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 : December 11, 2025

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 dae ji

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 |
|---|---|---|---|---|---|
| ANSI/CAN/UL 9540:2023 | Electrical materials and components | Energy Storage Systems and Equipment<br>(Exception)<br>36. Electromagnetic Immunity Test<br>37. Containment of Moving parts<br>39. Strength Test<br>41.4 Installation in seismic environments<br>42.3 Check of safety controls<br>43. Mechanical Production Test<br>44. Production Quality Control | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | 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<br>(Exception)<br>10. Installation Level | Peak heat release rate : (0 ~ 5) MW<br>Heat release rate : (0 ~ 5) MW<br>Light transmission : (0 ~ 100) %<br>Total hydrocarbon : (0 ~ 5 000) ppm<br>Hydrogen : (0 ~ 5) % | SF-1 | N |

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| 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<br>(Exception)<br>10. Installation Level | Peak heat release rate :<br>(0 ~ 5) MW<br>Heat release rate : (0 ~ 5) MW<br>Light transmission : (0 ~ 100) %<br>Total hydrocarbon : (0 ~ 5 000) ppm<br>Hydrogen : (0 ~ 5) % | SF-1 | N |
| ANSI/CAN/UL-1973:2018 | Electrical materials and components | Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications<br>(Exception)<br>25. Vibration Test (LER Motive Applications)<br>26. Shock Test (LER Motive Applications)<br>27. Crush Test (LER Motive Applications)<br>33. Pressure Release Test<br>34. Start-To-Discharge Test<br>35. Thermal Cycling Test (LER Motive Applications)<br>36. Resistance to Moisture Test<br>37. Salt Fog Test<br>38. External Fire Exposure Test | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |

| 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)<br>27. Crush Test (LER Motive Applications)<br>33. Pressure Release Test<br>34. Start-To-Discharge Test<br>36. Resistance to Moisture Test<br>37. Salt Fog Test<br>38. External Fire Exposure Test | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

Uncontrolled

| 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)<br>27. Electromagnetic Immunity Tests<br>28. Vibration Test (LER Motive and VAP Applications)<br>29. Shock Test (LER Motive and VAP Applications)<br>30. Crush Test (LER Motive and VAP Applications)<br>36. Pressure Release Test<br>37. Start-To-Discharge Test<br>38. Thermal Cycling Test (LER Motive and VAP Applications)<br>39. Resistance to Moisture Test<br>40. Salt Fog Test<br>41. External Fire Exposure for Projectile Hazards Test<br>Annex B (Normative) Test program for sodium-beta battery cells<br>Annex E (Normative) Cell Test Program | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |

| 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)<br>30. Crush Test (LER Motive and VAP Applications)<br>36. Pressure Release Test<br>37. Start-To-Discharge Test<br>39. Resistance to Moisture Test<br>40. Salt Fog Test<br>41. External Fire Exposure for Projectile Hazards Test | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| ANSI/CAN/UL/ULC 2271:2018 | Electrical materials and components | Batteries for Use In Light Electric Vehicle (LEV) Applications (Exception)<br>30 Vibration Endurance Test<br>31 Shock Test<br>32 Crush Test<br>36 Roll Over Test<br>39 Water Exposure Test<br>40 Thermal Cycling Test | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |

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| 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)<br>32 Crush Test<br>36 Roll Over Test<br>39 Water Exposure Test | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| ANSI/CAN/UL/ULC 2271:2023 | Electrical materials and components | Batteries for Use In Light Electric Vehicle (LEV) Applications (Exception)<br>30 Vibration Endurance Test<br>31 Shock Test<br>32 Crush Test<br>36 Roll Over Test<br>39 Water Exposure Test<br>40 Thermal Cycling Test | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |
| ANSI/CAN/UL/ULC 2271:2023 | Electrical materials and components | Batteries for Use In Light Electric Vehicle (LEV) Applications (Exception)<br>32 Crush Test<br>36 Roll Over Test<br>39 Water Exposure Test | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| DNV-RU-SHIP Pt.6 Ch.2. Edition July 2021 | Electrical materials and components | Part 6 Additional class notations<br>Chapter 2 Propulsion, power generation and auxiliary systems<br>(Exception)<br>Section 2~13<br>Section 1<br>external short circuit<br>impact<br>thermal abuse<br>forced discharge<br>pressure test of coolant piping/hoses<br>5 Electrochemical capacitor system and installations | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |
| DNV-RU-SHIP Pt.6 Ch.2. Edition July 2021 | Electrical materials and components | Part 6 Additional class notations<br>Chapter 2 Propulsion, power generation and auxiliary systems<br>(Exception)<br>Section 2~13<br>Section 1<br>pressure test of coolant piping/hoses<br>5 Electrochemical capacitor system and installations | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| EN 60695-10-2: 2014 | Electrical materials and components | Fire hazard testing - Part 10-2: Abnormal heat - Ball pressure test method | R = 2.5 mm, 20 N<br>(50 ~ 200) ℃ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | 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 | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN 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<br>(Exception)<br>7.3.9 Design evaluation - Forced internal short-circuit (cells) | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| EN 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN 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) | (0 ~ 1 500) Vd.c., (0 ~ 1 000) Ad.c., (-40 ~ 80) ℃ | 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 | (0 ~ 500) V d.c., (0 ~ 800) A d.c., (-70 ~ 180) ℃ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| 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 | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |
| EN 62660-1:2019 | Electrical materials and components | Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 1: Performance testing | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| EN 62660-3:2016 | Electrical materials and components | Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 3: Safety requirements (Exception)<br>6.4.4 Internal short circuit test | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| EN IEC 60086-4:2019 | Electrical materials and components | Primary batteries - Part 4: Safety of lithium batteries | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

Uncont

| 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<br>(Exception)<br>7.2.1 External short-circuit test (cell or cell block)<br>7.2.2 Impact test (cell or cell block)<br>7.2.4 Thermal abuse test (cell or cell block)<br>7.2.5 Overcharge test (cell or cell block)<br>7.2.6 Forced discharge test (cell or cell block)<br>7.3.2 Internal short-circuit test (cell) | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | 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<br>(Exception)<br>6.4.4 Internal short circuit test<br>Annex C Alternative internal short-circuit test(6.4.4.2.2) | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

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| 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<br>(Exception)<br>7.3 Casing material of a battery system that can be transported for installation or maintenance | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | 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<br>(Exception)<br>7.3 Casing material of a battery system that can be transported for installation or maintenance | (0 ~ 1 500) V d.c.,<br>(0 ~ 1 000) A d.c.,<br>(-40 ~ 180) ℃ | SF-1 | N |

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| 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) 7.1.11 Crush [reasonably foreseeable misuse] | (0 ~ 500) V d.c., (0 ~ 800) A d.c., (-70 ~ 180) ℃ | BS | N |

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| 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)<br>7.1.3 Mechanical shock [intended use]<br>7.1.4 Vibration [intended use]<br>7.1.5 Thermal cycling [intended use]<br>7.1.10 Thermal abuse [reasonably foreseeable misuse]<br>7.1.11 Crush [reasonably foreseeable misuse]<br>7.2.4 Vibration [intended use]<br>7.2.10 Thermal abuse [reasonably foreseeable misuse] | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |
| IEC 60086-4:2019, Edition 5.0 | Electrical materials and components | Primary batteries - Part 4: Safety of lithium batteries | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| IEC 60695-10-2 :2014, Edition 3.0 | Electrical materials and components | Fire hazard testing - Part 10-2: Abnormal heat - Ball pressure test method | R = 2.5 mm, 20 N<br>(50 ~ 200) ℃ | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 61960-3:2017, Edition 1.0 | 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 | (0 ~ 1 500) Vd.c., (0 ~ 1 000) Ad.c., (-40 ~ 80) ℃ | SF-1 | N |
| IEC 61960-3:2017, Edition 1.0 | 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 | (0 ~ 500) V d.c., (0 ~ 800) A d.c., (-70 ~ 180) ℃ | BS | N |
| IEC 61960-4:2020, Edition 1.0 | 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 | (0 ~ 500) V d.c., (0 ~ 800) A d.c., (-70 ~ 180) ℃ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 61960:2011, Edition 2.0 | Electrical materials and components | Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for portable applications | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| IEC 62133-1:2017, Edition 1.0 | 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| IEC 62133-2:2017, Edition 1.0 | 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<br>(Exception)<br>7.3.9 Design evaluation - Forced internal short-circuit (cells) | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| 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<br>(Exception)<br>7.3.9 Design evaluation - Forced internal short-circuit (cells) | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| IEC 62133:2012, Edition 2.0 | 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<br>(Exception)<br>8.3.9 Design evaluation - Forced internal short-circuit (cells) | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 62619:2017, Edition 1.0 | 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| IEC 62619:2017, Edition 1.0 | 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<br>(Exception)<br>7.2.1 External short-circuit test (cell or cell block)<br>7.2.2 Impact test (cell or cell block)<br>7.2.4 Thermal abuse test (cell or cell block)<br>7.2.5 Overcharge test (cell or cell block)<br>7.2.6 Forced discharge test (cell or cell block)<br>7.3.2 Internal short-circuit test (cell) | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 62619:2022, Edition 2.0 | 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| IEC 62619:2022, Edition 2.0 | 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<br>(Exception)<br>7.2.1 External short-circuit test (cell or cell block)<br>7.2.2 Impact test (cell or cell block)<br>7.2.4 Thermal abuse test (cell or cell block)<br>7.2.5 Overcharge test (cell or cell block)<br>7.2.6 Forced discharge test (cell or cell block)<br>7.3.2 Internal short-circuit test (cell) | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 62620:2014, Edition 1.0 | 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| IEC 62620:2014, Edition 1.0 | 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 | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |
| IEC 62660-1:2010 | Electrical materials and components | Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 1: Performance testing | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | 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)<br>6.4.4 Internal short circuit test | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| IEC 62660-3:2022, Edition 2.0 | Electrical materials and components | Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 3: Safety requirements (Exception)<br>6.4.4 Internal short circuit test<br>Annex C Alternative internal short-circuit test(6.4.4.2.2) | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

No. KT689

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 63056:2020, Edition 1.0 | 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<br>(Exception)<br>7.3 Casing material of a battery system that can be transported for installation or maintenance | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |
| IEC 63056:2020, Edition 1.0 | 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<br>(Exception)<br>7.3 Casing material of a battery system that can be transported for installation or maintenance | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

No. KT689

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 63057:2020, Edition 1.0 | 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] | (0 ~ 500) V d.c., (0 ~ 800) A d.c., (-70 ~ 180) ℃ | BS | N |

Uncontrolled

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 63057:2020, Edition 1.0 | 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)<br>7.1.3 Mechanical shock [intended use]<br>7.1.4 Vibration [intended use]<br>7.1.5 Thermal cycling [intended use]<br>7.1.10 Thermal abuse [reasonably foreseeable misuse]<br>7.1.11 Crush [reasonably foreseeable misuse]<br>7.2.4 Vibration [intended use]<br>7.2.10 Thermal abuse [reasonably foreseeable misuse] | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |

No. KT689

| 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) | (0 ~ 500) V d.c., (0 ~ 800) A d.c., (-70 ~ 180) ℃ | BS | N |
| KC 10031:2023 (10.19.2023.) | Electrical materials and components | Safety requirements for lithium secondary batteries for reuse of spent batteries | (0 ~ 1 500) Vd.c., (0 ~ 1 000) Ad.c., (-40 ~ 80) ℃ | SF-1 | N |
| KC 62133-2 (2020-07) | 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) | (0 ~ 500) V d.c., (0 ~ 800) A d.c., (-70 ~ 180) ℃ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KC 62619 (2019-10) | 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 | (0 ~ 500) V d.c., (0 ~ 800) A d.c., (-70 ~ 180) ℃ | BS | N |
| KC 62619 (2019-10) | Electrical materials and components | 산업용 리튬이차전지 안전<br>(Exception)<br>7.2.1 외부단락 시험<br>7.2.2 충돌 시험<br>7.2.4 고온 시험<br>7.2.5 과충전 시험<br>7.2.6 강제 방전 시험<br>7.3.2 내부단락 시험 | (0 ~ 1 500) Vd.c., (0 ~ 1 000) Ad.c., (-40 ~ 80) ℃ | SF-1 | N |
| KC 62619:2023-03-20 | 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 | (0 ~ 500) V d.c., (0 ~ 800) A d.c., (-70 ~ 180) ℃ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KC 62619:2023 -03-20 | 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)<br>7.2.1 External short-circuit test (cell or cell block)<br>7.2.2 Impact test (cell or cell block)<br>7.2.4 Thermal abuse test (cell or cell block)<br>7.2.5 Overcharge test (cell or cell block)<br>7.2.6 Forced discharge test (cell or cell block)<br>7.3.2 Internal short-circuit test (cell) | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C IEC 60695-10-2:2001 | 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 | R = 2.5 mm, 20 N<br>(50 ~ 200) ℃ | 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 | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | 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) | (0 ~ 1 500) Vd.c., (0 ~ 1 000) Ad.c., (-40 ~ 80) ℃ | 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 | (0 ~ 500) V d.c., (0 ~ 800) A d.c., (-70 ~ 180) ℃ | BS | N |

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| 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 | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |
| 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

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| 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<br>(Exception)<br>7.3 Casing material of a battery system that can be transported for installation or maintenance | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | 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<br>(Exception)<br>7.3 Casing material of a battery system that can be transported for installation or maintenance | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| Ministerial Ordinance 1, Appendix 9:2008 | Electrical materials and components | Technical requirement by the Ministerial Ordinance for electrical appliance Ministerial Ordinance 1, Appendix 9 Lithium ion secondary batteries | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| UL 1642:2015 | Electrical materials and components | Lithium Batteries | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| UL 1642:2020 | Electrical materials and components | Lithium Batteries | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| UL 1642:2022 | Electrical materials and components | Lithium Batteries | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| UL 2054:2011 | Electrical materials and components | Household and Commercial Batteries | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| UL 2054:2021 | Electrical materials and components | Household and Commercial Batteries | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| UL 2580:2022 | Electrical materials and components | Batteries for Use In Electric Vehicles (Exception)<br>34 Rotation Test<br>38 Crush Test<br>40 Salt Spray Test<br>42 External Fire Exposure Test | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | 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)<br>34 Rotation Test<br>38 Crush Test<br>40 Salt Spray Test<br>42 External Fire Exposure Test<br>ANNEX B (NORMATIVE) Test Program for Secondary Lithium Cells<br>ANNEX D (NORMATIVE) Alternative Test Program for Secondary Lithium Cells | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | 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 | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| 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<br>(Exception)<br>7.3.9 Design evaluation - Forced internal short-circuit (cells) | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |
| 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<br>(Exception)<br>8.3.9 Design evaluation - Forced internal short-circuit (cells) | (0 ~ 500) V d.c.,<br>(0 ~ 800) A d.c.,<br>(-70 ~ 180) ℃ | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| MOLIT Notice No.2023-481 (08.22.2023.) | Electrical materials and components | Enforcement regulations on performance and standards for automobiles and automobile parts<br>[Appendix 1] No. 48 Drive Battery Safety Test<br>48.7.4 External short circuit test<br>48.7.5 Overcharge test<br>48.7.6 Overdischarge test<br>48.7.7 Overheating protection Test<br>48.7.9 Immersion test<br><br>[Appendix 1] Article 48-2 Safety test of drive shaft battery of two-wheeled vehicle<br>48 2.7.4 External short circuit test<br>48-2.7.5 Overcharge test<br>48-2.7.6 Overdischarge test<br>48 2.7.7 Overheating protection Test<br>48.2.7.9 Immersion test<br>48.2.7.10 Drop test | (0 ~ 1 500) Vd.c.,<br>(0 ~ 1 000) Ad.c.,<br>(-40 ~ 80) ℃ | SF-1 | N |

## 03. Electrical Testing

03.011 EMC (Electromagnetic Compatibility)

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| ANSI C63.4a:2017 | Electrical materials and components | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz<br>(Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RE: 30 MHz ~ 40 GHz<br>CE: 9 kHz ~30 MHz | BS | N |
| AS/NZS 61000.6.3:2021 | Electrical machinery for industries | Electromagnetic compatibility (EMC)<br>-Part 6.3 : Generic standards -Emission standard for residential, commercial and light -industrial environments<br>(Exception)<br>-(0 kHz ~ 2 kHz) | RE : 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| AS/NZS 61000.6.4:2012 | Electrical machinery for industries | Electromagnetic compatibility (EMC) -Part 6.4 : Generic standards -Emission standard for industrial environments (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase, -(0 kHz ~ 2 kHz) | RE : 30 MHz ~ 6 GHz CE: 150 kHz ~ 30 MHz | BS | N |
| AS/NZS CISPR 11:2017 | Electrical machinery for industries | Industrial, Scientific and medical (ISM) radio frequency equip ment-Electromagnetic disturbance characteristics -Limits and methods of measurement (Exception) 3 phase equipment Equipment input current exceed 16 A per phase | RE: 9 kHz ~ 18 GHz CE: 9 kHz ~ 30 MHz | BS | N |
| AS/NZS CISPR 15:2017 | Lighting devices | Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment (Exception) 7.Method of insertion loss measurement | RE: 9 kHz ~ 300 MHz CE: 9 kHz ~ 30 MHz | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| CISPR 11:2024 | Electrical machinery for industries | Amendment 2 - Industrial scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | RE: 30 MHz ~ 18 GHz<br>CE: 9 kHz ~ 30 MHz | BS | N |
| CISPR 14-1:2020 | Electrical machinery for households | Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission | RE: 9 kHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>DP: 30 MHz ~ 300 MHz | BS | N |
| CISPR 14-2: 2020 | Electrical machinery for households | Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity - Product family standard | ESD: ±8 kV<br>RS: 80 MHz ~ 1 GHz, 3V/m<br>EFT: ±1 kV<br>SURGE: ±2 kV<br>CS: 150 kHz ~ 230 MHz, 3V<br>V-DIP: max 100 % | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| CISPR 15:2018 | Lighting devices | Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment (Exception)<br>7. Method of insertion loss measurement<br>3m,4m loop Antenna test method | RE: 9 kHz ~ 300 MHz<br>CE: 9 kHz ~ 30 MHz | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| CISPR 25:2021 | Electrical materials and components | Vehicles, boats and internal combustion engines-Radio disturbance characteristics- Limits and methods of measurement for the protection of on-board receivers (Exception)<br>5.Measurement of emissions received by an antenna on the same vehicle<br>6.6 Radiated emissions from components/modules-TEM cell methods<br>6.7 Radiated emissions from components/modules -Stripline method<br>Annex I<br>Test methods for shielded power supply systems for high voltages in electric and hybrid vehicles | RE: 150 kHz ~ 2.5 GHz<br>CE(Voltage method)<br>: 150 kHz~108 MHz<br>CE(Current Probe Method)<br>: 150 kHz~108 MHz | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| CISPR 32:2015/ AMD1:2019 | Wired/wireless communication devices | Electromagnetic compatibility of multimedia equipment - Emission requirements (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30MHz | BS | N |
| CISPR 35:2016 | Wired/wireless communication devices | Electromagnetic compatibility of multimedia equipment - Immunity requirements (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | SD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3 V/m<br>EFT: ±1 kV,<br>Surge: ±4 kV<br>CS: 150 kHz ~ 30 MHz, 3V<br>MF: 1 A/m<br>V-DIP: max 100 % | BS | N |
| DNVGL-CG-0339 Edition August 2021 | Electrical materials and components | Environmental test specification for electrical, electronic and programmable equipment and systems (Exception) 14.4 Conducted low frequency immunity test | CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2 GHz, 10 V/m<br>EFT: ±2 kV<br>SURGE: ±1 kV<br>CS: 150 kHz ~ 80 MHz, 10 V/m | BS | N |
| ECE R-10.06:2019 | Electrical materials and components | Uniform provisions concerning the approval of vehicles with regard to electromagnetic | RE : 30 MHz ~ 1 GHz<br>BCI : 20 MHz ~ 80 MHz, 60 mA<br>RI : 80 MHz ~ 2 GHz, 30 V/m | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| | | compatibility (Exception)<br>Annex 4 - Method of measurement of radiated broadband electromagnetic emissions form vehicles<br>Annex 5 - Method of measurement of radiated narrowband electromagnetic emissions from vehicles<br>Annex 6 - Method of testing for immunity of vehicles to electromagnetic radiation Annex 9 - Appendix 1 800 mm Stripline testing<br>Annex 9 - Appendix 2 TEM cell Testing<br>Annex 11 Method(s) of testing for emission of harmonics generated on AC power lines from vehicle<br>Annex 12 Method(s) of testing for emission of voltage changes, voltage fluctuations and flicker on AC power lines from vehicle Annex 13 Method(s) of testing | CTE: 12, 24 V system<br>CTI: Pulse 1, 2a, 2b, 3a, 3b, 4 | | |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| | | for emission of radiofrequency conducted disturbances on AC or DC power lines from vehicles Annex 14 Method(s) of testing for emission of radiofrequency conducted disturbances on network and telecommunication access from vehicles Annex 15 Method of testing for immunity of vehicles to electrical fast transient/burst disturbances conducted along AC and DC power lines Annex 16 Method of testing for immunity of vehicles to surges conducted along AC and DC power lines | | | |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN 50130-4:2011/A1:2014 | Wired/wireless communication devices | Alarm systems - Part 4: Electromagnetic compatibility - Product family standard: Immunity requirements for components of fire, intruder, hold up, CCTV, access control and social alarm systems | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 100 MHz, 10V<br>V-DIP: max 100 % | BS | N |
| EN 50498:2010 | Electrical materials and components | Electromagnetic compatibility (EMC) - Product family standard for aftermarket electronic equipment in vehicles | RE : 30 MHz ~ 1 GHz<br>CTE: 12, 24 V system<br>CTI:Pulse 1, 2a, 2b,3a/3b, 4 | BS | N |
| EN 55011:2016/A1:2017 | Electrical machinery for industries | Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RE: 30 MHz ~ 18 GHz<br>CE: 9 kHz ~ 30 MHz | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN 55032:2015 | Wired/wireless communication devices | Electromagnetic compatibility of multimedia equipment - Emission Requirements (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz | BS | N |
| EN 55035:2017 | Wired/wireless communication devices | Electromagnetic compatibility of multimedia equipment - Immunity requirements (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV,<br>Surge: ±4 kV<br>CS: 150 kHz ~ 30 MHz, 3V<br>MF: 1 A/m<br>V-DIP: max 100 % | BS | N |
| EN 55103-1:2009/A1:2012 | Wired/wireless communication devices | Electromagnetic compatibility - Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use - Part 1: Emissions | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN 55103-2:2009 | Electrical machinery for industries | Electromagnetic compatibility — Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use — Part 2: Immunity | ESD: ± 8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10V/m<br>EFT: ±2 kV<br>SURGE: ±2 kV<br>CS: 150 kHz ~ 230 MHz, 10V<br>M/F: 10 A/m<br>V-DIP: (0 ~ 100) % | BS | N |
| EN 60601-1-2:2015 | Medical devices | Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral Standard: Electromagnetic disturbances - Requirements and tests<br>(Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RE: 0.15 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 10V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 10V<br>V-DIP: max 100 %<br>M/F: 3 A/m | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN 61000-4-2:2009 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | ESD: max ±30 kV | BS | N |
| EN 61000-4-4:2012 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | EFT: max ±4 kV | BS | N |
| EN 61000-4-5:2014 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | SURGE: max ±4 kV | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN 61000-4-8:2010 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | MF: max 30 A/m (Continuous field) | BS | N |
| EN 61204-3:2018 | Electrical materials and components | Low-voltage switch mode power supplies - Part 3: Electromagnetic compatibility (EMC) (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 10V<br>V-DIP: max 100 %<br>MF:30 A/m | BS | N |
| EN 61326-1:2013 | Measuring instruments | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements (Exception)<br>3 phase equipment<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN IEC 55014-1:2021 | Electrical machinery for households | Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission | RE: 9 kHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>DP: 30 MHz ~ 300 MHz | BS | N |
| EN IEC 55014-2:2021 | Electrical machinery for households | Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity - Product family standard | ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV<br>SURGE: ±2 kV<br>CS: 150 kHz ~ 230 MHz, 3V<br>V-DIP: max 100 % | BS | N |
| EN IEC 55015:2019/A11:2020 | Lighting devices | Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment (Exception)<br>7. Method of insertion loss measurement<br>3m,4m loop Antenna test method | RE: 9 kHz ~ 1 000 MHz<br>CE: 9 kHz ~ 30 MHz | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN IEC 61000-4-11:2020 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase | V-DIP: max 100 % | BS | N |
| EN IEC 61000-4-3:2020 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RS: 80 MHz ~ 6 GHz, 10 V/m | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN IEC 61000-4-6:2023 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields<br>(Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | CS: 150 kHz ~ 230 MHz, 10 V | BS | N |
| EN IEC 61000-6-1:2019 | Electrical machinery for households | Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments<br>(Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3 V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 3 A/m | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN IEC 61000-6-2:2019 | Electrical machinery for industries | Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 10V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 10V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |
| EN IEC 61000-6-3:2021 | Electrical machinery for households | Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments (Exception)<br>-(0 kHz ~ 2 kHz) | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz | BS | N |
| EN IEC 61000-6-4:2019 | Electrical machinery for industries | Electromagnetic compatibility (EMC) - Part 6-4: Generic standards<br>- Emission standard for industrial environments (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN IEC 61326-1:2021 | Measuring instruments | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-1:Particular requirements - Test configurations, operational conditions and performance criteria for sensitive test and measurement equipment for EMC unprotected applications | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |
| EN IEC 61326-2-1:2021 | Measuring instruments | Electrical equipment for measurement, control and laboratory use — EMC requirements — Part 2-1: Particular requirements — Test configurations, operational conditions and performance criteria for sensitive test and measurement equipment for EMC unprotected applications<br>(Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN IEC 61326-2-2:2021 | Wired/wireless communication devices | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-2: Particular requirements - Test configurations, operational conditions and performance criteria for portable test, measuring and monitoring equipment used in low-voltage distribution systems (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |
| EN IEC 61326-2-3:2021 | Measuring instruments | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3:Particular requirements-Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN IEC 61326-2-4:2021 | Measuring instruments | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-4: Particular requirements - Test configurations, operational conditions and performance criteria for insulation monitoring devices according to IEC 61557-8 and for equipment for insulation fault location according to IEC 61557-9 | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |
| EN IEC 61326-2-5:2021 | Measuring instruments | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-5: Particular requirements - Test configurations, operational conditions and performance criteria for field devices with field bus interfaces according to IEC 61784-1 | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN IEC 61326-2-6:2021 | Measuring instruments | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-6: Particular requirements - In vitro diagnostic (IVD) medical equipment | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 3 A/m | BS | N |
| EN IEC 61547:2023 | Lighting devices | Equipment for general lighting purposes - EMC immunity requirements (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | ESD: ±15 kV<br>RS: 80 MHz~1 GHz, 3 V/m<br>EFT: ±1 kV<br>Surge: ±4 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 3 A/m | BS | N |
| EN IEC 62040-2:2018 | Electrical materials and components | Uninterruptible power systems (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RE: 9 kHz ~ 1 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 1 GHz, 10V/m<br>EFT: ±4 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 10V<br>M/F: 30 A/m<br>V-DIP: max 100 % | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| ETSI EN 300 386 V2.2.1(2022-09) | Wired/wireless communication devices | Electromagnetic compatibility and Radio Spectrum Matters (ERM) : Telecommunication network equipment Electromagnetic compatibility (EMC) requirements | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 10V/m<br>EFT: ±1 kV<br>SURGE: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3V<br>V-DIP: max 100 % | BS | N |
| ETSI EN 301 489-1 V2.2.3 (2019-11) | Wired/wireless communication devices | ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3V<br>V-DIP: max 100 % | BS | N |
| ETSI EN 301 489-17 V3.2.4 (2020-09) | Wired/wireless communication devices | ElectroMagnetic Compatibility (EMC) standard for radio equipment and services;<br>Part 17: Specific conditions for Broadband Data Transmission Systems;<br><br>Harmonised Standard for ElectroMagnetic Compatibility | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3V<br>V-DIP: max 100 % | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| ETSI EN 301 489-19 V2.2.1 (2022-09) | Wired/wireless communication devices | ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 19: Specific conditions for Receive Only Mobile Earth Stations (ROMES) operating in the 1,5 GHz band providing data communications and GNSS receivers operating in the RNSS band (ROGNSS) providing positioning, navigation, and timing data; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3V<br>V-DIP: max 100 % | BS | N |
| ETSI EN 301 489-3 V2.3.2 (2023-01) | Wired/wireless communication devices | Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3V<br>V-DIP: max 100 % | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| ETSI EN 301 489-5 V2.2.1 (2019-04) | Wired/wireless communication devices | ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 5: Specific conditions for Private land Mobile Radio (PMR) and ancillary equipment (speech and non-speech) and Terrestrial Trunked Radio (TETRA); Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3V<br>V-DIP: max 100 % | BS | N |
| ETSI EN 301 489-50 V2.3.1 (2021-03) | Wired/wireless communication devices | ElectroMagnetic Compatibility (EMC) standard for radio equipment and services;<br>Part 50: Specific conditions for Cellular Communication Base Station (BS), repeater and ancillary equipment;<br>Harmonised Standard for ElectroMagnetic Compatibility | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3V<br>V-DIP: max 100 % | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| ETSI EN 301 489-52 V1.2.1 (2021-11) | Wired/wireless communication devices | Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 52: Specific conditions for Cellular Communication Mobile and portable (UE) radio and ancillary equipment; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3V<br>V-DIP: max 100 % | BS | N |
| ETSI EN 301 489-9 V2.1.1 | Wired/wireless communication devices | (EMC) standard for radio equipment and services; Part 9: Specific conditions for wireless microphones, similar Radio Frequency (RF) audio link equipment, cordless audio and in-ear monitoring devices | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3V<br>V-DIP: max 100 % | BS | N |
| FCC PART 15:2018 | Wired/wireless communication devices | Radio frequency devices Subpart B-Unintentional Radiators | RE: 30 MHz ~ 40 GHz<br>CE: 150 kHz ~ 30 MHz | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| FCC PART 18:2018 | Electrical machinery for industries | Industral, scientific and medical equipment (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase, | RE: 9 kHz ~ 40 GHz CE: 9 kHz ~ 30 MHz | BS | N |
| ICES-001 Issue 5:2020 | Electrical machinery for industries | Spectrum Management and Telecommunications Interference - Causing Equipment Standard Industrial, scientific and medical radio-frequency Generators | RE: 30 MHz ~ 6 GHz CE: 9 kHz ~ 30 MHz | BS | N |
| ICES-003 Issue 7:2020 | Wired/wireless communication devices | Spectrum Management and Telecommunications Interference-Causing Equipment Standard Digital Apparatus | RE: 30 MHz ~ 6 GHz CE: 9 kHz ~ 30 MHz | BS | N |
| IEC 60571:2012 | Electrical materials and components | Railway applications - Electronic equipment used on rolling stock (Accept only) -12.2.7 Supply over voltage -12.2.8 electrostatic discharge(ESD) and transient burst susceptibility test -12.2.9 Radio frequency test | ESD: ±30 kV RS:80 MHz ~ 6 GHz, 10 V/m EFT: ±4 kV | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 60601-1-2: 2014 | Medical devices | Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral Standard: Electromagnetic disturbances - Requirements and tests<br>(Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RE: 0.15 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 10V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 10V<br>V-DIP: max 100 %<br>M/F: 3 A/m | BS | N |
| IEC 61000-4-11 :2020 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase | V-DIP: max 100 % | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 61000-4-2: 2008 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | ESD: max ±30 Kv | BS | N |
| IEC 61000-4-3: 2020 | Electrical materials and components | Amendment 2 - Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | RS: 80 MHz ~ 6 GHz, 10 V/m | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 61000-4-4: 2012 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | EFT: max ±4 kV | BS | N |
| IEC 61000-4-5: 2014/AMD1:2017 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | SURGE: max ±4 kV | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 61000-4-6: 2023 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields<br>(Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | CS: 150 kHz ~ 230 MHz, 10 V | BS | N |
| IEC 61000-4-8: 2009 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test<br>(Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | MF: max 30 A/m (Continuous field) | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 61000-6-1: 2016 | Electrical machinery for households | Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity standard for residential, commercial and light-industrial environments (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3 V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 3 A/m | BS | N |
| IEC 61000-6-2: 2016 | Electrical machinery for industries | Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 10V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 10V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |
| IEC 61000-6-3: 2020 | Electrical machinery for households | Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for equipment in residential environments | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 61000-6-4: 2018 | Electrical machinery for industries | Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments<br>(Exception)<br>3 phase equipment Equipment input current exceed 16 A per phase<br>(Exception)<br>-(0 kHz ~ 2 kHz) | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz | BS | N |
| IEC 61326-1:2020 RLV | Measuring instruments | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |
| IEC 61326-2-1: 2020 | Measuring instruments | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1:General requirements | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 61326-2-2: 2020 | Measuring instruments | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-2:Particular requirements - Test configuration, operational conditions and performance criteria for portable test, measuring and monitoring equipment used in low-voltage distribution systems | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |
| IEC 61326-2-3: 2020 | Measuring instruments | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3:Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning<br>(Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 61326-2-4: 2020 | Measuring instruments | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-4:Particular requirements-Test configuration, operational conditions and performance criteria for insulation monitoring devices according to IEC 61557-8 and for equipment for insulation fault location according to IEC 61557-9 | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |
| IEC 61326-2-5: 2020 | Measuring instruments | Electrical equipment for Measurement, control and laboratory use - EMC requirements - Part 2-5: Particular requirements - Test configuration, operational conditions and performance criteria for field devices with field bus interfaces according to IEC 61784-1 | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 61326-2-6: 2020 | Measuring instruments | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-6:Particular requirements - In vitro diagnostic (IVD) medical equipment | RE: 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 2.7 GHz, 10 V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 3 A/m | BS | N |
| IEC 61547:2020 | Lighting devices | Equipment for general lighting purposes. EMC immunity requirements | ESD: ±8 kV<br>RS: 80 MHz~1 GHz, 3 V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 3 A/m | BS | N |
| IEC 62233:2005 | Electrical machinery for households | Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure | 1 kHz ~ 400 kHz | BS | N |
| IEC 62236-1:2018 | Electrical materials and components | Railway applications - Electromagnertic compatibility - Part 1: General | General | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 62236-3-2: 2018 | Electrical materials and components | Railway applications - Electromagnertic compatibility - Part 3-2: Rolling stock - Apparatus (Exception)<br>THD: 50 Hz ~ 2 kHz | CE: 150 kHz ~ 30 MHz<br>RE: 30 MHz ~ 6 000 MHz<br>ESD: ±8 kV<br>RS: 20 V/m (80 MHz ~ 800 MHz)<br>20 V/m (800 MHz ~ 1 000 MHz)<br>10 V/m (1 400 MHz ~ 2 000 MHz)<br>5 V/m (2 000 MHz ~ 2 700 MHz)<br>3 V/m (5 100 MHz ~ 6 000 MHz)<br>EFT: ±2 kV<br>SURGE: ±2 kV<br>CS:10 V (150 kHz ~ 80 MHz) | BS | N |
| IEC 62236-4:2018 | Electrical materials and components | Railway applications - Electromagnertic compatibility - Part 4: Emission and immunity of the signalling and telecommunications apparatus (Exception)<br>PFM: 300 A/m | CE: 150 kHz ~ 30 MHz<br>RE: 30 MHz ~ 6 000 MHz<br>ESD: ±8 kV<br>RS: 10 V/m (80 MHz ~ 800 MHz)<br>20 V/m (800 MHz ~ 1 000 MHz)<br>10 V/m (1 400 MHz ~ 2 000 MHz)<br>5 V/m (2 000 MHz ~ 2 700 MHz)<br>3 V/m (5 100 MHz ~ 6 000 MHz)<br>EFT: ±2 kV<br>SURGE: ±2 kV<br>CS:10 V (150 kHz ~ 80 MHz) | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 62236-5:2018 | Electrical materials and components | Railway applications - Electromagnertic compatibility - Part 5: Emission and immunity of fixed power supply installations and apparatus (Exception)<br>RE: 30 MHz ~ 6 000 MHz<br>PFM: 300 A/m<br>Damped oscillatory voltage(oscillatory waves): ±2 | CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 10 V/m (80 MHz ~ 800 MHz)<br>20 V/m (800 MHz ~ 1 000 MHz)<br>10 V/m (1 400 MHz ~ 2 000 MHz)<br>5 V/m (2 000 MHz ~ 2 700 MHz)<br>3 V/m (5 100 MHz ~ 6 000 MHz)<br>EFT: ±4 kV<br>SURGE: ±4 kV<br>CS: 10 V (150 kHz ~ 80 MHz)<br>5 kV | BS | N |
| ISO 10605:2023 | Electrical materials and components | Road vehicles — Test methods for electrical disturbances from electrostatic discharge | ESD: ±30 kV | BS | N |
| ISO 11452-1:2015 | Electrical materials and components | Road vehicles - Component test methods for electrical disturbances from narrowband radiated electromagnetic energy<br>Part 1: General principles and terminology | General | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| ISO 11452-2:2019 | Electrical materials and components | Road vehicles - Component test methods for electrical disturbances from narrowband radiated electromagnetic energy - Part 2: Absorber-lined shielded enclosure (Exception) 8. The setup for DUT powered by a shielded power system | RI : 80 MHz ~ 2 GHz, 25 V/m | BS | N |
| ISO 11452-4:2020 | Electrical materials and components | Road vehicles-Component test methods for electrical disturbances from narrowband radiated electromagnetic energy Part4:Harness excitation methods (Exception) 8. The setup for DUT powered by a shielded power system | BCI : 20 MHz ~ 80 MHz, 60 mA | BS | N |
| ISO 16750-1:2023 | Electrical materials and components | Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 1: General | General | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| ISO 16750-2:2023 | Electrical materials and components | Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 2: Electrical loads | 12 V, 24 V System | BS | N |
| ISO 7637-1:2023 | Electrical materials and components | Road vehicles — Electrical disturbances from conduction and coupling — Part 1: Definitions and general considerations | General | BS | N |
| ISO 7637-2:2011 | Electrical materials and components | Road vehicles-Electrical disturbances from conduction and coupling Part 2:Electrical transient conduction along supply lines only | 12 V, 24 V System Pulse 1, 2a, 2b, 3a, 3b | BS | N |
| ISO 7637-3:2016 | Electrical materials and components | Road vehicles - Electrical disturbances from conduction and coupling Part 3:Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines | 12 V, 24 V, 42 V System Pulse a, b | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C 9040-2:2017 | Electrical materials and components | Uninterruptible power systems (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RE: 9 kHz ~ 1 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 1 GHz, 10V/m<br>EFT: ±4 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 10V<br>M/F: 30 A/m<br>V-DIP: max 100 % | BS | N |
| KS C 9547:2020 | Lighting devices | Equipment for general lighting purposes - EMC immunity requirements (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | ESD : ±8 kV<br>RS: 80 MHz ~ 1 GHz, 3 V/m<br>EFT : ±1 kV<br>SURGE : ±2 kV<br>CS : 150 kHz ~ 80 MHz, 3 V<br>M/F : 3 A/m<br>V-DIP : max 100 % | BS | N |
| KS C 9610-4-11 :2020 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | V-DIP: max 100 % | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C 9610-4-2:2017 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | ESD: ±30 kV | BS | N |
| KS C 9610-4-3:2017 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | RS: 80 MHz ~ 6 GHz, 10 V/m | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C 9610-4-4:2020 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | EFT: max ±4 kV | BS | N |
| KS C 9610-4-5:2023 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | SURGE: max ±4 kV | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C 9610-4-6:2020 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields<br>(Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | CS: 150 kHz ~ 230 MHz, 10 V | BS | N |
| KS C 9610-4-8:2017 | Electrical materials and components | Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test<br>(Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | MF: max 30 A/m (Continuous field) | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C 9610-6-1:2019 | Electrical machinery for households | Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3 V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3 V<br>V-DIP: max 100 %<br>M/F: 3 A/m | BS | N |
| KS C 9610-6-2:2019 | Electrical machinery for industries | Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 10 V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 10V<br>V-DIP: max 100 %<br>M/F: 30 A/m | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C 9610-6-3:2023 | Electrical machinery for industries | Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | RE: 30 MHz ~ 6 GHz CE: 150 kHz ~ 30 MHz | BS | N |
| KS C 9610-6-4:2022 | Electrical machinery for industries | Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments (Exception) -3 phase equipment -Equipment input current exceed 16 A per phase | RE: 30 MHz ~ 18 GHz CE: 150 kHz ~ 30 MHz | BS | N |
| KS C 9811:2019 | Electrical machinery for industries | Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement (Exception) -6.2.2 types 2 of 30 m measurement method | RE: 30 kHz ~ 6 GHz CE: 9 kHz ~ 30 MHz | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C 9814-1:2022 | Electrical machinery for households | Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission | RE: 30 MHz ~ 6 GHz<br>CE : 9 kHz ~ 30 MHz | BS | N |
| KS C 9814-2:2022 | Electrical machinery for households | Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity - Product family standard | ESD : ±30 kV<br>RS : 80 MHz ~ 6 GHz, 10 V/m<br>EFT : ±2 kV<br>SURGE : ±2 kV<br>CS : 150 kHz ~ 230 MHz, 3 V<br>M/F : 10 A/m<br>V-DIP : max 100 % | BS | N |
| KS C 9815:2023 | Lighting devices | Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment (Exception)<br>7. Method of insertion loss measurement | RE: 9 kHz ~ 1 000 MHz<br>CE: 9 kHz ~ 30 MHz | BS | N |
| KS C 9832:2023 | Wired/wireless communication devices | Electromagnetic compatibility of multimedia equipment - Emission Requirements (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C 9835:2019 | Wired/wireless communication devices | Electromagnetic compatibility of multimedia equipment - Immunity requirements (Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | ESD: ± 8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV,<br>Surge: ±4 kV<br>CS: 150 kHz ~ 30 MHz, 3V<br>MF: 1 A/m<br>V-DIP: max 100 % | BS | N |
| KS C 9990:2017 | Electrical materials and components | Electromagnetic compatibility (EMC) test method for automobiles and internal combustion engine driving equipment | RE : 30 MHz ~ 1 GHz<br>BCI: 20 MHz ~ 80 MHz<br>RS: 80 MHz ~ 2 GHz<br>CTE: 12, 24 V system<br>CTI: Pulse 1, 2a, 2b, 3a, 3b, 4 | BS | N |
| KS C IEC 60571:2020 | Electrical materials and components | Railway Applications - Electronic Devices for Railway Vehicles (Only the following items are accepted)<br>-12.2.6 Electrostatic discharge<br>-12.2.7 Transient current vs. autonomy test<br>-12.2.8 Radio Interference Test | ESD: ±30 kV<br>RS:80 MHz ~ 6 GHz, 10 V/m<br>EFT: ±4 kV | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C IEC 60601-1-2:2012 | Medical devices | Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral Standard: Electromagnetic disturbances - Requirements and tests<br>(Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | RE: 0.15 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 10V/m<br>EFT: ±2 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 10V<br>V-DIP: max 100 %<br>M/F: 3 A/m | BS | N |
| KS C IEC 61204-3:2003 | Electrical materials and components | Low-voltage switch mode power supplies - Part 3: Electromagnetic compatibility (EMC)<br>(Exception)<br>-3 phase equipment<br>-Equipment input current exceed 16 A per phase | ESD : ±8 kV<br>RS: 80 MHz ~ 1 GHz, 10 V/m<br>EFT : ±4 kV<br>SURGE : ±2 kV<br>CS : 150 kHz ~ 80 MHz, 10 V<br>M/F : 30 A/m<br>V-DIP : max 100 % | BS | N |
| KS X 3124:2020 | Wired/wireless communication devices | Common EMC test methods for specific low power radio equipment | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3V<br>V-DIP: max 100 % | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS X 3125:2020 | Wired/wireless communication devices | EMC test method for specific low power radio equipmetn | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3V<br>V-DIP: max 100 % | BS | N |
| KS X 3126:2020 | Wired/wireless communication devices | EMC test methods for specific low power radio equipment for wireless data communication systems | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3V<br>V-DIP: max 100 % | BS | N |
| KS X 3127:2014 | Wired/wireless communication devices | EMC test method for simple radio station equipmetn | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3V<br>V-DIP: max 100 % | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS X 3130:2014 | Wired/wireless communication devices | EMC Test Methods for Specific Low Power Radio Equipment for Transmission of Audio and Sound Signal | RE: 30 MHz ~ 6 GHz<br>CE: 150 kHz ~ 30 MHz<br>ESD: ±8 kV<br>RS: 80 MHz ~ 6 GHz, 3V/m<br>EFT: ±1 kV<br>Surge: ±2 kV<br>CS: 150 kHz ~ 80 MHz, 3V<br>V-DIP: max 100 % | BS | N |
| VCCI 32-1:2018 | Wired/wireless communication devices | Rules for voluntary control measures-Technical | RE : 30 MHz ~ 6 GHz<br>CE: 9 kHz ~ 30 MHz | BS | N |

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## 03. Electrical Testing

03.014 Environmental and Reliability

| 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<br>6. Vibration tests<br>7. Dry heat test<br>8. Damp heat test<br>9. Cold test<br>12. Insunation test<br>13. High voltage test | Vibration frequency: (2 ~ 100) Hz<br>Vibration acceleration: (1 ~ 50) ㎨<br>Temperature: (-30 ~ 75) ℃<br>Humidity: (50 ~ 95) % R.H.<br>Insulation Resistance: DC (250 ~ 500) V<br>Withstand voltage: Max. 3 000 V a.c. | BS | N |
| EN 50155:2017 | Railroad vehicles and related products | Railway applications-Rolling stock-Electronic equipment<br>13.4.10 salt mist test | Salt : 35 ˚C,<br>Nacl (5 ± 1) % | SF-2 | N |
| EN 50155:2017 | Railroad vehicles and related products | Railway applications-Rolling stock-Electronic equipment<br>13.4.4 Low temperature start-up test<br>13.4.5 Dry heat test<br>13.4.6 :Low temperature storage test<br>13.4.7 Cyclic damp heat test<br>13.4.9 Insulation test<br>13.4.11 Vibration and Shock test | Temperature: (-40 ~ 90) ℃<br>Humidity: (50 ~ 95) % R.H.<br>Vibration frequency: (1 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨<br>Withstand voltage: Max. 3 000 V<br>Insulation resistance: DC 500 V | BS | N |

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| 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<br>13.4.13 salt mist test | Salt : 35 °C,<br>Nacl (5 ± 1) % | SF-2 | N |
| EN 50155:2021 | Railroad vehicles and related products | Railway applications-Rolling stock-Electronic equipment<br>13.4.4 Low temperature start-up test<br>13.4.5 Dry heat test<br>13.4.6 Low temperature storage test<br>13.4.7 Insulation test<br>13.4.8 Cyclic damp heat test<br>13.4.10 Shock and vibration test<br>13.4.12 Rapid temperature variation test | Temperature: (-40 ~ 90) ℃<br>Humidity: (50 ~ 95) % R.H.<br>Vibration frequency: (1 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨<br>Withstand voltage: Max. 3 000 V<br>Insulation resistance: DC 500 V | BS | N |
| EN 60068-2-14: 2009 | Electrical machinery for industries | Environmental Testing - Part2-14: Tests-Test N: Change of temperature (Exception)<br>Test Nc Rapid change of temperature, two-fluid-bath method | Temperature: (-65 ~ 200) ℃ | BS | N |

No. KT689

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| EN 60068-2-1:2007 | Electrical machinery for industries | Environmental Testing - Part2-1: Tests-Test A: Cold | Temperature: (-70 ~ 10) ℃ | BS | N |
| EN 60068-2-2:2007 | Electrical machinery for industries | Environmental Testing - Part2-2: Tests-Test A: Dry heat | Temperature: (25 ~ 150) ℃ | BS | N |
| EN 60068-2-30:2005 | Electrical machinery for industries | Environmental Testing - Part 2-30: Tests - Test Db: Damp heat cyclic(12 h + 12 h cycle) | Temperature: (20 ~ 60) ℃<br>Humidity: (50 ~ 95) % R.H. | BS | N |
| EN 61373:2010 | Railroad vehicles and related products | Railway applications - Rolling stock equipment - Shock and vibration tests | Vibration frequency: (1 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 1 470) ㎨ | BS | N |
| EN IEC 62281:2019 | Electrical materials and components | Safety of primary and secondary lithium cells and batteries during transport | Altitude: (5 ~ 93.3) kPa<br>Temperature: ( -70 ~ 180) ℃<br>Vibration frequency: (4 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨<br>Drop height: (0.1 ~ 1.5)m | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| ES 95400-10:2020 | Automobile and related products | Envrionmental Test of Electronic Device For Vehicle<br>(Exception)<br>6.1.12 EMC Test<br>6.3.9.1 Salt water spray test 1<br>6.3.9.2 Salt water spray test 2<br>6.3.12 Ozone resistance test<br>6.5.1 Dust test<br>6.5.2 Water resistance test | DC voltage: (0 ~ 36) V d.c.,<br>Temperature: (-70 ~ 150) °C<br>Humidity: (50 ~ 95) % R.H.<br>Vibration frequency: (5 ~ 2 000) Hz<br>Vibration acceleratio: (0.98 ~ 980) ㎨<br>Shock acceleration: (0.98 ~ 500) ㎨<br>Drop height: Max 1.5 m | BS | N |
| ES 95400-10:2020 | Automobile and related products | Envrionmental Test of Electronic Device For Vehicle<br>6.3.9.1 Salt water spray test 1<br>6.3.9.2 Salt water spray test 2<br>6.5.1 Dust test<br>6.5.2 Water resistance test | Temperature: (-70 ~ 150) °C<br>Humidity: (50 ~ 95) % R.H.<br>Salt : (40 ± 2) °C, Nacl (5 ± 1) %<br>Storage: (23 ~ 55) °C, (45 ~ 95) % R.H.<br>Dust , Water:<br>IPX1 to IPX8<br>IP1X to IP6X,<br>R1, R2, S1, S2 | SF-2 | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| ES 95400-10:2024 | Automobile and related products | Envrionmental Test of Electronic Device For Vehicle (Exception)<br>6.1.12 Electromagnetic Immunity Test<br>6.3.9.1 Salt Spray Test 1<br>6.3.9.1 Salt Spray Test 2<br>6.3.12 Ozone Resistance Test<br>6.5.1 Dust Test<br>6.5.2 Water Resistance Test | Temperature: (-70 ~ 150) °C<br>Humidity: (50 ~ 95) % R.H.<br>Salt : (40 ± 2) °C, Nacl (5 ± 1) %<br>Storage: (23 ~ 55) °C, (45 ~ 95) % R.H.<br>Dust , Water:<br>IPX1 to IPX8<br>IP1X to IP6X,<br>R1, R2, S1, S2 | SF-3 | N |
| ES 95400-10:2024 | Automobile and related products | Envrionmental Test of Electronic Device For Vehicle (Exception)<br>6.1.12 Electromagnetic Immunity Test<br>6.3.9.1 Salt Spray Test 1<br>6.3.9.1 Salt Spray Test 2<br>6.3.12 Ozone Resistance Test<br>6.5.1 Dust Test<br>6.5.2 Water Resistance Test | Temperature: (-70 ~ 150) °C<br>Humidity: (50 ~ 95) % R.H.<br>Salt : (40 ± 2) °C, Nacl (5 ± 1) %<br>Storage: (23 ~ 55) °C, (45 ~ 95) % R.H.<br>Dust , Water:<br>IPX1 to IPX8<br>IP1X to IP6X,<br>R1, R2, S1, S2 | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| GMW 3172:2015 | Automobile and related products | General specification for electrical/electronic components-Environmental durability<br>9.3.1 Vibration with Thermal cycling<br>9.3.2 Mechanical Shock - Pothole<br>9.3.3 Mechanical Shock - Collision<br>9.3.4 Mechanical Shock - Closure Slam | Temperature: (-50 ~ 180) ℃<br>Vibration frequency: (4 ~ 2 000) Hz<br>Vibration acceleration: (0.98 ~ 980) ㎨<br>Shock acceleration: (0.98 ~ 1 470) ㎨ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| GMW 3172:2018 | Automobile and related products | General specification for electrical/electronic components-Environmental durability<br>9.3.1 Vibration with Thermal cycling<br>9.3.2 Mechanical Shock - Pothole<br>9.3.3 Mechanical Shock - Collision<br>9.3.4 Mechanical Shock - Closure Slam<br>9.4.1 High Temperature Degradation<br>9.4.2 Thermal Shock Air-To-Air(TS)<br>9.4.3 Power Temperature Cycle(PTC)<br>9.4.5 Humid Heat Cyclic(HHC)<br>9.4.6 Humid Heat Constant(HHCO)<br>9.4.9 Minimum Non Operating Temperature | Temperature: (-70 ~ 180) °C<br>Humidity: (10 ~ 95) % R.H.<br>Vibration frequency: (4 ~ 2 000) Hz<br>Vibration acceleration: (0.98 ~ 980) ㎨<br>Shock acceleration: (0.98 ~ 1 470) ㎨ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| GMW 3172:2023 | Automobile and related products | General specification for electrical/electronic components-Environmental durability<br>9.3.1 Vibration with Thermal cycling<br>9.3.2 Mechanical Shock - Pothole<br>9.3.3 Mechanical Shock - Collision<br>9.3.4 Mechanical Shock - Closure Slam<br>9.4.1 High Temperature Degradation<br>9.4.2 Thermal Shock Air-To-Air(TS)<br>9.4.3 Power Temperature Cycle(PTC)<br>9.4.5 Humid Heat Cyclic(HHC)<br>9.4.6 Humid Heat Constant(HHCO)<br>9.4.9 Minimum Non Operating Temperature | Temperature: (-70 ~ 180) °C<br>Humidity: (10 ~ 95) % R.H.<br>Vibration frequency: (4 ~ 2 000) Hz<br>Vibration acceleration: (0.98 ~ 980) ㎨<br>Shock acceleration: (0.98 ~ 1 470) ㎨ | SF-3 | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| GMW 3172:2023 | Automobile and related products | General specification for electrical/electronic components-Environmental durability<br>9.3.1 Vibration with Thermal cycling<br>9.3.2 Mechanical Shock - Pothole<br>9.3.3 Mechanical Shock - Collision<br>9.3.4 Mechanical Shock - Closure Slam<br>9.4.1 High Temperature Degradation<br>9.4.2 Thermal Shock Air-To-Air(TS)<br>9.4.3 Power Temperature Cycle(PTC)<br>9.4.5 Humid Heat Cyclic(HHC)<br>9.4.6 Humid Heat Constant(HHCO)<br>9.4.9 Minimum Non Operating Temperature | Temperature: (-70 ~ 180) °C<br>Humidity: (10 ~ 95) % R.H.<br>Vibration frequency: (4 ~ 2 000) Hz<br>Vibration acceleration: (0.98 ~ 980) ㎨<br>Shock acceleration: (0.98 ~ 1 470) ㎨ | BS | N |
| IEC 60068-2-11: 2021 | Electrical machinery for industries | Environmental testing - Part 2-11: Tests - Test Ka: Salt mist | Salt concentration: (5 ± 1) %<br>Exposure Zone: (35 ± 2) °C | SF-2 | N |
| IEC 60068-2-13 :2021 | Electrical machinery for industries | Environmental testing - Part 2-13: Tests - Test M: Low air pressure | Altitude: (5 ~ 101.3) kPa | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 60068-2-14 :2009 | Electrical machinery for industries | 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) ℃ | BS | N |
| IEC 60068-2-1: 2007 | Electrical machinery for industries | Environmental testing - Part 2-1: Tests-Test A: Cold | Temperature: (-70 ~ 10) ℃ | BS | N |
| IEC 60068-2-27 :2008 | Electrical machinery for industries | Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock | Shock acceleration: (0.98 ~ 1 470) ㎨ | BS | N |
| IEC 60068-2-2: 2007 | Electrical machinery for industries | Environmental testing - Part 2-2: Tests-Test B: Dry Heat | Temperature: (25 ~ 200) ℃ | BS | N |
| IEC 60068-2-30 :2005 | Electrical machinery for industries | Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle) | Temperature: (20 ~ 60) ℃ Humidity: (50 ~ 95) % R.H. | BS | N |
| IEC 60068-2-31 :2008 | Electrical machinery for industries | Environmental testing - Part 2-31: Tests - Test Ec: Rough handling shocks, primarily for equipment-type specimens | Drop height: (0.1 ~ 1.5) m | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 60068-2-38 :2021 | Electrical machinery for industries | Environmental testing - Part 2-38: Tests - Test Z/AD: Composite temperature/humidity cyclic test | Temperature: (-70 ~ 180) ℃<br>Humidity: (10 ~ 98) % R.H. | BS | N |
| IEC 60068-2-52: 2017 | Electrical machinery for industries | Environmental testing - Part 2-52 Tests - Test Kb: Salt mist, cyclic (sodium chloride solution)<br>(Exception)<br>Test methods 8 | Salt : (35 ± 2) °C, Nacl (5 ± 1) %<br>Storage: (23 ~ 55) °C, (45 ~ 95) % R.H. | SF-2 | N |
| IEC 60068-2-57 :2013 | Electrical machinery for industries | Environmental testing - Part 2-57: Tests - Test Ff: Vibration - Time-history and sine-beat method | Vibration frequency: (4 ~ 2 000) Hz<br>Vibration acceleration: (0.98 ~ 980) ㎨ | BS | N |
| IEC 60068-2-64 :2019 | Electrical machinery for industries | Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance | Vibration frequency: (4 ~ 2 000) Hz<br>Vibration acceleration: (0.98 ~ 980) ㎨ | BS | N |
| IEC 60068-2-66 :1994 | Electrical machinery for industries | Environmental testing - Part 2: Test methods - Test Cx: Damp heat steady sate(unsaturated pressurized vapour) | Max 150 ℃<br>Humidity: (80 ~ 98) % R.H. | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 60068-2-67 :2019 | Electrical machinery for industries | Environmental testing - Part 2-67: Tests - Test Cy: Damp heat, steady state, accelerated test primarily intended for components | Max 90 ℃<br>Humidity: (80 ~ 98) % R.H | BS | N |
| IEC 60068-2-6: 2007 | Electrical machinery for industries | Environmental testing - Part 2-6: Tests-Test Fc: Vibration (Sinusoidal) | Vibration frequency: (4 ~ 2 000)Hz<br>Vibration acceleration: (0.98 ~ 980) ㎨ | BS | N |
| IEC 60068-2-78 :2012 | Electrical machinery for industries | Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state | Temperature: (25 ~ 45) ℃<br>Humidity: (80 ~ 98) % R.H. | BS | N |
| IEC 60255-21-1 :1988 | Electrical machinery for industries | Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section One: Vibration tests (sinusoidal) | Vibration frequency: (4 ~ 2 000) Hz<br>Vibration acceleratio: (0.98 ~ 980) ㎨ | BS | N |
| IEC 60255-21-2 :1988 | Electrical machinery for industries | Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section Two: Shock and bump tests | Vibration frequency: (4 ~ 2 000) Hz<br>Vibration acceleration: (0.98 ~ 980) ㎨ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 60255-27:2023 | Electrical machinery for industries | Measuring relays and protection equipment - Part 27: Product safety requirements (Accept only)<br>9.6.4.3 A.C. or D.C. dielectric voltage<br>9.6.4.4 Insulation Resistance<br>9.6.4.5 Protective bonding tests | Withstand voltage: Max.3 kV<br>Insulation Resistance: DC 500 V, DC 1 000 V<br>8 V a.c. Max.45A | BS | N |
| IEC 60529: 2013 | Electrical machinery for industries | Degrees of protection provided by enclosure(IP Code) (Exception)<br>14.2.9 Test for second characteristic numerals 9 with the drip box | IPX1 to IPX8<br>IP1X to IP6X | SF-2 | N |
| IEC 60571:2012 | Railroad vehicles and related products | Railway applications-Electronic equipment used on rolling stock<br>12.2.11 salt mist test | Salt : 35 °C,<br>Nacl (5 ± 1) % | SF-2 | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| IEC 60571:2012 | Railroad vehicles and related products | Railway applications-Electronic equipment used on rolling stock<br>12.2.4 Cold start test<br>12.2.5 Dry heat test<br>12.2.6 Damp heat test, cyclic<br>12.2.10 Insulation test<br>12.2.12 Vibration, Shock and bump test<br>12.2.15 Low temperature storage test | Temperature: (-50 ~ 150) ˚C<br>Vibration frequency: (1 ~ 2 000) Hz<br>Humidity: (50 ~ 95) % R.H.<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨<br>Insulation resistance: DC 500 V<br>Withstand voltage: Max. 3 000 V a.c. | BS | N |
| IEC 61373:2010 | Railroad vehicles and related products | Railway applications - Rolling stock equipment - Shock and vibration tests | Vibration frequency: (1 ~ 2 000) Hz<br>Vibration acceleration: (0.98 ~ 980) ㎨ | 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<br>Temperature: (-70 ~ 180) ℃<br>Vibration frequency: (4 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 1 470) ㎨<br>Drop height: (0.1 ~ 1.5) m | BS | N |
| ISO 16750-3:2012 | Automobile and related products | Road vehicles - Environmental conditions and testing for electrical and electronic equipment - Part 3: Mechanical loads | Vibration frequency: (4 ~ 2 000) Hz<br>Vibration shock frequency: (0.98 ~ 1 470) ㎨<br>Drop Height: (0.1~1.5)m | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| ISO 16750-3:2012 | Automobile and related products | Road vehicles - Environmental conditions and testing for electrical and electronic equipment - Part 3: Mechanical loads | Vibration frequency: (4 ~ 2 000) Hz<br>Vibration shock frequency: (0.98 ~ 1 470) ㎨<br>Drop Height: (0.1~1.5)m | SF-3 | N |
| ISO 16750-4:2010 | Automobile and related products | Road vehicles - Environmental conditions and testing for electrical and electronic equipment - Part 4: Climatic loads (Exception)<br>5.4 Ice water shock test<br>5.5 Salt spray tests<br>5.8 Corrosion test with flow of mixed gas<br>5.9 Solar radiation<br>5.10 Dust test | Temperature: (-70 ~ 200) ℃<br>Humidity: (10 ~ 98) % R.H. | SF-3 | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| ISO 16750-4:2010 | Automobile and related products | Road vehicles - Environmental conditions and testing for electrical and electronic equipment - Part 4: Climatic loads (Exception)<br>5.4 Ice water shock test<br>5.5 Salt spray tests<br>5.8 Corrosion test with flow of mixed gas<br>5.9 Solar radiation<br>5.10 Dust test | Temperature: (-70 ~ 200) ℃<br>Humidity: (10 ~ 98) % R.H. | BS | N |
| ISO 20653: 2013 | Automobile and related products | Road vehicles - Degrees of protection (IP Code) - Protection of electrical equipment against foreign objects, water and access (Exception)<br>IPX4K, IPX9K | IP1X to IP6X<br>IPX1 to IPX8 | SF-2 | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KR:2021 | Ship | Guidance for Approval of Manufacturing Process and Type Approval, Etc. 2015<br>Chapter 3. Type Approval<br>Section 23. Automatic an Remote Control Systems<br>(Accept only)<br>1. External test<br>2. Functional test<br>3. Power lose test<br>4. Power change test<br>6. Dray heat test<br>7. Temperature and Humidity test<br>8. Vibration test<br>10. Insulation resistance test<br>11. Electric strength test<br>12. Cold test | Voltage: (0 ~ 380) V<br>Temperature: (-70 ~ 180) ℃<br>Humidity: (10 ~ 98) % R.H.<br>Vibration frequency: (4 ~ 2 000) Hz<br>Vibration acceleratio: (0.98 ~ 980) ㎨ | BS | N |
| KS C 5078:2015 | Automobile and related products | Video recording systems for road vehicle accidents<br>7.3 Environment test | Temperature: (-25 ~ 90) ℃<br>Vibration frequency: (4 ~ 2 000) Hz<br>Vibration shock frequency: (0.98 ~ 980) ㎨ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C 7620:2003 | Railroad vehicles and related products | Railway car luminaries for fluorescent lamps (Exception)<br>7.9 Noise test<br>7.11 Luminous Flux rate test<br>7.13 Noise strength test | Temperature: (-10 ~ 60) ℃<br>Vibration frequency: (4 ~ 2 000) Hz<br>Vibration acceleration: (0.98 ~ 980) ㎨" | BS | N |
| KS C IEC 60068-2-11: 2021 | Electrical machinery for industries | Environmental testing - Part 2-11: Tests - Test Ka: Salt mist | Salt : (35 ± 2) °C, Nacl (5 ± 1) % | SF-2 | N |
| KS C IEC 60068-2-13:2021 | Electrical machinery for industries | Envrionmental Testing-Part2: Tests-Tests M: Low air pressure | Altitude: (5 ~ 101.3) kPa | BS | N |
| KS C IEC 60068-2-14:2009 | Electrical machinery for industries | Environmental testing - Part 2-14 : Tests - Test N : Change of temperature (Exception)<br>Test Nc: Rapid change of temperatur, two-fluid-bath method | Temperature: (-65 ~ 200) ℃ | BS | N |
| KS C IEC 60068-2-1:2007 | Electrical machinery for industries | Environmental Testing - Part 2-1: Tests - Test A: Cold | Temperature: (-70 ~ 10) ℃ | BS | N |
| KS C IEC 60068-2-27:2008 | Electrical machinery for industries | Basic Environmental Testing Procedures - Part 2: Tests - Test Ea and guidance: Shock | Shock acceleration: (0.98 ~ 1 470) ㎨ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C IEC 60068-2-2:2007 | Electrical machinery for industries | Environmental Testing - Part 2-2: Tests - Test B: Dry heat | Temperature: (25 ~ 200) ℃ | BS | N |
| KS C IEC 60068-2-30:2005 | Electrical machinery for industries | Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle) | Temperature: (20 ~ 60) ℃<br>Humidity: (50 ~ 95) % R.H. | BS | N |
| KS C IEC 60068-2-31:2008 | Electrical machinery for industries | Environmental testing - Part 2-31 : Tests - Test Ec : Rough handling shocks, primarily for equipment-type specimens | Drop height: (0.1 ~ 1.5) m | BS | N |
| KS C IEC 60068-2-38:2021 | Electrical machinery for industries | Environmental Testing - Part 2-38: Tests - Test Z/AD: Composite temperature/humidity cyclic test | Temperature: (-70 ~ 180) ℃<br>Humidity: (10 ~ 98) % R.H. | BS | N |
| KS C IEC 60068-2-52: 2017 | Electrical machinery for industries | Environmental testing - Part 2-52: Tests - Test Kb: Salt mist, cyclic (sodium chloride solution)<br>(Exception)<br>Test method 8 | Salt : (35 ± 2) °C, Nacl (5 ± 1) %<br>Storage: (23 ~ 55) °C, (45 ~ 95) % R.H. | SF-2 | N |
| KS C IEC 60068-2-57:2013 | Electrical machinery for industries | Environmental testing - Part 2-57: Tests - Test Ff: Vibration - Time-history method | Vibration frequency: (4 ~ 2 000) Hz<br>Acceleration: (0.98 ~ 980) ㎨ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C IEC 60068-2-64:2008 | Electrical machinery for industries | Environmental Testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance | Vibration frequency: (4 ~ 2 000) Hz<br>Acceleration: (0.98 ~ 980) ㎨ | BS | N |
| KS C IEC 60068-2-66:1994 | Electrical machinery for industries | Environmental testing-Part2: Test methods-Test Cx: Damp heat, steady state(unsaturated pressurized vapour) | Max temperature: 150 ℃<br>Humidity: (80 ~ 95) % R.H. | BS | N |
| KS C IEC 60068-2-67:1995 | Electrical machinery for industries | Environmental testing - Part2: Tests-test Cy: Damp heat, steady state, accelerated test primarily intended for components | Max 90 ℃<br>Humidity: (80 ~ 95) % R.H | BS | N |
| KS C IEC 60068-2-6:2015 | Electrical machinery for industries | Environmental testing - Part 2-6: Tests - Test Fc: Vibration(sinusoidal) | Vibration frequency: (4 ~ 2 000) Hz<br>Vibration acceleration: (0.98 ~ 980) ㎨ | BS | N |
| KS C IEC 60068-2-78:2012 | Electrical machinery for industries | Envrionmental testing - Part1-78: Tests-Test Cab: Damp heat, steady state | Temperature: (25 ~ 45) ℃<br>Humidity: (80 ~ 98) % R.H | BS | N |
| KS C IEC 60255-21-1:1988 | Electrical machinery for industries | Electrical relays - Part 21 : Vibration, shock, bump and seismic tests on measuring relays and protection equipment- Section 1 : Vibration tests (sinusoidal) | Vibration frequency: (4 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C IEC 60255-21-2:1988 | Electrical machinery for industries | Electrical relays- Part 21 : Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section 2 : Shock and bump tests | Vibration frequency: (4 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨ | BS | N |
| KS C IEC 60255-27:2013 | Electrical machinery for industries | Measuring relays and protection equipment - Part 27: Product safety requirements<br>10.6.4.3 A.C or D.c. .dielectric voltage<br>10.6.4.4 Insulation Resistance<br>10.6.4.5 Protective bonding resistance | Withstand voltage: Max 3 kV<br>Insulation Resistance: DC 500 V, DC 1 000 V<br>8 V a.c. Max 45A | BS | N |
| KS C IEC 60529: 2013 | Electrical machinery for industries | Degrees of protection provided by enclosures (IP Code) (Exception)<br>14.2.9 Test for second characteristic numerals 9 with the drip box | IPX1 to IPX8<br>IP1X to IP6X | SF-2 | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS C IEC 60571:2012 | Railroad vehicles and related products | Electronic equipment used on rail vehicles 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) ℃<br>Vibration frequency: (1 ~ 2 000) Hz<br>Humidity: (50 ~ 95) % R.H.<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨<br>Insulation resistance: DC 500 V<br>withstand voltage: Max. 3 000 V a.c. | 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<br>Acceleration: (0.98 ~ 980) m/s² | BS | N |
| KS C IEC 62281:2021 | Electrical materials and components | Safety of primary and secondary lithium cells and batteries during transport | Altitude: (5 ~ 101.3) kPa<br>Temperature: (-70 ~ 180) ℃<br>Vibration frequency: (4 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 1 470) ㎨<br>Drop height: (0.1 ~ 1.5)m | BS | N |
| KS R 1034:2006 | Railroad vehicles and related products | Vibration Testing Methods For Automobile Parts | Vibration frequency: (4 ~ 2 000) Hz<br>Vibration acceleration: (0.98 ~ 980) ㎨ | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| KS R 9144:2021 | Railroad vehicles and related products | TEST METHODS FOR VIBRATION OF PARTS OF RAILWAY ROLLING STOCK | Vibration frequency: (1 ~ 2 000) Hz<br>Vibration acceleration: (0.98 ~ 980) ㎨ | BS | N |
| KS R 9186:2021 | Railroad vehicles and related products | PARTS FOR RAILWAY SIGNAL - VIBRATION TEST METHODS | Vibration frequency: (1 ~ 2 000) Hz<br>Acceleration: (0.98 ~ 980) ㎨ | BS | N |
| KS R 9187:2021 | Railroad vehicles and related products | PARTS FOR RAILWAY SIGNAL - SHOCK TEST METHODS | Shock acceleration: (0.98 ~ 1 470) ㎨ | BS | N |
| KS R ISO 7637-2:2015 | Automobile and related products | Road vehicles - Electrical disturbances from conduction and coupling<br>Part 2: Electrical transient conduction along supply lines only | 12 V, 24 V System | BS | N |
| MIL-STD-167-1 A:2005 | Electrical machinery for industries | mechanical vibrations of shipboard equipment(Type I-Environmental) | Vibration frequency: (4 ~ 33) Hz<br>Vibration acceleration: (0.98 ~ 980) ㎨ | BS | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| MIL-STD-810C: 1975 | Electrical machinery for industries | Environmental test Method<br>501.1 High temperature<br>502.1 Low temperature<br>503.1 Temperature shock<br>507.1 Humidity<br>514.2 Vibration Procedure Ⅰ, Ⅱ, Ⅴ, Ⅵ, Ⅶ, Ⅷ<br>516.2 Shock Procedure Ⅰ, Ⅱ, Ⅲ, Ⅴ | Altitude: (5 ~ 101.3) kPa<br>Temperature: (-70 ~ 180) ℃<br>Humidity: (10 ~ 98) % R.H.<br>Vibration frequency: (1 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨<br>Drop height: (0.1 ~ 1.5) m | BS | N |
| MIL-STD-810D: 1983 | Electrical machinery for industries | Environmental test method and engineering guidelines<br>500.2 Low pressure(Altitude) Procedure Ⅰ, Ⅱ<br>501.2 High temperature<br>502.2 Low temperature<br>503.2 Temperature shock<br>507.2 Humidity<br>514.3 Vibration Procedure Ⅰ<br>516.3 Shock Procedure Ⅰ, Ⅱ, Ⅳ, Ⅴ, Ⅵ | Altitude: (5 ~ 101.3) kPa<br>Temperature: (-70 ~ 180) ℃<br>Humidity: (10 ~ 98) % R.H.<br>Vibration frequency: (1 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨<br>Drop height: (0.1 ~ 1.5) m | BS | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| MIL-STD-810D: 1983 | Electrical machinery for industries | Environmental test method and engineering guidelines<br>509.3 salt Fog | Salt : 35 °C,<br>Nacl (5 ± 1) % | SF-2 | N |
| MIL-STD-810E:1989 | Electrical machinery for industries | Environmental test method and engineering guidelines<br>500.3 Low pressure(Altitude)<br>Procedure Ⅰ, Ⅱ<br>501.3 High temperature<br>502.3 Low temperature<br>503.3 Temperature shock<br>507.3 Humidity<br>514.4 Vibration<br>Procedure Ⅰ<br>516.4 Shock<br>Procedure Ⅰ, Ⅱ, Ⅳ, Ⅴ, Ⅵ | Altitude: (5 ~ 101.3) kPa<br>Temperature: (-70 ~ 180) ℃<br>Humidity: (10 ~ 98) % R.H.<br>Vibration frequency: (1 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨<br>Drop height: (0.1 ~ 1.5) m | BS | N |
| MIL-STD-810E:1989 | Electrical machinery for industries | Environmental test method and engineering guidelines<br>509.3 salt Fog | Salt : 35 °C,<br>Nacl (5 ± 1) % | SF-2 | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| MIL-STD-810F NOTICE 3: 2003 | Electrical machinery for industries | Environmental engineering considerations and laboratory tests<br>500.4 Low pressure(Altitude) Procedure Ⅰ, Ⅱ<br>501.4 High temperature<br>502.4 Low temperature<br>503.4 Temperature shock<br>507.4 Humidity<br>514.5 Vibration Procedure Ⅰ<br>516.6 Shock Procedure Ⅰ, Ⅱ, Ⅳ, Ⅴ, Ⅵ | Altitude: (5 ~ 101.3) kPa<br>Temperature: (-70 ~ 180) ℃<br>Humidity: (10 ~ 98) % R.H.<br>Vibration frequency: (1 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨<br>Drop height: (0.1 ~ 1.5) m | BS | N |
| MIL-STD-810F NOTICE 3: 2003 | Electrical machinery for industries | Environmental engineering considerations and laboratory tests<br>509.4 Salt Fog | Salt : 35 °C, Nacl (5 ± 1) % | SF-2 | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| MIL-STD-810F:2000 | Electrical machinery for industries | Environmental engineering considerations and laboratory tests<br>500.4 Low pressure(Altitude) Procedure Ⅰ, Ⅱ<br>501.4 High temperature<br>502.4 Low temperature<br>503.4 Temperature shock<br>507.4 Humidity<br>514.5 Vibration Procedure Ⅰ<br>516.5 Shock Procedure Ⅰ, Ⅱ, Ⅳ, Ⅴ, Ⅵ | Altitude: (5 ~ 101.3) kPa<br>Temperature: (-70 ~ 180) ℃<br>Humidity: (10 ~ 98) % R.H.<br>Vibration frequency: (1 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨<br>Drop height: (0.1 ~ 1.5) m | BS | N |
| MIL-STD-810F:2000 | Electrical machinery for industries | Environmental engineering considerations and laboratory tests<br>509.4 Salt Fog | Salt : 35 °C,<br>Nacl (5 ± 1) % | SF-2 | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| MIL-STD-810G w/Change 1: 2014 | Electrical machinery for industries | Environmental engineering considerations and laboratory tests<br>500.6 Low pressure(Altitude) Procedure Ⅰ, Ⅱ<br>501.6 High temperature<br>502.6 Low temperature<br>503.6 Temperature shock<br>507.6 Humidity<br>514.7 Vibration Procedure Ⅰ<br>516.7 Shock Procedure Ⅰ, Ⅱ, Ⅳ, Ⅴ, Ⅵ<br>528.1 Mechanical vibration of shipboard equipment(Type I Environmental vibration) | Altitude: (5 ~ 101.3) kPa<br>Temperature: (-70 ~ 180) ℃<br>Humidity: (10 ~ 98) % R.H.<br>Vibration frequency: (1 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨<br>Drop height: (0.1 ~ 1.5) m | BS | N |
| MIL-STD-810G w/Change 1: 2014 | Electrical machinery for industries | Environmental engineering considerations and laboratory tests<br>509.6 Salt Fog | Salt : 35 ˚C,<br>Nacl (5 ± 1) % | SF-2 | N |

| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| MIL-STD-810G: 2008 | Electrical machinery for industries | Environmental engineering considerations and laboratory tests<br>500.5 Low pressure(Altitude) Procedure Ⅰ, Ⅱ<br>501.5 High temperature<br>502.5 Low temperature<br>503.5 Temperature shock<br>507.5 Humidity<br>514.6 Vibration Procedure Ⅰ<br>516.6 Shock Procedure Ⅰ, Ⅱ, Ⅳ, Ⅴ, Ⅵ<br>528 Mechanical vibration of shipboard equipment(Type I Environmental vibration) | Altitude: (5 ~ 101.3) kPa<br>Temperature: (-70 ~ 180) ℃<br>Humidity: (10 ~ 98) % R.H.<br>Vibration frequency: (1 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨<br>Drop height: (0.1 ~ 1.5) m | BS | N |
| MIL-STD-810G: 2008 | Electrical machinery for industries | Environmental engineering considerations and laboratory tests<br>509.5 Salt Fog | Salt : 35 ˚C,<br>Nacl (5 ± 1) % | SF-2 | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| MIL-STD-810H: 2019 | Electrical machinery for industries | Environmental engineering consideration and laboratory tests<br>500.6 Low Pressure(Altitude) Procedure I, II<br>501.7 High temperature<br>502.7 Low temperature<br>503.7 Temperatures shock<br>507.6 Humidity<br>514.8 Vibration Procedure I<br>516.8 Shock Procedure I, Ⅱ, Ⅳ, Ⅴ, Ⅵ<br>528.1 Mechanical Vibration of Shipboard equipment(Type I Environmental Vibration)<br>(Exception) Type II - Internally excited | Altitude: (5 ~ 101.3) kPa<br>Temperature: (-70 ~ 180) ℃<br>Humidity: (10 ~ 98) % R.H.<br>Vibration frequency: (1 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 980) ㎨<br>Drop height: Max 1.5 m | BS | N |
| MIL-STD-810H: 2019 | Electrical machinery for industries | Environmental engineering consideration and laboratory tests<br>509.7 Salt Fog | Salt : 35 °C,<br>Nacl (5 ± 1) % | SF-2 | N |

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| Test method | Materials Products | Standard designation | Test range | Site | Field testing |
|---|---|---|---|---|---|
| RTCA DO-160G:2010 | Aviation and space related products | Environmental Conditions and Test Procedures for Airborne Equipment Section 4.0 Temperature and Altitude Section 5.0 Temperature Variation Section 6.0 Humidity Section 8.0 Vibration (Exception) 4.6 Altitude, Decompression and Overpressure Tests | Altitude: (5 ~ 101.3) kPa Temperature: (-55 ~ 85) ℃ Humidity: (50 ~ 95) % R.H. Vibration frequency: (1 ~ 2 000) Hz Vibration acceleratio: (0.98 ~ 980) ㎨ | BS | N |
| RTCA DO-160G:2010 | Aviation and space related products | Environmental Conditions and Test Procedures for Airborne Equipment Section 14.0 salt Spray(salt Fog) Section 10.0 Waterproofness | Salt : 35 ℃, Nacl (5 ± 1) % Waterproofness : Max 280 L/㎡/h | SF-2 | 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) ℃ Humidity: (10 ~ 98) % R.H. Vibration frequency: (4 ~ 2 000) Hz Vibration/Shock acceleration: (0.98 ~ 1 470) ㎨ Drop height: (0.1 ~ 1.5) m | BS | N |

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| 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<br>Temperature: (-70 ~ 180) ℃<br>Humidity: (10 ~ 98) % R.H.<br>Vibration frequency: (4 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 1 470) ㎨<br>Drop height: (0.1 ~ 1.5) m | BS | N |
| 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<br>Temperature: (-70 ~ 180) ℃<br>Humidity: (10 ~ 98) % R.H.<br>Vibration frequency: (4 ~ 2 000) Hz<br>Vibration/Shock acceleration: (0.98 ~ 1 470) ㎨<br>Drop height: Max 1.5 m | BS | N |

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