



# TECHNICAL SPECIFICATION

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**Electric vehicle conductive charging system –  
Part 3-1: DC EV supply equipment where protection relies on double or  
reinforced insulation – General rules and requirements for stationary equipment**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references .....	9
3 Terms and definitions .....	11
3.1 Electric supply equipment .....	12
3.2 Insulation .....	13
3.3 Functions .....	14
3.4 Vehicle .....	15
3.5 Cords, cables and connection means .....	16
4 Symbols and abbreviated terms.....	18
5 General requirements .....	18
6 Classification.....	19
6.1 Characteristics of supply network.....	19
6.2 Method of connection.....	19
6.3 Normal environmental conditions .....	20
6.4 Special environmental conditions .....	20
6.5 Access.....	20
6.6 Mounting method .....	20
6.7 EV supply system configuration .....	20
7 General EV supply system requirements .....	22
7.1 EV supply system requirements .....	22
7.1.1 General .....	22
7.1.2 EV supply system configuration type A .....	23
7.1.3 EV supply system configuration type B .....	23
7.1.4 EV supply system configuration type C .....	23
7.1.5 EV supply system configuration type D .....	23
7.1.6 EV supply system configuration type E .....	23
7.1.7 EV supply system configuration type F .....	23
7.1.8 Conversion device .....	24
7.2 Voltages and currents .....	24
7.2.1 Rated voltages and currents .....	24
7.2.2 Current and voltage regulation.....	24
7.2.3 AUX supply circuit .....	25
7.3 Functions provided.....	26
7.3.1 Mandatory functions for power transfer .....	26
7.3.2 Optional functions for power transfer .....	26
7.3.3 Objects for compatibility check .....	26
7.4 Requirements for AC/DC or DC/DC VCU for stationery DRI EV supply equipment.....	27
7.4.1 General .....	27
7.4.2 Built-in AC/DC VCU for stationery DRI EV supply equipment .....	27
7.4.3 Built-in DC/DC VCU for stationery DRI EV supply equipment .....	27
7.4.4 Protection against access to live parts of built-in VCUs .....	27
8 Communications .....	28
8.1 Command and control communication (mandatory) .....	28

8.2	Optional communication.....	28
8.3	Communication circuit from the DRI EV supply equipment to the telecommunication networks .....	28
9	Protection against electric shock .....	28
9.1	Protection against direct contact .....	28
9.1.1	General .....	28
9.1.2	IP ratings for protection against electric shock .....	29
9.2	Stored energy – Discharge of capacitors.....	29
9.2.1	Disconnection of plug connected EV supply equipment.....	29
9.2.2	Loss of supply voltage to permanently connected EV supply equipment .....	29
9.3	Fault protection.....	30
9.4	DC leakage currents .....	30
9.5	Y capacitors.....	30
10	Specific requirements for accessories.....	30
10.1	General requirements .....	30
10.2	Adaptors .....	30
10.3	Latching device.....	30
10.4	Contact sequencing of accessories .....	31
11	Cable assembly requirements.....	31
11.1	General.....	31
11.2	Electrical rating.....	31
11.3	Mechanical characteristics .....	31
11.4	Storage means for case C.....	32
11.5	Strain relief .....	32
12	DRI EV supply equipment constructional requirements and tests .....	32
12.1	Characteristics of mechanical switching devices .....	32
12.1.1	General .....	32
12.1.2	Switch and switch-disconnector .....	32
12.1.3	Contactors.....	32
12.1.4	Circuit-breaker.....	32
12.1.5	Relays .....	33
12.1.6	Switch-on peak current .....	33
12.2	Clearances and creepage distances.....	33
12.3	IP degrees .....	34
12.3.1	Degrees of protection against solid foreign objects and water for the enclosure.....	34
12.3.2	Degrees of protection against solid foreign objects and water for accessories .....	34
12.4	Insulation resistance .....	34
12.5	Touch current .....	35
12.6	Dielectric withstand voltage .....	35
12.6.1	AC withstand voltage .....	35
12.6.2	Impulse dielectric withstand (1,2/50 µs).....	36
12.7	Temperature rise .....	36
12.8	Damp heat functional test .....	36
12.9	Minimum temperature functional test.....	36
12.10	Mechanical strength.....	37
13	Overload and short-circuit protection .....	37
14	Emergency switching or disconnect (optional) .....	37

15	Marking and instructions.....	38
15.1	Installation manual.....	38
15.2	User manual (instructions) for DRI EV supply equipment .....	38
15.3	Marking of DRI EV supply equipment type A to type F .....	39
15.4	Marking of cable assemblies type C and type E .....	39
15.5	Durability test for marking .....	39
Annex A	(informative) Acoustical and optical signalling.....	41
A.1	General.....	41
A.2	Optical signalling .....	41
A.3	Acoustical signalling .....	41
Annex B	(informative) Example of position for socket outlets .....	42
Annex C	(informative) Conversion device.....	44
C.1	General.....	44
C.2	Consideration on how to connect a manufacturer specific EV/RESS to a DRI EV supply equipment .....	44
Annex D	(informative) Examples of VCU wirings .....	45
D.1	Built-in AC/DC VCU for stationary DRI EV supply equipment .....	45
D.2	Built-in DC/DC VCU for stationary DRI EV supply equipment .....	46
Bibliography	.....	47
Figure 1	– EV supply system configuration.....	21
Figure B.1	– Example of position of the socket-outlet overview .....	42
Figure B.2	– Example of position of the socket-outlet details.....	43
Figure D.1	– Built-in AC/DC VCU for stationary DRI EV supply equipment, design 1, +60 V, –120 V output .....	45
Figure D.2	– Built-in AC/DC VCU for stationary DRI EV supply equipment, design 2, +60 V or –120 V output .....	46
Figure D.3	– Built-in DC/DC VCU for stationary DRI EV supply equipment: 60 V to 400 V DC (side A), –120 V, +60 V output (side B).....	46
Table 1	– Corresponding type designations to ISO 18246 .....	22
Table 2	– Rated system input voltages.....	24
Table 3	– System output voltages class .....	24
Table 4	– IP ratings .....	29
Table 5	– Touch current limits.....	35

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

### **ELECTRIC VEHICLE CONDUCTIVE CHARGING SYSTEM –**

### **Part 3-1: DC EV supply equipment where protection relies on double or reinforced insulation – General rules and requirements for stationary equipment**

#### FOREWORD

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IEC TS 61851-3-1 has been prepared by IEC technical committee 69: Electrical power/energy transfer systems for electrically propelled road vehicles and industrial trucks. It is a Technical Specification.

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

Draft	Report on voting
69/845/DTS	69/882/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](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).

In this document, the following print types are used:

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

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

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](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

## INTRODUCTION

This document is published in separate parts according to the following structure:

IEC TS 61851-3-1, *Electric vehicle conductive charging system – Part 3-1: DC EV supply equipment where protection relies on double or reinforced insulation – General rules and requirements for stationary equipment*

IEC TS 61851-3-2, *Electric vehicle conductive charging system – Part 3-2: DC EV supply equipment where protection relies on double or reinforced insulation – Particular requirements for portable and mobile equipment*

IEC TS 61851-3-4, *Electric vehicle conductive charging system – Part 3-4: DC EV supply equipment where protection relies on double or reinforced insulation – General definitions and requirements for CANopen communication*

IEC TS 61851-3-5, *Electric vehicle conductive charging system – Part 3-5: DC EV supply equipment where protection relies on double or reinforced insulation – Pre-defined communication parameters and general application objects*

IEC TS 61851-3-6, *Electric vehicle conductive charging system – Part 3-6: DC EV supply equipment where protection relies on double or reinforced insulation – Voltage converter unit communication*

IEC TS 61851-3-7, *Electric vehicle conductive charging system – Part 3-7: DC EV supply equipment where protection relies on double or reinforced insulation – Battery system communication*

## **ELECTRIC VEHICLE CONDUCTIVE CHARGING SYSTEM –**

### **Part 3-1: DC EV supply equipment where protection relies on double or reinforced insulation – General rules and requirements for stationary equipment**

#### **1 Scope**

This part of IEC 61851, which is a Technical Specification, applies to the equipment, including stationary equipment

- for the conductive transfer of electric power between the supply network and
  - an electric road vehicle, or
  - a removable rechargeable energy storage system (RESS), or
  - an on-board RESS of an electric road vehicle,
- when the equipment is connected to the supply network having a supply voltage up to 480 V AC or up to 400 V DC and a rated output voltage up to 120 V DC, and
- where the protection against electric shock relies on double or reinforced insulation, and with double or reinforced insulation between all AC and DC inputs and outputs.

NOTE 1 In the following countries, the acceptable nominal supply voltage is up to 600 V AC: CA, US.

Particular requirements for portable and mobile DRI EV supply equipment are covered by IEC TS 61851-3-2023.

Equipment for the conductive transfer of electric power between the supply network and an electric road vehicle/RESS according to the IEC TS 61851-3 series is intended to be connected to vehicles where the vehicle power supply circuit is protected against electric shock by double or reinforced insulation.

NOTE 2 For information regarding protection against electric shock by double or reinforced insulation of the EV or of the vehicle power supply circuit, see ISO 18246:2023, 6.1.1 b) and Table 3.

Requirements for bidirectional energy transfer DC to AC are under consideration and are not part of this document.

This document also applies to EV supply equipment supplied from on-site storage systems (e.g. buffer batteries).

This document applies to VCU's intended to be a part of DRI EV supply equipment specified in this document.

This document applies to equipment for the conductive transfer of electric power between the supply network and an electric road vehicle/RESS intended to be installed and/or used at an altitude of up to 2 000 m.

The aspects covered in this document include

- the connection to the vehicle,
- characteristics to be complied with by the vehicle with respect to the AC or DC,
- the specification for required level of electrical safety for the double or reinforced insulated (DRI) EV supply equipment,



- operators and third-party electrical safety,
- requirements for command and control communication for safety and process matters, if required,
- requirements for bidirectional power transfer DC to DC, and
- the connection to installations according to IEC 60364-7-722.

NOTE 3 In the following countries, electrical installation codes other than those from IEC 60364-7-722 are used: CA, US.

Equipment covered by this document is not intended to be located in hazardous areas where flammable gas or vapour and/or combustible materials, fuels or other combustible or explosive materials are present. Additional requirements can apply to these locations.

This document does not apply to

- aspects related to maintenance,
- electrical devices and components, which are covered by their specific product standards,
- trolley buses and rail vehicles,
- vehicle power supply circuit, which is covered by ISO 18246, and
- EMC requirements for on-board equipment while connected to the supply, which are covered by IEC 61851-21-1.

## 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, *IEC standard voltages*

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-11:2021, *Environmental testing – Part 2-11: Tests – Test Ka: Salt mist*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-78:2012, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60269 (all parts), *Low-voltage fuses*

IEC 60309-2:2021, *Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes – Part 2: Dimensional compatibility requirements for pin and contact-tube accessories*

IEC 60320 (all parts), *Appliance couplers for household and similar general purposes*

IEC 60335-1:2020, *Household and similar electrical appliances – Safety – Part 1: General requirements*

IEC 60364-4-41:2005, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60364-4-41:2005/AMD1:2017

IEC 60364-7-722:2018, *Low-voltage electrical installations – Part 7-722: Requirements for special installations or locations – Supplies for electric vehicles*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

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

IEC 60884-1:2022, *Plugs and socket-outlets for household and similar purposes – Part 2: General requirements*

IEC 60898 (all parts), *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations*

IEC 60898-1, *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations – Part 1: Circuit-breakers for a.c. operation*

IEC 60947-2, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*

IEC 60947-3:2020, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

IEC 60947-4-1:2018, *Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters*

IEC 60947-6-2, *Low-voltage switchgear and controlgear – Part 6-2: Multiple function equipment – Control and protective switching devices (or equipment) (CPS)*

IEC 60950-1:2005, *Information technology equipment – Safety – Part 1: General requirements*  
IEC 60950-1:2005/AMD1:2009  
IEC 60950-1:2005/AMD2:2013

IEC 60990:2016, *Methods of measurement of touch current and protective conductor current*

IEC 61009-1:2010, *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 1: General rules*  
IEC 61009-1:2010/AMD1:2012  
IEC 61009-1:2010/AMD2:2013

IEC 61180:2016, *High-voltage test techniques for low-voltage equipment – Definitions, test and procedure requirements, test equipment*

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

IEC 61558-2-6, *Safety of transformers, reactors, power supply units and combinations thereof – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers for general applications*

IEC 61810-1, *Electromechanical elementary relays – Part 1: General and safety requirements*

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

IEC 61851-3 (all parts), *Electric vehicle conductive charging system – Part 3: DC EV supply equipment where protection relies on double or reinforced insulation*

IEC TS 61851-3-2:2023, *Electric vehicle conductive charging system – Part 3-2: DC EV supply equipment where protection relies on double or reinforced insulation – Particular requirements for portable and mobile equipment*

IEC TS 61851-3-4:2023, *Electric vehicle conductive charging system – Part 3-4: DC EV supply equipment where protection relies on double or reinforced insulation – General definitions and requirements for CANopen communication*

IEC TS 61851-3-5:2023, *Electric vehicle conductive charging system – Part 3-5: DC EV supply equipment where protection relies on double or reinforced insulation – Pre-defined communication parameters and general application objects*

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

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

IEC TS 62196-4:2022, *Plugs, socket-outlets, vehicle connectors and vehicles inlets – Conductive charging of electric vehicles – Part 4: Dimensional compatibility and interchangeability requirements for DC pin and contact-tube accessories for class II or class III applications*

IEC 62477-1:2022, *Safety requirements for power electronic converter systems and equipment – Part 1: General*

IEC PAS 62840-3:2021, *Electric vehicle battery swap system – Part 3: Particular safety and interoperability requirements for battery swap systems operating with removable RESS/battery systems*

ISO 11898-1:2015, *Road vehicles – Controller area network (CAN) – Part 1: Data link layer and physical signalling*

EN 50325-4:2002, *Industrial communications subsystem based on ISO 11898 (CAN) for controller-device interfaces – Part 4: CANopen*

EN 50604-1:2016, *Secondary lithium batteries for light EV (electric vehicle) applications – Part 1: General safety requirements and test methods*

EN 50604-1:2016/AMD1:2021