



BSI Standards Publication

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

National foreword

This Published Document is the UK implementation of CLC IEC/TS 61851-3-2:2023. It is identical to IEC TS 61851-3-2:2023.

The UK participation in its preparation was entrusted to Technical Committee PEL/69, Electric vehicles.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

This publication is not to be regarded as a British Standard.

© The British Standards Institution 2024
Published by BSI Standards Limited 2024

ISBN 978 0 580 87996 8

ICS 43.120

Compliance with a Published Document cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 January 2024.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

English Version

**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)**

Système de charge conductive pour véhicules électriques -
Partie 3-2 : Exigences relatives aux véhicules électriques
légers - Matériel de charge conductive en courant continu
(IEC/TS 61851-3-2:2023)

Konduktive Ladesysteme für Elektrofahrzeuge - Teil 3-2:
Gleichstrom-Versorgungseinrichtungen für
Elektrofahrzeuge mit Schutzwirkung durch doppelte oder
verstärkte Isolierung - Besondere Anforderungen für
tragbare und ortsveränderliche Betriebsmittel
(IEC/TS 61851-3-2:2023)

This Technical Specification was approved by CENELEC on 2023-12-04.

CENELEC members are required to announce the existence of this TS in the same way as for an EN and to make the TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

This document (CLC IEC/TS 61851-3-2:2023) consists of the text of IEC/TS 61851-3-2:2023, prepared by IEC/TC 69 "Electrical power/energy transfer systems for electrically propelled road vehicles and industrial trucks".

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a standardization request addressed to CENELEC by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Technical Specification IEC/TS 61851-3-2:2023 was approved by CENELEC as a European Technical Specification without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 60309 series	NOTE Approved as EN IEC 60309 series
IEC 60364-7-722:2018	NOTE Approved as HD 60364-7-722:2018
IEC 60990:2016	NOTE Approved as EN 60990:2016 (not modified)
ISO 18246:2023	NOTE Approved as EN ISO 18246:2023 (not modified)

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60038	-	IEC standard voltages	EN 60038	-
IEC 60335-1	2020	Household and similar electrical appliances - Safety - Part 1: General requirements	-	-
IEC 60335-2-29 (mod)	2016	Household and similar electrical appliances - Safety - Part 2-29: Particular requirements for battery chargers	EN 60335-2-29	2021
+ A1	2019		+ A1	2021
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	-	-
IEC/TS 61851-3-1	2023	Electric vehicles 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 vehicle 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 ¹	-	CANopen application profile for energy management systems - Part 12: Gateway unit	-	-

¹ Under preparation.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	8
3 Terms, definitions, symbols and abbreviated terms.....	8
3.1 Terms and definitions.....	8
3.2 Symbols and abbreviated terms	9
4 General requirements	9
5 Classification.....	10
6 Requirements for voltage converter units (VCUs)	10
6.1 General.....	10
6.2 Rated voltages and currents	10
6.3 Requirement for AC/DC VCU for portable and mobile DRI EV supply equipment.....	10
6.4 Built-in DC/DC VCU for battery systems.....	10
6.4.1 Built-in DC/DC VCU for battery systems (only AUX supply circuit)	10
6.4.2 Built-in DC/DC VCU for removable battery systems (IEC PAS 62840-3).....	11
7 Marking and instructions.....	11
8 Protection against access to live parts.....	11
9 Starting of motor-operated appliances	12
10 Power input and current.....	12
11 Heating.....	12
12 Void.....	12
13 Leakage current and electric strength at operating temperature.....	12
14 Transient overvoltages	12
15 Moisture resistance	12
16 Leakage current and electric strength.....	13
17 Overload protection of transformers and associated circuits	13
18 Endurance.....	13
19 Abnormal operation	13
20 Stability and mechanical hazards.....	13
21 Mechanical strength	13
22 Construction	13
23 Internal wiring.....	14
24 Components	14
25 Supply connection and external flexible cords	14
26 Terminals for external conductors.....	15
27 Provision for earthing	15
28 Screws and connections	15
29 Clearances, creepage distances and solid insulation	15
30 Resistance to heat and fire	15
31 Resistance to rusting	16
32 Radiation, toxicity and similar hazards.....	

Annexes	17
Annex AA (normative) Supply systems circuit diagrams	18
AA.1 Standard supply systems circuit diagrams using NFC	18
AA.1.1 General	18
AA.1.2 EV supply system configuration type C, case A, accessories 4-II	18
AA.1.3 EV supply system configuration type B, case B portable or mobile DRI EV supply equipment, accessories 4-II	20
AA.1.4 EV supply system configuration type D, accessories 4-II	20
AA.2 EV supply system configuration type B, case B, coupler 4-I and 4-III	21
AA.3 EV supply system conversion device using NFC	22
AA.3.1 EV supply system configuration type C, case A, type 4-II, EV supply system conversion device	22
AA.3.2 EV supply system configuration type C, case B, accessories 4-II, EV supply system conversion device	22
AA.4 EV supply system conversion device configuration type B, case B, type 4-I and 4-III	23
Annex BB (informative) Examples of VCU wirings	24
BB.1 AC/DC VCU for portable or mobile DRI EV supply equipment	24
BB.2 Built-in DC/DC VCU for battery systems (only AUX supply circuit)	25
BB.3 Built-in DC/DC VCU for removable battery systems (IEC PAS 62840-3)	25
Annex CC (informative) Current and voltage regulation	26
CC.1 Current and voltage regulation, AC/DC VCU	26
CC.2 Current and voltage regulation, DC/DC VCU	27
CC.3 Current and voltage regulation, DC/DC VCU for removable battery systems	29
Annex DD (normative) Applicable requirements and tests of IEC 60335-2-29	31
Bibliography	35
Figure AA.1 – EV supply system configuration type C, case A, accessories 4-II	19
Figure AA.2 – EV supply system configuration type B, case B portable or mobile DRI EV supply equipment, accessories 4-II	20
Figure AA.3 – EV supply system configuration type D, accessories 4-II	21
Figure AA.4 – EV supply system configuration type B, case B, coupler 4-I and 4-III	21
Figure AA.5 – EV supply system configuration type C, case A, accessories 4-II, EV supply system conversion device	22
Figure AA.6 – EV supply system configuration type C, case B, accessories 4-II, manufacturer device	22
Figure AA.7 – EV supply system conversion device configuration type B, case B, 4-I and 4-III	23
Figure BB.1 – AC/DC VCU for portable and mobile DRI EV supply equipment, +60 V or –120 V output	24
Figure BB.2 – Built-in DC/DC VCU: battery system (generation of internal AUX supply circuit)	25
Figure BB.3 – Built-in DC/DC VCU for removable battery systems (IEC PAS 62840-3)	25
Figure CC.1 – Current and voltage regulation, AC/DC VCU	27
Figure CC.2 – Current and voltage regulation, DC/DC VCU	29
Figure CC.3 – Current and voltage regulation, DC/DC VCU for removable battery systems	30

Table DD.1 – Applicable requirements and tests according to IEC 60335-2-29	31
--	----

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

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

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

- 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 3-2: 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

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.