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Interested committees:

Title: Draft BS EN 61851-23 Ed.3.0 BS EN 61851-23 Electric vehicle conductive charging system. Part 23: DC electric vehicle supply equipment.

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- iii) requires additional national guidance or information

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## Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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## UK Vote

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## Submission of Comments

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## Template for comments and secretariat observations

|                  |                        |
|------------------|------------------------|
| Date: xx/xx/20xx | Document: ISO/DIS xxxx |
|------------------|------------------------|

| 1  | 2                                          | (3)                          | 4               | 5                                                                                                                                  | (6)                                                                      | 7                                                  |
|----|--------------------------------------------|------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------|
| MB | Clause No./ Subclause No./Annex (e.g. 3.1) | Paragraph/ Figure/Table/Note | Type of comment | Comment (justification for change) by the MB                                                                                       | Proposed change by the MB                                                | Secretariat observations on each comment submitted |
|    | 3.1                                        | Definition 1                 | ed              | Definition is ambiguous and needs clarifying.                                                                                      | Amend to read '...so that the mains connector to which no connection...' |                                                    |
|    | 6.4                                        | Paragraph 2                  | te              | The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK. | Delete reference to UV photometer.                                       |                                                    |



**69/1076/CD**

COMMITTEE DRAFT (CD)

|                                            |                                                 |
|--------------------------------------------|-------------------------------------------------|
| PROJECT NUMBER:<br><b>IEC 61851-23 ED3</b> |                                                 |
| DATE OF CIRCULATION:<br><b>2025-08-15</b>  | CLOSING DATE FOR COMMENTS:<br><b>2025-11-07</b> |
| SUPERSEDES DOCUMENTS:<br><b>69/976A/RR</b> |                                                 |

|                                                                                                                     |                                        |
|---------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| IEC TC 69 : ELECTRICAL POWER/ENERGY TRANSFER SYSTEMS FOR ELECTRICALLY PROPELLED ROAD VEHICLES AND INDUSTRIAL TRUCKS |                                        |
| SECRETARIAT:<br>Belgium                                                                                             | SECRETARY:<br>Mr Peter Van den Bossche |
| OF INTEREST TO THE FOLLOWING COMMITTEES:<br>SC 23E, SC 23H, TC 64                                                   | HORIZONTAL FUNCTION(S):                |
| ASPECTS CONCERNED:<br>Safety                                                                                        |                                        |

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Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

**Conductive power and energy transfer systems for electric vehicles - Part 23: DC electric vehicle supply equipment**

NOTE FROM TC/SC OFFICERS:

## CONTENTS

**No table of contents entries found.**

|                                                                                                                                                      |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 1 – Example of a coupling session .....                                                                                                       | 30  |
| Figure 2 – Voltage $V_{T8}$ to apply to simulate short period overvoltage at side B between DC+ and DC– .....                                        | 59  |
| Figure 3 – Typical voltages between side B live parts (DC+/DC–) and protective conductor under normal operation .....                                | 62  |
| Figure 4 – IMD connection which results in a voltage more than the maximum voltage limits .....                                                      | 63  |
| Figure 5 – Examples of a fault between the secondary circuit and the protective conductor .....                                                      | 65  |
| Figure 6 – Measurement of the touch leakage current .....                                                                                            | 74  |
| Figure 7 – Touch time – DC voltage under single fault condition (water wet, fingertip to feet) .....                                                 | 76  |
| Figure 8 – Insulation barriers .....                                                                                                                 | 83  |
| Figure 9 – Construction types of vehicle adapters .....                                                                                              | 90  |
| Figure 10 – Apparatus to test the side B cable assembly anchorage .....                                                                              | 92  |
| Figure 11 – Test setup the side B cable assembly anchorage .....                                                                                     | 93  |
| Figure 12 – Example of a side B cable assembly equipped with handle and a warning label attached to the cable .....                                  | 95  |
| Figure 13 – Example setup of SPD for the protection of the EV supply equipment against transients .....                                              | 104 |
| Figure 14 – Example of an SPD-assembly having one voltage switching type SPD between side B live conductors (DC+/DC–) and protective conductor ..... | 106 |
| Figure 15 – Symbol ISO 7000-0434B:2004-01 .....                                                                                                      | 122 |
| Figure 16 – Side B voltage tolerances in CVM .....                                                                                                   | 127 |
| Figure 17 – Current control delay for an increasing current request .....                                                                            | 129 |
| Figure 18 – Current control delay for a decreasing current control request .....                                                                     | 130 |
| Figure 19 – Voltage at side B in CVM operation in steady state with ripple .....                                                                     | 133 |
| Figure 20 – Setup to measure the maximum side B inductance .....                                                                                     | 135 |
| Figure 21 – Reference device (RD) A_0 .....                                                                                                          | 139 |
| Figure 22 – Test arrangement A_0 .....                                                                                                               | 140 |
| Figure 23 – Reference device RD A_1 .....                                                                                                            | 140 |
| Figure 24 – Test arrangement A_1 .....                                                                                                               | 141 |
| Figure 25 – Reference device RD C_0 .....                                                                                                            | 142 |
| Figure 26 – Test arrangement C_0 .....                                                                                                               | 143 |
| Figure 27 – Reference device RD C_1 .....                                                                                                            | 143 |
| Figure 28 – Test arrangement C_1 .....                                                                                                               | 144 |
| Figure 29 – Test procedure for EV supply equipment with temperature-controlled energy transfer .....                                                 | 146 |
| Figure 30 – General test setup for system A .....                                                                                                    | 151 |
| Figure 31 – General test setup for system B .....                                                                                                    | 152 |
| Figure 32 – General test setup for system C .....                                                                                                    | 153 |
| Figure 33 – Test load example .....                                                                                                                  | 154 |
| Figure 34 – Operating points .....                                                                                                                   | 156 |

|    |                                                                                           |     |
|----|-------------------------------------------------------------------------------------------|-----|
| 46 | Figure A.1 – Overall circuit diagram of system A EV supply equipment and EV .....         | 159 |
| 47 | Figure A.2 – Failure detection principle by detection of DC leakage current .....         | 163 |
| 48 | Figure A.3 – Example of vehicle connector latch monitoring circuit .....                  | 167 |
| 49 | Figure A.4 – Example of vehicle inlet with the latch holder covered by a metal plate      |     |
| 50 | that inhibits latch holding .....                                                         | 168 |
| 51 | Figure A.5 – Flow diagram for forward power transfer .....                                | 181 |
| 52 | Figure A.6 – Sequence diagram for forward power transfer .....                            | 182 |
| 53 | Figure A.7 – Representation of the delay between the measurement and the digital          |     |
| 54 | communication transmission for system A .....                                             | 188 |
| 55 | Figure A.8 – Acceptable range of the measured current at side B (target current of the    |     |
| 56 | EV $I_{EV\_trg} = 50$ A) .....                                                            | 189 |
| 57 | Figure A.9 – Change in the target current requested by the EV .....                       | 190 |
| 58 | Figure A.10 – Side B performance of EV supply equipment .....                             | 191 |
| 59 | Figure A.11 – Circuit diagram of a system A BPT EV supply equipment and EV .....          | 193 |
| 60 | Figure A.12 – Flow diagram for bidirectional power transfer .....                         | 199 |
| 61 | Figure A.13 – Sequence diagram for bidirectional power transfer .....                     | 200 |
| 62 | Figure A.14 – Transition of applicable maximum current of the EV supply equipment at      |     |
| 63 | side B and target current of the EV during dynamic control .....                          | 201 |
| 64 | Figure B.1 – System B EV supply equipment circuit diagram .....                           | 205 |
| 65 | Figure B.2 – Representation of delay between the measures current and voltage at          |     |
| 66 | side B and the digital communication transmission for system B .....                      | 207 |
| 67 | Figure B.3 – FPT control sequence for system B .....                                      | 210 |
| 68 | Figure B.4 – Timing sequence diagram of FPT .....                                         | 220 |
| 69 | Figure B.5 – Operating points and test points for side B current regulation in CCM .....  | 221 |
| 70 | Figure B.6 – Operating points and test points for side B voltage regulation in CVM .....  | 226 |
| 71 | Figure B.7 – Definition of CCM, CVM and CPM .....                                         | 227 |
| 72 | Figure B.8 – Typical FTP process .....                                                    | 228 |
| 73 | Figure C.1 – Circuit diagram for a system C EV supply equipment of configuration EE ..... | 231 |
| 74 | Figure C.2 – Circuit diagram of a system C EV supply equipment of configuration FF .....  | 234 |
| 75 | Figure C.3 – Equivalent disabled side B of the EV supply equipment .....                  | 236 |
| 76 | Figure C.4 – Example of a sequence diagram .....                                          | 239 |
| 77 | Figure C.5 – Sequence diagram for normal startup .....                                    | 240 |
| 78 | Figure C.6 – Sequence diagram for normal shutdown or pause after energy transfer by       |     |
| 79 | EV or EV supply equipment .....                                                           | 250 |
| 80 | Figure C.7 – Sequence diagram for EV supply equipment and EV initiated error              |     |
| 81 | shutdown .....                                                                            | 256 |
| 82 | Figure C.8 – Sequence diagram for EV initiated error shutdown based on DIN SPEC           |     |
| 83 | 70121 during energy transfer .....                                                        | 259 |
| 84 | Figure C.9 – Sequence diagram for an emergency shutdown executed by the EV .....          | 262 |
| 85 | Figure C.10 – Sequence diagram for an emergency shutdown executed by the EV               |     |
| 86 | supply equipment .....                                                                    | 265 |
| 87 | Figure C.11 – Sequence diagram for pause before cable-check phase by EV supply            |     |
| 88 | equipment using ISO 15118-2:2026 .....                                                    | 268 |
| 89 | Figure C.12 – Sequence diagram for pause after pre-charge phase and before energy         |     |
| 90 | transfer stage by the EV supply equipment using ISO 15118-2:2014, ISO 15118-              |     |
| 91 | 2:2026 or ISO 15118-20:2022 and ISO 15118-20:2022/AMD1:2025 .....                         | 274 |

|     |                                                                                                                                         |     |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------|-----|
| 92  | Figure C.13 – Sequence diagram for renegotiation initiated by EV or EV supply equipment using ISO 15118-2:2014 or ISO 15118-2:2026..... | 284 |
| 94  | Figure C.14 – Worst case equivalent circuit during pre-charge.....                                                                      | 293 |
| 95  | Figure C.15 – Restart methods sequence for the EV supply equipment.....                                                                 | 296 |
| 96  | Figure C.16 – Restart method verification on the EV supply equipment.....                                                               | 297 |
| 97  | Figure C.17 – Example of a B1 – B2 transition .....                                                                                     | 298 |
| 98  | Figure C.18 – Example of a B1 – E – B1 – B2 transition.....                                                                             | 299 |
| 99  | Figure C.19 – Example of a B1 – F – B1 – B2 transition.....                                                                             | 299 |
| 100 | Figure C.20 – Restart methods sequence for the EV .....                                                                                 | 301 |
| 101 | Figure C.21 – Example of a B – C – B toggle .....                                                                                       | 302 |
| 102 | Figure C.22 – Operating points .....                                                                                                    | 328 |
| 103 | Figure C.23 – Approaching a single test point TP in CCM (example 1).....                                                                | 331 |
| 104 | Figure C.24 – Approaching multiple test points TP <sub>n</sub> CCM (example 2) .....                                                    | 332 |
| 105 | Figure C.25 – Test points TP <sub>n</sub> .....                                                                                         | 341 |
| 106 | Figure C.26 – Voltage at the vehicle connector .....                                                                                    | 349 |
| 107 | Figure C.27 – Test points TP <sub>n</sub> for the load dump test.....                                                                   | 353 |
| 108 | Figure C.28 – Test point matrix for side B current regulation in CCM including static deviation and ripple .....                        | 357 |
| 110 | Figure C.29 – Test point sequence for side B current regulation in CCM.....                                                             | 360 |
| 111 | Figure C.30 – Test point matrix for 0 A mode during energy transfer .....                                                               | 361 |
| 112 | Figure C.31 – Test point matrix for side B voltage regulation in CVM during pre-charge.....                                             | 364 |
| 113 | Figure C.32 – Test point matrix for control delay of charging current in CCM .....                                                      | 370 |
| 114 | Figure C.33 – Test point sequence .....                                                                                                 | 372 |
| 115 | Figure C.34 – Test points for voltage measurement during welding detection.....                                                         | 389 |
| 116 | Figure C.35 – Test setup for IMD measurement connections .....                                                                          | 396 |
| 117 | Figure D.1 – Circuit diagram for an EV supply equipment of configuration GG .....                                                       | 401 |
| 118 | Figure D.2 – Example of a circuit diagram for SRN1(switched resistor network) in the EVSE of configuration GG.....                      | 401 |
| 120 | Figure D.3 – Example of a circuit diagram for SRN2(switched resistor network) in the EV of configuration GG .....                       | 402 |
| 122 | Figure D.4 – Equivalent disabled side B of the EV supply equipment .....                                                                | 409 |
| 123 | Figure D.5 – Example of a sequence diagram .....                                                                                        | 411 |
| 124 | Figure D.6 – Sequence diagram for normal startup .....                                                                                  | 412 |
| 125 | Figure D.7 – Sequence diagram for normal shutdown during transfer by EV or EV supply equipment.....                                     | 419 |
| 127 | Figure D.8 – Sequence diagram for EV supply equipment or EV initiated error shutdown .....                                              | 423 |
| 129 | Figure D.9 – Sequence diagram for an emergency shutdown executed by the EV .....                                                        | 426 |
| 130 | Figure D.10 – Sequence diagram for an emergency shutdown executed by the EV supply equipment.....                                       | 429 |
| 132 | Figure E.1 – Fault-ride through for EV on side B .....                                                                                  | 449 |
| 133 | Figure F.1 – Magnitude of the impedance of the test load between DC+ and DC– for system A and system B.....                             | 452 |
| 135 | Figure F.2 – Magnitude of the impedance of the test load between DC+ and DC– for system A for current ripple measurements .....         | 453 |

|     |                                                                                        |     |
|-----|----------------------------------------------------------------------------------------|-----|
| 137 | Figure F.3 – Magnitude of the impedance of the test load between DC+ and DC– for       |     |
| 138 | system C .....                                                                         | 453 |
| 139 | Figure F.4 – Test setup for test load verification .....                               | 454 |
| 140 | Figure G.1 – Example of a multi-side B EV supply equipment with a single PEC .....     | 458 |
| 141 | Figure G.2 – Example of a multi-side B EV supply equipment with multiple PECs .....    | 459 |
| 142 | Figure I.1 – EV and EV supply equipment equivalent circuit .....                       | 466 |
| 143 | Figure I.2 – Circuit diagram simplification of the circuit in Figure I.1 .....         | 469 |
| 144 | Figure I.3 – Thevenin equivalent circuit diagram of the circuit in Figure I.1 .....    | 469 |
| 145 | Figure I.4 – Leakage current and impulse current in relation to limits in IEC 60479    |     |
| 146 | series .....                                                                           | 470 |
| 147 | Figure I.5 – Examples of circuits with equivalent impulse current and leakage current  |     |
| 148 | through a human body .....                                                             | 471 |
| 149 |                                                                                        |     |
| 150 | Table 1 – Verification criterion .....                                                 | 51  |
| 151 | Table 2 – Data/message for the compatibility check test .....                          | 55  |
| 152 | Table 3 – Voltage threshold for emergency shutdown reaction for system B and system    |     |
| 153 | C 57                                                                                   |     |
| 154 | Table 4 – EV supply equipment reaction depending on the present voltage at side B      |     |
| 155 | condition .....                                                                        | 57  |
| 156 | Table 5 – Compliance tests for protection against overvoltage at side B between DC+    |     |
| 157 | and DC– .....                                                                          | 58  |
| 158 | Table 6 – Test load setup for protection against overvoltage test .....                | 58  |
| 159 | Table 7 – Data/messages for protection against overvoltage test .....                  | 59  |
| 160 | Table 8 – Overvoltage condition and verification criterion .....                       | 59  |
| 161 | Table 9 – Control circuit supply integrity test .....                                  | 60  |
| 162 | Table 10 – Touch voltage under normal operation .....                                  | 77  |
| 163 | Table 11 – Touch voltage under single fault conditions .....                           | 77  |
| 164 | Table 12 – Safety provisions for protection against electric shock for EV supply       |     |
| 165 | equipment at side B .....                                                              | 80  |
| 166 | Table 13 – Minimum protective measures .....                                           | 85  |
| 167 | Table 14 – Pull force and torque test values for side B cable assembly anchorage ..... | 95  |
| 168 | Table 15 – Touch current limits .....                                                  | 101 |
| 169 | Table 16 – Sizes of conductors of power supply cord .....                              | 110 |
| 170 | Table 17 – Cord strain relief pull force .....                                         | 111 |
| 171 | Table 18 – Current ripple limit of the EV supply equipment .....                       | 133 |
| 172 | Table 19 – Test parameter values .....                                                 | 145 |
| 173 | Table 20 – Rated boost current setups .....                                            | 150 |
| 174 | Table 21 – Recommended circuit parameters of the test load .....                       | 156 |
| 175 | Table A.1 – Definition of symbols of the overall circuit diagram of a system A EV      |     |
| 176 | supply equipment .....                                                                 | 161 |
| 177 | Table A.2 – Parameters and values of the circuit diagram for a system A EV supply      |     |
| 178 | equipment .....                                                                        | 162 |
| 179 | Table A.3 – Principle of fault protection .....                                        | 163 |
| 180 | Table A.4 – Requirements for earth leakage current fault monitoring .....              | 165 |
| 181 | Table A.5 – Error shutdown times and criteria .....                                    | 170 |

|     |                                                                                       |     |
|-----|---------------------------------------------------------------------------------------|-----|
| 182 | Table A.6 – Action and message parameter for error shutdown triggered by the EV       |     |
| 183 | supply equipment.....                                                                 | 172 |
| 184 | Table A.7 – Action and message parameter for error shutdown triggered by the EV ..... | 172 |
| 185 | Table A.8 – Emergency shutdown times and criteria .....                               | 173 |
| 186 | Table A.9 – Actions and criteria for emergency shutdown .....                         | 174 |
| 187 | Table A.10 – System A setup of the test load for regulation of the present current at |     |
| 188 | side B in CCM.....                                                                    | 175 |
| 189 | Table A.11 – System A recommended steps for regulation of the present current at      |     |
| 190 | side B in CCM.....                                                                    | 175 |
| 191 | Table A.12 – Specification of measuring instrument .....                              | 177 |
| 192 | Table A.13 – Voltage threshold for emergency shutdown .....                           | 177 |
| 193 | Table A.14 – Maximum boost current for system A EV supply equipment .....             | 179 |
| 194 | Table A.15 – FPT states of the FPT EV supply equipment .....                          | 180 |
| 195 | Table A.16 – FPT control process and states of the FPT EV supply equipment .....      | 181 |
| 196 | Table A.17 – Test scenarios .....                                                     | 185 |
| 197 | Table A.18 – Normal shutdown times and criteria.....                                  | 186 |
| 198 | Table A.19 – Actions and message parameters for normal shutdown .....                 | 186 |
| 199 | Table A.20 – Recommended specification of target current of the EV .....              | 191 |
| 200 | Table A.21 – Requirements for the side B performance of EV supply equipment .....     | 192 |
| 201 | Table A.22 – Setup of test load for protection against under-voltage at the vehicle   |     |
| 202 | connector.....                                                                        | 197 |
| 203 | Table A.23 – BPT states of BPT EV supply equipment.....                               | 197 |
| 204 | Table A.24 – BPT control process of BPT EV supply equipment .....                     | 199 |
| 205 | Table A.25 – Selection of protection measures against over-temperature .....          | 204 |
| 206 | Table A.26 – Protection measures against over-temperature .....                       | 204 |
| 207 | Table B.1 – Parameters values of the control circuit for FPT .....                    | 207 |
| 208 | Table B.2 – Error shutdown times and criteria .....                                   | 213 |
| 209 | Table B.3 – Emergency shutdown times and criteria .....                               | 213 |
| 210 | Table B.4 – EV simulator voltage ranges emergency shutdown reaction test.....         | 217 |
| 211 | Table B.5 – Setup of the test load for side B current regulation in CCM .....         | 222 |
| 212 | Table B.6 – Recommended steps for minimum side B current regulation in CCM .....      | 223 |
| 213 | Table B.7 – Recommended steps for side B voltage regulation in CVM .....              | 225 |
| 214 | Table C.1 – Vehicle couplers for system C.....                                        | 231 |
| 215 | Table C.2 – Component values and tolerances for configuration EE .....                | 233 |
| 216 | Table C.3 – Proximity pilot voltages .....                                            | 234 |
| 217 | Table C.4 – Component values and tolerances for configuration FF .....                | 236 |
| 218 | Table C.5 – Component limits for the disabled side B of the EV supply equipment ..... | 238 |
| 219 | Table C.6 – Message code mapping for sequence diagram.....                            | 239 |
| 220 | Table C.7 – Example of a sequence description .....                                   | 240 |
| 221 | Table C.8 – Sequence description for normal startup using DIN TS 70121 or ISO         |     |
| 222 | 15118-2 .....                                                                         | 242 |
| 223 | Table C.9 – Sequence description for normal start up using ISO 15118-20 .....         | 247 |
| 224 | Table C.10 – Sequence description for normal shutdown or pause after energy transfer  |     |
| 225 | by EV or EV supply equipment using DIN TS 70112 or ISO 15118-2.....                   | 251 |

|     |                                                                                             |     |
|-----|---------------------------------------------------------------------------------------------|-----|
| 226 | Table C.11 – Sequence description for normal shutdown during energy transfer by EV          |     |
| 227 | or EV supply equipment using ISO 15118-20 .....                                             | 253 |
| 228 | Table C.10 – Overview of error and emergency shutdown cases .....                           | 255 |
| 229 | Table C.11 – Sequence description for EV supply equipment and EV initiated error            |     |
| 230 | shutdown .....                                                                              | 258 |
| 231 | Table C.12 – Sequence description for EV initiated error shutdown based on DIN              |     |
| 232 | SPEC 70121 during energy transfer .....                                                     | 260 |
| 233 | Table C.13 – Sequence diagram an emergency shutdown executed by the EV .....                | 264 |
| 234 | Table C.14 – Sequence diagram an emergency shutdown executed by the EV supply               |     |
| 235 | equipment .....                                                                             | 267 |
| 236 | Table C.15 – Sequence description for pause before cable-check phase by EV supply           |     |
| 237 | equipment using ISO 15118-2:2026 .....                                                      | 270 |
| 238 | Table C.18 – Sequence description for pause before cable-check phase by EV supply           |     |
| 239 | equipment using ISO 15118-20:2022 and ISO 15118-20:2022/AMD1:2025 .....                     | 272 |
| 240 | Table C.16 – Sequence description for pause after pre-charge phase and before               |     |
| 241 | energy transfer stage by the EV supply equipment using ISO 15118-2:2014 or ISO              |     |
| 242 | 15118-2:2026 .....                                                                          | 276 |
| 243 | Table C.20 – Sequence description for pause after pre-charge phase and before               |     |
| 244 | energy transfer stage by the EV supply equipment using ISO 15118-20:2022 and ISO            |     |
| 245 | 15118-20:2022/AMD1:2025 .....                                                               | 280 |
| 246 | Table C.17 – Sequence description for renegotiation initiated by EV or EV supply            |     |
| 247 | equipment using ISO 15118-2:2014 or ISO 15118-2:2026 .....                                  | 286 |
| 248 | Table C.18 – Insulation states and EV supply equipment reaction based on the                |     |
| 249 | insulation resistance .....                                                                 | 291 |
| 250 | Table C.19 – Values to design the EV supply equipment during pre-charge based on            |     |
| 251 | Figure C.14 .....                                                                           | 294 |
| 252 | Table C.20 – Energy transfer control modes at different communication session               |     |
| 253 | stage/phase .....                                                                           | 326 |
| 254 | Table C.21 – EV simulator target current and voltage .....                                  | 345 |
| 255 | Table C.22 – Current ripple limits .....                                                    | 345 |
| 256 | Table C.23 – Component valued for the inrush current limit test .....                       | 356 |
| 257 | Table C.24 – Current ripple limits .....                                                    | 362 |
| 258 | Table C.25 – Test setup values to measure side B voltage regulation in CVM during           |     |
| 259 | pre-charge .....                                                                            | 367 |
| 260 | Table C.26 – Current ripple limits .....                                                    | 376 |
| 261 | Table C.27 – EV simulator characteristics .....                                             | 388 |
| 262 | Table C.28 – Test cases for the functional check of the IMD .....                           | 398 |
| 263 | Table D.1 – EV supply equipment component values and tolerances for configuration           |     |
| 264 | GG 404 .....                                                                                |     |
| 265 | Table D.2 – EV component values and tolerances for configuration GG .....                   | 405 |
| 266 | Table D.3 – Switched resistor network component values and tolerances in EV supply          |     |
| 267 | equipment .....                                                                             | 405 |
| 268 | Table D.4 – Adjustable resistor network component values and tolerances in EV .....         | 406 |
| 269 | Table D.5 – System states of configuration GG based on the CE voltage .....                 | 407 |
| 270 | Table D.6 – Charge Enable states and voltage ranges for the EV supply equipment .....       | 408 |
| 271 | Table D.7 – Charge Enable states and voltage ranges for the EV .....                        | 408 |
| 272 | Table D.8 – Insertion Detection states and voltage ranges for the EV supply equipment ..... | 409 |
| 273 | Table D.9 – Insertion Detection states and voltage ranges for the EV .....                  | 409 |

|     |                                                                                        |     |
|-----|----------------------------------------------------------------------------------------|-----|
| 274 | Table D.10 – Component limits for the disabled side B of the EV supply equipment ..... | 410 |
| 275 | Table D.11 – Example of a sequence description .....                                   | 412 |
| 276 | Table D.12 – Sequence description for normal startup .....                             | 414 |
| 277 | Table D.13 – Sequence description for normal shutdown during energy transfer by EV     |     |
| 278 | or EV supply equipment .....                                                           | 421 |
| 279 | Table D.14 – Overview of error and emergency shutdown cases .....                      | 422 |
| 280 | Table D.15 – Sequence description for EV supply equipment and EV initiated error       |     |
| 281 | shutdown .....                                                                         | 424 |
| 282 | Table D.16 – Sequence diagram of an emergency shutdown executed by the EV .....        | 428 |
| 283 | Table D.17 – Sequence diagram an emergency shutdown executed by the EV supply          |     |
| 284 | equipment.....                                                                         | 430 |
| 285 | Table D.18 – Insulation states and EV supply equipment reaction based on the           |     |
| 286 | insulation resistance .....                                                            | 435 |
| 287 | Table E.1 – Examples of Pre-Conditions to send an Event Notification .....             | 448 |
| 288 | Table F.1 – Test load parameters .....                                                 | 453 |
| 289 | Table G.1 – Possible combinations for multi-side B EV supply equipment.....            | 458 |
| 290 | Table I.1 – Key(s) and exemplary values for design verification .....                  | 468 |
| 291 | Table K.1 – Notional Boost Setups for rated boost current .....                        | 478 |
| 292 | Table K.2 – Notional Boost Setups for further boost currents under other ambient       |     |
| 293 | temperatures .....                                                                     | 478 |
| 294 | Table M.1 –Shutdown conditions and error codes .....                                   | 481 |
| 295 |                                                                                        |     |
| 296 |                                                                                        |     |

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## ELECTRIC VEHICLE CONDUCTIVE CHARGING SYSTEM –

## Part 23: DC electric vehicle supply equipment

## FOREWORD

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IEC 61851-23 has been prepared by IEC technical committee 69: Electric power/energy transfer systems for electrically propelled road vehicles and industrial trucks. It is an International Standard.

This third edition cancels and replaces the second edition published in 2023. This edition constitutes a technical revision.

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

- a) the structure has been rearranged and does not follow the same structure as IEC 61851-1:202X (TBC);
- b) electrical safety requirements in Clause 8 and Clause 12 have been revised based on the requirements in IEC 62477-1 and inspired by the hazard based safety approach of IEC 62368-1;

- c) test methods for checking conformity to the stated requirements have been improved; general provisions for compliance tests have been specified in Clause 18;
- d) specific requirements and/or information for the following functions have been added: energy transfer with thermal management system (17.2), bi-directional power transfer control (Annex E), multi-side B separated EV supply equipment (Annex G), and communication and energy transfer process (Annex H);
- e) Annex A (system A), Annex B (system B) and Annex C (system C) have been updated including additions in conjunction with b) and c).;
- f) Annex D(system D) has been added.
- g) a new informative annex for the touch current and the touch impulse current (Annex I) has been added.

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

| Draft    | Report on voting |
|----------|------------------|
| 69/XX/CD | 69/XX/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

**SecNote: References to IEC 61851-1 need to be updated due to the removal of mode 4.**

The clauses of particular requirements in this document supplement or modify the corresponding clauses in IEC 61851-1:2017. Where the text of subsequent clauses indicates an "addition" to or a "replacement" of the relevant requirement, test specification or explanation of IEC 61851-1:2017, these changes are made to the relevant text of IEC 61851-1:2017, which then becomes part of this document. Where no change is necessary, the words "This clause of IEC 61851-1:2017 is applicable" are used. The new clauses which are not included in IEC 61851-1:2017 have a clause number starting from 101, for example 3.101, 101.1, etc. The annexes of this document are numbered using double-alphabet, for example Annex AA, to avoid confusion with the annexes in IEC 61851-1:2017.

In this document, the following print types are used:

- *test specifications: italic type.*
- notes: smaller roman type.

Figures in this document use L1 and N to represent the connection of the side A of the EV supply equipment to the AC supply network or DC supply network. This is only to simplify the figures and not to impose requirements.

A list of all parts in the IEC 61851 series, published under the general title *Electric vehicle conductive charging system*, can be found on the IEC website.

391 The committee has decided that the contents of this document will remain unchanged until the  
392 stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the  
393 specific document. At this date, the document will be

- 394 • reconfirmed,  
395 • withdrawn, or  
396 • revised.

397

**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.**

398

399

# ELECTRIC VEHICLE CONDUCTIVE CHARGING SYSTEM –

## Part 23: DC electric vehicle supply equipment

### 1 Scope

This part of IEC 61851 applies to the EV supply equipment to provide energy transfer between the supply network and electric vehicles (EVs), with a rated maximum voltage at side A of up to 1 000 V AC or up to 1 500 V DC and a rated maximum voltage at side B up to 1 500 V DC.

This document specifies the EV supply equipment of system A, system B, system C and system D as defined in Annex A, Annex B, Annex C, and Annex D. Other systems are under consideration.

This document provides the requirements for bidirectional power transfer (BPT) EV supply equipment for system A and system C, with a rated maximum voltage at side A up to 1 000 V AC or 1 500 V DC. The requirements for reverse power transfer (RPT) and BPT for system B are under consideration and are not specified in this document.

Annex E provides information on the behaviour and functional requirements at side B to support grid code compliance during bidirectional power transfer (forward power transfer is under consideration). It focuses on the coordination between the EV supply equipment and the EV in response to grid events on side A.

NOTE 1 Users of this standard should be aware that in most jurisdictions there are national or local requirements that must be met by systems using EV supply equipment with reverse power transfer. Examples include EN 50549-1, IEEE 1547, DIN VDE-AR-N 4105, and AS/NZS 4777.2

This document does not cover all safety aspects related to maintenance.

This document specifies systems with protective separation between side A and side B. Systems without protective separation between side A and side B are under consideration. For example, systems without separation or systems with simple separation.

The requirements for digital communication between EV supply equipment and the EV to control energy transfer are defined in IEC 61851-24.

Requirements for energy transfer with an automated connection device are given in IEC 61851-23-1<sup>1</sup>.

Specific requirements for EV supply equipment with multiple vehicle connectors are provided in Annex G.

General information about energy transfer control, signalling and digital communication is provided in Annex H.

General information on the touch current and touch impulse current is provided in Annex I.

Requirements for EV supply equipment without current, voltage and/or power control are under consideration.

<sup>1</sup> Under preparation. Stage at the time of publication: IEC CDV 61851-23-1:2025.

For CVM, when the battery system is not connected: under consideration.

EV supply equipment in compliance with this document are not intended to provide energy transfer to a single EV with

- multiple vehicle connectors of the same EV supply equipment, or
- multiple EV supply equipment.

Requirements for such use case are under consideration.

**SecNote:** There are discussions from organization like CharIN about energy transfer with EVs with multiple vehicle connectors. Proposals are welcomed. See Annex J.

NOTE 2 Requirements for EVs mated to an EV supply equipment are specified in ISO 5474 series.

This document does not cover accessibility requirements related to the use of EV supply equipment by persons with reduced mobility and persons with disabilities.

## 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 60038:2009, *IEC standard voltages*

IEC 60068-2-75:2014, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60227-1:2007, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 60245-1:2003, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 1: General requirements*  
IEC 60245-1:2003/AMD1:2007

IEC 60320-1, *Appliance couplers for household and similar general purposes – Part 1: General requirements*

IEC 60364-4-43:2008, *Low-voltage electrical installations – Part 4-43: Protection for safety – Protection against overcurrent*

IEC 60364-5-53:2019, *Low-voltage electrical installations – Part 5-53: Selection and erection of electrical equipment – Devices for protection for safety, isolation, switching, control and monitoring*

IEC 60364-5-54:2011, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors*  
IEC 60364-5-54:2011/AMD1:2021

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

- 476 IEC 60479-1:2018, *Effects of current on human beings and livestock – Part 1: General aspects*
- 477 IEC 60479-2:2019, *Effects of current on human beings and livestock – Part 2: Special aspects*
- 478 IEC 60529, *Degrees of protection provided by enclosures (IP Code)*
- 479 IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage supply systems –*  
480 *Part 1: Principles, requirements and tests*
- 481 IEC 60811-501, *Electric and optical fibre cables – Test methods for non-metallic materials –*  
482 *Part 501: Mechanical tests – Tests for determining the mechanical properties of insulating and*  
483 *sheathing compounds*
- 484 IEC 60812:2018, *Failure modes and effects analysis (FMEA and FMECA)*
- 485 IEC 60990:2016, *Methods of measurement of touch current and protective conductor current*
- 486 IEC 61008-1:2010, *Residual current operated circuit-breakers without integral overcurrent*  
487 *protection for household and similar uses (RCCBs) – Part 1: General rules*  
488 IEC 61008-1:2010/AMD1:2012  
489 IEC 61008-1:2010/AMD2:2013
- 490 IEC 61009-1:2009, *Residual current operated circuit-breakers with integral overcurrent*  
491 *protection for household and similar uses (RCBOs) – Part 1: General rules*  
492 IEC 61009-1:2009/AMD1:2012  
493 IEC 61009-1:2009/AMD2:2013
- 494 IEC 60947-2:2016, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*  
495 IEC 60947-2:2016/AMD1:2019
- 496 IEC 61140:2016, *Protection against electric shock – Common aspects for installation and*  
497 *equipment*
- 498 IEC 61439-1:2020, *Low-voltage switchgear and controlgear assemblies – Part 1: General rules*
- 499 IEC 61439-7:2022, *Low-voltage switchgear and controlgear assemblies – Part 7: Assemblies*  
500 *for specific applications such as marinas, camping sites, market squares, electric vehicle*  
501 *charging stations*
- 502 IEC 61540:1997, *Electrical accessories – Portable residual current devices without integral*  
503 *overcurrent protection for household and similar use (PRCDs)*  
504 IEC 61540:1997/AMD1:1998
- 505 IEC 61557-8:2014, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and*  
506 *1 500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 8:*  
507 *Insulation monitoring devices for IT systems*
- 508 IEC 61558-1:2017, *Safety of transformers, reactors, power supply units and combinations*  
509 *thereof – Part 1: General requirements and tests*
- 510 IEC 61558-2-4:2021, *Safety of transformers, reactors, power supply units and combinations*  
511 *thereof – Part 2-4: Particular requirements and tests for isolating transformers and power supply*  
512 *units incorporating isolating transformers for general applications*
- 513 IEC 61643 (all parts), *Low-voltage surge protective devices*

- 514 IEC 61643-11, *Low-voltage surge protective devices – Part 11: Surge protective devices*  
 515 *connected to low-voltage power systems – Requirements and test methods*
- 516 IEC 61643-21, *Low voltage surge protective devices – Part 21: Surge protective devices*  
 517 *connected to telecommunications and signalling networks – Performance requirements and*  
 518 *testing methods*
- 519 IEC 61851-1:2017, *Electric vehicle conductive charging system – Part 1: General requirements*
- 520 IEC 61851-21-2:2018, *Electric vehicle conductive charging system – Part 21-2: Electric vehicle*  
 521 *requirements for conductive connection to an AC/DC supply – EMC requirements for off-board*  
 522 *electric vehicle charging systems*
- 523 IEC 61851-24:2023, *Electric vehicle conductive charging system – Part 24: Digital*  
 524 *communication between a DC EV charging station and an electric vehicle for control of DC*  
 525 *charging*
- 526 IEC 62196-1:2022, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive*  
 527 *charging of electric vehicles – Part 1: General requirements*
- 528 IEC 62196-3:2022, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive*  
 529 *charging of electric vehicles – Part 3: Dimensional compatibility and interchangeability*  
 530 *requirements for DC and AC/DC pin and contact-tube vehicle couplers*
- 531 IEC TS 62196-3-1:2020, *Plugs, socket-outlets, vehicle connectors and vehicle inlets –*  
 532 *Conductive charging of electric vehicles – Part 3-1: Vehicle connector, vehicle inlet and cable*  
 533 *assembly for DC charging intended to be used with a thermal management system*
- 534 IEC 62368-1:2023, *Audio/video, information and communication technology equipment – Part 1:*  
 535 *Safety requirements*
- 536 IEC 62423:2009, *Type F and type B residual current operated circuit-breakers with and without*  
 537 *integral overcurrent protection for household and similar uses*
- 538 IEC 62262, *Degrees of protection provided by enclosures for electrical equipment against*  
 539 *external mechanical impacts (IK code)*
- 540 IEC 62477-1:2022, *Safety requirements for power electronic converter systems and equipment*  
 541 *– Part 1: General*
- 542 IEC 62893-4-1:2020, *Charging cables for electric vehicles of rated voltages up to and including*  
 543 *0,6/1 kV – Part 4-1: Cables for DC charging according to mode 4 of IEC 61851-1 – DC charging*  
 544 *without use of a thermal management system*
- 545 IEC Guide 115, *Application of measurement uncertainty to conformity assessment activities in*  
 546 *the electrotechnical sector*
- 547 ISO 2719:2016, *Determination of flash point – Pensky-Martens closed cup method*
- 548 ISO 5474-1:2024, *Electrically propelled road vehicles – Functional and safety requirements for*  
 549 *power transfer between vehicle and external electric circuit – Part 1: General requirements for*  
 550 *conductive power transfer*
- 551 ISO 5474-3:2024, *Electrically propelled road vehicles – Functional and safety requirements for*  
 552 *power transfer between vehicle and external electric circuit – Part 3: DC power transfer*

ISO 6469-3:2018<sup>2</sup>, *Electrically propelled road vehicles – Safety specifications – Part 3: Electrical safety*

ISO 7000, *Graphical symbols for use on equipment*, available at <http://www.graphical-symbols.info/equipment>

ISO 7010, *Graphical symbols – Safety colours and safety signs – Registered safety signs*, available at <https://www.iso.org/obp>

ISO 15118-2:2014, *Road vehicles – Vehicle-to-grid communication interface – Part 2: Network and application protocol requirements*

ISO 15118-3, *Road vehicles – Vehicle to grid communication interface – Part 3: Physical and data link layer requirements*

DIN TS 70121:2024, *Electromobility – Digital communication between a DC EV charging station and an electric vehicle for control of DC charging in the combined charging system*

OECD 301 B, *OECD Guideline for testing of chemicals*

### 3 Terms and definitions

**SecNote:** To be aligned with IEC 61851-1 Ed4.

For the purposes of this document, the terms and definitions given in IEC 61851-1:2017 apply, except as follows.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

*Addition:*

NOTE The definitions included in this document are those having general application herein. Definitions applying to isolating transformers, safety isolating transformers, switch mode power supplies, and their construction are included in IEC 61558-1.

#### 3.1 Electric supply equipment

*Additional terms and definitions:*

##### 3.1.101

##### **separated EV supply equipment**

EV supply equipment where the side B circuit is separated from all other circuits

Note 1 to entry: See Clause 8 for the requirements of separation between each circuit.

##### 3.1.102

##### **non-separated EV supply equipment**

EV supply equipment where the side B circuit is not separated from one or more other circuits

Note 1 to entry: See Clause 8 for the requirements of separation between each circuit.

<sup>2</sup> This publication has been withdrawn. A new edition of ISO 6469-3 (4<sup>th</sup> edition) came out in 2021.

**3.1.103****energy transfer****power transfer**

DEPRECATED: charging

delivery of energy, in either direction, between parts of a system

Note 1 to entry: The direction of the energy transfer is defined by the application.

**3.2 Insulation****3.2.1****basic insulation***Addition:*

Note 1 to entry: This concept does not apply to insulation used exclusively for functional purposes.

**3.2.8****insulation***Replacement:*

all the materials and parts used to insulate conductive elements of a device

[SOURCE: IEC 60050-151:2001, 151-15-41]

*Additional terms and definitions:***3.2.101****asymmetrical insulation faults****asymmetrical faults**

defect in the insulation of an electric installation or equipment creating a resistive path to protective conductor having different resistances from the live conductors to protective conductor

[SOURCE: IEC 61557-8:2014, 3.1.20, modification – Words "phase conductors" replaced with "live conductors", and "earth" with "protective conductor".]

**3.2.102****dead, adj**

de-energized, adj

qualifies a conductive part when it is not energized

[SOURCE: IEC 60050-151:2001, 151-15-59, modified – Term "de-energized" added.]

**3.2.103****live, adj**

energized, adj

qualifies a conductive part having an electric potential difference with respect to a relevant reference

Note 1 to entry: The reference potential is usually the Earth or an equipotential frame.

Note 2 to entry: A live part may be temporarily dead when it is not energized. A neutral conductor is considered as live but earthing conductors are not.

Note 3 to entry: A part is energized (live) when it is electrically connected to a source of electric energy. It can also be energized (live) when it is electrically charged and/or under the influence of an electric or magnetic field.

Note 4 to entry: See IEC 60050-651:2014, 651-21-08.

629 [SOURCE: IEC 60050-151:2001, 151-15-58, modified – Term "live" added, as well as Notes 2  
630 and 3 to entry.]

### 631 **3.2.104**

#### 632 **leakage current monitoring device**

633 DEPRECATED: leakage measuring device

634 passive electrical device for monitoring insulation resistance of separated DC system by  
635 measuring leakage current between live parts and exposed conductive part or the protective  
636 conductor

### 637 **3.2.105**

#### 638 **enhanced protective provision**

639 protective provision having a reliability of protection not less than that provided by two  
640 independent protective provisions

641 [SOURCE: IEC 60050-195:2021, 195-06-27]

### 642 **3.2.106**

#### 643 **fault protection**

644 protection against electric shock under single-fault conditions

645 [SOURCE: IEC 60050-195:2021, 195-06-02]

### 646 **3.2.107**

#### 647 **insulation**

648 set of properties which characterize the ability of insulation to provide its function

649 Note 1 to entry: Examples of relevant properties are: resistance, breakdown voltage.

650 [SOURCE: IEC 60050-151:2001, 151-15-42]

### 651 **3.2.108**

#### 652 **insulation monitoring device**

653 IMD

654 device which permanently monitors the insulation resistance to protective conductor of  
655 separated AC IT systems, AC IT systems with galvanically connected DC circuits having  
656 nominal voltages less than or equal to 1 000 V AC, as well as monitoring the insulation  
657 resistance of a separated DC IT systems with voltages less than or equal to 1 500 V DC,  
658 independent from the method of measuring

659 [SOURCE: IEC 61557-8:2014, 3.1.14, modified – Word "earth" replaced with "protective  
660 conductor" and "unearthed" with "separated".]

### 661 **3.2.109**

#### 662 **live part**

663 <in electrical installations and equipment> conductive part intended to be energized under  
664 normal operating conditions, including the neutral conductor and mid-point conductor, but  
665 excluding the PEN conductor, PEM conductor and PEL conductor

666 Note 1 to entry: This concept does not necessarily imply a risk of electric shock.

667 [SOURCE: IEC 60050-195:2021, 195-02-19, modified – Note to entry added.]

**3.2.110****PELV system**

electric system in which the voltage cannot be more than the value of extra low voltage:

- under normal conditions; and
- under single fault conditions, except earth faults in other electric circuits

Note 1 to entry: PELV is the abbreviation for protective extra low voltage.

[SOURCE: IEC 60050-826:2022, 826-12-32]

**3.2.111****protective conductor****PE**

conductor provided for purposes of safety, for example, protection against electric shock

EXAMPLE Protective bonding conductor, protective earthing conductor and an earthing conductor when used for protection against electric shock.

[SOURCE: IEC 60050-826:2022, 826-13-22, modified – Word "electrical" deleted and example added in the definition. The Note to entry 1 has been deleted, and the example added.]

**3.2.112****protective-equipotential-bonding**

equipotential bonding for purposes of safety

EXAMPLE Protection against electric shock.

[SOURCE: IEC 60050-826:2022, 826-13-20, modified – Word "electrical" deleted in the definition and example added.]

**3.2.113****protective screening**

protective shielding <electrically> US

<electrically> separation of electric circuits and/or conductors from hazardous-live-parts by an electrically protective screen connected to the protective equipotential bonding system and intended to provide protection against electric shock

[SOURCE: IEC 60050-195:2021, 195-06-18]

**3.2.114****protective separation**

<electrically> separation of one electric circuit from another by means of:

- double insulation, or
- basic insulation and electrically protective screening, or
- reinforced insulation

[SOURCE: IEC 60050-826:2022, 826-12-29]

**3.2.115****rated DC withstand voltage**

value of a DC withstand voltage declared by the manufacturer to characterize the isolating behaviour of a surge protective device (SPD)

[SOURCE: IEC 62561-3:2017, 3.8, modified – Words "an ISG" replaced with "a surge protective device (SPD)".]

**3.2.116****single fault condition**

condition in which there is a fault of a single protective provision that is not an enhanced protective provision

Note 1 to entry: If a single fault condition results in one or more other fault conditions, all those are considered as one single fault condition.

**3.2.117****startle reaction**

physiological reaction due to a minimum derived value of touch voltage for a population for which a current flowing through the body is just enough to cause involuntary muscular contraction to the person through which it is flowing

**3.2.118****touch impulse current**

impulse current, or the corresponding charge or energy, dissipated in a human body or through livestock when it touches either a live part, or a hazardous-live-part or an exposed-conductive part of an installation or of equipment under certain conditions

Note 1 to entry: The impulse current has an RMS magnitude and duration associated with it in accordance with IEC 60479-2:2019, Clause 11.

Note 2 to entry: Capacitive coupling between side B live parts and protective conductor usually results from Y-capacitance, used for electromagnetic compatibility reasons, or from parasitic capacitive coupling.

**3.2.119****touch voltage**

<effective> voltage between conductive parts when touched simultaneously by a person or an animal

Note 1 to entry: The value of the effective touch voltage may be appreciably influenced by the impedance of the person or the animal in electric contact with these conductive parts.

[SOURCE: IEC 60050-826:2022, 826-11-05, modified – Words "a human being or a livestock" replaced with "a person or an animal, and note to entry added.]

**3.2.120****SELV system**

electric system in which the voltage cannot be more than the value of extra-low voltage:

- under normal conditions; and
- under single fault conditions, including earth faults in other electric circuits

Note 1 to entry: SELV is the abbreviation for safety extra-low voltage.

[SOURCE: IEC 60050-195:2021, 195-06-28]

**3.2.121****surge protective device****SPD**

device that is intended to protect the electrical apparatus from transient overvoltages and to divert surge currents

Note 1 to entry: A surge protective device contains at least one non-linear component.

[SOURCE: IEC 60050-614:2016, 614-03-48]

**3.2.122****symmetrical insulation fault****symmetrical fault**

defect in the insulation of an electric installation or equipment creating a resistive path to protective conductor having approximately the same resistance from all live conductors to protective conductor

[SOURCE: IEC 61557-8:2014, 3.1.19, modified – Words “symmetrical fault” added in the term and “phase” is replaced by “live”]

**3.2.123****Y-capacitance**

total capacitance bridging the insulation barriers of the DC+ and DC– of side B to other circuits and protective conductor

Note 1 to entry: The capacitors are of a type suitable for use in situations where failure of the capacitor could lead to electric shock.

Note 2 to entry: The total capacitance is commonly distributed equally over the live conductors.

Note 3 to entry: For more information, see IEC 60384-14.

**3.2.124****simple separation**

separation between electric circuits or between an electric circuit and local earth by means of basic insulation

[SOURCE: IEC 60050-826:2022, 195-06-30]

**3.3 Functions****3.3.1****control pilot conductor**

*Replacement:*

**control pilot conductor****CP**

conductor incorporated in a cable assembly, which, together with the protective conductor, is part of the control pilot circuit

**3.3.5****proximity function**

*Replacement:*

**proximity function****PP**

DEPRECATED: proximity pilot

electrical or mechanical means to indicate the insertion state of the vehicle connector in the vehicle inlet of the EV and/or to indicate the insertion state of the EV plug in the EV socket-outlet of the EV supply equipment

Note 1 to entry: The acronym PP is based on “plug present”.

*Additional terms and definitions:*

**3.3.101****coupling session**

DEPRECATED: charging session

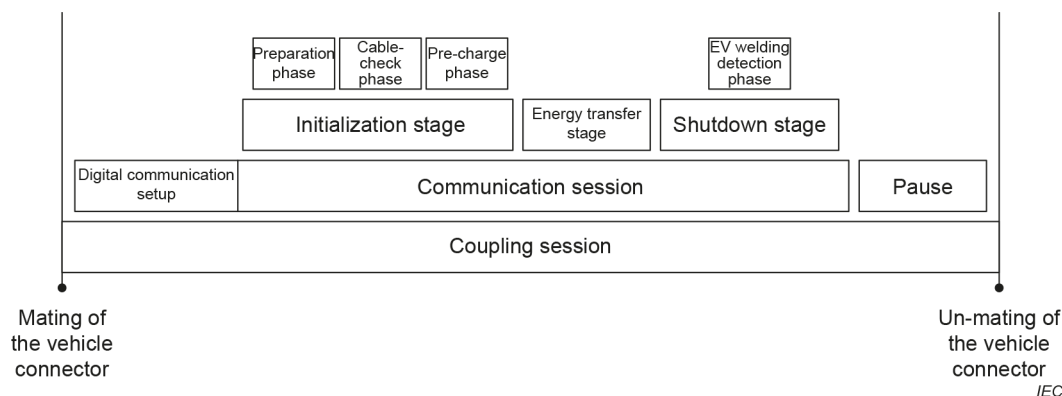
DEPRECATED: charge session

DEPRECATED: supply session

session that starts when the vehicle connector is mated to the vehicle inlet and terminates when the vehicle connector is un-mated from the vehicle inlet

Note 1 to entry: A coupling session can have zero, one or multiple communication sessions.

Note 2 to entry: See Figure 1.



NOTE 1 Figure 1 shows the naming of the sessions, stages and phases. This is not a timing or sequence diagram. Sequence diagrams are specified for each system in the respective annex.

NOTE 2 Details about the digital communication setup are specified in IEC 61851-24.

**Figure 1 – Example of a coupling session**

**3.3.102****communication session**

session that includes the initialization stage, energy transfer stage, and the shutdown stage

Note 1 to entry: Multiple consecutive communication sessions can occur in a coupling session.

Note 2 to entry: A communication session can include only the initialization stage and shutdown stage, if the EV supply equipment is unable to perform energy transfer.

**3.3.103****pause**

period of time between communication sessions where the EV supply equipment does not perform energy transfer

Note 1 to entry: The EV supply equipment and/or the EV may enable sleep mode during a pause.

**3.3.104****sleep mode**

state of a device or equipment to reduce energy consumption

**3.3.105****initialization stage**

stage at the beginning of a communication session to set, check and confirm parameters for the purpose of energy transfer

Note 1 to entry: An initialization stage can be triggered by the user, wake-up/re-initialization triggered by the EV or EV supply equipment after sleep, a pause or a power outage.

- 825 **3.3.106**  
 826 **energy transfer stage**  
 827 stage to perform energy transfer between the EV and the EV supply equipment
- 828 **3.3.107**  
 829 **shutdown stage**  
 830 stage at the end of a communication session to reach a safe state
- 831 EXAMPLE Normal shutdown, error shutdown and emergency shutdown.
- 832 **3.3.108**  
 833 **preparation phase**  
 834 phase during which an EV and EV supply equipment interact to set, check and confirm  
 835 parameters and working conditions
- 836 EXAMPLE Perform compatibility check, verification of smart charging conditions.
- 837 **3.3.109**  
 838 **cable-check phase**  
 839 phase to check if the side B can safely become live, based on the parameters exchanged by  
 840 basic signalling and digital communication
- 841 **3.3.110**  
 842 **pre-charge phase**  
 843 phase for the EV supply equipment or EV to limit the inrush current at side B
- 844 **3.3.111**  
 845 **EV welding detection phase**  
 846 phase for the EV to check if the EV disconnection device is not welded
- 847 Note 1 to entry: EV welding detection phase is optional.
- 848 **3.3.112**  
 849 **normal shutdown**  
 850 termination of the energy transfer initiated by the user, by the EV or by the EV supply equipment
- 851 **3.3.113**  
 852 **error shutdown**  
 853 termination of the energy transfer caused by a failure detected by the EV supply equipment or  
 854 the EV
- 855 **3.3.114**  
 856 **emergency shutdown**  
 857 urgent termination of the energy transfer caused by a failure detected by the EV supply  
 858 equipment or the EV
- 859 Note 1 to entry: An emergency shutdown may be performed by disconnecting the EV supply equipment from the  
 860 supply network.
- 861 **3.3.115**  
 862 **controlled current mode**  
 863 **CCM**  
 864 DEPRECATED: CCC  
 865 DEPRECATED: CCCM  
 866 <EV supply equipment> control mode of the EV supply equipment to control the present current  
 867 at side B according to the target current of the EV supply equipment

- 868 **3.3.116**  
 869 **controlled voltage mode**  
 870 **CVM**  
 871 DEPRECATED: CVC  
 872 DEPRECATED: CVCM  
 873 <EV supply equipment> control mode of the EV supply equipment to control the present voltage  
 874 at side B according to the target voltage of the EV supply equipment
- 875 **3.3.117**  
 876 **controlled power mode**  
 877 **CPM**  
 878 DEPRECATED: CPCM  
 879 <EV supply equipment> control mode of the EV supply equipment to control the present power  
 880 at side B according to the target power of the EV supply equipment
- 881 **3.3.118**  
 882 **thermal exchange**  
 883 function dissipating thermal energy from the thermal transport
- 884 [SOURCE: IEC TS 62196-3-1:2020, 3.105, modified – Words "method for cooling and" replaced  
 885 with "function".]
- 886 **3.3.119**  
 887 **thermal exchange device**  
 888 means for dissipating thermal energy from the thermal transport
- 889 [SOURCE: IEC TS 62196-3-1:2020, 3.106, modified – Words "cooling and" removed.]
- 890 **3.3.120**  
 891 **thermal sensing**  
 892 function to provide a signal or measurement for obtaining temperature data of cable assemblies  
 893 or parts thereof
- 894 [SOURCE: IEC TS 62196-3-1:2020, 3.101, modified – Word "method" replaced with "function  
 895 to provide a signal or measurement", and "accessories" removed.]
- 896 **3.3.121**  
 897 **thermal sensing device**  
 898 means for thermal sensing
- 899 [SOURCE: IEC TS 62196-3-1:2020, 3.102, modified – Words "providing temperature data of  
 900 accessories, cable assemblies or parts thereof" replaced with "thermal sensing".]
- 901 **3.3.122**  
 902 **thermal transport**  
 903 function for managing the thermal energy dissipation of cable assemblies or parts thereof by  
 904 heat transfer
- 905 [SOURCE: IEC TS 62196-3-1:2020, 3.103, modified – Word "method" replaced with "function",  
 906 "heat dissipation of accessories" replaced with "thermal energy dissipation of", and  
 907 "independent of changing the current" replaced with "by heat transfer".]
- 908 **3.3.123**  
 909 **thermal transport device**  
 910 means for managing thermal energy dissipation of cable assemblies or parts thereof

911 [SOURCE: IEC TS 62196-3-1:2020, 3.104, modified – Words "the heat dissipation of  
912 accessories" replaced with "thermal energy dissipation of", and "independent of changing the  
913 current" removed.]

914 **3.3.124**  
915 **forward power transfer**  
916 forward energy transfer  
917 FPT  
918 DEPRECATED: charging  
919 distribution of electricity from the supply network to an EV

920 **3.3.125**  
921 **reverse power transfer**  
922 reverse energy transfer  
923 RPT  
924 distribution of electricity from an EV to the supply network or to a load

925 Note 1 to entry: Household appliances are covered by the IEC 60335 series.

926 Note 2 to entry: Load according to IEC 60050-151:2001, 151-15-15, means a device intended to absorb power  
927 supplied by another device or an electric power system.

928 **3.3.126**  
929 **bidirectional power transfer**  
930 bidirectional energy transfer  
931 BPT  
932 DEPRECATED: bi-directional power transfer  
933 combination of forward power transfer (FPT) and reverse power transfer (RPT)

934 Note 1 to entry: BPT can only be FPT, RPT or (free) floating between FPT and RPT, depending on the agreement  
935 with or request of DSO/CSO.

## 936 **3.4 Vehicle**

937 **3.4.1**  
938 **electric vehicle**  
939 **EV**  
940 **(electric road vehicle)**

941 *Replacement:*

942 **electrically propelled vehicle**  
943 EV  
944 vehicle with one or more electric drive(s) for vehicle propulsion

945 [SOURCE: ISO 6469-3:2021, 3.15]

946 **3.4.3**  
947 **rechargeable energy storage system**  
948 **RESS**

949 *Replacement:*

950 **battery system**  
951 DEPRECATED: RESS  
952 DEPRECATED: EV battery  
953 DEPRECATED: vehicle battery  
954 DEPRECATED: vehicle/traction battery  
955 DEPRECATED: traction battery  
956 <EV> energy storage device that includes cells, cell assemblies or battery pack(s) as well as  
957 electrical circuits and electronics

958 Note 1 to entry: Battery system components can also be distributed in different devices (battery packs) within the  
 959 vehicle.

960 Note 2 to entry: Examples of electronics are the battery control unit and contactors.

961 *Additional terms and definitions:*

#### 962 **3.4.101**

##### 963 **EV disconnection device**

964 dedicated disconnect or equivalent device(s) for energy transfer located in the vehicle power  
 965 supply circuit between the vehicle inlet and the EV battery system

966 Note 1 to entry: The EV disconnection device is controlled during the communication session in accordance with  
 967 the system specific sequence diagram between the EV supply equipment and the EV.

#### 968 **3.4.102**

##### 969 **vehicle power supply circuit**

970 voltage class B electric circuit which includes all parts that are conductively connected to the  
 971 vehicle inlet that are mounted on the EV and that is energized during the energy transfer

972 Note 1 to entry: The definition is different from that in ISO 17409:2020. In the ISO 5474 series, the vehicle power  
 973 supply circuit does not include anything off-board of the EV.

974 [SOURCE: ISO 5474-1:—, 3.2.21, modified – Definition reformulated and Note 1 to entry  
 975 added.]

### 976 **3.5 Cords, cables and connection means**

#### 977 **3.5.13**

978 *Replacement:*

##### 979 **vehicle connector**

980 electric vehicle connector

981 part integral with, or intended to be attached to, one flexible cable

982 [SOURCE: IEC 62196-1:2022, 3.56]

#### 983 **3.5.14**

##### 984 **vehicle inlet**

##### 985 **electric vehicle inlet**

986 *Replacement:*

##### 987 **vehicle inlet**

988 electric vehicle inlet

989 part incorporated in, or fixed to, the EV

990 Note 1 to entry: The resulting assembly when a vehicle connector is inserted into a vehicle inlet is called a "vehicle  
 991 coupler".

992 [SOURCE: IEC 62196-1:2022, 3.57, modified – Words "electric vehicle" replaced with "EV".]

993 *Additional terms and definitions:*

#### 994 **3.5.101**

##### 995 **cable assembly**

996 <side B> assembly consisting of flexible cable fitted with a vehicle connector, and that is used  
 997 to connect the EV to the EV supply equipment

998 **3.6 Service and usage**

999 **3.6.10**  
1000 **user**

1001 *Replacement:*

1002 person who uses or benefits from, or uses and benefits from, devices, systems or services

1003 EXAMPLE Device or system may be HMI, EV or EV supply equipment; service may be energy transfer between EV  
1004 and EV supply equipment.

1005 [SOURCE: IEC 60050-871:2018, 871-02-05, modified – Term "active assisted living user"  
1006 removed, abbreviated term "AAL" removed in the entry, and example added.]

1007 **3.6.111**  
1008 **ordinary person**

1009 person who is neither a skilled person nor an instructed person

1010 Note 1 to entry: Ordinary persons include users of the EV supply equipment, persons who may have access to the  
1011 EV supply equipment, and who may be in the vicinity of the EV supply equipment. Under normal operating conditions,  
1012 ordinary persons should not be exposed to energy sources causing startle reaction, pain or injury.

1013 [SOURCE: IEC 60050-826:2022, 826-18-03, modified – Note 1 to entry added.]

1014 **3.6.112**  
1015 **skilled person**

1016 <electrically> person with relevant education and experience to perceive risks and to avoid  
1017 hazards which electricity can create

1018 [SOURCE: IEC 60050-826:2022, 826-18-01, modified – Second preferred term "electrically  
1019 skilled person" removed.]

1020 **3.6.113**  
1021 **instructed person**

1022 <electrically> person adequately advised or supervised by electrically skilled persons to  
1023 perceive risks and to avoid hazards which electricity can create

1024 [SOURCE: IEC 60050-826:2021, 826-18-02, modified – Second preferred term "electrically  
1025 instructed person" removed.]

1026 **3.6.114**  
1027 **human machine interface**

1028 HMI

1029 DEPRECATED: user interface

1030 device/means that allows user interaction, interface between operator, operating staff or end  
1031 user and the instrumentation and computer systems connected to the EVCC/EMS

1032 EXAMPLE Display or user communication system, mobile phone interface.

1033 Note 1 to entry: The HMI can be connected to an EVCC, an energy management system or another controller  
1034 depending on the communication system used.

1035 **3.7 General terms**1036 *Additional terms and definitions:*1037 **3.7.101**1038 **fire enclosure**1039 enclosure intended as protection against the spread of fire from within the enclosure to outside  
1040 the enclosure

1041 Note 1 to entry: Some standards use the term "safeguard" instead of "protection".

1042 [SOURCE: IEC 60050-903:2014, 903-04-10]

1043 **3.7.102**1044 **side A**

1045 supply network side

1046 DEPRECATED: input

1047 DEPRECATED: primary circuit

1048 side of the EV supply equipment connected to the supply network

1049 **3.7.103**1050 **side B**

1051 EV side

1052 DEPRECATED: output

1053 DEPRECATED: DC output circuit

1054 DEPRECATED: secondary circuit

1055 side of the EV supply equipment connected to the EV

1056 **3.7.104**1057 **side B circuit**1058 electrical circuit at side B which includes all parts of the EV supply equipment that are  
1059 conductively connected to the DC+ or DC– of the vehicle connector1060 **3.7.105**1061 **supply network**

1062 system for the distribution of electricity connected to side A

1063 Note 1 to entry: The following terms are also used frequently in this context: system for distribution of electricity to  
1064 the public, public distribution network, public network, prosumer's electrical installation (PEI), distributed energy  
1065 resources (DER), battery bank, PV installation, generator, mains or electric grid, etc.1066 **3.7.106**1067 **load dump**1068 spontaneous disconnection, during the energy transfer stage, of the battery system or other  
1069 loads connected to side B

1070 Note 1 to entry: Load dump can be caused by the load for the purpose of protection, or by a fault.

1071 **3.7.107**1072 **power electronics converter**

1073 PEC

1074 DEPRECATED: power electronic converter system

1075 device or part thereof for the purpose of electronic power conversion

1076 Note 1 to entry: PEC can include signalling, measurement, control circuitries and other parts, if essential for the  
1077 power conversion function.

- 1078 **3.7.108**  
 1079 **ripple**  
 1080 <current or voltage> set of unwanted periodic deviations with respect to the average value of  
 1081 the measured or supplied quantity
- 1082 EXAMPLE Ripple occurring at frequencies which can be related to that of the supply network, or of some other  
 1083 definite source, such as a power-electronics converters (PECs).
- 1084 Note 1 to entry: Ripple is determined under specified conditions and is a part of periodic and/or random deviation  
 1085 (PARD) – IEC 60050-312:2001, 312-07-01.
- 1086 [SOURCE: IEC 60050-312:2001, 312-07-02, modified – Example added, which comes from the  
 1087 definition, and note clarified.]
- 1088 **3.7.109**  
 1089 **transient, adj**  
 1090 pertaining to a phenomenon or quantity which passes from one steady state to another  
 1091 consecutive steady state
- 1092 Note 1 to entry: The term "transient" is also used as a noun to mean a transient phenomenon or quantity.
- 1093 [SOURCE: IEC 60050-312:2009, 103-05-02]
- 1094 **3.7.110**  
 1095 **transient, noun**  
 1096 <current or voltage> phenomenon or quantity which varies between two consecutive steady  
 1097 states during a time interval short compared to the timescale of interest
- 1098 [SOURCE: IEC 60050-702:2019, 702-07-781]
- 1099 **3.7.111**  
 1100 **applicable maximum current**  
 1101 upper limit of the current that is used during the energy transfer stage, and which may  
 1102 dynamically be changed throughout the energy transfer stage
- 1103 Note 1 to entry: On side B, there is an applicable maximum current of the EV supply equipment as well as an  
 1104 applicable maximum current of the EV.
- 1105 Note 2 to entry: On side B, this limit may be changed by digital communication.
- 1106 **3.7.112**  
 1107 **applicable maximum power**  
 1108 upper limit of the power that is used during the energy transfer stage, and which may  
 1109 dynamically be changed throughout the energy transfer stage
- 1110 Note 1 to entry: On side B, there is an applicable maximum power of the EV supply equipment as well as an  
 1111 applicable maximum power of the EV.
- 1112 Note 2 to entry: On side B, this limit may be changed by digital communication.
- 1113 **3.7.113**  
 1114 **applicable maximum voltage**  
 1115 upper limit of the voltage between live parts that is used during the energy transfer stage, and  
 1116 which may dynamically be changed throughout the energy transfer stage
- 1117 Note 1 to entry: On side B, there is an applicable maximum voltage of the EV supply equipment as well as an  
 1118 applicable maximum voltage of the EV.
- 1119 Note 2 to entry: On side B, this limit may be changed by digital communication.
- 1120 Note 3 to entry: For DC, the voltage between DC+ and DC-. For AC, the voltage between L1, L2, L3 and N as  
 1121 needed by the configuration.

- 1122 **3.7.114**  
 1123 **applicable minimum current**  
 1124 lower limit of the current that is used during the energy transfer stage, and which may  
 1125 dynamically be changed throughout the energy transfer stage
- 1126 Note 1 to entry: On side B, there is an applicable minimum current of the EV supply equipment as well as an  
 1127 applicable minimum current of the EV.
- 1128 Note 2 to entry: On side B, this limit may be changed by digital communication.
- 1129 **3.7.115**  
 1130 **applicable minimum power**  
 1131 lower limit of the power that is used during the energy transfer stage, and which may  
 1132 dynamically be changed throughout the energy transfer stage
- 1133 Note 1 to entry: On side B, there is an applicable minimum power of the EV supply equipment as well as an  
 1134 applicable minimum power of the EV.
- 1135 Note 2 to entry: On side B, this limit may be changed by digital communication.
- 1136 **3.7.116**  
 1137 **applicable minimum voltage**  
 1138 lower limit of the voltage between live parts that is used during the energy transfer stage, and  
 1139 which may dynamically be changed throughout energy transfer
- 1140 Note 1 to entry: On side B, there is an applicable minimum voltage of the EV supply equipment as well as an  
 1141 applicable minimum voltage of the EV.
- 1142 Note 2 to entry: On side B, this limit may be changed by digital communication.
- 1143 Note 3 to entry: For DC, the voltage between DC+ and DC-. For AC the voltage between L1, L2, L3 and N as  
 1144 needed by the configuration.
- 1145 **3.7.117**  
 1146 **measured current**  
 1147 result of a measurement of the present current measured under certain measurement conditions
- 1148 Note 1 to entry: Measurement conditions can be applying a filter, having an uncertainty in measurement, etc.
- 1149 **3.7.118**  
 1150 **measured voltage**  
 1151 result of a measurement of the present voltage measured under certain measurement  
 1152 conditions
- 1153 Note 1 to entry: Measurement conditions can be applying a filter, having an uncertainty in measurement, etc.
- 1154 **3.7.119**  
 1155 **measured power**  
 1156 result of a measurement of the present power measured under certain measurement conditions
- 1157 Note 1 to entry: Measurement conditions can be applying a filter, having an uncertainty in measurement, etc.
- 1158 **3.7.120**  
 1159 **negotiated maximum current**  
 1160 <at side B> upper limit of the current operating range agreed upon during the initialization stage  
 1161 between the EV supply equipment and the EV
- 1162 Note 1 to entry: At side B, this limit is negotiated between the EV supply equipment and the EV by digital  
 1163 communication and can be changed in a new initialization stage.

1164 **3.7.121**  
 1165 **negotiated maximum power**  
 1166 <at side B> upper limit of the power operating range agreed upon during the initialization stage  
 1167 between the EV supply equipment and the EV

1168 Note 1 to entry: At side B, this limit is negotiated between the EV supply equipment and the EV by digital  
 1169 communication and can be changed in a new initialization stage.

1170 **3.7.122**  
 1171 **negotiated maximum voltage**  
 1172 <at side B> upper limit of the voltage operating range between live parts agreed upon during  
 1173 the initialization stage between the EV supply equipment and the EV

1174 Note 1 to entry: At side B, this limit is negotiated between the EV supply equipment and the EV by digital  
 1175 communication and can be changed in a new initialization stage.

1176 **3.7.123**  
 1177 **negotiated minimum current**  
 1178 <at side B> lower limit of the current operating range agreed upon during the initialization stage  
 1179 between the EV supply equipment and the EV

1180 Note 1 to entry: At side B, this limit is negotiated between the EV supply equipment and the EV by digital  
 1181 communication, and can be changed in a new initialization stage.

1182 **3.7.124**  
 1183 **negotiated minimum power**  
 1184 <at side B> lower limit of the power operating range agreed upon during the initialization stage  
 1185 between the EV supply equipment and the EV

1186 Note 1 to entry: At side B, this limit is negotiated between the EV supply equipment and the EV by digital  
 1187 communication, and can be changed in a new initialization stage.

1188 **3.7.125**  
 1189 **negotiated minimum voltage**  
 1190 <at side B> lower limit of the voltage operating range between live parts agreed upon during  
 1191 the initialization stage between the EV supply equipment and the EV

1192 Note 1 to entry: At side B, this limit is negotiated between the EV supply equipment and the EV by digital  
 1193 communication, and can be changed in a new initialization stage.

1194 **3.7.126**  
 1195 **present current**  
 1196 instantaneous physical value of the current

1197 Note 1 to entry: The present current is the instantaneous value of the current which would be acquired by an  
 1198 ideal/perfect measurement device in a single sample without any filtering and without any measurement  
 1199 tolerance/error.

1200 **3.7.127**  
 1201 **present voltage**  
 1202 instantaneous physical value of the voltage

1203 Note 1 to entry: The present voltage is the instantaneous value of the voltage which would be acquired by an  
 1204 ideal/perfect measurement device in a single sample without any filtering and without any measurement  
 1205 tolerance/error.

1206 **3.7.128**  
 1207 **present power**  
 1208 instantaneous physical value of the power

1209 Note 1 to entry: The present power is the instantaneous value of the power which would be acquired by an  
 1210 ideal/perfect measurement device in a single sample without any filtering and without any measurement  
 1211 tolerance/error.

- 1212 **3.7.129**  
 1213 **rated boost current**  
 1214 <side B> upper limit of the current specified by the manufacturer up to which the EV supply  
 1215 equipment has been designed to operate for a limited period of time
- 1216 Note 1 to entry: The rated boost current is more than or equal to the rated continuous current.
- 1217 Note 2 to entry: The rated boost current of the side B cable assembly is under consideration in IEC 62196-1, IEC  
 1218 62196-3 and IEC 62196-3-1. For more information, see 17.3.
- 1219 **3.7.130**  
 1220 **rated current**  
 1221 <side A> current under normal operating conditions assigned by the manufacturer
- 1222 **3.7.131**  
 1223 **rated continuous current**  
 1224 <side B> upper limit of the current specified by the manufacturer up to which the EV supply  
 1225 equipment has been designed to operate continuously
- 1226 Note 1 to entry: In the IEC 62196 (published before 2023) series, the rated continuous current is called "rated  
 1227 current".
- 1228 **3.7.132**  
 1229 **rated boost power**  
 1230 <side B> upper limit of the power specified by the manufacturer up to which the EV supply  
 1231 equipment has been designed to operate for a limited period of time
- 1232 Note 1 to entry: The rated boost power is greater than or equal to the rated continuous power.
- 1233 **3.7.133**  
 1234 **rated continuous power**  
 1235 <side B> upper limit of the power specified by the manufacturer up to which the EV supply  
 1236 equipment has been designed to operate continuously
- 1237 **3.7.134**  
 1238 **rated maximum power**  
 1239 <side A> upper limit of the power specified by the manufacturer up to which the EV supply  
 1240 equipment has been designed to operate
- 1241 **3.7.135**  
 1242 **rated maximum voltage**  
 1243 <side A or side B> upper limit of the voltage between live parts specified by the manufacturer  
 1244 up to which the EV supply equipment has been designed to operate
- 1245 **3.7.136**  
 1246 **rated minimum current**  
 1247 <side A or side B> lower limit of the current specified by the manufacturer down to which the  
 1248 EV supply equipment has been designed to operate
- 1249 **3.7.137**  
 1250 **rated minimum power**  
 1251 <side A or side B> lower limit of the power specified by the manufacturer down to which the EV  
 1252 supply equipment has been designed to operate
- 1253 **3.7.138**  
 1254 **rated minimum voltage**  
 1255 <side A or side B> lower limit of the voltage between live parts specified by the manufacturer  
 1256 down to which the EV supply equipment has been designed to operate

- 1257 **3.7.139**  
 1258 **target current**  
 1259 <EV> requested current to the EV supply equipment, which may dynamically be changed by  
 1260 digital communication
- 1261 Note 1 to entry: On side B, this target current is requested by the EV only.
- 1262 **3.7.140**  
 1263 **target power**  
 1264 <EV> requested power to the EV supply equipment, which may dynamically be changed by  
 1265 digital communication
- 1266 Note 1 to entry: On side B, this target power is requested by the EV only.
- 1267 **3.7.141**  
 1268 **target voltage**  
 1269 <EV> requested voltage to the EV supply equipment, which may dynamically be changed by  
 1270 digital communication
- 1271 Note 1 to entry: On side B, this target voltage is requested by the EV only.
- 1272 **3.7.142**  
 1273 **target current**  
 1274 <EV supply equipment> value of current that the EV supply equipment attempts to reach
- 1275 Note 1 to entry: The target current of the EV supply equipment at side B is dynamically calculated based on certain  
 1276 values, for example, the target values of the EV, the negotiated limits of side B or applicable limits of side B or of  
 1277 side A.
- 1278 Note 2 to entry: The target current of the EV supply equipment at side B is not communicated to the EV by digital  
 1279 communication.
- 1280 Note 3 to entry: The target current of the EV supply equipment at side A is following the grid code of the DSO.
- 1281 **3.7.143**  
 1282 **target power**  
 1283 <EV supply equipment> value of power that the EV supply equipment attempts to reach
- 1284 Note 1 to entry: The side B target power of the EV supply equipment is dynamically calculated based on certain  
 1285 values, for example, the target values of the EV, the negotiated limits of side B or applicable limits of side B or of  
 1286 side A.
- 1287 Note 2 to entry: The side B target power of the EV supply equipment is not communicated to the EV by digital  
 1288 communication.
- 1289 Note 3 to entry: The side A target power of the EV supply equipment is following the grid code of the DSO.
- 1290 **3.7.144**  
 1291 **target voltage**  
 1292 <EV supply equipment> value of voltage that the EV supply equipment attempts to reach
- 1293 Note 1 to entry: The side B target voltage of the EV supply equipment is dynamically calculated based on certain  
 1294 values, for example, the target values of the EV, the negotiated limits of side B or applicable limits of side B or of  
 1295 side A.
- 1296 Note 2 to entry: The side B target voltage of the EV supply equipment is not communicated to the EV by digital  
 1297 communication.
- 1298 Note 3 to entry: The side A target voltage of the EV supply equipment is following the grid code of the DSO.

- 1299 **3.7.145**  
 1300 **auxiliary circuit**  
 1301 auxiliary power supply  
 1302 classification of an electric component or circuit with a maximum working voltage of  $\leq 30$  V AC  
 1303 (RMS) or  $\leq 60$  V DC, respectively
- 1304 Note 1 to entry: Circuit(s) for signalling, digital communication, and for the management and control of energy  
 1305 transfer.
- 1306 **3.7.146**  
 1307 **EV communication controller**  
 1308 EVCC  
 1309 DEPRECATED: vehicle charging control function  
 1310 DEPRECATED: VCCF  
 1311 DEPRECATED: vehicle charging/discharging control function  
 1312 DEPRECATED: VCDCF  
 1313 embedded system, within the EV, which implements the communication between the EV and  
 1314 the SECC in order to support specific functions
- 1315 Note 1 to entry: Such specific functions could be, for example, controlling input and output channels, encryption, or  
 1316 data transfer between EV and SECC.
- 1317 **3.7.147**  
 1318 **supply equipment communication controller**  
 1319 SECC  
 1320 entity which implements the communication to one or multiple EVCC(s)
- 1321 Note 1 to entry: Further details regarding possible architectures are given in Annex A of ISO 15118-1:2019.
- 1322 Note 2 to entry: Functions of a supply equipment communication controller may control input and output channels,  
 1323 data encryption, or digital communication between EVCC and SECC.
- 1324 [SOURCE: ISO 15118-1:2019, 3.1.68, modified – Words "and which may be able to interact with  
 1325 secondary actors" deleted, Note 1 to entry deleted, and word "vehicle" replaced with EVCC in  
 1326 Note 3 to entry.]
- 1327 **3.7.148**  
 1328 **digital communication**  
 1329 exchange of digitally encoded information
- 1330 Note 1 to entry: HLC in the ISO 15118 series is compliant with the term digital communication in SAE J1772, SAE  
 1331 2836, SAE 2847 and SAE 2931.
- 1332 Note 2 to entry: See also IEC 61851-24 for additional information about digital communication exchanged between  
 1333 EV supply equipment and an EV.
- 1334 [SOURCE: ISO 15118-1:2019, 3.1.47, modified, Note 2 to entry added]
- 1335 **3.7.149**  
 1336 **working voltage**  
 1337 highest RMS value of the AC or DC voltage across any particular insulation which can occur  
 1338 when the equipment is supplied at rated maximum voltage of the EV supply equipment at side  
 1339 A and operated at the rated maximum voltage of the EV supply equipment at side B
- 1340 Note 1 to entry: Transient overvoltages are disregarded.
- 1341 Note 2 to entry: Both open-circuit conditions and normal operating conditions are taken into account.
- 1342 [SOURCE: IEC 60050-851:2008, 851-12-31, modified – Words "rated voltage" replaced with the  
 1343 end of the definition starting with "rated maximum voltage".]

1344 **3.7.150**  
 1345 **switching**  
 1346 process of a rapid change, which is caused by intentional dynamic and normal operations. A  
 1347 switch can be initiated by the source or the load.

1348 **3.7.151**  
 1349 **boost duration**  
 1350  $\Delta t_{BC}$

1351 duration for applying a boost current  $I_{BC}$

1352 **3.7.152**  
 1353 **Rated boost duration**  
 1354  $\Delta t_{RBC}$

1355 maximum duration for applying the rated boost current at a distinct ambient temperature at a  
 1356 defined boost setup as specified in the manufacturer's datasheet

1357 Note to entry: This duration is used solely for certification and to define the rated boost current. In real charging  
 1358 processes, the duration  $\Delta t_{BC}$  can be shorter than  $\Delta t_{RBC}$ .

1359 **3.7.153**  
 1360 **Minimum rated boost duration**  
 1361  $\Delta t_{RBC\_min}$

1362 minimum value of the rated boost duration required for qualification

1363 **3.7.154**  
 1364 **Rated boost duration at ambient temperature**  
 1365  $\Delta t_{RBC\_T}$

1366 rated boost duration at arbitrary ambient temperature

1367 Note to entry: For ambient temperature 40 °C this corresponds to  $\Delta t_{RBC}$ .

1368 **3.7.155**  
 1369 **Rated boost current**  
 1370  $I_{RBC}$

1371 upper limit of the current specified by EV supply equipment manufacturer that allows to operate  
 1372 for a limited period of time in a defined boost setup at a distinct ambient temperature

1373 **3.7.156**  
 1374 **Boost current**  
 1375  $I_{BC}$

1376 current which is more than or equal to the rated continuous current and which is always smaller  
 1377 than or equal to the rated boost current at ambient temperature  $I_{RBC\_T}$

1378 **3.7.157**  
 1379 **Rated cool down duration**  
 1380  $\Delta t_{RCD}$

1381 minimum cool down duration to recover from a previous full thermal saturation of the system to  
 1382 ensure the next boost period as given by the manufacturer's datasheet at a distinct ambient  
 1383 temperature

1384 **3.7.158**  
 1385 **Boost setup**  
 1386 set of specific framework parameters and additional parameters specified by the manufacturer,  
 1387 which must be ensured in order to apply a certain rated boost current

1388 **3.7.159**  
 1389 **grid following mode**  
 1390 mode of reverse power transfer when the power electronic converter (PEC) follows operational  
 1391 parameters of the electrical installation and operates in parallel either to the distribution network  
 1392 or to a grid forming source

1393 [SOURCE: IEC CD2 61851-1 ED4, 3.x]

1394 **3.7.160**  
 1395 **grid forming mode**  
 1396 mode of reverse power transfer when the power electronic converter (PEC) establishes and  
 1397 maintains both a stable voltage and a stable frequency to supply an electrical installation which  
 1398 is islanded from the distribution network

1399 [SOURCE: IEC CD2 61851-1 ED4, 3.x]

1400 **3.7.161**  
 1401 **generating unit**  
 1402 smallest set of installations which can generate electrical energy running independently and  
 1403 which can feed this energy into a distribution network

1404 [SOURCE: EN 50549-1:2019, 3.2.3]

1405 **3.7.162**  
 1406 **under-voltage ride through**  
 1407 UVRT  
 1408 ability of a generating unit or generating plant to stay connected during voltage dips

1409 Note 1 to entry: In some documents the expression low voltage ride through (LVRT) is used for the same concept.

1410 [SOURCE: EN 50549-1:2019, 3.4.6]

1411 **3.7.163**  
 1412 **over-voltage ride through**  
 1413 OVRT  
 1414 ability of a generating unit or generating plant to stay connected during voltage swells

1415 Note 1 to entry: Ability of a generating unit or generating plant to stay connected during voltage swells.

1416 [SOURCE: EN 50549-1:2019, 3.4.7]

1417 **3.7.164**  
 1418 **rate of change of frequency**  
 1419 ROCOF  
 1420 first derivative of instantaneous frequency or second derivative of instantaneous phase

1421 [SOURCE: EN 50549-1:2019/A1:2023, 3.4.11]

1422 **3.7.165**  
 1423 **phase jump**  
 1424 abrupt change in the phase of the voltage of an AC electrical network

1425 [SOURCE: EN 50549-1:2019/A1:2023, 3.4.12]

**3.7.166****grid code**

document that recommends practices or procedures for the activities of connection, management, planning, development and maintenance of the electrical transmission and distribution grid, as well as dispatching and metering, etc.

**3.7.167****scheduled mode**

control mode where the EVCC (3.7.146) and SECC (3.7.146) have negotiated a power profile fulfilling the user's mobility needs and based on the energy target, power and tariff information

Note 1 to entry: In this control mode, the EV (3.4.1) is in charge of fulfilling the user's mobility needs.

[SOURCE: ISO 15118-1:2019, 3.2.1]

**3.7.168****dynamic mode**

control mode, without negotiation, where a secondary actor system controls the power flow fulfilling the user's mobility needs and its own constraints

[SOURCE: ISO 15118-1:2019, 3.2.2]

**4 General requirements**

The EV supply equipment shall be so constructed that an EV can be connected to the EV supply equipment so that in normal conditions of use, the energy transfer operates safely, and its performance is reliable and minimizes the risk of danger to the user or surroundings.

*Compliance is checked by meeting all of the relevant requirements of the IEC 61851 series.*

Unless otherwise stated all tests indicated in this document are type tests.

Unless otherwise stated, all tests required by this standard may be conducted on separate samples. They may be done on the same samples at the manufacturer's agreement.

Unless otherwise stated, each test is conducted once.

Unless otherwise specified, all tests shall be carried out in a draught-free location and at an ambient temperature of  $20^{\circ} \pm 5^{\circ}\text{C}$ .

The EV supply equipment shall be rated for one or more of standard nominal voltages and frequencies as given in IEC 60038.

NOTE In the following countries, national standards or regulations provide different requirements for frequency: JP.

The standard applies to equipment that is designed to be used at an altitude up to 2 000 m.

For equipment designed to be used at altitudes above 2 000 m, it is necessary to take into account the reduction of the dielectric strength and the cooling effect of the air. Electrical equipment intended to operate under these conditions shall be designed or used in accordance with an agreement between manufacturer and user.

NOTE In the following countries, the EV supply equipment is designed to be used at an altitude  $\leq 1\,000\text{ m}$  according to the national standard: JP.

1463 System A, system B, system C and system D (TBD) shall provide protective separation between  
 1464 side A and side B. Systems without protective separation between side A and side B are under  
 1465 consideration.

## 1466 **5 Classification**

### 1467 **5.1 Characteristics of power supply and output**

#### 1468 **5.1.1 Characteristics of power supply input**

1469 The EV supply equipment shall be classified according to the supply network system that it is  
 1470 intended to be connected to:

- 1471 – EV supply equipment connected to AC supply network;
- 1472 – EV supply equipment connected to DC supply network.

1473 The EV supply equipment shall be classified according to the electric connection method:

- 1474 – Plug and cable connected;
- 1475 – Permanently connected.

#### 1476 **5.1.2 Characteristics of power supply output**

1477 The EV supply equipment shall be classified according to the type of current the EV supply  
 1478 equipment delivers:

- 1479 – AC EV supply equipment;
- 1480 – DC EV supply equipment;
- 1481 – AC and/or DC EV supply equipment.

### 1482 **5.2 Normal environmental conditions**

1483 The EV supply equipment shall be classified according to the environmental conditions and use:

- 1484 – indoor use;
- 1485 – outdoor use.

1486 NOTE The conditions that define indoor and outdoor use are given in 7.1.1 of IEC 61439-1:2011.

### 1487 **5.3 Special environmental conditions**

1488 The EV supply equipment may be classified according to their suitability for use in special  
 1489 environmental conditions other than those specified in this document, if declared so by the  
 1490 manufacturer.

### 1491 **5.4 Access**

1492 The EV supply equipment shall be classified according to the location they are intended for:

- 1493 – equipment for locations with restricted access;
- 1494 – equipment for locations with non-restricted access.

### 1495 **5.5 Mounting method**

1496 The EV supply equipment shall be classified according to the type of mounting:

- 1497 a) stationary equipment;
- 1498 – mounted on walls, poles or equivalent positions;
- 1499 – flush mounted;

- 1500 – surface mounted.
- 1501 – pole/column/pipe-mounted
- 1502 – floor mounted
- 1503 – ground mounted.

1504 b) non-stationary equipment

- 1505 – portable equipment;
- 1506 – mobile equipment.

1507 NOTE More than one classification can apply.

## 1508 **5.6 Protection against electric shock**

1509 The equipment shall be classified according to the protection against electric shock:

- 1510 – class I equipment;
- 1511 – class II equipment;
- 1512 – class III equipment.

1513 NOTE Class I, Class II and Class III descriptions can be found in IEC 61140:2016, 7.3, 7.4 and 7.5.

## 1514 **5.7 Charging modes**

1515 The EV supply equipment shall be classified according to 6.2:

- 1516 – Mode 4.

1517 NOTE EV supply equipment with multiple outputs can be classified as supporting more than one mode.

## 1518 **5.8 Characteristics of EV supply equipment**

### 1519 **5.8.1 Separation type**

1520 The EV supply equipment shall be classified according to the type of separation between side  
1521 A and side B:

- 1522 – separated EV supply equipment;
- 1523 – non-separated EV supply equipment (under consideration).

### 1524 **5.8.2 Control system**

1525 The EV supply equipment shall be classified according to the type of control system:

- 1526 – regulated EV supply equipment:
  - 1527 a) controlled current mode;
  - 1528 b) controlled voltage mode;
  - 1529 c) combination of a) and b);
- 1530 – non-regulated EV supply equipment (under consideration).

### 1531 **5.8.3 System**

1532 The EV supply equipment shall be classified according to the system:

- 1533 – system A (see Annex A);
- 1534 – system B (see Annex B);
- 1535 – system C (see Annex C);
- 1536 – system D (see Annex D).

**5.8.4 Thermal management system**

The EV supply equipment shall be classified according to the thermal management system of the side B cable assembly:

- using thermal sensing;
- using thermal sensing and thermal transport;
- none.

**5.8.5 Power distribution system**

The EV supply equipment shall be classified according to the power distribution system to which the EV supply equipment is intended to be connected in its final application:

- single-phase equipment on star TN or TT system;
- single-phase equipment on centre-earthed TN or TT system;
- single-phase equipment connected line-to-line on star TN or TT system;
- single-phase equipment connected line-to-neutral on star IT system;
- single-phase equipment connected line-to-line on star IT system;
- three-phase equipment on star TN or TT system;
- three-phase equipment on star IT system;
- three-phase equipment on unearthed delta system;
- three-phase equipment on centre-earthed delta system.

**5.8.6 According to the ability of RPT**

The Mode 4 EV charging station shall be classified according to its ability of supplying electric power from an EV to an electrical installation:

- Mode 4 EV supply equipment not suitable for RPT;
- Mode 4 EV supply equipment suitable for RPT in grid following mode connected to the distribution network;
- Mode 4 EV supply equipment suitable for RPT in grid following mode islanded from the distribution network;
- Mode 4 EV supply equipment suitable for RPT in grid forming mode islanded from the distribution network.

NOTE More than one classification can apply.

**6 Charging modes and functions****6.1 General**

Clause 6 describes the different charging modes and functions for energy transfer to EVs.

**6.2 Charging modes****6.2.1 Mode 4**

Mode 4 is a method for the connection of an EV to an AC or DC supply network utilizing a DC EV supply equipment, with a control pilot function that extends from the DC EV supply equipment to the EV.

Mode 4 equipment may be either permanently connected or connected by a cable and plug to the supply network.

1577 EV supply equipment intended for Mode 4 charging shall provide a protective earthing  
1578 conductor or protective conductor to the vehicle connector.

### 1579 **6.3 Functions provided in Mode 4**

#### 1580 **6.3.1 Mandatory functions in Mode 4**

##### 1581 **6.3.1.1 General**

1582 The EV supply equipment shall supply a DC current and voltage to the EV battery system  
1583 according to an EVCC request.

1584 The following functions shall be provided by EV supply equipment:

- 1585 – continuous continuity checking of the protective conductor according to 6.3.1.2;
- 1586 – verification that the EV is properly connected to the EV supply equipment according to  
1587 6.3.1.3;
- 1588 – energization of the power supply to the EV according to 6.3.1.4;
- 1589 – de-energization of the power supply to the EV according to 6.3.1.5;
- 1590 – maximum allowable current according to 6.3.1.6;
- 1591 – DC supply for EV according to 6.3.1.7;
- 1592 – measuring current and voltage according to 6.3.1.8;
- 1593 – latching of the vehicle coupler according to 6.3.1.9;
- 1594 – compatibility check according to 6.3.1.10;
- 1595 – insulation resistance check before energy transfer according to 6.3.1.11;
- 1596 – protection against overvoltage between DC+ and DC– according to 6.3.1.12;
- 1597 – verification of vehicle connector latching according to 6.3.1.13;
- 1598 – control circuit supply integrity according to 6.3.1.14;
- 1599 – short-circuit check before energy transfer according to 6.3.1.15;
- 1600 – user initiated shutdown according to 6.3.1.16;
- 1601 – overload protection for parallel conductors (conditional function) according to 6.3.1.17;
- 1602 – voltage limitation between side B live parts (DC+ and DC–) and protective conductor  
1603 according to 6.3.1.18;
- 1604 – shutdown of EV supply equipment according to 6.3.1.19.

1605 The EV manufacturer should consider the requirements for overvoltage and overcurrent  
1606 according to this document and ISO 17409.

1607 If the EV supply equipment can supply more than one EV simultaneously, the EV supply  
1608 equipment shall provide all functions listed above independently at each vehicle connector.

##### 1609 **6.3.1.2 Continuous continuity checking of the protective conductor**

1610 The protective conductor continuity between the EV supply equipment and the EV shall be  
1611 monitored continuously. The EV supply equipment shall trigger and complete an emergency  
1612 shutdown according to 6.3.1.19.4 and according to:

- 1613 – A.3.8.2 for system A;
- 1614 – B.5.1 for system B;
- 1615 – C.4.7 for system C;

1616 after a loss of electrical continuity of the protective conductor between the EV supply equipment  
1617 and EV.

1618 NOTE Protective conductor continuity is monitored by the control pilot function.

1619 *Compliance for system A and system B is checked by the following test. Compliance for system*  
 1620 *C is checked by C.7.5.5.*

1621 *The test setup for system A is shown in Figure 30. The test setup for system B is shown in*  
 1622 *Figure 31.*

1623 *The test shall be performed according to the following procedure.*

1624 1) *Connect the EV supply equipment to a test load with a dedicated EV simulator for each*  
 1625 *system.*

1626 2) *Measure  $V_{T8}$  and  $A_{T1}$  continuously.*

1627 3) *Start a communication session with the procedure specified by the EV supply equipment*  
 1628 *manufacturer.*

1629 4) *Confirm that side B is at OP4, specified in Figure 34.*

1630 5) *Open  $S_{T15}$ .*

1631 6) *Check that the EV supply equipment triggered and completed an emergency shutdown.*

1632 7) *Check the result in Table 1.*

1633 **Table 1 – Verification criterion**

| System | Verification criterion                                                                                                                                                                                                                         |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A      | See Table A.8.                                                                                                                                                                                                                                 |
| B      | The present current at side B ( $A_{T1}$ ) is $\leq 5$ A DC in $t_{pe}$ or less after the loss of protective conductor continuity. The $t_{pe}$ includes the detection time and fall time of the current. See Table B.3 for the specific time. |

1634

1635 8) *Confirm that  $V_{T8} \leq 60$  V DC.*

1636

### 1637 **6.3.1.3 Verification that the EV is properly connected to the EV supply equipment**

1638 The EV supply equipment shall be able to determine that the EV is properly connected to the  
 1639 EV supply equipment.

1640 Proper connection is assumed when the continuity of the control pilot circuit is detected.

### 1641 **6.3.1.4 Energization of the power supply to the EV**

1642 The EV socket-outlet or the vehicle connector shall not be energized unless the control pilot  
 1643 function between EV supply equipment and EV has been established correctly with signal states  
 1644 allowing energization.

1645 The presence of such states does not imply that energy will be transferred between the EV  
 1646 supply equipment and the EV as this may be subject to other external conditions, e.g. energy  
 1647 management system.

1648 If the EV requests ventilation, the EV supply equipment shall only energize the system if such  
 1649 ventilation is provided by the installation or the premises.

1650 Further requirements for normal startup are given in C.3.2 for system C.

1651 *Compliance is checked by the following test.*

1652 *The test setup for system A is shown in Figure 30. The test setup for system B is shown in*  
 1653 *Figure 31. The test setup for system C is shown in Figure 32.*

1654 *The test shall be performed according to the following procedure.*

- 1655 1) *Connect the EV supply equipment to a test load with a dedicated EV simulator for each*  
 1656 *system.*
- 1657 2) *Measure  $V_{T8}$  continuously.*
- 1658 3) *Simulate the open circuit of the control pilot by opening the switch for each system shown*  
 1659 *below:*
  - 1660 – *system A:  $S_{T5}$ ;*
  - 1661 – *system B:  $S_{T4}$ ;*
  - 1662 – *system C:  $S_{T3}$ ;*
- 1663 4) *Start a communication session with the procedure specified by the EV supply equipment*  
 1664 *manufacturer.*
- 1665 5) *Confirm that  $V_{T8} \leq 60 \text{ V DC}$ .*

#### 1666 **6.3.1.5 De-energization of the power supply to the EV**

1667 If the pilot signal is interrupted, the EV supply equipment shall perform a shutdown as indicated  
 1668 for each system.

1669 *Compliance is checked for system A by the test in A.3.2, for system B by the test in B.5.5, and*  
 1670 *for system C by the test in C.7.5.8.*

##### 1671 **6.3.1.5.101 De-energization in case of failure in control circuit**

1672 In case of failure in the control circuit of the EV supply equipment, such as short-circuit, earth  
 1673 leakage current, SECC failure or excess temperature, the EV supply equipment shall terminate  
 1674 the supply of current at side B. The EV supply equipment manufacturer shall perform a failure  
 1675 modes and effects analysis (FMEA) according to IEC 60812 to show conformity with the above  
 1676 requirement.

1677 *Compliance is checked by inspection.*

#### 1678 **6.3.1.6 Maximum allowable current**

1679 A means shall be provided to inform the EV of the value of the applicable maximum current of  
 1680 the EV supply equipment at side B. The value of the applicable maximum current of the EV  
 1681 supply equipment at side B shall be communicated and shall be less than or equal to the rated  
 1682 boost current of the EV supply equipment at side B.

1683 The communicated value may change, without being more than the rated boost current of the  
 1684 EV supply equipment at side B, to adapt to power limitations, for example, for load management.

1685 *Compliance is checked by design review for system A, system B and system C.*

#### 1686 **6.3.1.7 DC supply for the EV**

1687 The EV supply equipment shall supply controlled DC voltage or current (not simultaneously, but  
 1688 as requested by the EV during the communication session) to the EV according to the EVCC  
 1689 requests. Requirements for energy transfer performance of regulated DC voltage or current are  
 1690 given in 17.1.1, 17.1.2, 17.1.3, 17.1.4, 17.1.5, and 17.1.6.

1691 In either case mentioned above, the supplied regulated values shall be less than or equal to  
 1692 the maximum ratings of the EV supply equipment.

1693 *Compliance is checked by the applicable tests in 17.1.1 through 17.1.6.*

1694 The EV can change the target current of the EV and/or the target voltage of the EV.

1695 NOTE EVs are equipped with different technologies and battery systems with different voltages. In order to avoid  
1696 any error during energy transfer and to guarantee that the EV supply equipment will be able to transfer energy to all  
1697 existing and future battery systems, any communication session is controlled by the EV. Any EV that is to be  
1698 connected to a EV supply equipment is equipped with an EVCC for controlling the communication session.

### 1699 **6.3.1.8 Measuring current and voltage**

1700 The EV supply equipment shall measure the present current and the present voltage at side B.  
1701 The accuracy of these measurements shall meet the defined accuracy for each system in A.4.4,  
1702 B.4.2 and C.6.3.

1703 The measured values of present voltage and present current at side B shall be provided by the  
1704 EV supply equipment to the EV through digital communication.

1705 *Compliance for system A and system B is checked by the following test. Compliance for system*  
1706 *C is checked by C.7.5.11, C.7.5.12, and C.7.5.19.*

1707 *The test setup for system A is shown in Figure 30. The test setup for system B is shown in*  
1708 *Figure 31.*

1709 *For system A:*

1710 *The test shall be performed according to the following procedure.*

1711 1) *Connect the EV supply equipment to a test load with a dedicated EV simulator for the system*  
1712 *under test.*

1713 NOTE 1 Test load indicated in Figure 33 unless otherwise specified.

1714 2) *Start a communication session with the procedure specified by the EV supply equipment*  
1715 *manufacturer.*

1716 3) *Set the target current of the EV simulator at  $I_{EVSE\_rated\_boost\_sideB}$ ,  $I_{Avg}$  and  $I_{Min}$  of the EV*  
1717 *supply equipment which are defined as:*

1718  $I_{EVSE\_rated\_boost\_sideB}$  = rated boost current of the EV supply equipment at side B

1719  $I_{Avg} = I_{EVSE\_rated\_boost\_sideB} / 2$

1720  $I_{Min} = 5\text{ A}$

1721 4) *Set the target voltage of the EV simulator at  $V_{EVSE\_rated\_max\_sideB}$ ,  $V_{Avg}$  and*  
1722  *$V_{EVSE\_rated\_min\_sideB}$  of the EV supply equipment which are defined as:*

1723  $V_{EVSE\_rated\_max\_sideB}$  = rated maximum voltage of the EV supply equipment at side B

1724  $V_{Avg} = (V_{EVSE\_rated\_max\_sideB} + V_{EVSE\_rated\_min\_sideB}) / 2$

1725  $V_{EVSE\_rated\_min\_sideB}$  = rated minimum voltage of the EV supply equipment at side B

1726 *The side B voltage is set to  $V_{EVSE\_rated\_max\_sideB}$ ,  $V_{Avg}$  and  $V_{EVSE\_rated\_min\_sideB}$  of the EV*  
1727 *supply equipment by one of the following measures:*

1728 –  *$A_{T1}$  shall be adjusted to set  $V_{T8}$  at  $V_{EVSE\_rated\_max\_sideB}$ ,  $V_{Avg}$  and  $V_{Min}$  of the EV supply*  
1729 *equipment with either the electronic load  $U_{T5}$  operating at constant resistance or using*  
1730 *the resistors  $R_{T10}$  and  $R_{T11}$  to set the voltage point;*

1731 – *electronic load  $U_{T5}$  shall be operated under the constant voltage mode.*

1732 5) *Trend a chart of  $V_{T8}$  and  $A_{T1}$ .*

- 6) Check that the difference between the measured current and voltage of the EV supply equipment at side B and the values measured with  $V_{T8}$  and  $A_{T1}$  are between the limits specified in A.4.4.

For system B:

- 1) Connect the EV supply equipment to a test load with a dedicated EV simulator for the system under test.

NOTE 2 Test load indicated in Figure 33 unless otherwise specified.

- 2) Start a communication session with the procedure specified by the EV supply equipment manufacturer.

- 3) Set the target current of the EV simulator at  $I_{EVSE\_rated\_boost\_sideB}$ ,  $I_{Med}$  and  $I_{Min}$  of the EV supply equipment which are defined as:

$I_{EVSE\_rated\_boost\_sideB}$  = rated boost current of the EV supply equipment at side B

$I_{Med} = (I_{EVSE\_rated\_boost\_sideB} + I_{Min}) / 2$

$I_{Min}$  = the higher value between 5 A and rated minimum current specified of the EV supply equipment at side B

- 4) Set the target voltage of the EV simulator at  $V_{EVSE\_rated\_max\_sideB}$ ,  $V_{Med}$  and  $V_{EVSE\_rated\_min\_sideB}$  of the EV supply equipment which are defined as:

$V_{EVSE\_rated\_max\_sideB}$  = rated maximum voltage of the EV supply equipment at side B

$V_{Med} = (V_{EVSE\_rated\_max\_sideB} + V_{EVSE\_rated\_min\_sideB}) / 2$

$V_{EVSE\_rated\_min\_sideB}$  = rated minimum voltage of the EV supply equipment at side B

- 5) Trend a chart of  $V_{T8}$  and  $A_{T1}$ .

- 6) Check that the difference between the measured current and voltage of the EV supply equipment at side B and the values measured with  $V_{T8}$  and  $A_{T1}$  are between the limits specified in B.4.2.

### 6.3.1.9 Latching of the vehicle connector

The requirements for latching the vehicle connector are defined in Annex A, Annex B and Annex C for each system.

Once latched, the vehicle connector shall remain latched until the present voltage at side B between DC+ and DC- is < 60 V DC. This voltage limit applies throughout the coupling session including after the energy transfer stage. In case of an EV supply equipment malfunction, a means for disconnection may be provided, but if provided, that disconnection means shall be safe according to this document.

NOTE 1 The actuation portion of the latching function can be in either the vehicle connector or the vehicle inlet.

NOTE 2 Voltage criteria for latching/unlatching function can be < 60 V DC; for example, 30 V DC in system A.

The EV supply equipment shall have the following functions when the latching is done by the EV supply equipment:

- electrical or mechanical latching function to retain the latched status;
- function to detect the disconnection of the electrical circuits for the latching function.

Additional requirements are given in A.3.6, B.5.9 and C.4.2. Specific voltage for system A is specified in A.3.3.

Compliance is checked by the following tests a) and b).

- a) Normal condition test

1775 *Simulate a normal coupling session. Check that the vehicle connector is latched on the*  
 1776 *vehicle inlet whenever the present voltage at side B between DC+ and DC– is  $\geq 60$  V DC.*

1777 **b) Abnormal condition test**

1778 *Simulate a condition in which the present voltage at side B between DC+ and DC– remains*  
 1779  *$\geq 60$  V DC after the end of the energy transfer stage, for example, by keeping the EV*  
 1780 *disconnection device closed. Check that the vehicle connector is latched on the vehicle inlet*  
 1781 *whenever the present voltage at side B between DC+ and DC–  $\geq 60$  V DC.*

1782 Vehicle connectors and vehicle inlets shall comply with the requirements of IEC 62196-1 and  
 1783 IEC 62196-3. See also 9.8.

1784 **6.3.1.10 Compatibility check**

1785 Compatibility between the EV and the EV supply equipment shall be checked with the  
 1786 information exchanged at the preparation phase.

1787 For system A, the EV supply equipment shall check if target voltage and rated minimum voltage  
 1788 of the EV ("target battery voltage" and "minimum battery voltage" in IEC 61851-24) are between  
 1789 the rated maximum and rated minimum voltage of the EV supply equipment at side B. In case  
 1790 this condition is not met, the EV supply equipment shall trigger an error shutdown.

1791 For system B, the EV supply equipment checks that rated minimum voltage of the EV supply  
 1792 equipment at side B is less than the maximum permissible charge voltage. In case this condition  
 1793 is not met, the EV supply equipment shall trigger an error shutdown.

1794 For system C, see C.5.6.

1795 *Compliance for system A and system B is checked by the following test. Compliance for system*  
 1796 *C is checked by C.7.5.1.*

1797 *The test setup for system A is shown in Figure 30. The test setup for system B is shown in*  
 1798 *Figure 31.*

- 1799 1) *Connect the EV supply equipment to a test load with a dedicated EV simulator for the system*  
 1800 *under test.*
- 1801 2) *Start energy transfer with the procedure specified by the EV supply equipment*  
 1802 *manufacturer.*
- 1803 3) *Using the EV simulator, communicate the data or message in Table 2 to the EV supply*  
 1804 *equipment via digital communication.*

1805 **Table 2 – Data/message for the compatibility check test**

| System        | Data/Message<br>(refer to IEC 61851-24)                 | Value                                                                |
|---------------|---------------------------------------------------------|----------------------------------------------------------------------|
| A<br>(case 1) | Target battery voltage                                  | 420 V                                                                |
|               | Maximum battery voltage                                 | 410 V                                                                |
| A<br>(case 2) | Target battery voltage                                  | Rated maximum voltage of the EV supply equipment at side B<br>+ 10 V |
|               | Maximum battery voltage                                 | 600 V                                                                |
| A<br>(case 3) | Target battery voltage                                  | Rated minimum voltage of the EV supply equipment at side B<br>– 10 V |
|               | Maximum battery voltage                                 | Rated maximum voltage of the EV supply equipment at side B           |
| B             | Maximum permissible charge<br>voltage of battery system | Rated minimum voltage of the EV supply equipment at side B<br>– 10 V |

1806

1807 4) *For each case, check that the EV supply equipment triggers an error shutdown, displaying*  
 1808 *a relevant alarm or error information, if any. For system A, perform the test separately for*  
 1809 *each case.*

1810 5) *Confirm that  $V_{T6}$ ,  $V_{T7}$  and  $V_{T8}$  are  $< 60$  V DC.*

#### 1811 **6.3.1.11 Insulation resistance check before energy transfer**

1812 The EV supply equipment shall check the insulation resistance between side B live parts  
 1813 (DC+/DC-) and protective conductor to the vehicle chassis, including any exposed conductive  
 1814 part of the EV supply equipment, before the EV disconnection device are allowed to close.

1815 If the insulation resistance is less than the system specific limit or it cannot be determined in  
 1816 the specified time or less, the EV supply equipment shall trigger an error shutdown and indicate  
 1817 to the EV that energy transfer is not allowed.

1818 For system A and system B, when the insulation resistance  $R$  does not fulfil Formula (1), the  
 1819 EV supply equipment shall trigger an error shutdown:

$$R \geq 100 \frac{\Omega}{V} \times U \quad (1)$$

1820

1821 where

1822  $U$  is the rated maximum voltage of the EV supply equipment at side B, expressed in volts.  
 1823 Details are specified in A.4.3.3 and B.8.

1824 For system C, see C.4.1.4.

1825 *Compliance is checked by the tests in A.4.3.3, B.8 and C.7.5.15.*

#### 1826 **6.3.1.12 Protection against overvoltage at side B between DC+ and DC-**

##### 1827 **6.3.1.12.1 General**

1828 The EV supply equipment shall detect an overvoltage between DC+ and DC- at the vehicle  
 1829 connector and perform an emergency shutdown or error shutdown if an overvoltage is detected,  
 1830 according to 6.3.1.12.2 and 6.3.1.12.3.

1831 When the vehicle connector is being mated to the vehicle inlet, the EV supply equipment and  
 1832 the EV shall not trigger a shutdown due to a present voltage at side B (positive or negative  
 1833 voltage), between DC+ and DC-, between DC+ and PE or between DC- and PE, unless  
 1834 otherwise specified in 6.3.1.18, Annex A, Annex B and Annex C.

1835 According to ISO 17409:2020, 6.5.2, when unmated, the EV can have a voltage  $> 60$  V DC and  $>$   
 1836  $30$  V AC between DC+ and PE, and between DC- and PE. It is recommended that the EV does  
 1837 not have a common mode voltage  $> 60$  V, as unbalanced insulation faults can generate  
 1838 differential voltages at side B  $> 60$  V. For system C, the EV may try to use  $R_{S7}$  and  $R_{S8}$  in  
 1839 Figure C.3 of the disabled side B circuit to limit this common mode voltage.

1840 Overvoltage protection during the initialization stage, cable-check phase and pre-charge phase  
 1841 is under consideration.

##### 1842 **6.3.1.12.2 Protection against overvoltage at side B between DC+ and DC- by** 1843 **emergency shutdown**

1844 For system A, the EV supply equipment shall fulfil the overvoltage protection requirements in  
 1845 A.3.12.

For system B and system C, the EV supply equipment shall trigger an emergency shutdown in 1 ms or less if, during the energy transfer stage, the present voltage at side B between DC+ and DC– is more than the voltage thresholds specified in Table 3 for more than 9 consecutive ms.

**Table 3 – Voltage threshold for emergency shutdown reaction for system B and system C**

| Negotiated maximum voltage at side B<br>( $U$ ) | Voltage threshold<br>V |
|-------------------------------------------------|------------------------|
| $U \leq 500 \text{ V}$                          | 550                    |
| $500 \text{ V} < U \leq 750 \text{ V}$          | 825                    |
| $750 \text{ V} < U \leq 850 \text{ V}$          | 935                    |
| $850 \text{ V} < U \leq 1\,000 \text{ V}$       | 1 100                  |

*Compliance is checked by B.5.6 for system B and C.7.5.7.1 for system C.*

### 6.3.1.12.3 Protection against overvoltage at side B between DC+ and DC– by error shutdown

The EV supply equipment shall also react depending on condition of the present voltage at side B between DC+ and DC– according to Table 4.

**Table 4 – EV supply equipment reaction depending on the present voltage at side B condition**

| Present voltage at side B condition                                                                                                                                       | System  | EV supply equipment reaction                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------------------------------------------------|
| The present voltage at side B between DC+ and DC– is more than the negotiated maximum voltage at side B for 400 consecutive ms                                            | A       | Trigger an error shutdown in 1,6 s or less         |
|                                                                                                                                                                           | C       | Trigger an error shutdown in 50 ms or less         |
| The present voltage at side B between DC+ and DC– is more than the negotiated maximum voltage at side B for more than 200 consecutive ms and less than 400 consecutive ms | A and C | Allow energy transfer or trigger an error shutdown |
| The present voltage at side B between DC+ and DC– is more than the negotiated maximum voltage at side B for 200 or less consecutive ms                                    | A and C | Allow energy transfer                              |
| The present voltage at side B between DC+ and DC– is more than the negotiated maximum voltage at side B                                                                   | B       | Trigger an error shutdown in 500 ms or less        |

NOTE 1 For system A and system B, the EV cannot change the applicable maximum voltage of the EV during the communication session.

For system A, specific requirements for the error shutdown timing criteria are defined in Table A.5.

NOTE 2 The emergency and error shutdown are necessary to prevent overcharging the battery system and cannot be assumed as a withstand capability of the EV supply equipment.

*Compliance is checked by the following tests according to Table 5.*