

SLOVENSKI STANDARD oSIST prEN ISO 17409:2019

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Cestna vozila na električni pogon - Prevodni prenos moči - Varnostne zahteve (ISO/DIS 17409:2019)

Electrically propelled road vehicles - Conductive power transfer - Safety requirements (ISO/DIS 17409:2019)

iTeh STANDARD PREVIEW (standards.iteh.ai)

<u>SIST EN ISO 17409:2020</u>

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43.120 Električna cestna vozila

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Electrically propelled road vehicles — Conductive power transfer — Safety requirements

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1 Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

9 The procedures used to develop this document and those intended for its further maintenance are 10 described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the 11 different types of ISO documents should be noted. This document was drafted in accordance with the 12 editorial rules of the ISO/IEC Directives, Part 2. <u>www.iso.org/directives</u>

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: <u>Foreword - Supplementary information</u>

- 22 The committee responsible for this document is ISO/TC22/SC37 "Electrically propelled road vehicles"
- This 2nd edition replaces the 1st edition. Beside regular maintenance and update of definitions, the following changes were performed to the 1st edition:
- 25 Requirements for mode 1 removed because it is no longer relevant for new design.
- 26 Requirements for reverse power transfer added
- 27 Requirements for High Power Charging (HPC) added
- 28 Short circuit during DC charging reworked
- 29 Charging with pantograph reflected
- 30 With this edition of ISO 17409 the limitation of y-capacitance for protection against electric shock under
- 31 single failure conditions is no longer applicable as a fault protection measure when the vehicle is
- 32 conductively connected to an external electric circuit.

Electrically propelled road vehicles – Conductive power transfer – Safety requirements

35 **1 Scope**

This standard specifies electric safety requirements for conductive connection of electrically propelled road vehicles to external electric circuits. External electric circuits include external electric power supplies and external electric loads. This document provides requirements for Mode 2, 3, 4 and reverse power flow.

- 40 NOTE 1 This edition does not provide requirements for Mode 1.
- This standard applies to the on-board sections of vehicle power supply circuits. It applies also to dedicated power supply control functions used for the connection of the vehicle to an external electric circuit.
- It does not provide comprehensive safety information for manufacturing, maintenance and repairpersonnel.
- 46 This document provides requirements for the charging modes as defined in IEC 61851-1:2017. For mode
- 47 4, this document provides requirements regarding the connection to an isolated DC EV charging station
- 48 according to IEC 61851-23.
- 49 NOTE 2 The requirements when not connected to external electric circuits are specified in ISO 6469-3.
- NOTE 3 Safety requirements for conductive connection of electrically propelled mopeds and motorcycles to external
 electric power supplies are covered by ISO 18246./standards/sist/38469d72-8e9c-4fad-854d-

211a9e12d459/sist-en-iso-17409-2020

52 **2 Normative references**

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- 56 ISO 6469-3:2018, Electrically propelled road vehicles Safety specifications Part 3: Protection of 57 persons against electric shock
- 58 ISO 15118 (all parts), Road vehicles Vehicle to grid communication interface
- ISO 20653, Road vehicles Degrees of protection (IP code) Protection of electrical equipment against
 foreign objects, water and access
- 61 ISO 26262 (all parts), *Road vehicles Functional safety*
- 62 IEC 60038, IEC standard voltages
- 63 IEC 60309-1, Plugs, socket-outlets and couplers for industrial purposes Part 1: General requirements

IEC 60309-2, Plugs, socket-outlets and couplers for industrial purposes — Part 2: Dimensional
 interchangeability requirements for pin and contact-tube accessories

- 66 IEC 60364-4-41:2005; Low-voltage electrical installations –Part 4-41: Protection for safety –Protection 67 against electric shock
- IEC 60364-4-43:2008, Electrical installations of buildings Part 4-43: Protection for safety Protection
 against overcurrent
- IEC 60364-5-54, Low-voltage electrical installations Part 5-54: Selection and erection of electrical
 equipment Earthing arrangements and protective conductors
- 72 IEC 60364-6, Low-voltage electrical installations Part 6: Verification
- 73 IEC 60664 (all parts), Insulation coordination for equipment within low-voltage systems
- 74 IEC 61000-3-3; Electromagnetic compatibility (EMC) Part 3-3: Limits Limitation of voltage changes,
- voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current
- $16 \leq 16 \text{ A per phase and not subject to conditional connection}$
- IEC 610003-11, Electromagnetic compatibility (EMC) Part 3-11: Limits Limitation of voltage changes,
 voltage fluctuations and flicker in public low-voltage supply systems Equipment with rated current ≤
- 79 75 A and subject to conditional connection
- 80 IEC 61851-1:2017, Electric vehicle conductive charging system Part 1: General requirements
- 81 IEC 61851-23, Electric vehicle conductive charging system Part 23: DC electric vehicle charging station
- 82 IEC 62196-1, *Plugs, socket-outlets, vehicle connectors and vehicle inlets Conductive charging of electric* 83 *vehicles — Part 1: General requirements* IST EN ISO 17409:2020
- https://standards.iteh.ai/catalog/standards/sist/38469d72-8e9c-4fad-854d
- 84 IEC 62196-2, Plugs, socket-outlets, vehicle connectors and vehicle inlets Conductive charging of electric
- vehicles Part 2: Dimensional compatibility and interchangeability requirements for a.c. pin and contact tube accessories
- 87 IEC 62196-3:2015, *Plugs, socket-outlets, vehicle connectors and vehicle inlets conductive charging of* 88 *electric vehicles — Part 3: Dimensional compatibility and interchangeability requirements for dedicated d.c.*
- 89 and combined a.c./d.c. pin and contact-tube vehicle couplers
- 90 IEC 62196-3-1, *Plugs, socket-outlets, vehicle connectors and vehicle inlets conductive charging of electric*
- 91 vehicles Part 3-1: Vehicle connector, vehicle inlet and cable assembly intended to be used with a thermal
- 92 management system for DC charging

93 **3 Terms and definitions**

94 **3.1**

95 **autoconnect charging device**

96 ACD

- active device where the physical connection between EV supply equipment and vehicle is made withoutuser interaction providing an electromechanical interface.
- 99 [SOURCE: IEC 61851-23-1:-1, 3.1.203]

100 101 102 103	 3.2 ACD counterpart passive device which is used in combination with an ACD to make the physical connection between EV supply equipment and vehicle providing an electromechanical interface without user interaction.
104	[SOURCE: IEC 61851-23-1:- ¹ , 3.1.204]
105 106 107	3.3 automatic coupler system comprising of an ACD and ACD counterpart.
108	[SOURCE: IEC 61851-23-1:- ¹ , 3.1.205]
109 110 111 112	3.4balance of electric power systemremaining section of an electric circuit when all electric power sources that are energized (e.g. RESS and fuel cell stacks) are disconnected
113	[SOURCE: ISO 6469-3: 2018, 3.2]
114 115 116	3.5 basic insulation insulation of hazardous live parts which provides basic protection
117	Note 1 to entry: This concept does not apply to insulation used exclusively for functional purposes.
118 119 120 121	[SOURCE: ISO 6469-3: 2018, 3.3] SIST EN ISO 17409:2020 https://standards.iteh.ai/catalog/standards/sist/38469d72-8e9e-4fad-854d- 3.6 211a9e12d459/sist-en-iso-17409-2020 case A connection of an EV to the supply network with a plug and cable permanently attached to the EV
122	Note 1 to entry: The cable assembly is part of the vehicle.
123	[SOURCE: IEC 61851-1:2017, 3.1.10]
124 125 126	3.7 case B connection of an EV to the supply network with a cable assembly detachable at both ends
127	Note 1 to entry: The cable assembly is not part of the vehicle or the EV charging station.
128	[SOURCE: IEC 61851-1:2017, 3.1.11]
129 130 131 132	 3.8 case C connection of an EV to the supply network utilizing a cable and vehicle connector permanently attached to the EV charging station.
133	Note 1 to entry: The cable assembly is part of the EV charging station.

134	[SOURCE: IEC 61851-1:2017, 3.1.12]
135 136 137 138	3.9case Dconnection of an EV to a supply network utilizing an automatic coupler which has an ACD on the EV supply equipment
139	[SOURCE: IEC 61851-23-1:- ¹ , 3.1.201]
140 141 142	3.10 case E connection of an EV to a supply network utilizing an automatic coupler which has an ACD on the EV
143	[SOURCE: IEC 61851-23-1:-1, 3.1.202]
144 145 146 147	3.11 charger power converter at the vehicle power supply circuit which supplies electric power, e.g. for charging a RESS
148 149 150 151	3.12 conductive part The STANDARD PREVIEW part which can carry electric current [SOURCE: ISO 6469-3: 2018, 3.6]
152 153 154	3.13 SIST EN ISO 17409:2020 control pilot function 21109-124459/sist-en-iso-17409-2020 function used to monitor and control the interaction between the EV and the EV supply equipment
155	[SOURCE: IEC 61851-1:2017, 3.3.3]
156	3.14
157	cut-off current
158	let-through current
159 160	the maximum instantaneous value of current attained during the breaking operation of a switching device or a fuse
161 162	Note 1 to entry: This concept of particular importance when the switching device or the fuse operates in such a manner that the prospective peak current of the circuit is not reached.
163	[SOURCE: IEC 60050-441:1984, 441-17-12]
164	3.15
165	DC EV charging station
166	EV charging station that supplies direct current to an EV
167	[SOURCE: IEC 61851-1:2017, 3.1.6]

168	3.16
169	degree of protection
170	protection provided by an enclosure against access, foreign objects and/or water and verified by
171	standardized test methods
172	[SOURCE: ISO 20653:2013, 3.2]
173	3.17
174	direct contact
175	electric contact of persons or animals with live parts
176	[SOURCE: ISO 6469-3: 2018, 3.10]
177	3.18
178	displacement power factor
179	cosφ
180	cosine of the phase angle between the fundamental frequency of the voltage between a line conductor
181	and earth and the current in this line conductor
182	[SOURCE: VDE-AR-N 4100:-1, 3.1.59, modified – translated to English]
183	3.19 iTeh STANDARD PREVIEW
184	distortion power factor
185	coefficient, used to take into account harmonics influence into the true power factor
186	Note 1 to entry: Calculation is as follows: SIST EN ISO 17409:2020
187	https://standards.iteh.ai/catalog/standards/sist/38_19d72-8e9c-4fad-854d- distortion power factor = $\frac{1}{\sqrt[2]{1 + THDi^2}}$
188	THDi being the total harmonic distortion for current.
189	3.20
190	double insulation
191	insulation comprising both basic insulation and supplementary insulation
192	[SOURCE: ISO 6469-3: 2018, 3.11]
193	3.21
194	electrically propelled vehicle
195	EV
196	vehicle with one or more electric drive(s) for vehicle propulsion
197	[SOURCE: ISO 6469-3: 2018, 3.15]
198	3.22
199	electric chassis
200	conductive parts of a vehicle that are electrically connected and whose potential is taken as reference

¹ Under preparation. Stage at the time of publication: Entwurf, 2018-01-23

- 201 [SOURCE: ISO 6469-3: 2018, 3.12]
- 202 **3.23**
- 203 electric drive
- 204 combination of traction motor, power electronics and their associated controls for the conversion of205 electric to mechanical power and vice versa
- 206 [SOURCE: ISO 6469-3: 2018, 3.13]

207 **3.24**

- 208 electric shock
- 209 physiological effect resulting from an electric current through a human body or animal body
- 210 [SOURCE: ISO 6469-3: 2018, 3.14]
- 211 **3.25**

212 EV charging station

- 213 stationary part of EV supply equipment connected to the supply network
- 214 [SOURCE: IEC 61851-1: 2017, 3.1.5]

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EV plug

3.26

215

- specific plug intended to be used as part of EV supply equipment or for the connection of EV to EV supply
 equipment, and defined in the IEC 62196 series
- 219 [SOURCE: IEC 61851-1: 2017, 3.5.8] SIST EN ISO 17409:2020

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220 **3.27**

221 **EV supply equipment**

- 222 equipment or a combination of equipment, providing dedicated functions to supply electric energy from
- 223 a fixed electrical installation or supply network to an EV for the purpose of charging
- EXAMPLE 1: For Mode 3 case B, the EV supply equipment consists of the EV charging station and the cable assembly.
- 225 EXAMPLE 2: For Mode 3 case C, the EV supply equipment consists of the EV charging station with its cable assembly.
- 226 [SOURCE: IEC 61851-1:2017, 3.1.1]

227 **3.28**

228 exposed conductive part

- conductive part of equipment which can be touched and which is not normally live, but which can becomelive when basic insulation fails
- 231 [SOURCE: ISO 6469-3: 2018, 3.18]

232 **3.29**

233 external electric circuit

- electric circuit which connects to the vehicle power supply circuit using the plug (case A), the vehicle inlet
- 235 (case B and case C), the ACD counterpart (case D) or the ACD (case E)

- 236 EXAMPLE: EV charging station, external electric load.
- 237 **3.30**
- 238 external electric power supply
- electric power source that is not part of the vehicle for supplying electric energy to an EV using an EVsupply equipment
- 241 **3.31**
- 242 hazard
- 243 potential source of harm
- 244 [SOURCE: IEC 60050-903:2013, 903-01-02]
- 245 **3.32**

246 hazardous live part

- 247 live part which, under certain conditions, can give a harmful electric shock
- 248 [SOURCE: ISO 6469-3: 2018, 3.22, modified Note 1 to entry removed.]

3.33

250 interlock function

- 251 function that prevents the power contacts of a socket-outlet/vehicle connector from becoming live
- before it is in proper engagement with a plug/vehicle inlet, and which either prevents the plug/vehicle
- 253 connector from being withdrawn while its power contacts are live or makes the power contacts dead
- 254 before separation
- [SOURCE: IEC 61851-1:2017, 3.5.16, modified term changed from "interlock" to "interlock function",
 definition changed from "device or combination of devices" to "function"]
- 257 **3.34**
- 258 isolation resistance
- 259 insulation resistance
- 260 resistance between live parts of an electric circuit and the electric chassis as well as other electric
- 261 circuits which are insulated from this electric circuit
- 262 [SOURCE: ISO 6469-3: 2018, 3.23]

263 **3.35**

264 isolation resistance monitoring system

- system that periodically or continuously monitors the isolation resistance between live parts and theelectric chassis
- 267 [SOURCE: ISO 6469-3: 2018, 3.24]

268 **3.36**

- 269 live conductor
- 270 conductor which is energized in normal operation and capable of contributing to the transmission or
- 271 distribution of electric energy
- Note 1 to entry: Live conductors include line conductors (including DC+ conductors and DC- conductors) andneutral conductors.

274 3.37

275 live part

276 conductor or conductive part intended to be energized in normal use, but by convention not the electric 277 chassis

278 [SOURCE: ISO 6469-3: 2018, 3.25]

279 3.38

280 maximum working voltage

281 highest value of AC voltage (rms) or of DC voltage that can occur under normal operating conditions 282 according to the manufacturer's specifications, disregarding transients and ripple

283 [SOURCE: ISO 6469-3: 2018, 3.26, modified – term "any" deleted from "normal operating conditions"]

284 3.39

285 mode 1

286 method for the connection of an EV to a standard socket-outlet of an AC supply network, utilizing a cable 287 and plug, both of which are not fitted with any supplementary pilot or auxiliary contacts

[SOURCE: IEC 61851-1:2017, 6.2.1] 288

290 mode 2

3.40

289

291 method for the connection of an EV to a standard socket-outlet of an AC supply network utilizing an AC 292 EV supply equipment with a cable and plug, with a control pilot function and system for personal 293 protection against electric shock placed between the standard plug and the EV

[SOURCE: IEC 61851-1:2017, 6.2.2] a9e12d459/sist-en-iso-17409-2020 294

295 3.41

296 mode 3

297 method for the connection of an EV to an AC EV supply equipment permanently connected to an AC supply 298 network, with a control pilot function that extends from the AC EV supply equipment to the EV

299 Note 1 to entry: Mode 3 includes the use of cable assembly not permanently connected to the a.c supply network 300 (case A and case B).

301 [SOURCE: IEC 61851-1:2017, 6.2.3, modified – Note 1 to entry added.]

302 3.42

- 303 mode 4
- 304 method for the connection of an EV to an AC or DC supply network utilizing a DC EV supply equipment, 305 with a control pilot function that extends from the DC EV supply equipment to the EV
- 306 [SOURCE: IEC 61851-1:2017, 6.2.4]
- 307 3.43

308 overcurrent protection

- 309 protection intended to operate when the current is in excess of a predetermined value
- 310 Note 1 to entry: a charge control function is not considered an overcurrent protection