

TECHNICAL SPECIFICATION

**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 61851-3-2:2023

<https://standards.iteh.ai/catalog/standards/sist/175fdae8-8ac0-4e6e-9e66-7d878019502f/iec-ts-61851-3-2-2023>



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**

FOREWORD

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IEC TS 61851-3-2 has been prepared by IEC technical committee 69: Electrical power/energy transfer systems for electrically 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
69/846/DTS	69/883/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 part is to be used in conjunction with IEC 60335-2-29:2016 and IEC 60335-1:2020.

The clauses of the particular requirements in this document supplement or modify the corresponding clauses of IEC 60335-2-29:2016 and IEC 60335-1:2020. Where the text indicates an "addition" to or a "replacement" of the relevant requirement, test specification or explanation of IEC 60335-2-29:2016 and IEC 60335-1:2020, these changes are made to the relevant text of IEC 60335-2-29:2016 and IEC 60335-1:2020, which then becomes part of this document. Where no change is necessary, the words "The xxx of portable and mobile DRI EV supply equipment shall be in accordance with the relevant requirements (for class II appliances or heating appliances) of IEC 60335-2-29:2016" are used, where "xxx" represents the relevant title of the clause referred to. See also Annex DD. Additional annexes are lettered AA, BB, CC and DD.

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 in the data related to the specific document. At this date, the document will be ²⁰²³

- 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*

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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

1 Scope

This part of IEC 61851, which is a Technical Specification, applies to the portable and mobile DRI EV supply equipment where the protection against electric shocks relies on double or reinforced insulation, and with double or reinforced insulation between all AC and DC inputs and outputs with a rated input voltage being not more than 250 V AC and output voltages not more than 120 V DC.

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

NOTE 2 These specified rated input and output voltages supersede all references.

This document applies to

- VCUs intended to be a part of portable and mobile DRI EV supply equipment,
- portable and mobile DRI EV supply equipment according to the IEC 61851-3 series intended to be installed and/or used at an altitude of up to 2 000 m, and
- portable and mobile DRI EV supply equipment for the conductive transfer of electric power between the supply network and an electric road vehicle/RESS according to the IEC 61851-3 series intended to be connected to vehicles where the vehicle power supply circuit is protected against electric shock by double or reinforced insulation.

NOTE 3 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.

The aspects covered in this document include

- the characteristics and operating conditions of the portable and mobile DRI EV supply equipment,
- the specification for required level of electrical safety for the portable and mobile DRI EV supply equipment,
- requirements for bidirectional power transfer from DC to DC, and
- requirements for command and control basic communication for safety and process matters, if required.

This document does not apply to

- safety aspects related to maintenance, and
- electrical devices and components, which are covered by their specific product standards.

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

IEC 60335-2-29:2016, *Household and similar electrical appliances – Safety – Part 2-29: Particular requirements for battery chargers*
IEC 60335-2-29:2016/AMD1:2019

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

IEC TS 61851-3-1:2023, *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 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*

CiA 454-12, *CANopen application profile for energy management systems – Part 12: Gateway unit*, available at www.can-cia.org¹

<https://standards.iteh.ai/catalog/standards/sist/175fdae8-f8ac0-4e6e-9e66-7d878019502f/iec-ts-61851-3-2-2023>

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC TS 61851-3-1:2023 apply.

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>

3.1.1

protective impedance

impedance connected between live parts and accessible conductive parts of class II constructions so that the current, in normal use and under likely fault conditions in the appliance, is limited to a safe value

[SOURCE: IEC 60335-1:2020, 3.3.6]

¹ Under preparation.

3.2 Symbols and abbreviated terms

AC	alternating current
DC	direct current
EMS	energy management system
EMSC	energy management system controller
IMD	insulation monitoring device
EV	electric vehicle
NFC	near field communication
VCU	voltage converter unit

4 General requirements

Portable and mobile DRI EV supply equipment shall be constructed so that, in normal use, they function safely so as to cause no danger to persons or surroundings, even in the event of carelessness that may occur in normal use.

Compliance is checked by meeting all of the relevant requirements of this document.

Annex DD provides references to applicable requirements and tests to the relevant clauses of IEC 60335-2-29:2016.

The portable and mobile DRI EV supply equipment may have one or more "connecting points" according to IEC 60364-7-722:2018 that are used for energy supply to electric vehicle. This includes socket-outlets (case A or case B) and/or cord sets attached with vehicle connectors (case C). Each connecting point shall have its own dedicated protection means.

Each connecting point shall be supplied by its own safety isolating transformer according to IEC TS 61851-3-1:2023, 7.1.1.

Measures for fault protection are specified in IEC TS 61851-3-1:2023, 9.3.

Unless otherwise specified, the tests are carried out in accordance with Clause 5.

Unless otherwise specified, all tests indicated in this document are type tests.

NOTE 1 Routine tests are carried out for portable and mobile DRI EV supply equipment, according to IEC 60335-1:2020, Annex A.

Unless otherwise specified, all tests shall be carried out in the order of the clauses and subclauses in this document.

The tests of IEC 60335-2-29:2016, Clause 5, are carried out on one sample (portable and mobile DRI EV supply equipment) that shall withstand all the relevant tests.

The DRI EV supply equipment shall be rated for one or a range of standard nominal voltages as given in IEC 60038.

For the purpose of portable and mobile DRI EV supply equipment, IEC TS 61851-3-1:2023, Clause 7 and Clause 8, apply.

NOTE 2 IEC TS 61851-3-1:2023, Figure 1, shows EV supply system configuration type A, B and D covering portable and mobile DRI EV supply equipment.

Compliance is tested according to IEC TS 61851-3-1:2023, Clause 7 and Clause 8.

5 Classification

For the purposes of this document, the classifications as given in IEC TS 61851-3-1:2023 apply.

6 Requirements for voltage converter units (VCUs)

6.1 General

Clause 6 covers requirements for VCUs for AC/DC or DC/DC conversion of electric power used within the DRI EV supply equipment.

6.2 Rated voltages and currents

Standard ratings of voltages and currents shall be in accordance with IEC TS 61851-3-1:2023, 7.2.

Compliance shall be verified by inspection.

NOTE Current and voltage regulation is shown in Annex CC.

6.3 Requirement for AC/DC VCU for portable and mobile DRI EV supply equipment

The AC/DC VCU for portable and mobile DRI EV supply equipment provides AC input voltage (side A) according to IEC TS 61851-3-1:2023, Table 2, and DC output voltages (side B) according to IEC TS 61851-3-1:2023, Table 3.

AC/DC VCUs for portable and mobile DRI EV supply equipment provides AUX voltage for AUX supply circuit at side B.

AC/DC VCUs for portable and mobile DRI EV supply equipment intended for maximum output voltage of +60 V DC to the DC power circuits on side B by the following connection:

- DC +60 V;
- DC 0 V.

AC/DC VCUs for portable and mobile DRI EV supply equipment intended for maximum output voltage of –120 V DC to the DC power circuits on side B by the following connection:

- DC 0 V;
- DC –120 V.

NOTE Example for wiring and insulation of AC/DC VCU for portable and mobile DRI EV supply equipment is shown in Figure BB.1.

6.4 Built-in DC/DC VCU for battery systems

6.4.1 Built-in DC/DC VCU for battery systems (only AUX supply circuit)

DC/DC VCUs for battery systems provides AUX voltage for AUX supply circuit at side A. Providing AUX voltage for AUX supply circuit at side B is optional.

NOTE Example for wiring and insulation of built-in DC/DC VCU for battery systems is shown in Figure BB.2.

6.4.2 Built-in DC/DC VCU for removable battery systems (IEC PAS 62840-3)

The built-in DC/DC VCU for removable battery systems provides DC output voltage (side A) according to Annex AA and DC battery system maximum voltage (side B) according to the specification of the manufacturer.

Built-in DC/DC VCUs for removable battery systems provides AUX voltage for AUX supply circuit at side A. Providing AUX voltage for AUX supply circuit at side B is optional.

NOTE Example for wiring and insulation of built-in DC/DC VCU for removable battery systems is shown in Figure BB.3.

7 Marking and instructions

IEC 60335-2-29:2016 and IEC 60335-2-29:2016/AMD1:2019, Clause 7, applies.

Compliance is tested in accordance with IEC 60335-2-29:2016 and IEC 60335-2-29:2016/AMD1:2019, Clause 7.

See also Table DD.1.

8 Protection against access to live parts

The protection against access to live parts of portable and mobile DRI EV supply equipment shall be in accordance with requirements for class II appliances of IEC 60335-2-29 and IEC 60335-2-29:2016/AMD1:2019, Clause 8.

See also Table DD.1.

IEC 60335-1:2020, Clause 8, applies, except as follows.

8.1.4

Replacement:

8.1.4.1 An accessible live part is not considered to be live if

- the part is supplied at safety extra-low voltage, provided that,
 - for AC, the RMS value of the voltage does not exceed 30 V, and
 - for DC, the voltage does not exceed 60 V, or
- the part is separated from live parts by protective impedance.

If protective impedance is used, the current between the part and the supply source shall not exceed 2 mA for DC; its peak value shall not exceed 0,7 mA for AC and

- for voltages having a peak value over 42,4 V up to and including 450 V, the capacitance shall not exceed 0,1 μF ;
- for voltages having a RMS value over 450 V up to and including 15 kV, the discharge shall not exceed 45 μC .

Compliance is checked by measurement, the appliance being supplied at rated voltage.

Voltages and currents are measured between the relevant parts and each pole of the supply source. Discharges are measured immediately after the interruption of the supply. The quantity of electricity and energy in the discharge is measured using a resistor having a nominal non-inductive resistance of 2 000 Ω .