ICS 29.120.50 SLOVENSKÁ TECHNICKÁ NORMA Február 2025

| STN | **Ovládacie a ochranné prístroje v kábli pre režim nabíjania 2 elektrických vozidiel (IC-CPD)** | **STN EN IEC 62752**<br><br>34 1590 |
|---|---|---|

In-cable control and protection device (IC-CPD) for mode 2 charging of electric road vehicles

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 01/25

Obsahuje: EN IEC 62752:2024, IEC 62752:2024

Oznámením tejto normy sa od 31.10.2027 ruší
STN EN 62752 (34 1590) z apríla 2017

obsahuje farebné strany

**139840**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN IEC 62752

October 2024

ICS 29.120.50

Supersedes EN 62752:2016; EN 62752:2016/AC:2019-03; EN 62752:2016/A1:2020

English Version

# In-cable control and protection device (IC-CPD) for mode 2 charging of electric road vehicles (IEC 62752:2024)

Dispositif de contrôle et de protection intégré au câble (IC-CPD) pour la charge en mode 2 des véhicules électriques (IEC 62752:2024)

Ladeleitungsintegrierte Steuer- und Schutzeinrichtung für die Ladebetriebsart 2 von Elektro-Straßenfahrzeugen (IC-CPD) (IEC 62752:2024)

This European Standard was approved by CENELEC on 2024-05-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**



Ref. No. EN IEC 62752:2024 E

**EN IEC 62752:2024 (E)**

# European foreword

The text of document 23E/1342/FDIS, future edition 2 of IEC 62752, prepared by SC 23E "Circuit-breakers and similar equipment for household use" of IEC/TC 23 "Electrical accessories" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62752:2024.

The following dates are fixed:

| | | |
|---|---|---|
| • latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2025-10-31 |
| • latest date by which the national standards conflicting with the document have to be withdrawn | (dow) | 2027-10-31 |

This document supersedes EN 62752:2016 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

## Endorsement notice

The text of the International Standard IEC 62752:2024 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

| | | |
|---|---|---|
| IEC 60269-1 | NOTE | Approved as EN 60269-1 |
| IEC 60309 series | NOTE | Approved as EN IEC 60309 series |
| IEC 60364 series | NOTE | Approved as HD 60364 series |
| IEC 60364-7-722 | NOTE | Approved as HD 60364-7-722 |
| IEC 60947-1:2020 | NOTE | Approved as EN IEC 60947-1:2021 (not modified) |
| IEC 60999-1:1999 | NOTE | Approved as EN 60999-1:2000 (not modified) |
| IEC 61140:2016 | NOTE | Approved as EN 61140:2016 (not modified) |
| IEC 61249-2 series | NOTE | Approved as EN 61249-2 series |
| ISO 15118 series | NOTE | Approved as EN ISO 15118 series |

# Annex ZA
(normative)

## Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cencenelec.eu.

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC 60068-2-1 | - | Environmental testing - Part 2-1: Tests - Test A: Cold | EN 60068-2-1 | - |
| IEC 60068-2-5 | 2018 | Environmental testing - Part 2-5: Tests - Test S: Simulated solar radiation at ground level and guidance for solar radiation testing and weathering | EN IEC 60068-2-5 | 2018 |
| IEC 60068-2-11 | - | Environmental testing - Part 2-11: Tests - Test Ka: Salt mist | EN IEC 60068-2-11 | - |
| IEC 60068-2-27 | - | Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock | EN 60068-2-27 | - |
| IEC 60068-2-30 | - | Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle) | EN 60068-2-30 | - |
| IEC 60068-2-31 | - | Environmental testing - Part 2-31: Tests - Test Ec: Rough handling shocks, primarily for equipment-type specimens | EN 60068-2-31 | - |
| IEC 60068-2-64 | - | Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance | EN 60068-2-64 | - |
| IEC 60068-3-4 | - | Environmental testing - Part 3-4: Supporting documentation and guidance - Damp heat tests | EN IEC 60068-3-4 | - |
| IEC 60112 | - | Method for the determination of the proof and the comparative tracking indices of solid insulating materials | EN IEC 60112 | - |
| IEC 60227 | series | Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 1: General requirements | - | |
| IEC 60245 | series | Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 1: General requirements | - | |

**EN IEC 62752:2024 (E)**

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC 60309-1 | 2021 | Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes - Part 1: General requirements | EN IEC 60309-1 | 2022 |
| IEC 60309-2 | - | Plugs, fixed or portable socket-outlets and appliance inelts for industrial purposes - Part 2: Dimensional compatibility requirements for pin and contact-tube accessories | EN IEC 60309-2 | - |
| IEC 60364-4-44 (mod) | 2007 | Low-voltage electrical installations - Part 4-44: Protection for safety - Protection against voltage disturbances and electromagnetic disturbances | HD 60364-4-442 | 2012 |
| IEC 60384-14 | 2023 | Fixed capacitors for use in electronic equipment - Part 14: Sectional specification - Fixed capacitors for electromagnetic interference suppression and connection to the supply mains | EN IEC 60384-14 | 2023 |
| IEC 60417-DB | - | Graphical symbols for use on equipment | - | - |
| IEC 60529 | 1989 | Degrees of protection provided by enclosures (IP Code) | EN 60529 | 1991 |
| - | - | | + corrigendum May | 1993 |
| + A1 | 1999 | | + A1 | 2000 |
| + A2 | 2013 | | + A2 | 2013 |
| IEC 60664-1 | 2020 | Insulation coordination for equipment within low-voltage supply systems - Part 1: Principles, requirements and tests | EN IEC 60664-1 | 2020 |
| IEC 60664-3 | - | Insulation coordination for equipment within low-voltage systems - Part 3: Use of coating, potting or moulding for protection against pollution | EN 60664-3 | - |
| IEC 60695-2-10 | - | Fire hazard testing - Part 2-10: Glowing/hot-wire based test methods - Glow-wire apparatus and common test procedure | EN IEC 60695-2-10 | - |
| IEC 60695-2-11 | - | Fire hazard testing - Part 2-11: Glowing/hot-wire based test methods - Glow-wire flammability test method for end products (GWEPT) | EN IEC 60695-2-11 | - |
| IEC 60884-1 | 2022 | Plugs and socket-outlets for household and similar purposes - Part 1: General requirements | - | - |
| IEC 61000-4-2 | - | Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test | EN 61000-4-2 | - |
| IEC 61000-4-3 | - | Electromagnetic compatibility (EMC) - Part 4-3 : Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test | EN IEC 61000-4-3 | - |

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC 61000-4-4 | - | Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test | EN 61000-4-4 | - |
| IEC 61000-4-5 | 2014 | Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test | EN 61000-4-5 | 2014 |
| + A1 | 2017 | | + A1 | 2017 |
| IEC 61000-4-6 | - | Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields | EN IEC 61000-4-6 | - |
| IEC 61439-7 | 2022 | Low-voltage switchgear and controlgear assemblies - Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicle charging stations | EN IEC 61439-7 | 2023 |
| IEC 61540 | - | Portable residual current devices (PRCDS) without integral overcurrent protecion for household and similar use | - | - |
| IEC 61543 | 2022 | Residual current-operated protective devices (RCDs) for household and similar use - Electromagnetic compatibility | EN IEC 61543 | 2023 |
| IEC 61851-1 | 2017 | Electric vehicle conductive charging system - Part 1: General requirements | EN IEC 61851-1 | 2019 |
| IEC 62196 | series | Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles - Part 1: General requirements | EN IEC 62196 | series |
| IEC 62196-1 | 2022 | Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles - Part 1: General requirements | EN IEC 62196-1 | 2022 |
| IEC 62262 | - | Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code) | EN 62262 | - |
| IEC 62368-1 | 2023 | Audio/video, information and communication technology equipment - Part 1: Safety requirements | EN IEC 62368-1 | 2024 |
| IEC 62893-3 | - | Charging cables for electric vehicles for rated voltages up to and including 0,6/1 kV - Part 3: Cables for AC charging according to modes 1, 2 and 3 of IEC 61851-1 of rated voltages up to and including 450/750 V | - | - |
| CISPR 14-1 | - | Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission | - | - |
| ISO 178 | - | Plastics - Determination of flexural properties | EN ISO 178 | - |

**EN IEC 62752:2024 (E)**

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| ISO 179 | series | Plastics - Determination of Charpy impact strength | EN ISO 179 | series |
| ISO 2409 | - | Paints and varnishes - Cross-cut test | EN ISO 2409 | - |
| ISO 4628-3 | - | Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 3: Assessment of degree of rusting | EN ISO 4628-3 | - |
| ISO 4892-2 | 2013 | Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps | EN ISO 4892-2 | 2013 |
| ISO 16750-5 | 2010 | Road vehicles - Environmental conditions and testing for electrical and electronic equipment - Part 5: Chemical loads | - | - |
| ISO 17409 | 2020 | Electrically propelled road vehicles - Conductive power transfer - Safety requirements | EN ISO 17409 | 2020 |

IEC 62752

Edition 2.0 2024-03

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

colour inside

## In-cable control and protection device (IC-CPD) for mode 2 charging of electric road vehicles

## Dispositif de contrôle et de protection intégré au câble (IC-CPD) pour la charge en mode 2 des véhicules électriques

IEC 62752:2024-03(en-fr)

IEC 62752

Edition 2.0 2024-03

# INTERNATIONAL STANDARD

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colour inside

## In-cable control and protection device (IC-CPD) for mode 2 charging of electric road vehicles

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.120.50 ISBN 978-2-8322-8434-6

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# IN-CABLE CONTROL AND PROTECTION DEVICE (IC-CPD) FOR MODE 2 CHARGING OF ELECTRIC ROAD VEHICLES

## FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 62752 has been prepared by subcommittee 23E: Circuit-breakers and similar equipment for household use, of IEC technical committee 23: Electrical accessories, in co-operation with ISO TC 22/SC 37 Electrically propelled vehicles. It is an International Standard.

This second edition cancels and replaces the first edition published in 2016, and Amendment 1:2018. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

– Subclause 8.3.1 revised to add requirements for a mandatory control device that detects the temperature of the current carrying parts in the household plug;
– Test requirements added in a new Subclause 9.36 for the temperature control device;
– Harmonization of EMC requirements with new edition of IEC 61543 and IEC 61851-21-2;
– General improvement of test and requirements.

The text of this International Standard is based on the following documents:

| Draft | Report on voting |
|---|---|
| 23E/1342/FDIS | 23E/1346/RVD |

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

In this document, the following print types are used:

- Requirements proper, in roman type;
- *Test specifications, in italic type;*
- NOTES, in smaller roman type.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

**IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

# INTRODUCTION

The essential purpose of this document is the safe and reliable access of electric vehicles to a supply system. The definition for "mode 2 charging of electric vehicle" is described in IEC 61851-1.

For all charging modes, protection against electric shock in case of failure of basic protection and/or fault protection is provided, at least by a type A residual current device (RCD) (see IEC 60364-7-722 and IEC 61851-1).

For mode 2 charging, including the situation where it cannot be guaranteed that the installation is equipped with RCDs, for example charging the electric vehicle at an unknown installation, a dedicated protection is used for the connected electric vehicle. The intention of this document is to describe the relevant requirements for an in-cable control and protection device (IC-CPD) to be used for mode 2 charging.

This version of IEC 62752 covers also the content of the former IEC 62335.

# IN-CABLE CONTROL AND PROTECTION DEVICE (IC-CPD) FOR MODE 2 CHARGING OF ELECTRIC ROAD VEHICLES

## 1 Scope

This International Standard applies to in-cable control and protection devices (IC-CPDs) for mode 2 charging of electric road vehicles, hereafter referred to as "IC-CPD", including control and safety functions.

This document applies to portable devices performing simultaneously the functions of detection of the residual current, of comparison of the value of this current with the residual operating value and of opening of the protected circuit when the residual current exceeds this value.

The IC-CPD according to this document

- provides a control pilot function in accordance with IEC 61851-1:2017, Annex A;
- checks supply conditions and prevents charging in the event of supply faults under specified conditions;
- can have a switched protective conductor.

Residual currents with frequencies different from the rated frequency, DC residual currents and specific environmental situations are considered.

This document is applicable to IC-CPDs performing the safety and control functions as required in IEC 61851-1 for mode 2 charging of electric vehicles.

This document is applicable to IC-CPDs for single-phase circuits not exceeding 250 V or multi-phase circuits not exceeding 480 V, their maximum rated current being 32 A.

This document is applicable to IC-CPDs to be used in AC circuits only, with preferred values of rated frequency 50 Hz, 60 Hz or 50/60 Hz. IC-CPDs according to this document are not intended to be used for bidirectional or reverse power transfer, feeding back energy to the system for distribution of electricity.

This document is applicable to IC-CPDs having a rated residual operating current not exceeding 30 mA and which are intended to provide additional protection for the circuit downstream of the IC-CPD as it cannot be guaranteed that the upstream installation is equipped with an RCD rated $I_{\Delta n} \leq 30$ mA.

The IC-CPD consists of:

- a plug for connection to a socket-outlet in the fixed installation;
- one or more subassemblies containing the control and protection features;
- a cable between the plug and the subassemblies (optional);
- a cable between the subassemblies and the vehicle connector (optional);
- a vehicle connector for connection to the electric vehicle.

For plugs for household and similar use the respective requirements of the national standard and specific requirements defined by the national committee of the country where the product is placed on the market apply. If no national requirements exist, IEC 60884-1 applies. For industrial plugs IEC 60309-2 applies. For specific applications and areas non-interchangeable industrial plugs can be used. In this case IEC 60309-1 applies.

Plugs, connectors and cables which are part of the IC-CPD are tested according to relevant product standards.

The switching contacts of the IC-CPD are not intended to provide an isolation function, as isolation can be ensured by disconnecting the plug.

The IC-CPD is not considered to be a protective device for use in fixed installations.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-5:2018, *Environmental testing – Part 2-5: Tests – Test S: Simulated solar radiation at ground level and guidance for solar radiation testing and weathering*

IEC 60068-2-11, *Environmental testing – Part 2-11: Tests – Test Ka: Salt mist*

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-30, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-31, *Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens*

IEC 60068-2-64, *Environmental testing – Part 2-64: Tests – Test Fh: Vibration, broadband random and guidance*

IEC 60068-3-4, *Environmental testing – Part 3-4: Supporting documentation and guidance – Damp heat tests*

IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60227 (all parts), *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

IEC 60245 (all parts), *Rubber insulated cables – Rated voltages up to and including 450/750 V*

IEC 60309-1:2021, *Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes – Part 1: General requirements*

IEC 60309-2, *Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes – Part 2: Dimensional compatibility requirements for pin and contact-tube accessories*

IEC 60364-4-44:2007, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*

IEC 60384-14:2023, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification – Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

IEC 60417, *Graphical symbols for use on equipment* (available at: https://www.graphical-symbols.info/equipment)

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage supply systems – Part 1: Principles, requirements and tests*

IEC 60664-3, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60695-2-10, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end products (GWEPT)*

IEC 60884-1:2022, *Plugs and socket-outlets for household and similar purposes – Part 1: General requirements*

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*
IEC 61000-4-5:2014/AMD1:2017

IEC 61000-4-6, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61439-7:2022, *Low-voltage switchgear and controlgear assemblies – Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicle charging stations*

IEC 61540, *Portable residual current devices (PRCDs) without integral overcurrent protection for household and similar use*

IEC 61543:2022, *Residual current-operated protective devices (RCDs) for household and similar use – Electromagnetic compatibility*

IEC 61851-1:2017, *Electric vehicle conductive charging system – Part 1: General requirements*

IEC 62196 (all parts), *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles*

IEC 62196-1:2022, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 1: General requirements*

IEC 62262, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*

IEC 62368-1:2023, *Audio/video, information and communication technology equipment – Part 1: Safety requirements*

IEC 62893-3, *Charging cables for electric vehicles for rated voltages up to and including 0,6/1 kV – Part 3: Cables for AC charging according to modes 1, 2 and 3 of IEC 61851-1 of rated voltages up to and including 450/750 V*

CISPR 14-1, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

ISO 178, *Plastics – Determination of flexural properties*

ISO 179 (all parts), *Plastics – Determination of Charpy impact properties*

ISO 2409, *Paints and varnishes – Cross-cut test*

ISO 4628-3, *Paints and varnishes – Evaluation of degradation of coatings – Designation of quantity and size of defects, and of intensity of uniform changes in appearance – Part 3: Assessment of degree of rusting*

ISO 4892-2:2013, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

ISO 16750-5:2010, *Road vehicles – Environmental conditions and testing for electrical and electronic equipment – Part 5: Chemical loads*

ISO 17409:2020, *Electrically propelled road vehicles – Conductive power transfer – Safety requirements*