
Vtiči, vtičnice, konektorji in uvodnice na vozilih - Kabelsko napajanje električnih vozil - 1. del: Splošne zahteve

Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles - Part 1: General requirements

Stecker, Steckdosen, Fahrzeugkupplungen und Fahrzeugstecker - Konduktives Laden von Elektrofahrzeugen – Teil 1: Allgemeine Anforderungen

Fiches, socles de prise de courant, prises mobiles de véhicule et socles de connecteur de véhicule - Charge conductive des véhicules électriques - Partie 1: Règles générales

Ta slovenski standard je istoveten z: prEN IEC 62196-1:2020

[SIST EN IEC 62196-1:2023](https://standards.slovenski-standard.si/standards/sist/62196-1:2020)

ICS:

29.120.30	Vtiči, vtičnice, spojke	Plugs, socket-outlets, couplers
43.120	Električna cestna vozila	Electric road vehicles

oSIST prEN IEC 62196-1:2020

en,fr,de



23H/461/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: IEC 62196-1 ED4	
DATE OF CIRCULATION: 2020-01-10	CLOSING DATE FOR VOTING: 2020-04-03
SUPERSEDES DOCUMENTS: 23H/444/CD,23H/449A/CC	

IEC SC 23H : PLUGS, SOCKET-OUTLETS AND COUPLERS FOR INDUSTRIAL AND SIMILAR APPLICATIONS, AND FOR ELECTRIC VEHICLES	
SECRETARIAT: France	SECRETARY: Mr Bertrand Doignon
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 69	PROPOSED HORIZONTAL STANDARD: <input type="checkbox"/> Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: <input type="checkbox"/> EMC <input type="checkbox"/> ENVIRONMENT <input type="checkbox"/> QUALITY ASSURANCE <input type="checkbox"/> SAFETY	
<input checked="" type="checkbox"/> SUBMITTED FOR CENELEC PARALLEL VOTING <input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING	
<p>Attention IEC-CENELEC parallel voting</p> <p>The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.</p> <p>The CENELEC members are invited to vote through the CENELEC online voting system.</p>	

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles - Part 1: General requirements

PROPOSED STABILITY DATE: 2025

NOTE FROM TC/SC OFFICERS:

If necessary, comments will be reviewed in an MT 8 meeting in April 2020

Copyright © 2019 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.

CONTENTS

1		
2		
3	FOREWORD	6
4	INTRODUCTION	8
5	1 Scope	9
6	2 Normative references	9
7	3 Terms and definitions	11
8	4 General	19
9	4.1 General requirements	19
10	4.2 Components	19
11	4.3 General notes on tests	20
12	5 Ratings	21
13	5.1 Preferred rated operating voltage ranges	21
14	5.2 Preferred rated currents	21
15	6 Connection between the power supply and the electric vehicle	22
16	6.1 Interfaces	22
17	6.2 Basic interface	22
18	6.3 DC interface	23
19	6.4 Combined interface	23
20	7 Classification of accessories and cable assemblies	23
21	7.1 According to purpose	23
22	7.2 According to the method of connecting the conductors	23
23	7.3 According to serviceability	23
24	7.4 According to electrical operation	23
25	7.5 According to interface	23
26	7.6 According to use with cable management systems	23
27	7.7 According to locking facilities	23
28	7.8 According to interlock facilities:	23
29	7.9 According to the presence of shutter(s)	24
30	8 Marking	24
31	9 Dimensions	26
32	10 Protection against electric shock	27
33	10.1 General	27
34	10.2 Accessories with shutters	27
35	10.3 Contact sequencing and order of contact insertion and withdrawal	30
36	10.4 Misassembly	31
37	11 Size and colour of protective earthing and neutral conductors	31
38	12 Provisions for earthing	32
39	13 Terminals	35
40	13.1 Common requirements	35
41	13.2 Screw type terminals	37
42	13.3 Mechanical tests on terminals	39
43	14 Interlocks	42
44	14.1 Accessories with interlock	42
45	14.2 Accessories with integral switching device	47
46	14.3 Control circuit devices and switching elements	47

47	14.4	Pilot contacts and auxiliary circuits	47
48	15	Resistance to ageing of rubber and thermoplastic material	47
49	16	General construction	48
50	17	Construction of socket-outlets.....	52
51	17.1	General.....	52
52	18	Construction of plugs and vehicle connectors	52
53	19	Construction of vehicle inlets	53
54	20	Degrees of protection	54
55	21	Insulation resistance and dielectric strength	55
56	22	Breaking capacity	56
57	23	Normal operation	59
58	24	Temperature rise	61
59	25	Flexible cables and their connection	63
60	25.1	Strain relief	63
61	25.2	Requirements for plugs and vehicle connectors	64
62	25.3	Plugs and vehicle connectors provided with a flexible cable.....	64
63	26	Mechanical strength.....	66
64	26.1	General.....	66
65	26.2	Ball Impact.....	67
66	26.3	Drop Test.....	69
67	26.4	Flexing Test.....	70
68	26.5	Cable Glands Test	71
69	26.6	Shutters	72
70	26.7	Insulated end caps.....	72
71	27	Screws, current-carrying parts and connections	73
72	28	Creepage distances, clearances and distances.....	76
73	29	Resistance to heat and fire	77
74	30	Corrosion and resistance to rusting	79
75	31	Conditional short-circuit current	79
76	31.1	General.....	79
77	31.2	Ratings and test conditions	79
78	31.3	Test circuit	80
79	31.4	Calibration	83
80	31.5	Test procedure.....	84
81	31.6	Behaviour of the equipment under test.....	84
82	31.7	Acceptance conditions	84
83	32	Electromagnetic compatibility	84
84	32.1	Immunity.....	84
85	32.2	Emission	84
86	33	Vehicle driveover	84
87	34	Thermal cycling	85
88	34.1	General.....	85
89	34.2	Initial temperature rise test.....	85
90	34.3	Thermal cycling test.....	85
91	34.4	Final temperature rise test	86
92	35	Humidity exposure	86

93	35.1	General.....	86
94	35.2	Initial temperature rise test.....	86
95	35.3	Humidity test.....	86
96	35.4	Final temperature rise test	87
97	36	Misalignment	87
98	36.1	General.....	87
99	36.2	Samples.....	87
100	36.3	Misalignment Test.....	87
101	37	Contact endurance test.....	89
102	37.1	Equipment.....	89
103	37.2	Test sequence	90
104	37.3	Compliance.....	91
105		Bibliography.....	93
106			
107		Figure 1 – Diagram showing the use of the accessories	12
108		Figure 2 – Pillar terminals	15
109		Figure 3 – Screw-type terminals.....	15
110		Figure 4 – Stud terminals	15
111		Figure 5 – Saddle terminals	16
112		Figure 6 – Lug terminals	16
113		Figure 7 – Mantle terminals.....	16
114		Figure 8 – Test piston	26
115		Figure 9 – Gauge “A” for checking shutters	29
116		Figure 10 – Gauge “B” for checking shutters	30
117		Figure 11 – Gauges for testing insertability of round unprepared conductors having the	
118		maximum specified cross-section.....	38
119		Figure 12 – Equipment test arrangement	40
120		Figure 13 – Apparatus for checking the withdrawal force.....	45
121		Figure 14 – Verification of the latching device.....	46
122		Figure 15 – Circuit diagrams for breaking capacity and normal operation tests	58
123		Figure 16 – Points of measurement.....	63
124		Figure 17 – Apparatus for testing the cable anchorage.....	65
125		Figure 18 – Ball Impact test	67
126		Figure 19 – Arrangement for mechanical strength test for plugs and vehicle connectors	69
127		Figure 20 – Apparatus for flexing test	71
128		Figure 21 – Diagram of the test circuit for the verification of short-circuit current	
129		withstand of a two-pole equipment on a single-phase AC or DC.....	81
130		Figure 22 – Diagram of the test circuit for the verification of short-circuit current	
131		withstand of a three-pole equipment	82
132		Figure 23 – Diagram of the test circuit for the verification of short-circuit current	
133		withstand of a four-pole equipment	83
134		Figure 24 – Overview of the mechanical load test	88
135		Figure 25 – Application of External Mechanical Load (Mounted According to Figure 24)	88
136		Figure 21 – Temperature Rise Criteria Under External Mechanical Load.....	89
137		Figure 27 – Forced-air circulating oven	89
138		Figure 28 – Thermal cycling	91

139	Figure 29 – Pass/fail based on temperature rise criteria.....	92
140		
141	Table 1 – Size for conductors.....	32
142	Table 2 – Short-time test currents	34
143	Table 3 – Values for flexing under mechanical load test.....	41
144	Table 4 – Value for terminal pull test.....	42
145	Table 5 – Withdrawal force with respect to ratings	46
146	Table 6 – Cable length used to determine pull force on retaining means	49
147	Table 7 – Test voltage for dielectric strength test.....	56
148	Table 8 – Breaking capacity.....	59
149	Table 9 – Normal operation.....	60
150	Table 10 – Test current and nominal cross-sectional areas of copper conductors for	
151	temperature rise test.....	62
152	Table 11 – Pull force and torque test values for cable anchorage.....	66
153	Table 12 – Summary of mechanical tests	67
154	Table 13 – Impact energy for ball impact test.....	68
155	Table 14 – Mechanical load flexing test	70
156	Table 15 – Torque test values for glands	72
157	Table 16 – Pulling force on insulated end caps	73
158	Table 17 – Tightening torque for verification of mechanical strength of screw-type	
159	terminals.....	74
160		

(<https://standards.iteh.ai>)
Document Preview

[SIST EN IEC 62196-1:2023](https://standards.iteh.ai/catalog/standards/sist/edd7cef0-5221-49c3-b142-e98ebc0d5ccb/sist-en-iec-62196-1-2023)

<https://standards.iteh.ai/catalog/standards/sist/edd7cef0-5221-49c3-b142-e98ebc0d5ccb/sist-en-iec-62196-1-2023>

161 INTERNATIONAL ELECTROTECHNICAL COMMISSION

162

163

164

165

166

167

168

169

170

—————

**PLUGS, SOCKET-OUTLETS, VEHICLE
CONNECTORS AND VEHICLE INLETS –
CONDUCTIVE CHARGING OF ELECTRIC VEHICLES –**

Part 1: General requirements

FOREWORD

171 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization
172 comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to
173 promote international co-operation on all questions concerning standardization in the electrical and
174 electronic fields. To this end and in addition to other activities, IEC publishes International Standards,
175 Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter
176 referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National
177 Committee interested in the subject dealt with may participate in this preparatory work. International,
178 governmental and non-governmental organizations liaising with the IEC also participate in this preparation.
179 IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with
180 conditions determined by agreement between the two organizations.

181 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international
182 consensus of opinion on the relevant subjects since each technical committee has representation from all
183 interested IEC National Committees.

184 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National
185 Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC
186 Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any
187 misinterpretation by any end user.

188 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications
189 transparently to the maximum extent possible in their national and regional publications. Any divergence
190 between any IEC Publication and the corresponding national or regional publication shall be clearly indicated
191 in the latter.

192 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity
193 assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any
194 services carried out by independent certification bodies.

195 6) All users should ensure that they have the latest edition of this publication.

196 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and
197 members of its technical committees and IEC National Committees for any personal injury, property damage or
198 other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and
199 expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC
200 Publications.

201 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is
202 indispensable for the correct application of this publication.

203 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of
204 patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

205 International Standard IEC 62196-1 has been prepared by subcommittee 23H: Plugs, socket-
206 outlets and couplers for industrial and similar applications, and for electric vehicles, of IEC
207 technical committee 23: Electrical accessories.

208 This fourth edition cancels and replaces the third edition published in 2014 and constitutes a
209 technical revision.

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

212 a) deletion of references to Universal AC and DC Interfaces;

- 213 b) additional requirements for contact materials and plating;
 214 c) changes to the Temperature rise test to include additional points of measurement;
 215 d) additional tests for accessories to address thermal stresses and stability, mechanical wear
 216 and abuse, and exposure to contaminants.
 217 e) Editing to relocate information and requirements for DC charging in IEC 62196-3.

218 The text of this standard is based on the following documents:

FDIS	Report on voting
23H/---/FDIS	23H/---/RVD

219

220 A list of all the parts in the IEC 62196 series, under the general title *Plugs, socket-outlets,*
 221 *vehicle connectors and vehicle inlets – Conductive charging of electric vehicles*, can be found
 222 on the IEC website.

223 Subsequent parts of IEC 62196 deal with the requirements of particular types of accessories.
 224 The clauses of these particular requirements supplement or modify the corresponding clauses
 225 in Part 1.

226 In this standard, the following print types are used:

- 227 – requirements proper: in roman type;
 228 – *test specifications: in italic type;*
 229 – notes: in smaller roman type.

230 The committee has decided that the contents of this publication will remain unchanged until
 231 the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data
 232 related to the specific publication. At this date, the publication will be

- 233 • reconfirmed,
 234 • withdrawn,
 235 • replaced by a revised edition, or
 236 • amended.

237

238

INTRODUCTION

239 IEC 61851 series specifies requirements for EV conductive charging systems.

240 IEC 62196 series specifies the requirements for plugs, socket-outlets, vehicle connectors,
241 vehicle inlets and cable assemblies as described in the IEC 61851 series.

242 Some charging can be achieved by direct connection from an electric vehicle to standard
243 socket-outlets connected to a supply network (mains or electrical grid).

244 Some modes of charging require a dedicated supply and charging equipment incorporating
245 control and communication circuits.

246 IEC 62196 covers the mechanical, electrical and performance requirements for plugs, socket
247 outlets, vehicle connectors and vehicle inlets for the connection between the EV supply
248 equipment and the electric vehicle.

249 IEC 62196 series consists of the following parts:

250 – Part 1: General requirements, comprising clauses of a general character.

251 – Part 2: Dimensional compatibility and interchangeability requirements for AC pin and
252 contact-tube accessories.

253 – Part 3: Dimensional compatibility and interchangeability requirements for DC and AC/DC
254 pin and contact-tube vehicle couplers.

255 – Part 3-1²: Vehicle connector, vehicle inlet and cable assembly intended to be used with a
256 thermal management system for DC charging.

257 – Part 4¹: Dimensional compatibility and interchangeability requirements for DC pin and
258 contact-tube accessories for Class II or Class III applications.

259 – Part 6²: Dimensional compatibility and interchangeability requirements for DC pin and
260 contact-tube couplers for applications using a system of protective electrical separation.

261

[SIST EN IEC 62196-1:2023](https://standards.iteh.ai/catalog/standards/sist/edd7cef0-5221-49c3-b142-e98ebc0d5ccb/sist-en-iec-62196-1-2023)

<https://standards.iteh.ai/catalog/standards/sist/edd7cef0-5221-49c3-b142-e98ebc0d5ccb/sist-en-iec-62196-1-2023>

1 Publication of Part 4 is dependent on the publication of IEC 61851-23 ed.2. Stage at the time of publication: IEC CDV 61851-23:2019.

2 Under preparation.

262 **PLUGS, SOCKET-OUTLETS, VEHICLE**
263 **CONNECTORS AND VEHICLE INLETS –**
264 **CONDUCTIVE CHARGING OF ELECTRIC VEHICLES –**

265
266 **Part 1: General requirements**
267

268
269
270 **1 Scope**

271 This part of IEC 62196 is applicable to plugs, socket-outlets, vehicle connectors, vehicle inlets
272 herein referred to as “accessories”, and cable assemblies for electric vehicles (EV), intended
273 for use in conductive charging systems which incorporate control means, with a rated
274 operating voltage not exceeding

275 – 690 V AC 50 Hz to 60 Hz, at a rated current not exceeding 250 A,

276 – 1 500 V DC at a rated current not exceeding 800 A.

277 These accessories and cable assemblies are intended to be installed by instructed persons
278 (IEV 195-04-02) or skilled persons (IEV 195-04-01) only

279 These accessories and cable assemblies are intended to be used for circuits specified in
280 IEC 61851 series, which operate at different voltages and frequencies and which may include
281 extra-low voltage and communication signals.

282 These accessories and cable assemblies are to be used at an ambient temperature between
283 –30 °C and +40 °C.

284 NOTE 1 In some countries, other requirements may apply.

285 NOTE 2 In the following countries, –35 °C applies: SE.

286 NOTE 3 The manufacturer may declare higher temperature providing necessary information.

287 These accessories are intended to be connected only to cables with copper or copper-alloy
288 conductors.

289 The accessories covered by this part of IEC 62196 are intended for use in electric vehicle
290 supply equipment in accordance with IEC 61851 series.

291 This part of IEC 62196 does not apply to standard plug and socket-outlets used for mode 1
292 and mode 2 according to IEC 61851-1:2017 6.2.

293 NOTE 4 In the following countries, mode 1 is not allowed: UK, US, CA, SG

294 **2 Normative references**

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

299 IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

- 300 IEC 60068-2-30, *Environmental testing – Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h*
301 *+ 12 h cycle)*
- 302 IEC 60068-2-60, *Environmental testing – Part 2-60: Tests - Test Ke: Flowing mixed gas*
303 *corrosion test*
- 304 IEC 60112, *Method for the determination of the proof and the comparative tracking indices of*
305 *solid insulating materials*
- 306 IEC 60227 (all parts), *Polyvinyl chloride insulated cables of rated voltages up to and including*
307 *450/750 V*
- 308 IEC 60228:2004, *Conductors of insulated cables*
- 309 IEC 60245-4, *Rubber insulated cables of rated voltages up to and including 450/750 V –*
310 *Part 4: Cords and flexible cables*
- 311 IEC 60269-1, *Low-voltage fuses – Part 1: General requirements*
- 312 IEC 60269-2, *Low-voltage fuses – Part 2: Supplementary requirements for fuses for use by*
313 *authorised persons (fuses mainly for industrial application) – Examples of standardized*
314 *systems of fuses A to K*
- 315 IEC 60309-4:2006, *Plugs, socket-outlets and couplers for industrial purposes – Part 4:*
316 *Switched socket-outlets and connectors with or without interlock*
- 317 IEC 60449, *Voltage bands for electrical installations of buildings*
- 318 IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*
- 319 IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1:*
320 *Principles, requirements and tests*
- 321 IEC 60664-3, *Insulation coordination for equipment within low-voltage systems – Part 3: Use*
322 *of coating, potting or moulding for protection against pollution*
- 323 IEC 60695-2-11, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods –*
324 *Glow-wire flammability test method for end-products*
- 325 IEC 60695-10-2, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test*
- 326 IEC 61032:1997, *Protection of persons and equipment by enclosures - Probes for verification*
- 327 IEC 61851-1:2017, *Electric vehicle conductive charging system – Part 1: General*
328 *requirements*
- 329 IEC 61851-23:2014, *Electric vehicle conductive charging system – Part 23: d.c. electric*
330 *vehicle charging station*
- 331 IEC 62893-1:2017, *Charging cables for electric vehicles for rated voltages up to and including*
332 *0,6/1 kV - Part 1: General requirements*

333 IEC 62893-2:2017, *Charging cables for electric vehicles for rated voltages up to and including*
334 *0,6/1 kV - Part 2: Test methods*

335 IEC 62893-3:2017, *Charging cables for electric vehicles for rated voltages up to and including*
336 *0,6/1 kV - Part 3: Cables for AC charging according to modes 1, 2 and 3 of IEC 61851-1 of*
337 *rated voltages up to and including 450/750 V*

338 ISO 1456, *Metallic and other inorganic coatings – Electrodeposited coatings of nickel, nickel*
339 *plus chromium, copper plus nickel and of copper plus nickel plus chromium*

340 ISO 2081, *Metallic and other inorganic coatings – Electroplated coatings of zinc with*
341 *supplementary treatments on iron or steel*

342 ISO 2093, *Electroplated coatings of tin – Specification and test methods*

343 ISO 4521:2008, *Metallic and other inorganic coatings -- Electrodeposited silver and silver*
344 *alloy coatings for engineering purposes -- Specification and test methods*

345 ISO 4522-1:2008, *Metallic coatings - Test methods for electrodeposited silver and silver alloy*
346 *coatings - Part 1: Determination of coating thickness*

347 **3 Terms and definitions**

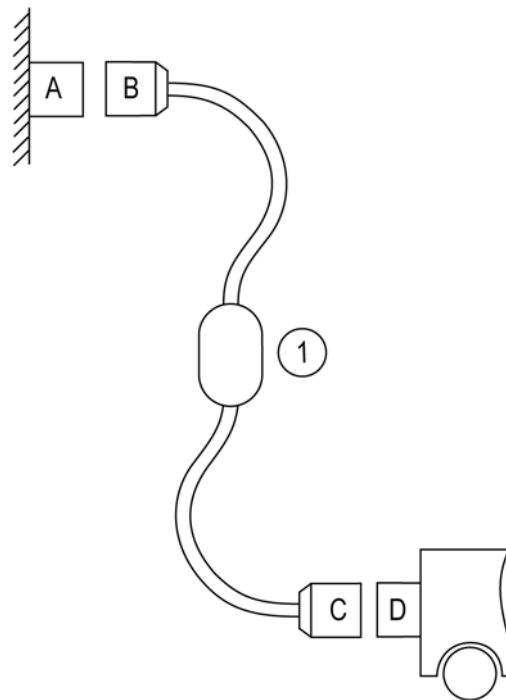
348 For the purposes of this document, the terms and definitions given in IEC 61851-1:2017 as
349 well as the following apply.

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

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

354 NOTE 1 Where the terms voltage and current are used, they imply root mean square (RMS) values, unless
355 otherwise specified.

356 NOTE 2 The application of accessories is shown in Figure 1.



357

Key

- 1 In-cable control and protective device (IC-CPD)
- A Socket-outlet
- B Plug
- C Vehicle connector
- D Vehicle inlet

358

359

Figure 1 – Diagram showing the use of the accessories**3.1****cable assembly**

assembly consisting of flexible cable or cord fitted with a plug and/or a vehicle connector, that is used to establish the connection between the EV and the supply network or an EV charging station

Note 1 to entry: A cable assembly can be detachable or be a part of the EV or of the EV charging station.

Note 2 to entry: A cable assembly can include one or more cables, with or without a fixed jacket, which can be in a flexible tube, conduit or wire way.

[Source 61851-1:2017, 3.5.2]

3.2**plug**

part integral with or intended to be attached to one flexible cable connected to the electric vehicle or to a vehicle connector

Note 1 to entry: It may include mechanical, electrical or electronic components and circuitry, which perform control functions.

3.3**socket-outlet**

part intended to be installed with the fixed wiring, or incorporated in equipment

377