) 7.3 Casing material of a battery system that can be transported for installation or maintenance	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N
IEC 62619:2022	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications (Exception) 7.3.2 Internal short-circuit test	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
IEC 62619:2017	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications (Exception) 7.3.2 Internal short-circuit test	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
KS C IEC 62620:2014	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes — Secondary lithium cells and batteries for use in industrial applications	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
DNV-RU-SHIP Pt.6 Ch.2. Edition July 2021	Electrical materials and components	Part 6 Additional class notations Chapter 2 Propulsion, power generation and auxiliary systems (Exception) Section 2~13 Section 1 external short circuit impact thermal abuse forced discharge pressure test of coolant piping/hoses 5 Electrochemical capacitor system and installations	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N
ANSI/CAN/UL/ULC 2271:2023	Electrical materials and components	Batteries for Use In Light Electric Vehicle (LEV) Applications (Exception) 32 Crush Test 36 Roll Over Test 39 Water Exposure Test	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
ANSI/CAN/UL/ULC 2271:2023	Electrical materials and components	Batteries for Use In Light Electric Vehicle (LEV) Applications (Exception) 30 Vibration Endurance Test 31 Shock Test 32 Crush Test 36 Roll Over Test 39 Water Exposure Test 40 Thermal Cycling Test	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N
KS C IEC 63056:2020	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries for use in electrical energy storage systems (Exception) 7.3 Casing material of a battery system that can be transported for installation or maintenance	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N
EN 62620:2015	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for use in industrial applications	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
EN IEC 63057:2020	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium batteries for use in road vehicles not for the propulsion (Exception) 7.1.3 Mechanical shock [intended use] 7.1.4 Vibration [intended use] 7.1.5 Thermal cycling [intended use] 7.1.10 Thermal abuse [reasonably foreseeable misuse] 7.1.11 Crush [reasonably foreseeable misuse] 7.2.4 Vibration [intended use] 7.2.10 Thermal abuse [reasonably foreseeable misuse]	Voltage: DC (0 ~ 80) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	SF-1	N
IEC 63057:2020	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium batteries for use in road vehicles not for the propulsion (Exception) 7.1.11 Crush [reasonably foreseeable misuse]	Voltage: DC (0 ~ 80) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
KC 62133-2:2020	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications – Part 2 : Lithium systems (Exception) 7.3.9 Design evaluation – Forced internal short-circuit (cells)	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
IEC 61960-3:2017	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for portable applications - Part 3: Prismatic and cylindrical lithium secondary cells, and batteries made from them	Voltage: DC (0 ~ 80) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
EN 61960-3:2017	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for portable applications - Part 3: Prismatic and cylindrical lithium secondary cells, and batteries made from them	Voltage: DC (0 ~ 80) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 62133:2012	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications (Exception) 8.3.9 Design evaluation – Forced internal short-circuit (cells)	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
UL 62133-1:2020	Electrical materials and components	Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes - Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made from Them, for Use in Portable Applications - Part 1: Nickel Systems	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

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Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 63057:2020	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium batteries for use in road vehicles not for the propulsion (Exception) 7.1.3 Mechanical shock [intended use] 7.1.4 Vibration [intended use] 7.1.5 Thermal cycling [intended use] 7.1.10 Thermal abuse [reasonably foreseeable misuse] 7.1.11 Crush [reasonably foreseeable misuse] 7.2.4 Vibration [intended use] 7.2.10 Thermal abuse [reasonably foreseeable misuse]	Voltage: DC (0 ~ 80) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 62619:2022	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications (Exception) 7.2.1 External short-circuit test (cell or cell block) 7.2.2 Impact test (cell or cell block) 7.2.4 Thermal abuse test (cell or cell block) 7.2.5 Overcharge test (cell or cell block) 7.2.6 Forced discharge test (cell or cell block) 7.3.2 Internal short-circuit test (cell)	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N
IEC 62133-2:2017/AMD1:2021	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications - Part 2: Lithium systems (Exception) 7.3.9 Design evaluation – Forced internal short-circuit (cells)	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
KS C IEC 62660-1:2018	Electrical materials and components	Secondary lithium-ion cells for the propulsion of electric road vehicles — Part 1: Performance testing	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
IEC 62660-2:2010	Electrical materials and components	Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 2: Reliability and abuse testing	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
IEC 62660-2:2018	Electrical materials and components	Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 2: Reliability and abuse testing	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
UL 1642:2015	Electrical materials and components	Lithium Batteries	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
KS C IEC 60695-10-2:2014	Electrical materials and components	Fire hazard testing - Part 10-2: Guidance and test methods for the minimzation of the effects of abnormal heat on electrotechnical products involved in fires - Method for testing products made from non-metallic materials for resistance to heat using the ball pressure test	Radius: 2.5 mm, Force: 20 N, Temperature: (50 ~ 200) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 62133-1:2017	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications - Part 1: Nickel systems	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
KS C IEC 62660-2:2018	Electrical materials and components	Secondary Batteries for the Propulsion of Electric Road Vehicles – Part 2 : Reliability and abuse testing for lithium-ion cells	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
IEC 62660-3:2016	Electrical materials and components	Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 3: Safety requirements (Exception) 6.4.4 Internal short circuit test	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
EN IEC 63056:2020	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries for use in electrical energy storage systems (Exception) 7.3 Casing material of a battery system that can be transported for installation or maintenance	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
KS C IEC 63056:2020	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries for use in electrical energy storage systems (Exception) 7.3 Casing material of a battery system that can be transported for installation or maintenance	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
KS C IEC 62660-3:2022	Electrical materials and components	Secondary lithium-ion cells for the propulsion of electric road vehicles – Part 3: Safety requirements (Exception) 6.4.4 Internal short circuit test Annex C Alternative internal short-circuit test(6.4.4.2.2)	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
KC 62619:2023	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes — Safety requirements for secondary Lithium cells and batteries, for use in industrial applications	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 63056:2020	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries for use in electrical energy storage systems (Exception) 7.3 Casing material of a battery system that can be transported for installation or maintenance	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
IEC 63056:2020	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries for use in electrical energy storage systems (Exception) 7.3 Casing material of a battery system that can be transported for installation or maintenance	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N
KS C IEC 61960-3:2017	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for portable applications - Part 3: Prismatic and cylindrical lithium secondary cells, and batteries made from them	Voltage: DC (0 ~ 80) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 62133-2:2017	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications - Part 2: Lithium systems (Exception) 7.3.9 Design evaluation – Forced internal short-circuit (cells)	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
UL 62133-2:2020	Electrical materials and components	Standard for Safety for Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes - Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made from Them, for Use in Portable Applications - Part 2: Lithium Systems (Exception) 7.3.9 Design evaluation – Forced internal short-circuit (cells)	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
UL 62133:2017	Electrical materials and components	Standard For Safety For Secondary Cells And Batteries Containing Alkaline Or Other Non-Acid Electrolytes - Safety Requirements For Portable Sealed Secondary Cells, And For Batteries Made From Them, For Use In Portable Applications (Exception) 8.3.9 Design evaluation – Forced internal short-circuit (cells)	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
IEC 61960:2011	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for portable applications	Voltage: DC (0 ~ 80) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
IEC 62660-1:2018	Electrical materials and components	Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 1: Performance testing	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
EN 62660-1:2019	Electrical materials and components	Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 1: Performance testing	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 62619:2017	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications (Exception) 7.2.1 External short-circuit test (cell or cell block) 7.2.2 Impact test (cell or cell block) 7.2.4 Thermal abuse test (cell or cell block) 7.2.5 Overcharge test (cell or cell block) 7.2.6 Forced discharge test (cell or cell block) 7.3.2 Internal short-circuit test (cell)	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N

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Test method	Materials Products	Standard designation	Test range	Site	Field testing
EN IEC 62619:2022	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications (Exception) 7.2.1 External short-circuit test (cell or cell block) 7.2.2 Impact test (cell or cell block) 7.2.4 Thermal abuse test (cell or cell block) 7.2.5 Overcharge test (cell or cell block) 7.2.6 Forced discharge test (cell or cell block) 7.3.2 Internal short-circuit test (cell)	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N

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Test method	Materials Products	Standard designation	Test range	Site	Field testing
KS C IEC 62619:2022	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications (Exception) 7.2.1 External short-circuit test (cell or cell block) 7.2.2 Impact test (cell or cell block) 7.2.4 Thermal abuse test (cell or cell block) 7.2.5 Overcharge test (cell or cell block) 7.2.6 Forced discharge test (cell or cell block) 7.3.2 Internal short-circuit test (cell)	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N

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Test method	Materials Products	Standard designation	Test range	Site	Field testing
KC 62619:2023	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications (Exception) 7.2.1 External short-circuit test (cell or cell block) 7.2.2 Impact test (cell or cell block) 7.2.4 Thermal abuse test (cell or cell block) 7.2.5 Overcharge test (cell or cell block) 7.2.6 Forced discharge test (cell or cell block) 7.3.2 Internal short-circuit test (cell)	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N
KS C IEC 62620:2014	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for use in industrial applications	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N
EN 62620:2015	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for use in industrial applications	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 62620:2014	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for use in industrial applications	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N
IEC 61960-3:2017	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for portable applications - Part 3: Prismatic and cylindrical lithium secondary cells, and batteries made from them	Voltage: DC (0 ~ 80) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N
EN 61960-3:2017	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for portable applications - Part 3: Prismatic and cylindrical lithium secondary cells, and batteries made from them	Voltage: DC (0 ~ 80) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N
UL 1642:2020	Electrical materials and components	Lithium Batteries	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
ANSI/CAN/UL/ULC 2271:2018	Electrical materials and components	Batteries for Use In Light Electric Vehicle (LEV) Applications (Exception) 32 Crush Test 36 Roll Over Test 39 Water Exposure Test	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
KC 62133-2:2025	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications – Part 2 : Lithium systems (Exception) 7.3.9 Design evaluation – Forced internal short-circuit (cells)	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

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Test method	Materials Products	Standard designation	Test range	Site	Field testing
ANSI/CAN/UL 9540:2023	Electrical materials and components	Energy Storage Systems and Equipment (Exception) 36. Electromagnetic Immunity Test 37. Containment of Moving parts 39. Strength Test 41.4 Installation in seismic environments 42.3 Check of safety controls 43. Mechanical Production Test 44. Production Quality Control	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N
ANSI/CAN/UL 9540A:2025	Electrical materials and components	Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems (Exception) 10. Installation Level	Peak heat release rate : (0 ~ 5) MW, Heat release rate : (0 ~ 5) MW, Light transmission : (0 ~ 100) %, Total hydrocarbon : (0 ~ 5 000) μmol/mol, Hydrogen : (0 ~ 50 000) μmol/mol	SF-1	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
ANSI/CAN/UL 9540A:2025	Electrical materials and components	Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems (Exception) 10. Installation Level	Peak heat release rate : (0 ~ 5) MW, Heat release rate : (0 ~ 5) MW, Light transmission : (0 ~ 100) %, Total hydrocarbon : (0 ~ 5 000) µmol/mol, Hydrogen : (0 ~ 50 000) µmol/mol	SF-1	N
ANSI/CAN/UL 9540A:2019	Electrical materials and components	Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems (Exception) 10. Installation Level	Peak heat release rate : (0 ~ 5) MW, Heat release rate : (0 ~ 5) MW, Light transmission : (0 ~ 100) %, Total hydrocarbon : (0 ~ 5 000) µmol/mol, Hydrogen : (0 ~ 50 000) µmol/mol	SF-1	N
KC 10031:2023	Electrical materials and components	Safety requirements for lithium secondary batteries for reuse of spent batteries	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N
MOLIT Notice No.2023-481 (08.22.2023.)	Electrical materials and components	Enforcement regulations on performance and standards for automobiles and automobile parts [Appendix 1] No. 48 Drive Battery Safety Test 48.7.4 External short circuit test 48.7.5 Overcharge test 48.7.6 Overdischarge test 48.7.7 Overheating	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
		protection test 48.7.9 Immersion test (Exception) 48.7.4.3.4 External short circuit test of vehicle-level 48.7.5.3.5.1 ~ 48.7.5.3.5.3 Overcharge test of vehicle-level 48.7.6.3.5.1 ~ 48.7.6.3.5.3 Overdischarge test of vehicle-level 48.7.7.3.2 Overheating protection test of vehicle-level [Appendix 1] Article 48-2 Safety test of drive shaft battery of two-wheeled vehicle 48-2.7.4 External short circuit test 48-2.7.5 Overcharge test 48-2.7.6 Overdischarge test 48-2.7.7 Overheating protection test 48-2.7.9 Immersion test 48-2.7.10 Drop test (Exception) 48-2.7.4.3.4 External short circuit test of vehicle-level 48-2.7.5.3.5.1 ~ 48-2.7.5.3.5.3 Overcharge test of vehicle-level 48-2.7.6.3.5.1 ~			

Test method	Materials Products	Standard designation	Test range	Site	Field testing
		48-2.7.6.3.5.3 Overdischarge test of vehicle-level 48.2.7.7.2.2, 48.2.7.7.3.2 Overheating protection test of vehicle-level			
EN IEC 63057:2020	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium batteries for use in road vehicles not for the propulsion (Exception) 7.1.11 Crush [reasonably foreseeable misuse]	Voltage: DC (0 ~ 60) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

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Test method	Materials Products	Standard designation	Test range	Site	Field testing
ANSI/CAN/UL-1973:2018	Electrical materials and components	Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications (Exception) 25. Vibration Test (LER Motive Applications) 26. Shock Test (LER Motive Applications) 27. Crush Test (LER Motive Applications) 33. Pressure Release Test 34. Start-To-Discharge Test 35. Thermal Cycling Test (LER Motive Applications) 36. Resistance to Moisture Test 37. Salt Fog Test 38. External Fire Exposure Test	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N

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Test method	Materials Products	Standard designation	Test range	Site	Field testing
ANSI/CAN/UL-1973:2018	Electrical materials and components	Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications (Exception) 27. Crush Test (LER Motive Applications) 33. Pressure Release Test 34. Start-To-Discharge Test 36. Resistance to Moisture Test 37. Salt Fog Test 38. External Fire Exposure Test	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
IEC 61960-4:2020	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for portable applications – Part 4: Coin secondary lithium cells, and batteries made from them	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
EN IEC 61960-4:2020	Electrical materials and components	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for portable applications – Part 4: Coin secondary lithium cells, and batteries made from them	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 60086-4:2019	Electrical materials and components	Primary batteries – Part 4: Safety of lithium batteries (Exception) Annex E Child resistant packaging of coin cells	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
EN IEC 60086-4:2019	Electrical materials and components	Primary batteries – Part 4: Safety of lithium batteries (Exception) Annex E Child resistant packaging of coin cells	Voltage: DC (0 ~ 500) V, Current: (0 ~ 800) A, Temperature: (-70 ~ 180) °C	BS	N
ANSI/CAN/UL/ULC 2271:2018	Electrical materials and components	Batteries for Use In Light Electric Vehicle (LEV) Applications (Exception) 30 Vibration Endurance Test 31 Shock Test 32 Crush Test 36 Roll Over Test 39 Water Exposure Test 40 Thermal Cycling Test	Voltage: DC (0 ~ 1500) V, Current: (0 ~ 1000) A, Temperature: (-40 ~ 80) °C	SF-1	N

Uncontrolled

03. Electrical Testing

03.014 Environmental and Reliability

Test method	Materials Products	Standard designation	Test range	Site	Field testing
MIL-STD-810C:1975	Industrial electrical products	Environmental test Method 501.1 High temperature 502.1 Low temperature 503.1 Temperature shock 507.1 Humidity 514.2 Vibration Procedure I, II, V, VI, VII, VIII 516.2 Shock Procedure I, II, III, V	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (1 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N
MIL-STD-810F:2000	Industrial electrical products	Environmental engineering considerations and laboratory tests 500.4 Low pressure (Altitude) Procedure I, II 501.4 High temperature 502.4 Low temperature 503.4 Temperature shock 507.4 Humidity 514.5 Vibration Procedure I 516.5 Shock Procedure I, II, IV, V, VI	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (1 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N
IEC 60068-2-57:2013	Industrial electrical products	Environmental testing - Part 2-57: Tests - Test Ff: Vibration - Time-history and sine-beat method	Frequency: (4 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s²	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 60068-2-38: 2021	Industrial electrical products	Environmental testing - Part 2-38: Tests - Test Z/AD: Composite temperature/humidity cyclic test	Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H.	BS	N
IEC 60068-2-31: 2008	Industrial electrical products	Environmental testing - Part 2-31: Tests - Test Ec: Rough handling shocks, primarily for equipment-type specimens	Free fall height: (0.1 ~ 1.5) m	BS	N
IEC 60068-2-30: 2025	Industrial electrical products	Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)	Temperature: (20 ~ 60) °C Humidity: (50 ~ 95) % R.H.	BS	N
IEC 60068-2-27: 2008	Industrial electrical products	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	Acceleration: (0.98 ~ 1 470) m/s^2	BS	N
EN IEC 62281:2023	Electrical materials and components	Safety of primary and secondary lithium cells and batteries during transport	Altitude: (5 ~ 93.3) kPa Temperature: (-70 ~ 180) °C Frequency: (4 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s^2 Free fall height: (0.1 ~ 1.5) m	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
DNV-CG-0339:2021	Ship	Environmental test specification for electrical, electronic and programmable equipment and systems 6. Vibration tests 7. Dry heat test 8. Damp heat test 9. Cold test 12. Insulation test 13. High voltage test	Frequency: (2 ~ 100) Hz Acceleration: (1 ~ 50) m/s² Temperature: (-30 ~ 75) °C Humidity: (50 ~ 95) % R.H. Insulation Resistance: DC (250 ~ 500) V Withstand Voltage: AC (0 ~ 3) kV	BS	N
GMW 3172:2015	Automobiles and related products	General specification for electrical/electronic components-Environmental durability 9.3.1 Vibration with Thermal cycling 9.3.2 Mechanical Shock-Pothole 9.3.3 Mechanical Shock-Collision 9.3.4 Mechanical Shock-Closure Slam	Temperature: (-50 ~ 180) °C Frequency: (4 ~ 2 000) Hz Vibration Acceleration: (0.98 ~ 980) m/s² Shock Acceleration: (0.98 ~ 1 470) m/s²	BS	N
IEC 62281:2023	Electrical materials and components	Safety of primary and secondary lithium cells and batteries during transport	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Frequency: (4 ~ 2 000) Hz Acceleration: (0.98 ~ 1 470) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
KS C IEC 60068-2-14:2023	Industrial electrical products	Environmental testing - Part 2-14: Test N: Change of temperature (Excl. Test Nc: Rapid change of temperature, two-fluid-bath method)	Temperature: (-65 ~ 200) °C	BS	N
EN 60068-2-14: 2023	Industrial electrical products	Environmental Testing - Part2-14: Tests-Test N: Change of temperature (Exception) Test Nc Rapid change of temperature, two-fluid-bath method	Temperature: (-65 ~ 200) °C	BS	N
IEC 60068-2-14: 2023	Industrial electrical products	Environmental testing - Part 2-14: Tests - Test N: Change of temperature (Exception) Test Nc Rapid change of temperature, two-fluid-bath method	Temperature: (-65 ~ 200) °C	BS	N
EN 60068-2-1:2025	Industrial electrical products	Environmental Testing - Part2-1: Tests-Test A: Cold [Exception] 5.3 Test Ad 5.4 Test Ae	Temperature: (-70 ~ 10) °C	BS	N
EN 60068-2-2:2025	Industrial electrical products	Environmental Testing - Part2-2: Tests-Test A: Dry heat [Exception] 5.3 Test Bd 5.4 Test Be	Temperature: (25 ~ 150) °C	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 60068-2-1:2025	Industrial electrical products	Environmental testing - Part 2-1: Tests-Test A: Cold [Exception] 5.3 Test Ad 5.4 Test Ae	Temperature: (-70 ~ 10) °C	BS	N
IEC 60068-2-2:2025	Industrial electrical products	Environmental testing - Part 2-2: Tests-Test B: Dry Heat [Exception] 5.3 Test Bd 5.4 Test Be	Temperature: (25 ~ 200) °C	BS	N
IEC 60068-2-6:2007	Industrial electrical products	Environmental testing - Part 2-6: Tests-Test Fc: Vibration (Sinusoidal)	Frequency: (4 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s²	BS	N
ES 95400-10:2024	Automobiles and related products	Environmental testing for automotive electronic equipment (Excl. 6.1.12 EMI/EMC, 6.3.9.1 Salt spray, 16.3.9.1 Salt spray, 26.3.12 Ozone resistance, 6.5.1 Dust test, 6.5.2 Water resistance)	Temperature: (-70 ~ 150) °C Humidity: (50 ~ 95) % R.H.	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
GMW 3172:2023	Automobiles and related products	General specification for electrical/electronic components-Environmental durability 9.3.1 Vibration with Thermal cycling 9.3.2 Mechanical Shock-Pothole 9.3.3 Mechanical Shock-Collision 9.3.4 Mechanical Shock-Closure Slam 9.4.1 High Temperature Degradation 9.4.2 Thermal Shock Air-To-Air(TS) 9.4.3 Power Temperature Cycle (PTC) 9.4.5 Humid Heat Cyclic (HHC) 9.4.6 Humid Heat Constant (HHCO) 9.4.9 Minimum Non Operating Temperature	Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (4 ~ 2 000) Hz Vibration Acceleration: (0.98 ~ 980) m/s² Shock Acceleration: (0.98 ~ 1 470) m/s²	BS	N

Uncontrolled

Test method	Materials Products	Standard designation	Test range	Site	Field testing
KS C IEC 60571:2012	Railroad vehicles and related products	Railway applications - Electrical equipment for rolling stock: 12.2.4 Cooling test, 12.2.5 Dry heat test, 12.2.6 Damp heat cyclic test, 12.2.10 Insulation test, 12.2.12 Vibration, shock and bump test, 12.2.15 Low temperature storage test	Temperature: (-50 ~ 150) °C Vibration Frequency: (1 ~ 2 000) Hz Humidity: (50 ~ 95) % R.H. Vibration/Shock acceleration: (0.98 ~ 980) m/s² Insulation Resistance: DC 500 V Withstands Voltage: AC 3 000 V	BS	N
KS C IEC 60255-27:2013	Industrial electrical products	Measuring relays and protection equipment - Part 27: Product safety requirements: 10.6.4.3 AC/DC dielectric voltage, 10.6.4.4 Insulation resistance, 10.6.4.5 Protective bonding test	Withstands Voltage: AC 3 000 V Insulation Resistance: DC 500 V, DC 1 000 V AC 8 V, 45 A	BS	N
ES 95400-10:2020	Automobiles and related products	Environmental testing for automotive electronic equipment (Excl. items as above)	Voltage: DC (0 ~ 36) V Temperature: (-70 ~ 150) °C Humidity: (50 ~ 95) % R.H. Vibration Frequency: (5 ~ 2 000) Hz Vibration Acceleration: (0.98 ~ 980) m/s² Shock Acceleration: (0.98 ~ 500) m/s² Free fall height: 1.5 m이하	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
KS R ISO 7637-2:2015	Automobiles and related products	Road vehicles — Electrical disturbances from conduction and coupling — Part 2: Electrical transient conduction along supply lines only	DC 12 V, DC 24 V System	BS	N
KS C IEC 61373:2010	Railroad vehicles and related products	Railway applications - Rolling stock equipment - Shock and vibration tests	Vibration Frequency: (1 ~ 2 000) Hz acceleration: (0.98 ~ 980) m/s²	BS	N
KS C 7620:2003	Railroad vehicles and related products	Fluorescent lamp fixtures for railway rolling stock (Excl. 7.9 Noise test, 7.11 Luminous flux ratio test, 7.13 Radio interference test)	Temperature: (-10 ~ 60) °C Vibration frequency: (4 ~ 2 000) Hz Vibration acceleration: (0.98 ~ 980) m/s²	BS	N
KS C IEC 60068-2-1:2007	Industrial electrical products	Environmental testing - Part 2-1: Tests - Test A: Cold	Temperature: (-70 ~ 10) °C	BS	N
KS C IEC 60068-2-2:2007	Industrial electrical products	Environmental testing - Part 2-2: Tests - Test B: Dry heat	Temperature: (25 ~ 200) °C	BS	N
KS C IEC 60068-2-6:2015	Industrial electrical products	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	Vibration Frequency: (4 ~ 2 000) Hz Vibration acceleration: (0.98 ~ 980) m/s²	BS	N
IEC 60068-2-13: 2021	Industrial electrical products	Environmental testing - Part 2-13: Tests - Test M: Low air pressure	Altitude: (5 ~ 101.3) kPa	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 60068-2-64: 2019	Industrial electrical products	Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broad band random and guidance	Frequency: (4 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s²	BS	N
IEC 60068-2-66: 1994	Industrial electrical products	Environmental testing - Part 2: Test methods - Test Cx: Damp heat steady sate (unsaturated pressurized vapour)	Temperature: (50 ~ 150) °C Humidity: (80 ~ 95) % R.H.	BS	N
MIL-STD-810G w/ Change 1:2014	Industrial electrical products	Environmental engineering considerations and laboratory tests 500.6 Low pressure (Altitude) Procedure I,II 501.6 High temperature 502.6 Low temperature 503.6 Temperature shock 507.6 Humidity 514.7 Vibration Procedure I 516.7 Shock Procedure I,II, IV, V, VI 528.1 Mechanical vibration of ship board equipment (Type I Environmental vibration)	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (1 ~ 2000) Hz Acceleration: (0.98 ~ 980) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
MIL-STD-810G:2008	Industrial electrical products	Environmental engineering considerations and laboratory tests 500.5 Low pressure(Altitude) Procedure I, II 501.5 High temperature 502.5 Low temperature 503.5 Temperature shock 507.5 Humidity 514.6 Vibration Procedure I 516.6 Shock Procedure I,II, IV, V, VI 528 Mechanical vibration of ship board equipment (Type I Environmental vibration)	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (1 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s² Free fall height: (0.1 ~ 1.5) m height: (0.1~1.5)m	BS	N
IEC 60255-21-1:1988	Industrial electrical products	Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section One: Vibration tests (sinusoidal)	Frequency: (4 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s²	BS	N
IEC 60255-27:2023	Industrial electrical products	Measuring relays and protection equipment - Part 27: Product safety requirements (Accept only) 9.6.4.3 A.C. or D.C. dielectric voltage 9.6.4.4 Insulation Resistance 9.6.4.5 Protective bonding tests	Withstand Voltage: AC (0 ~ 3) kV DC (0 ~ 3) kV Insulation Resistance: DC 500 V DC 1 000 V AC 8 V (0 ~ 45) A	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
KS C 5078:2015	Automobiles and related products	Event Data Recorder (EDR) for Automobiles 7.3 Environmental Test	Temperature: (-20 ~ 70) °C Vibration frequency: (5 ~ 200) Hz Vibration/Shock acceleration: (44.1 ~ 490) m/s²	BS	N
KS C IEC 60068-2-64:2019	Industrial electrical products	Environmental testing — Part 2-64: Test Fh: Vibration, broadband random and guidance	Vibration Frequency: (4 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s²	BS	N
KS C IEC 62281:2023	Electrical materials and components	Safety of lithium batteries during transport	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Vibration Frequency: (4 ~ 2 000) Hz Vibtaion/Shock Acceleration: (0.98 ~1 470) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N
IEC 60068-2-67: 2019	Industrial electrical products	Environmental testing - Part 2-67: Tests - Test Cy: Damp heat, steady state, accelerated test primarily intended for components	Temperature: 85 °C Humidity: 85 % R.H.	BS	N
MIL-STD-167-1 A:2005	Industrial electrical products	Mechanical vibrations of ship board equipment (Type I- Environmental)	Frequency: (4 ~ 33) Hz Acceleration: (0.98 ~ 980) m/s²	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
ST/SG/AC.10/11/ Rev.6:2015	Electrical materials and components	Recommendations on the TRANSPORT OF DANGEROUS GOODS - Manual of Tests and Criteria (38.3 Lithium metal and lithium ion batteries)	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (4 ~ 2 000) Hz Acceleration: (0.98 ~ 1 470) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N
EN 60068-2-30: 2025	Industrial electrical products	Environmental Testing - Part 2-30: Tests - Test Db: Damp heat cyclic (12 h + 12 h cycle)	Temperature: (20 ~ 60) °C Humidity: (50 ~ 95) % R.H.	BS	N
MIL-STD-810F NOTICE 3:2003	Industrial electrical products	Environmental engineering considerations and laboratory tests 500.4 Low pressure (Altitude) Procedure I, II 501.4 High temperature 502.4 Low temperature 503.4 Temperature shock 507.4 Humidity 514.5 Vibration Procedure I 516.6 Shock Procedure I, II, IV, V, VI	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (1 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
RTCA DO-160G:2010	Aerospace products and related products	Environmental Conditions and Test ProceduresforAirborneEquipment Section4.0 Temperature and Altitude Section5.0 Temperature Variation Section6.0 Humidity Section8.0 Vibration (제외항목) 4.6 Altitude, Decompression and Over pressure Tests	Altitude: (5 ~ 101.3) kPa Temperature: (-55 ~ 85) °C Humidity: (40 ~ 95) % R.H. Frequency: (1 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s²	BS	N
ST/SG/AC.10/11/ Rev.6 Amend.1:2017	Electrical materials and components	Recommendations on the TRANSPORT OF DANGEROUS GOODS - Manual of Tests and Criteria (38.3 Lithium metal and lithium ion batteries)	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (4 ~ 2 000) Hz Acceleration: (0.98 ~ 1 470) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
MIL-STD-810D:1983	Industrial electrical products	Environmental test method and engineering guidelines 500.2 Low pressure (Altitude) Procedure I,II 501.2 High temperature 502.2 Low temperature 503.2 Temperature shock 507.2 Humidity 514.3 Vibration Procedure I 516.3 Shock Procedure I,II, IV, V, VI	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (1 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N
MIL-STD-810E:1989	Industrial electrical products	Environmental test method and engineering guidelines 500.3 Low pressure (Altitude) Procedure I,II 501.3 High temperature 502.3 Low temperature 503.3 Temperature shock 507.3 Humidity 514.4 Vibration Procedure I 516.4 Shock Procedure I,II, IV, V, VI	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (1 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N
IEC 60255-21-2:1988	Industrial electrical products	Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section Two: Shock and bump tests	Frequency: (4 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s²	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
IEC 61373:2010	Railroad vehicles and related products	Railway applications - Rolling stock equipment - Shock and vibration tests	Frequency: (1 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s²	BS	N
ISO 16750-4:2023	Automobiles and related products	Road vehicles - Environmental conditions and testing for electrical and electronic equipment-Part4: Climatic loads (Exception) 5.4 Cold water shock test 5.5 Salt spray tests 5.8 Condensation test 5.9 Corrosion test with flow of mixed gas 5.10 Solar radiation test 5.11 Dust test 5.12 Atmospheric pressure test	Temperature: (-70 ~ 200) °C Humidity: (40 ~ 95) % R.H.	BS	N
EN 61373:2010	Railroad vehicles and related products	Railway applications - Rolling stock equipment - Shock and vibration tests	Frequency: (1 ~ 2 000) Hz Acceleration: (0.98 ~ 1 470) m/s²	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
GMW 3172:2018	Automobiles and related products	General specification for electrical/electronic components-Environmental durability 9.3.1 Vibration with Thermal cycling 9.3.2 Mechanical Shock-Pothole 9.3.3 Mechanical Shock-Collision 9.3.4 Mechanical Shock-Closure Slam 9.4.1 High Temperature Degradation 9.4.2 Thermal Shock Air-To-Air(TS) 9.4.3 Power Temperature Cycle (PTC) 9.4.5 Humid Heat Cyclic (HHC) 9.4.6 Humid Heat Constant (HHCO) 9.4.9 Minimum Non Operating Temperature	Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (4 ~ 2 000) Hz Vibration Acceleration: (0.98 ~ 980) m/s² Shock Acceleration: (0.98 ~ 1 470) m/s²	BS	N
KS C IEC 60068-2-67:2019	Industrial electrical products	Environmental testing — Part 2-67: Test Cy: Damp heat, steady state, accelerated test primarily intended for components	Temperature: 85 °C Humidity: 85 % R.H	BS	N
KS R 1034:2023	Railroad vehicles and related products	Vibration test methods for automobile parts	Vibration Frequency: (4 ~ 2 000) Hz Vibration Acceleration: (0.98 ~ 980) m/s²	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
KR:2021	Ship	Standards for Manufacturing and Type Approval, Chapter 3 Type Approval, Section 2 Automotive Systems - Test Items and Criteria, Test Conditions, Sample Humidity, Test Temperature	Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H.	BS	N
IEC 60571:2012	Railroad vehicles and related products	Railway applications-Electronic equipment used on rolling stock 12.2.4 Cold start test 12.2.5 Dry heat test 12.2.6 Damp heat test, cyclic 12.2.10 Insulation test 12.2.12 Vibration, Shock and bump test 12.2.15 Low temperature storage test	Temperature: (-50 ~ 150) °C Humidity: (40 ~ 95) % R.H. Frequency: (1 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s² Insulation Resistance: DC 500 V Withstand Voltage: AC (0 ~ 3) kV DC (0 ~ 3) kV	BS	N
IEC 60068-2-78: 2025	Industrial electrical products	Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state	Temperature: (25 ~ 45) °C Humidity: (80 ~ 95) % R.H.	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
EN 50155:2021	Railroad vehicles and related products	Railway applications-Rolling stock-Electronic equipment 13.4.4 Low temperature start-up test 13.4.5 Dry heat test 13.4.6 Low temperature storage test 13.4.7 Insulation test 13.4.8 Cyclic damp heat test 13.4.10 Shock and vibration test 13.4.12 Rapid temperature variation test	Temperature: (-40 ~ 90) °C Humidity: (40 ~ 95) % R.H. Frequency: (1 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s² Insulation Resistance: DC 500 V Withstand Voltage: AC (0 ~ 3) kV DC (0 ~ 3) kV	BS	N
MIL-STD-810H:2019	Industrial electrical products	Environmental engineering consideration and laboratory tests 500.6 Low Pressure (Altitude) Procedure I, II 501.7 High temperature 502.7 Low temperature 503.7 Temperatures shock 507.6 Humidity 514.8 Vibration Procedure I 516.8 Shock Procedure I, II, IV, V, VI 528.1 Mechanical Vibration of Ship board equipment (Type I Environmental Vibration) (Exception) Type II–Internally excited	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (1 ~ 2 000) Hz Acceleration: (0.98 ~ 980) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
ST/SG/AC.10/11/ Rev.7:2019	Electrical materials and components	Recommendations on the TRANSPORT OF DANGEROUS GOODS - Manual of Tests and Criteria (38.3 Lithium metal and lithium ion batteries)	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (4 ~ 2 000) Hz Acceleration: (0.98 ~ 1 470) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N
ISO 16750-3:2023	Automobiles and related products	Road vehicles - Environmental conditions and testing for electrical and electronic equipment - Part 3: Mechanical loads	Frequency: (4 ~ 2 000) Hz Acceleration: (0.98 ~ 1 470) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N
KS C IEC 60255-21-2:1988	Industrial electrical products	Electrical relays - Part 21-2: Vibration, shock, bump and seismic tests — Seismic tests	Vibration Frequency: (4 ~ 2 000) Hz Vibration/Shock acceleration: (0.98 ~ 980) m/s²	BS	N
KS C IEC 60255-21-1:1988	Industrial electrical products	Electrical relays - Part 21-1: Vibration, shock, bump and seismic tests — Vibration tests (sinusoidal)	Vibration Frequency: (4 ~ 2 000) Hz Vibration/Shock acceleration: (0.98 ~ 980) m/s²	BS	N
IEC 60068-2-11: 2021	Industrial electrical products	Environmental testing – Part 2-11: Tests – Test Ka: Salt mist	Salt concentration: (5 ± 1) % Exposure Zone: (35 ± 2) °C	SF-2	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
KS C IEC 60529:2013	Industrial electrical products	Degrees of protection provided by enclosures (IP Code): 14.2.9 Test for second characteristic numeral 9 with high pressure and temperature water jet	Water, Dust: IPX1 to IPX8 IP1X to IP6X	SF-2	N
IEC 60529:2013	Industrial electrical products	Degrees of protection provided by enclosure (IP Code) <Exception> 14.2.9 Test for second characteristic numerals 9with the drip box	Water, Dust: IPX1 to IPX8 IP1X to IP6X	SF-2	N
ISO 20653:2023	Automobiles and related products	Road vehicles – Degrees of protection (IP Code) – Protection of electrical equipment against foreign objects, water and access <Exception> IPX4K, IPX9K	Water, Dust: IP1X to IP6X IPX1 to IPX8	SF-2	N
MIL-STD-810D:1983	Industrial electrical products	Environmental test method and engineering guidelines 509.3 salt Fog	Temperature: 35 °C NaCl: 5 %	SF-2	N
MIL-STD-810E:1989	Industrial electrical products	Environmental test method and engineering guidelines 509.3 salt Fog	Temperature: 35 °C NaCl: 5 %	SF-2	N
MIL-STD-810G:2008	Industrial electrical products	Environmental engineering considerations and laboratory tests 509.5 Salt Fog	Temperature: 35 °C NaCl: 5 %	SF-2	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
MIL-STD-810G w/Change 1:2014	Industrial electrical products	Environmental engineering considerations and laboratory tests 509.6 Salt Fog	Temperature: 35 °C NaCl: 5 %	SF-2	N
RTCA DO-160G:2010	Aerospace products and related products	Environmental Conditions and Test Procedures for Airborne Equipment Section14.0 salt Spray (salt Fog) Section10.0 Water proofness	Temperature: 35 °C NaCl: 5 % Water proofness: 280 L/m²/h	SF-2	N
MIL-STD-810F NOTICE 3:2003	Industrial electrical products	Environmental engineering considerations and laboratory tests 509.4 Salt Fog	Temperature: 35 °C NaCl: 5 %	SF-2	N
KS C IEC 60068-2-52:2017	Industrial electrical products	Environmental testing — Part 2-52: Tests - Test Kb: Salt mist, cyclic (sodium chloride solution)	NaCl: 5 % Temperature: (23 ~ 55) °C Humidity: (45 ~ 95) % R.H.	SF-2	N
IEC 60068-2-52: 2017	Industrial electrical products	Environmental testing – Part 2-52 Tests – Test Kb: Salt mist, cyclic (sodium chloride solution) <Exception> Test methods 8	Temperature: 35 °C NaCl: 5 % Storage: (23 ~ 55) °C, (45 ~ 95) % R.H.	SF-2	N
IEC 60571:2012	Railroad vehicles and related products	Railway applications-Electronic equipment used on rolling stock 12.2.11 salt mist test	Temperature: 35 °C NaCl: 5 %	SF-2	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
MIL-STD-810F:2000	Industrial electrical products	Environmental engineering considerations and laboratory tests 509.4 Salt Fog	Temperature: 35 °C NaCl: 5 %	SF-2	N
MIL-STD-810H:2019	Industrial electrical products	Environmental engineering consideration and laboratory tests 509.7 Salt Fog	Temperature: 35 °C NaCl: 5 %	SF-2	N
EN 50155:2021	Railroad vehicles and related products	Railway applications-Rolling stock-Electronic equipment 13.4.13 salt mist test	Temperature: 35 °C NaCl: 5 %	SF-2	N
ES 95400-10:2020	Automobiles and related products	Environmental testing for automotive electronic equipment: 6.3.9.1 Salt spray, 16.3.9.1 Salt spray, 26.5.1 Dust test, 6.5.2 Water resistance	NaCl: 5 % Temperature: (23 ~ 55) °C Humidity: (45 ~ 95) % R.H. Water, Dust: IPX1 to IPX8 IP1X to IP6X, R1, R2, S1, S2	SF-2	N
KS C IEC 60068-2-13:2021	Industrial electrical products	Environmental testing - Part 2-13: Tests - Test M: Low air pressure	Altitude: (5 ~ 101.3) kPa	BS	N
KS R 9187:2021	Railroad vehicles and related products	Railway signaling safety components — Shock test methods	Shock acceleration: (0.98 ~ 1 470) m/s²	BS	N
KS C IEC 60068-2-38:2021	Industrial electrical products	Environmental testing - Part 2-38: Tests - Test Z/AD: Composite temperature/humidity cyclic test	Temperature: (-70 ~ 180) °C Humidity: (10 ~ 98) % R.H.	BS	N

Test method	Materials Products	Standard designation	Test range	Site	Field testing
KS C IEC 60068-2-31:2008	Industrial electrical products	Environmental testing — Part 2-31: Tests — Test Ec: Rough handling shocks, primarily for equipment-type specimens	Free fall height: (0.1 ~ 1.5) m	BS	N
KS C IEC 60068-2-30:2005	Industrial electrical products	Environmental testing — Part 2-30: Tests — Test Db: Damp heat, cyclic (12 h + 12 h cycle)	Temperature: (20 ~ 60) °C Humidity: (50 ~ 95) % R.H.	BS	N
KS C IEC 60068-2-78:2012	Industrial electrical products	Environmental testing — Part 2-78: Tests — Test Cab: Damp heat, steady state	Temperature: (25 ~ 45) °C Humidity: (80 ~ 98) % R.H.	BS	N
KS R 9144:2021	Railroad vehicles and related products	Vibration test methods for railway rolling stock parts	Vibration Frequency: (1 ~ 2 000) Hz Vibrationacceleration: (0.98 ~ 980) m/s²	BS	N
KS R 9186:2021	Railroad vehicles and related products	Railway signaling safety components — Vibration test methods	Vibration Frequency: (1 ~ 2 000) Hz acceleration: (0.98 ~ 980) m/s²	BS	N
KS C IEC 60068-2-66:1994	Industrial electrical products	Environmental testing — Part 2-66: Test methods — Damp heat, steady state (unsaturated pressurized vapour)	Max: 150 °C Humidity: (80 ~ 95) % R.H	BS	N
KS C IEC 60068-2-27:2008	Industrial electrical products	Environmental testing — Part 2-27: Tests — Test Ea and guidance: Shock	Shock acceleration: (0.98 ~ 1 470) m/s²	BS	N

No. KT689

Test method	Materials Products	Standard designation	Test range	Site	Field testing
KS C IEC 60068-2-57:2013	Industrial electrical products	Environmental testing — Part 2-57: Tests — Test Ff: Vibration — Time-history and sine-beat method	Vibration Frequency: (4 ~ 2 000) Hz acceleration: (0.98 ~ 980) m/s²	BS	N
KS C IEC 60068-2-11:2021	Industrial electrical products	Environmental testing — Part 2-11: Tests - Test Ka: Salt mist	Temperature range: (35 ± 2) °C NaCl: (5 ± 1) %	SF-2	N
ST/SG/AC.10/11/Rev.8 Amend.1:2025	Electrical materials and components	Electrical materials and components	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (4 ~ 2 000) Hz Acceleration: (0.98 ~ 1 470) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N
ST/SG/AC.10/11/Rev.8:2023	Electrical materials and components	Electrical materials and components	Altitude: (5 ~ 101.3) kPa Temperature: (-70 ~ 180) °C Humidity: (40 ~ 95) % R.H. Frequency: (4 ~ 2 000) Hz Acceleration: (0.98 ~ 1 470) m/s² Free fall height: (0.1 ~ 1.5) m	BS	N

END.