

TECHNICAL SPECIFICATION

Vehicle connector, vehicle inlet and cable assembly for megawatt DC charging

CONTENTS

FOREWORD	9
INTRODUCTION	11
1 Scope	12
2 Normative references	12
3 Terms and definitions	14
4 General	15
4.100 System architecture	15
4.101 Manufacturers product data sheet	18
4.102 Maximum temperatures	18
4.103 Ambient rating	19
4.104 POC design	19
5 Ratings	19
6 Connection between the power supply and the electric vehicle	20
7 Classification of accessories	20
8 Marking	21
9 Dimensions	21
10 Protection against electric shock	21
11 Size and colour of protective earthing conductors	22
12 Provision for earthing	23
13 Terminals	23
14 Interlocks	23
14.100 Accessories with interlocks	23
14.100.1 General	23
14.100.2 Electrical interlock	24
14.100.3 Mechanical interlock	24
14.100.4 Test of interlock	24
14.101 Engage and disengage the latching device	25
14.101.1 General	25
14.101.2 Samples	25
14.101.3 Test sequence	25
14.102 Withdrawal test	27
15 Resistance to ageing of rubber and thermoplastic material	28
16 General construction	28
16.100 Thermal sensing device	29
16.101 Loss of thermal transport	29
16.101.1 Loss of thermal transport of connectors and cable assemblies	29
16.101.2 Loss of thermal transport of the vehicle inlet	30
16.102 Accessories using thermal sensing	30
16.103 Rated current for accessories	31
16.104 Operation conditions of thermal management system	31
16.105 Minimum cross section of line conductors	31
16.106 Contact temperature	31
17 Construction of socket-outlets	32
18 Construction of plugs and vehicle connectors	32
18.100 DC contact surface	32

18.101 Hand clearance zone	32
19 Construction of vehicle inlets	32
19.100 DC contact surface	32
20 Degrees of protection	33
21 Insulation resistance and dielectric strength	33
22 Breaking capacity	33
23 Normal operation	33
23.2 Load endurance test	33
24 Temperature rise	33
24.100 General test conditions	33
24.101 Temperature rise test for cable assembly	33
24.101.1 Temperature rise test for cable assembly of configuration HH	33
24.101.2 Temperature rise test for cable assembly of configuration JJ with thermal transport on or thermal sensing only	34
24.101.3 Temperature rise test for cable assembly of configuration JJ with thermal transport off	35
24.102 Test for thermal sensing device of cable assembly	36
24.102.1 Test for thermal sensing device of cable assembly of configuration HH	36
24.102.2 Test for thermal sensing device of cable assembly of configuration JJ	37
24.103 Temperature rise test for vehicle inlet	40
24.103.1 Temperature rise test for vehicle inlet of configuration HH	40
24.103.2 Temperature rise test for vehicle inlet of configuration JJ with thermal transport on	42
24.103.3 Temperature rise test for vehicle inlet of configuration JJ with thermal transport off	42
24.104 Test for thermal sensing device of vehicle inlet	43
24.104.1 Test for thermal sensing device of vehicle inlet of configuration HH	43
24.104.2 Test for thermal sensing device of vehicle inlet of configuration JJ	45
25 Flexible cables and their connection	46
25.100 Design of cables	46
26 Mechanical strength	46
27 Screws, current-carrying parts and connections	48
28 Creepage distances, clearances and distances through sealing compound	48
29 Resistance to heat and to fire	48
30 Corrosion and resistance to rusting	48
31 Conditional short-circuit current	48
32 Electromagnetic compatibility	48
33 Vehicle drive over	48
34 Thermal cycling	49
35 Humidity exposure	49
36 Misalignment	49
37 Contact endurance test	49
38 Liquid coolants	49
38.1 Type of coolant	49
38.2 Environmental considerations	49
38.3 Flammability	50
38.4 Conductivity	50

38.5	Material compatibility	50
38.6	Overpressure test	50
39	Signal integrity	51
Annex A (normative) Standard sheet of configuration HH: Vehicle coupler 1 500 V DC and up to 3 000 A		52
A.1	Vehicle inlet of configuration HH	52
A.1.1	Vehicle inlet of configuration HH, Sheet 1 (see Figure A.1)	52
A.1.2	Vehicle inlet of configuration HH, Sheet 2 (see Figure A.2)	53
A.1.3	Vehicle inlet of configuration HH, Sheet 3 (see Figure A.3)	54
A.1.4	Vehicle inlet of configuration HH, Sheet 4 (see Figure A.4)	55
A.1.5	Vehicle inlet of configuration HH, Sheet 5 (see Figure A.5)	56
A.1.6	Vehicle inlet of configuration HH, Sheet 6 (see Figure A.6)	57
A.1.7	Vehicle inlet of configuration HH, Sheet 7 (see 7).....	58
A.1.8	Vehicle inlet of configuration HH, Sheet 8 (see Figure A.8)	59
A.1.9	Vehicle inlet of configuration HH, Sheet 9 (see Figure A.9)	60
A.1.10	Vehicle inlet of configuration HH, table of keys.....	60
A.2	Vehicle connector of configuration HH	61
A.2.1	Vehicle connector of configuration HH, Sheet 1 (see Figure A.10).....	61
A.2.2	Vehicle connector of configuration HH, Sheet 2 (see Figure A.11).....	62
A.2.3	Vehicle connector of configuration HH, Sheet 3 (see Figure A.12).....	63
A.2.4	Vehicle connector of configuration HH, Sheet 4 (see Figure A.13).....	64
A.2.5	Vehicle connector of configuration HH, Sheet 5 (see Figure A.14).....	65
A.2.6	Vehicle connector of configuration HH, Sheet 6 (see Figure A.15).....	66
A.2.7	Vehicle connector of configuration HH, Sheet 7 (see Figure A.16).....	67
A.2.8	Vehicle connector of configuration HH, Sheet 8 (see Figure A.17).....	68
A.2.9	Vehicle connector of configuration HH, Sheet 9 (see Figure A.18).....	69
A.2.10	Vehicle connector of configuration HH, Sheet 10 (see Figure A.19).....	70
A.2.11	Dimensions of vehicle connector body outline (see Figure A.20)	71
A.2.12	Vehicle connector of configuration HH, table of keys	71
A.3	Coordinate systems for automatic docking and undocking of configuration HH.....	72
A.3.1	General.....	72
A.3.2	Coordinate system of vehicle inlet	72
A.3.3	Coordinate system of vehicle connector	72
A.3.4	Package space for automatic docking	73
Annex B (normative) Standard sheets of configuration JJ : Vehicle coupler 1 500 V DC and up to 1 600 A		74
B.1	Vehicle inlet of configuration JJ with mechanical coding	74
B.1.1	Vehicle inlet of configuration JJ with mechanical coding, Sheet 1 (see Figure B.1).....	74
B.1.2	Vehicle inlet of configuration JJ with mechanical coding, Sheet 2 (see Figure B.2).....	75
B.1.3	Vehicle inlet of configuration JJ with mechanical coding, Sheet 3 (see Figure B.3).....	76
B.1.4	Vehicle inlet of configuration JJ with mechanical coding, Sheet 4 (see Figure B.4).....	77
B.1.5	Vehicle inlet of configuration JJ with mechanical coding, Sheet 5 (see Figure B.5).....	78
B.1.6	Vehicle inlet of configuration JJ with mechanical coding, table of keys.....	78
B.2	Vehicle inlet of configuration JJ without mechanical coding.....	79

B.2.1	Vehicle inlet of configuration JJ without mechanical coding, Sheet 1 (see Figure B.6).....	79
B.2.2	Vehicle inlet of configuration JJ without mechanical coding, Sheet 2 (see Figure B.7).....	80
B.2.3	Vehicle inlet of configuration JJ without mechanical coding, Sheet 3 (see Figure B.8).....	81
B.2.4	Vehicle inlet of configuration JJ without mechanical coding, Sheet 4 (see Figure B.9).....	82
B.2.5	Vehicle inlet of configuration JJ without mechanical coding, Sheet 5 (see Figure B.10).....	83
B.2.6	Vehicle inlet of configuration JJ without mechanical coding, table of keys	83
B.3	Vehicle connector of configuration JJ.....	84
B.3.1	Vehicle connector of configuration JJ, Sheet 1 (see Figure B.11).....	84
B.3.2	Vehicle connector of configuration JJ, Sheet 2 (see Figure B.12).....	85
B.3.3	Vehicle connector of configuration JJ, Sheet 3 (see Figure B.13).....	86
B.3.4	Vehicle connector of configuration JJ, Sheet 4 (see Figure B.14).....	87
B.3.5	Vehicle connector of configuration JJ, Sheet 5 (see Figure B.15).....	88
B.3.6	Vehicle connector of configuration JJ, Sheet 6 (see Figure B.16).....	89
B.3.7	Vehicle connector of configuration JJ, table of keys.....	89
Annex C	(normative) Specific information for configuration HH.....	90
C.1	General	90
C.2	Test setups for temperature rise tests and temperature sensing test.....	90
C.2.1	Test setups for temperature rise test and temperature sensing test of cable assembly.....	90
C.2.2	Test setups for temperature rise and temperature sensing test of vehicle inlet.....	91
C.3	Vehicle inlet reference device preparation.....	92
C.3.1	Validation measurement of the vehicle inlet reference device	92
C.3.2	Vehicle inlet reference device assembly	93
C.3.3	Vehicle inlet reference device sub-assembly.....	98
C.3.4	Vehicle inlet reference device components	105
Annex D	(normative) Specific information for configuration JJ	131
D.1	General	131
D.2	Reference devices and test setups for configuration JJ.....	131
D.2.1	Reference device and test setups for temperature rise test and thermal sensing device test of cable assembly (configuration JJ).....	131
D.2.2	Reference device and test setups for temperature rise test and thermal sensing device test of vehicle inlet (configuration JJ).....	133
D.3	Test setup for configuration JJ	135
D.4	Contacts for configuration JJ.....	136
D.5	Other drawings.....	136
D.5.1	Final assembly of the vehicle inlet reference device	136
D.5.2	Final assembly of the vehicle connector reference device	137
D.5.3	Sub-assembly of the vehicle inlet reference device.....	138
D.5.4	Sub-assembly of the vehicle connector reference device.....	139
D.5.5	Connector pin of vehicle connector reference device	140
D.5.6	Contact tube of vehicle inlet reference device	141
D.5.7	Contact clip of vehicle inlet reference device	142
D.5.8	Copper busbar of vehicle inlet reference device	143
D.5.9	Copper busbar of vehicle connector reference device	144

D.5.10	Connector pin holder	145
D.5.11	Connector pin fastening plate	146
D.5.12	Drilling jig for DUT connector interface	146
Annex E (informative)	Overview about tests	148
Annex F (normative)	Data to be provided	169
Bibliography	171
Figure 1	– Example of system architecture of connector design 1 and inlet design 1	16
Figure 2	– Example of system architecture of connector design 2 and inlet design 1	17
Figure 3	– Example of system architecture of connector design 2 and inlet design 2	18
Figure 4	– Verification of the latching device	25
Figure 5	– Interlock test setup for checking latched position and unlatched position	26
Figure 6	– Verification of the latching device	28
Figure A.1	– Vehicle inlet of configuration HH, Sheet 1	52
Figure A.2	– Vehicle inlet of configuration HH, Sheet 2	53
Figure A.3	– Vehicle inlet of configuration HH, Sheet 3	54
Figure A.4	– Vehicle inlet of configuration HH, Sheet 4	55
Figure A.5	– Vehicle inlet of configuration HH, Sheet 5	56
Figure A.6	– Vehicle inlet of configuration HH, Sheet 6	57
Figure A.7	– Vehicle inlet of configuration HH, Sheet 7	58
Figure A.8	– Vehicle inlet of configuration HH, Sheet 8	59
Figure A.9	– Vehicle inlet of configuration HH, Sheet 9	60
Figure A.10	– Vehicle connector of configuration HH, Sheet 1	61
Figure A.11	– Vehicle connector of configuration HH, Sheet 2	62
Figure A.12	– Vehicle connector of configuration HH, Sheet 3	63
Figure A.13	– Vehicle connector of configuration HH, Sheet 4	64
Figure A.14	– Vehicle connector of configuration HH, Sheet 5	65
Figure A.15	– Vehicle connector of configuration HH, Sheet 6	66
Figure A.16	– Vehicle connector of configuration HH, Sheet 7	67
Figure A.17	– Vehicle connector of configuration HH, Sheet 8	68
Figure A.18	– Vehicle connector of configuration HH, Sheet 9	69
Figure A.19	– Vehicle connector of configuration HH, Sheet 10	70
Figure A.20	– Dimensions of vehicle connector body outline	71
Figure A.21	– Vehicle inlet coordinate system of vehicle inlet according to configuration HH	72
Figure A.22	– Vehicle connector coordinate system of vehicle connector according to Configuration HH	73
Figure B.1	– Vehicle inlet of configuration JJ with mechanical coding, Sheet 1	74
Figure B.2	– Vehicle Inlet of configuration JJ with mechanical coding, Sheet 2	75
Figure B.3	– Vehicle inlet of configuration JJ with mechanical coding, Sheet 3	76
Figure B.4	– Vehicle inlet of configuration JJ with mechanical coding, Sheet 4	77
Figure B.5	– Vehicle inlet of configuration JJ with mechanical coding, Sheet 5	78
Figure B.6	– Vehicle inlet of configuration JJ without mechanical coding, Sheet 1	79
Figure B.7	– Vehicle inlet of configuration JJ without mechanical coding, Sheet 2	80

Figure B.8 – Vehicle inlet of configuration JJ without mechanical coding, Sheet 3	81
Figure B.9 – Vehicle inlet of configuration JJ without mechanical coding, Sheet 4	82
Figure B.10 – Vehicle inlet of configuration JJ without mechanical coding, Sheet 5	83
Figure B.11 – Vehicle connector of configuration JJ, Sheet 1	84
Figure B.12 – Vehicle connector of configuration JJ, Sheet 2	85
Figure B.13 – Vehicle connector of configuration JJ, Sheet 3	86
Figure B.14 – Vehicle connector of configuration JJ, Sheet 4	87
Figure B.15 – Vehicle connector of configuration JJ, Sheet 5	88
Figure B.16 – Vehicle connector of configuration JJ, Sheet 6	89
Figure C.1 – General test setup for cable assemblies.....	91
Figure C.2 – General test setup for vehicle inlets.....	92
Figure C.3 – Assembly of the vehicle inlet reference device for 1 000 A.....	94
Figure C.4 – Assembly of the vehicle inlet reference device for 1 500 A.....	95
Figure C.5 – Assembly of the vehicle inlet reference device for 2 000 A.....	96
Figure C.6 – Assembly of the vehicle inlet reference device for 2 500 A.....	97
Figure C.7 – Assembly of the vehicle inlet reference device for 3 000 A.....	98
Figure C.8 – Configuration HH: Sub-assembly of the vehicle inlet reference device for 1 000 A	100
Figure C.9 – Configuration HH: Sub-assembly of the vehicle inlet reference device for 1 500 A	101
Figure C.10 – Configuration HH: Sub-assembly of the vehicle inlet reference device for 2 000 A	102
Figure C.11 – Configuration HH: Sub-assembly of the vehicle inlet reference device for 2 500 A	103
Figure C.12 – Configuration HH: Sub-assembly of the vehicle inlet reference device for 3 000 A	104
Figure C.13 – Configuration HH: Drawing of DC-Pin for 1 000 A.....	105
Figure C.14 – Configuration HH: Drawing of DC-Pin for 1 500 A.....	106
Figure C.15 – Configuration HH: Drawing of DC-Pin for 3 000 A.....	108
Figure C.16 – Configuration HH: Drawing of busbar for 1 000 A – basic structure.....	109
Figure C.17 – Configuration HH: Drawing of busbar for 1 000 A – paintwork.....	110
Figure C.18 – Configuration HH: Drawing of busbar for 1 000 A – temperature sensor.....	111
Figure C.19 – Configuration HH: Drawing of busbar for 1 500 A – basic structure.....	112
Figure C.20 – Configuration HH: Drawing of busbar for 1 500 A – paintwork.....	113
Figure C.21 – Configuration HH: Drawing of busbar for 1 500 A – temperature sensor.....	114
Figure C.22 – Configuration HH: Drawing of busbar for 2 000 A – basic structure.....	115
Figure C.23 – Configuration HH: Drawing of busbar for 2 000 A – paintwork.....	116
Figure C.24 – Configuration HH: Drawing of busbar for 2 000 A – temperature sensor.....	117
Figure C.25 – Configuration HH: Drawing of busbar for 2 500 A – basic structure.....	118
Figure C.26 – Configuration HH: Drawing of busbar for 2 500 A – paintwork.....	119
Figure C.27 – Configuration HH: Drawing of busbar for 2 500 A – temperature sensor.....	120
Figure C.28 – Configuration HH: Drawing of busbar for 3 000 A – basic structure.....	121
Figure C.29 – Configuration HH: Drawing of busbar for 3 000 A – paintwork.....	122
Figure C.30 – Configuration HH: Drawing of busbar for 3 000 A – temperature sensor.....	123
Figure C.31 – Configuration HH: Drawing inlet contact holder for 1 000 A	124

Figure C.32 – Configuration HH: Drawing inlet contact holder for 1 500 A	125
Figure C.33 – Configuration HH: Drawing inlet contact holder for 3 000 A	126
Figure C.34 – Configuration HH: Drawing fastening plate for 1 000 A.....	127
Figure C.35 – Configuration HH: Drawing fastening plate for 1 500 A.....	128
Figure C.36 – Configuration HH: Drawing fastening plate for 3 000 A.....	129
Figure C.37 – Configuration HH: Drawing manual latching pin.....	130
Figure D.1 – Vehicle inlet reference device JJ_0.....	131
Figure D.2 – Test setup JJ_0.....	132
Figure D.3 – Vehicle connector reference device JJ_1	133
Figure D.4 – Test setup JJ_1	134
Figure D.5 – General test setup for temperature rise tests and thermal sensing device tests (configuration JJ).....	135
Figure D.6 – General test setup for temperature rise tests and thermal sensing device tests (configuration JJ).....	136
Figure D.7 – Final assembly of the vehicle inlet reference device	137
Figure D.8 – Final assembly of the vehicle connector reference device	138
Figure D.9 – Sub-assembly of the vehicle inlet reference device	139
Figure D.10 – Sub-assembly of the vehicle connector reference device.....	140
Figure D.11 – Connector pin of vehicle connector reference device	141
Figure D.12 – Contact tube of vehicle inlet reference device	142
Figure D.13 – Contact clip of vehicle inlet reference device	143
Figure D.14 – Copper busbar of vehicle inlet reference device	144
Figure D.15 – Copper busbar of vehicle inlet reference device	145
Figure D.16 – Example of connector pin holder.....	146
Figure D.17 – Example of connector pin fastening plate	146
Figure D.18 – Drilling jig for cable assembly.....	147
Table 1 – Overview of the DC vehicle interface.....	20
Table 2 – Interface overview.....	21
Table 3 – Protective earthing test parameters.....	23
Table 4 – Withdrawal force.....	24
Table 5 – Definition of interlock test numbers for checking latched position and unlatched position	26
Table 6 – Properties of DC accessory contact plating for pin.....	32
Table 7 – Pull force and torque test values for cable anchorage	46
Table 8 – Mechanical strength tests	47
Table 9 – Impact energy for ball impact test	47
Table C.1 – Vehicle inlet reference device ratings and electrical resistance.....	93
Table D.1 – Dimensions of vehicle inlet reference device JJ_0.....	132
Table D.2 – Maximum contact resistances and dimensions of vehicle connector reference device JJ_1	134
Table D.3 – Thickness dimensions of copper busbar of vehicle connector reference device	145
Table E.1 – Tests for cable assembly of configuration HH.....	148
Table E.2 – Tests for cable assembly of configuration JJ.....	151

Table E.3 – Tests for vehicle Inlets of configuration HH.....	155
Table E.4 – Tests for vehicle Inlets of configuration JJ	158
Table E.5 – Tests for cable assembly of configuration HH, test sequence A.....	161
Table E.6 – Tests for cable assembly of configuration HH, test sequence B.....	161
Table E.7 – Tests for cable assembly of configuration HH, test sequence C	162
Table E.8 – Tests for cable assembly of configuration HH, test sequence D	162
Table E.9 – Tests for cable assembly of configuration JJ, test sequence A.....	163
Table E.10 – Tests for cable assembly of configuration JJ, test sequence B	163
Table E.11 – Tests for cable assembly of configuration JJ, test sequence C	164
Table E.12 – Tests for cable assembly of configuration JJ, test sequence D.....	164
Table E.13 – Tests for vehicle inlets of configuration HH, test sequence A	165
Table E.14 – Tests for vehicle inlets of configuration HH, test sequence B	165
Table E.15 – Tests for vehicle inlets of configuration HH, test sequence C	166
Table E.16 – Tests for vehicle inlets of configuration HH, test sequence D.....	166
Table E.17 – Tests for vehicle inlets of configuration JJ, test sequence A.....	167
Table E.18 – Tests for vehicle inlets of configuration JJ, test sequence B.....	167
Table E.19 – Tests for vehicle inlets of configuration JJ, test sequence C	168
Table E.20 – Tests for vehicle inlets of configuration JJ, test sequence D	168
Table F.1 – Data provided in the PDS.....	169

INTERNATIONAL ELECTROTECHNICAL COMMISSION

Vehicle connector, vehicle inlet and cable assembly for megawatt DC charging

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch> or www.iso.org/patents. IEC shall not be held responsible for identifying any or all such patent rights.

IEC TS 63379 has been prepared by subcommittee 23H: Plugs, socket-outlets and couplers for industrial and similar applications, and for electric vehicles, of IEC technical committee TC 23: Electrical accessories. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
23H/574/DTS	23H/590/RVDTS

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 Technical Specification is English.

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

This document is to be read in conjunction with IEC 62196-1:2022 and IEC 62196-3:2022. The clauses of the particular requirements supplement or modify the corresponding clauses in IEC 62196-1 or IEC 62196-3. Where the text indicates an "addition" to or a "replacement" of the relevant requirement, test specification or explanation of IEC 62196-1 or IEC 62196-3, these changes are made to the relevant text of IEC 62196-1 or IEC 62196-3, which then becomes part of the standard.

Subclauses, figures, tables or notes which are additional to those in IEC 62196-1 or IEC 62196-3 are numbered starting from 100.

In this document, the following print types are used:

- requirements proper: in roman type;
- *test specifications: in italic type.*

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

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

Responding to global challenges of CO₂ reduction and energy safety, the automobile industries have been accelerating the development and commercialization of electric vehicles (EV) and hybrid electric vehicles. Plug-in hybrid electric vehicles and battery electric vehicles are all mass-marketed today and continue to gain market share in all vehicle categories. To support the broad diffusion of such vehicles, this document provides the standard interface configurations of vehicle couplers and accessories to be used in conductive charging of electric vehicles, taking the most frequent charging situations into consideration.

To meet the market demand for instance the Truck and Bus industry to quickly charge electric heavy-duty vehicles within a reasonable time, a new solution for high-power commercial vehicle charging is needed. Enabling rapid charging of these expensive assets increases vehicle flexibility and enables fleet owners to optimize their total cost of ownership (TCO). Other industries will also benefit from this quick charging solution. Other electric vehicles can also use this charging system to fulfil their high-power charging needs. All of these applications will focus on power in the range of 1 MW and above, which implies cooling measures and direct current usage only.

In order to enable this charging rate, batteries with larger capacities are integrated. To rapidly charge those large-capacity batteries, overall charging power is increased. In order to boost the charging power, both charging voltage and current need are increased. The larger charging current implies either larger conductor cross-sections for the cable assembly, according to existing standards, or additional measures in the cable assembly. A mandatory use of a handling support for these accessories is not necessary.

The large conductor cross sections that are required according to the existing design requirements and test methods result in significantly thicker and heavier cable assemblies. These are difficult to handle and thus less desirable for public use. Therefore, to improve the usability of charging systems this document makes use of thermal management techniques to enhance the performance of the accessories.

For the future, the application of automated charging by using auxiliary machines is an option which is considered when defining the geometrical and mechanical boundaries.

This document provides definitions, requirements, and tests for EV couplers, which supports backward compatibility to definitions, requirements and tests according to IEC 62196 series.

1 Scope

This document is applicable to vehicle couplers with pins and contact-tubes of standardized configuration, herein also referred to as "accessories", and to cable assemblies intended for use in electric vehicle conductive charging systems which incorporate control means, with rated operating voltage not exceeding 1 500 V DC and a rated current up to and including 3 000 A that employ:

- a) thermal sensing, or
- b) thermal transport and thermal sensing,

with the system architecture described in 4.100.

These accessories and cable assemblies are used only in conductive charging systems for circuits specified in IEC 61851-23-3:20—.

These accessories are intended to be connected to cables according to IEC 62893-4-1 or IEC TS 62893-4-2.

As an option, these accessories are intended to operate with an automated connection means according to IEC 61851-27.

These accessories and cable assemblies are intended to be used at an ambient temperature between $-30\text{ }^{\circ}\text{C}$ and $+40\text{ }^{\circ}\text{C}$.

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

NOTE Different materials for conductors need further consideration

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.

Clause 2 of IEC 62196-3:2022 applies, except as follows:

Additional normative references:

IEC 60216-5, *Electrical insulating materials - Thermal endurance properties - Part 5: Determination of relative temperature index (RTI) of an insulating material*

IEC 60364-4-41, *Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock*

IEC 60364-4-43:2023, *Low-voltage electrical installations - Part 4-43: Protection for safety - Protection against overcurrent*

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

IEC 60811-501, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 501: Mechanical tests - Tests for determining the mechanical properties of insulating and sheathing compounds*

IEC 61851-23-3:20—, *Electric vehicle conductive charging system - Part 23-3: DC electric vehicle supply equipment for Megawatt charging systems*¹

IEC TS 61851-27:20—, *Electric vehicle conductive charging system - Part 27: EV supply equipment with automated connection of a vehicle coupler according to IEC 62196-2 or IEC 62196-3*²

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

IEC 62196-3:2022, *Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles - Part 3: Dimensional compatibility requirements for DC and AC/DC pin and contact-tube vehicle couplers*

IEC 62893-4-1, *Charging cables for electric vehicles of rated voltages up to and including 0,6/1 kV - Part 4-1: Cables for DC charging according to mode 4 of IEC 61851-1 - DC charging without use of a thermal management system*

IEC TS 62893-4-2, *Charging cables for electric vehicles of rated voltages up to and including 0,6/1 kV - Part 4-2: Cables for DC charging according to mode 4 of IEC 61851-1 - Cables intended to be used with a thermal management system*

ISO/IEC 11801-1:2017, *Information technology, Generic cabling for customer premises – Part 1: General requirements*

ISO 2719:2016, *Determination of flash point - Pensky-Martens closed cup method*

ISO 20457:2018, *Plastics moulded parts - Tolerances and acceptance conditions*

ISO 5474-3:2024, *Electrically propelled road vehicles - Functional and safety requirements for power transfer between vehicle and external electric circuit - Part 3: DC power transfer*

ISO 25178-1:2016, *Geometrical product specifications (GPS) - Surface texture: Areal - Part 1: Indication of surface texture*

ANSI/UL 746B, *Standard for Polymeric Materials - Long Term Property Evaluations*

IEEE 802.3, *IEEE Standard for Ethernet*

OECD *Guidelines for the Testing of Chemicals, Section 3, Test No. 301: Ready Biodegradability*, 17 July 1992

¹ Under preparation. Stage at the time of publication: IEC RFDIS 61851-23-3:2026.

² Under preparation. Stage at the time of publication: IEC BPUB 61851-27:2026.

Bibliography

IEC 60216-1, *Electrical insulating materials - Thermal endurance properties - Part 1: Ageing procedures and evaluation of test results*

IEC 61851-24, *Electric vehicle conductive charging system - Part 24: Digital communication between a DC EV supply equipment and an electric vehicle for control of DC charging*

IEC 62196 (all parts), *Plugs, socket-outlets, vehicle connectors and vehicle inlets*

IEC Guide 117:2010, *Electrotechnical equipment - Temperatures of touchable hot surfaces*

ISO 4032, *Fasteners - Hexagon regular nuts (style 1)*

ISO 4762:2004, *Hexagon socket head cap screws*

ISO 7089:2000, *Plain washers - Normal series - Product grade A*

ISO 13715, *Technical product documentation - Edges of undefined shape - Indication and dimensioning*

DIN 6796:2009-08, *Conical spring washers for bolted connections*

DIN 7349:2009-08, *Plain washers for bolts with heavy clamping sleeves*
