# UL 60335-2-29

## STANDARD FOR SAFETY

Household and Similar Electrical Appliances – Safety – Part 2-29: Particular Requirements For Battery Chargers

UL Standard for Safety for Household and Similar Electrical Appliances – Safety – Part 2-29: Particular Requirements For Battery Chargers, UL 60335-2-29

First Edition, Dated October 12, 2020

***Summary of Topics***

***Adoption of the First Edition of UL 60335-2-29, Standard For Household and Similar Electrical Appliances – Safety – Part 2-29: Particular Requirements For Battery Chargers. UL 60335-2-29 is an adoption of IEC 60335-2-29, Edition 5.1, issued March 2019. IEC 60335-2-29 is copyrighted by the IEC. Please note that the National Difference document incorporates all of the U.S. national differences for UL 60335-2-29.***

The new requirements are substantially in accordance with Proposal(s) on this subject dated March 27, 2020.

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CSA Group
CSA C22.2 No. 60335-2-29:20
Fourth Edition
(IEC 60335-2-29:2016+A1:2019, MOD)

Underwriters Laboratories Inc
UL 60335-2-29
First Edition

# Standard For Household and Similar Electrical Appliances – Safety – Part 2-29: Particular Requirements For Battery Chargers

October 12, 2020

This national standard is based on publication IEC 60335-2-29, Edition 5.1 (edition 5:2016 consolidated with Amendment 1:2019).



ANSI/UL 60335-2-29-2020

**Commitment for Amendments**

This standard is issued jointly by the Canadian Standards Association (operating as “CSA Group”) and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to CSA Group or UL at anytime. Revisions to this standard will be made only after processing according to the standards development procedures of CSA Group and UL. CSA Group and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

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**ISBN 978-1-4883-2793-3 © 2020 Canadian Standards Association**



This Standard is subject to review within five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. The technical content of IEC and ISO publications is kept under constant review by IEC and ISO. To submit a proposal for change, please send the following information to inquiries@csagroup. org and include "Proposal for change" in the subject line: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

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This ANSI/UL Standard for Safety consists of the First Edition.

The most recent designation of ANSI/UL 60335-2-29 as an American National Standard (ANSI) occurred on October 12, 2020. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface. The National Difference Page and IEC Foreword are also excluded from the ANSI approval of IEC-based standards.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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## CONTENTS

**Annexes**

**Annex A (informative) Routine tests**



**Annex AA (normative) Battery chargers for use by children**

No Text on This Page

# PREFACE

This is the harmonized CSA Group and UL standard for Household and Similar Electrical Appliances – Safety – Part 2-29: Particular Requirements for Battery Chargers. It is the fourth edition of CSA C22.2 No. 60335-2-29 and the first edition of UL 60335-2-29. This edition of CSA C22.2 No. 60335-2-29 supersedes the previous edition published in 2006 as CAN/CSA-E60335-2-29 (adopted IEC 60335-2-29:2003).

This harmonized standard is based on IEC Publication 60335-2-29: Edition 5.1, Household and similar electrical appliances – Safety – Part 2-29: Particular requirements for battery chargers, issued March 2019. IEC 60335-2-29 is copyrighted by the IEC.

This harmonized standard was prepared by CSA Group and Underwriters Laboratories Inc. (UL). The efforts and support of the Technical Harmonization Committee are gratefully acknowledged.

This standard is considered suitable for use for conformity assessment within the stated scope of the standard.

This standard was reviewed by the CSA Technical Committee on Consumer and Commercial Products, under the jurisdiction of the CSA Strategic Steering Committee on requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee. This standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

**Application of Standard**

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

NOTE: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

CSA C22.2 No. 60335-2-29 is to be used in conjunction with the second edition of CAN/CSA-C22.2 No. 60335-1:16. Requirements of this Part 2 Standard, where stated, amend the requirements of CAN/CSA-C22.2 No. 60335-1:16. Where a particular subclause of CAN/CSA-C22.2 No. 60335-1:16 is not mentioned in the Part 2, the CAN/CSA-C22.2 No. 60335-1:16 subclause applies.

UL 60335-2-29 is to be used in conjunction with the sixth edition of UL 60335-1. Requirements of this Part 2 Standard, where stated, amend the requirements of UL 60335-1. Where a particular subclause of UL 60335-1 is not mentioned in UL 60335-2-29, the UL 60335-1 subclause applies.

**Level of Harmonization**

This standard adopts the IEC text with national differences.

This standard is published as an identical standard for CSA Group and UL.

An identical standard is a standard that is exactly the same in technical content except for national differences resulting from conflicts in codes and governmental regulations and basic safety principles and requirements. Presentation is word for word except for editorial changes.

All national differences from the IEC text are included in the CSA Group and UL versions of the standard. While the technical content is the same in each organization's version, the format and presentation may differ.

**Reasons for Differences From IEC**

National differences from the IEC are being added in order to address safety and regulatory situations present in the US and Canada.

**Interpretations**

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

**IEC Copyright**

For CSA Group, the text, figures, and tables of International Electrotechnical Commission Publication 60335-2-29, Household and similar electrical appliances – Safety – Part 2-29: Particular requirements for battery chargers, copyright 2019, are used in this standard with the consent of the International Electrotechnical Commission. The IEC Foreword and Introduction are not a part of the requirements of this standard but are included for information purposes only.

## NATIONAL DIFFERENCES

National Differences from the text of International Electrotechnical Commission (IEC) Publication 60335-2-29, ed 5.1, Household and similar electrical appliances – Safety – Part 2-29: Particular requirements for battery chargers, copyright 2019, are indicated by notations (differences) and are presented in bold text. The national difference type is included in the body.

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

**DR –** These are National Differences based on the **national regulatory requirements**.

**D1 –** These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

**D2 –** These are National Differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

**DC –** These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

**DE –** These are National Differences based on **editorial comments or corrections**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

***Addition / Add*** - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.

***Modification / Modify*** - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.

***Deletion / Delete*** - A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

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# FOREWORD

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY – Part 2-29: Particular requirements for battery chargers

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.

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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.



**DISCLAIMER**
**This Consolidated version is not an official IEC Standard and has been prepared for user convenience. Only the current versions of the standard and its amendment(s) are to be considered the official documents.**

**This Consolidated version of IEC 60335-2-29 bears the edition number 5.1. It consists of the fifth edition (2016-06) [documents 61/5142/FDIS and 61/5173/RVD] and its amendment 1 (2019-03) [documents 61/5760/FDIS and 61/5799/RVD]. The technical content is identical to the base edition and its amendment.**

**This Final version does not show where the technical content is modified by amendment 1. A separate Redline version with all changes highlighted is available in this publication.**

This part of International Standard IEC 60335 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances.

This fifth edition constitutes a technical revision.

The principal changes in this edition as compared with the fourth edition of IEC 60335 2 29 are as follows (minor changes are not listed):

• Revised the drop test to refer to IEC 60068-2-31 (21.101);

• Requirements for supply cords on battery chargers used at low temperatures (25.7);

• Requirements for battery chargers having an output voltage exceeding SELV have been added (1, 3.2.2, 3.4.3, 10.101, 24.4, 25.5, 25.7, 25.8, 25.15. 26.5);

• A classification for battery chargers used outdoors has been added (6.2, 29.2);

• Some notes in Clause 1, Subclauses 7.1 and 22.102, Figure 101 and Annex AA 11.8 have been converted to normative text.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fifth edition (2010) of that standard.

NOTE 1 When “Part 1” is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for battery chargers.

When a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. When this standard states “addition”, “modification” or “replacement”, the relevant text in Part 1 is to be adapted accordingly.

NOTE 2 The following numbering system is used:

– subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;

– unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;

– additional annexes are lettered AA, BB, etc.

NOTE 3 The following print types are used:

– requirements: in roman type;

– *test specifications: in italic type;*

– notes: in small roman type.

Words in bold in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

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

• reconfirmed,

• withdrawn,

• replaced by a revised edition, or

• amended.

NOTE 4 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this standard be adopted for implementation nationally not earlier than 12 months or later than 36 months from the date of publication.

The following differences exist in the countries indicated below.

– 3.1.9: The artificial load may not be used (USA).

– 11.2: The appliance is not placed in a test corner (USA).

– 21.101: The drop test is carried out differently on outdoor direct plug-in battery chargers (USA).

– 21.102: The test is different (USA).

– 22.26: Basic insulation is allowed between live parts and SELV circuits (USA).

– Annex AA, 11.8: Higher temperature rises are allowed (USA).

– Annex AA, Clause 17: Higher temperature rises are allowed (USA).

– Annex AA, 19.13: Higher temperature rises are allowed (USA).

**101DV D2 *Modify NOTE 1 and the paragraph following it in the Part 2 IEC Foreword by replacing them with the following:***

**NOTE 1 When "Part 1" is mentioned in this Standard, it refers to CAN/CSA-C22.2 No. 60335-1:16 / UL 60335-1 (6th Ed.).**

**This Part 2 supplements or modifies the corresponding clauses in CAN/CSA-C22.2 No. 60335-1, Ed 2: 2016-10-31 / UL 60335-1, Ed. 6: 2016-10-31 (based on IEC 60335-1 Ed. 5.1:2013), so as to convert that publication into the CSA/UL standard: *Particular requirements for battery chargers.***

**102DV DE *Modify the last paragraph in NOTE 3 of the Part 2 IEC Foreword by replacing it with the following:***

**Words in bold or SMALL ROMAN CAPS in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold or SMALL ROMAN CAPS.**

**103DV D2** ***Modification to delete the text of the last paragraph of the Part 2 IEC Foreword, including all eight dashed items.***

**104DV DE** ***Modification to add the following text at the end of the Part 2 IEC Foreword:***

**The numbering system in the standard uses a space instead of a comma to indicate thousands and uses a comma instead of a period to indicate a decimal point. For example, 1 000 means 1,000 and 1,01 means 1.01.**

# INTRODUCTION

It has been assumed in the drafting of this International Standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This standard recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice and takes into account the way in which electromagnetic phenomena can affect the safe operation of appliances.

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

If an appliance within the scope of this standard also incorporates functions that are covered by another part 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

When a part 2 standard does not include additional requirements to cover hazards dealt with in Part 1, Part 1 applies.

NOTE 1 This means that the technical committees responsible for the part 2 standards have determined that it is not necessary to specify particular requirements for the appliance in question over and above the general requirements.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

NOTE 2 Horizontal and generic standards covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features that impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

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# HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY – Part 2-29: Particular requirements for battery chargers

## 1 Scope

This clause of Part 1 is replaced by the following.

This part of IEC 60335 deals with the safety of electric battery chargers for household and similar use having an output not exceeding 250 V ripple-free direct current, their **rated voltage** being not more than 250 V.

**1DV.1 DR *Modification to add the following text to Clause 1 of the Part 2 after the second paragraph:***

**This standard covers the above-noted products that are intended to be installed or used in accordance with:**

**– CSA C22.1, Canadian Electrical Code (CE Code), Part I;**

**– NFPA 70, National Electrical Code (NEC), in the United States.**

Battery chargers intended for charging batteries in a household end use application outside the scope of the IEC 60335 series of standards are within the scope of this standard.

Requirements for battery chargers for use by children at least 8 years old without supervision are given in Annex AA.

**1DV.2 D2 *Modification to replace the fourth paragraph of Clause 1 of the Part 2 with the following NOTE:***

**NOTE 101ADV Annex AA, which is a normative annex in IEC 60335-2-29, is included in this Standard as an informative annex for reference only.**

Battery chargers not intended for normal household use, but which nevertheless may be a source of danger to the public, such as battery chargers intended for use in garages, shops, light industry and on farms, are within the scope of this standard.

**1DV.3 D2 *Modification to add the following text and NOTE 101BDV to Clause 1 of the Part 2 after the fifth paragraph:***

**Battery chargers intended for use in a commercial environment are within the scope of this standard.**

**NOTE 101BDV The following list, although not comprehensive, gives an indication of commercial environments:**

**– public use areas such as hotels, schools, hospitals;**

**– retail outlets, for example shops and supermarkets;**

**– business premises, for example offices and banks.**

As far as is practicable, this standard deals with the common hazards presented by appliances that are encountered by all persons in and around the home. However, in general, it does not take into account

– persons (including children) whose

- physical, sensory or mental capabilities; or
- lack of experience and knowledge

prevents them from using the appliance safely without supervision or instruction;

– children playing with the appliance.

NOTE 101 Attention is drawn to the fact that

– for appliances intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary;

– in many countries additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour and similar authorities.

NOTE 102 This standard does not apply to

– built-in battery chargers, except those for installing in caravans and similar vehicles;

– battery chargers that are part of an appliance, the battery of which is not accessible to the user;

– battery chargers intended exclusively for industrial purposes;

– battery chargers intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas);

– battery chargers for emergency lighting (IEC 60598-2-22);

– supply units for electronic equipment.

**1DV.4 D2 *Modification to replace NOTE 102 of Clause 1 of the Part 2 with the following:***

**NOTE 102 This standard does not apply to**

**– built-in battery chargers;**

**– battery chargers installed on land vehicles, including caravans;**

**– battery chargers installed on marine craft;**

**– automotive battery chargers;**

**– battery chargers for e-mobility devices and e-bikes, provided the batteries are separately charged;**

**– battery chargers that are part of an appliance, the battery of which is not accessible to the user;**

**– battery chargers intended exclusively for industrial purposes where use by trained operators in an environment that is not accessible by the general public is relied upon as a measure of risk reduction;**

**– battery chargers intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas);**

**– battery chargers for emergency lighting;**

**– supply units for electronic equipment;**

**– battery chargers for uninterruptable power supplies;**

**– DC distribution boards.**

**1DV.5 D2 *Add NOTE 103DV to Clause 1 of the Part 2:***

**NOTE 103DV This Part 2-29 may be employed for investigation of components and sub-assemblies for the purpose of their pre-selection for use in appliances. If the component or sub-assembly used complies with this standard, the tests for the component or sub-assembly specified in the particular appliance standard in some cases will not need to be made in the particular appliance or assembly. Additional testing on a component or subassembly might be required. For example, if a control system is associated with the particular appliance control system, additional tests could potentially be necessary on the final appliance.**

## 2 Normative references

This clause of Part 1 is applicable except as follows.

*Addition:*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 61558-2-4:2009, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-4: Particular requirements and tests for isolating transformers and power supply units incorporating isolating transformers*

IEC 61558-2-7:2007, *Safety of power transformers, power supplies, reactors and similar products – Part 2-7: Particular requirements and tests for transformers and power supplies for toys*

**2DV D2 *Modification to replace Clause 2 of the Part 2 with the following:***

**This clause of Part 1 is applicable except as follows.**

***Addition:***

**CSA C22.2 No. 94.2-15, *Enclosures for electrical equipment, environmental considerations***

**IEC 61558-2-4:2009, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-4: Particular requirements and tests for isolating transformers and power supply units incorporating isolating transformers***

**IEC 61558-2-7:2007, *Safety of power transformers, power supplies, reactors and similar products – Part 2-7: Particular requirements and tests for transformers and power supplies for toys***

**UL 50E, *Enclosures for electrical equipment, environmental considerations***

## 3 Terms and definitions

This clause of Part 1 is applicable except as follows.

### 3.1 Definitions relating to physical characteristics

3.1.1 *Addition:*

Note 1 to entry: The **rated voltage** is the rated input voltage.

3.1.6 *Addition:*

Note 2 to entry: The **rated current** is the rated input current.

3.1.9 *Replacement:*

**normal operation**
operation of the appliance under the following conditions:

Battery chargers for charging lead-acid batteries, and other battery chargers having a **rated DC output current** not exceeding 20 A, are connected to the circuit of Figure 101. The variable resistor is adjusted so that the current in the circuit is the **rated DC output current** when the battery charger is supplied at **rated voltage**.

When the charging current is controlled by the state of charge of the battery, the variable resistor and the capacitor are replaced by a discharged battery of the type and having the largest capacity specified in the instructions.

Other battery chargers are connected to a discharged battery of the type and having the largest capacity specified in the instructions.

3.1.101
**rated DC output voltage**
output voltage assigned to the battery charger by the manufacturer

3.1.102
**rated DC output current**
output current assigned to the battery charger by the manufacturer

### 3.2 Definitions relating to means of connection

3.2.2 *Addition:*

Output flexible cords are not considered to be interconnection cords.

3.4.3 *Replacement:*

**safety isolating transformer**
transformer, the input winding of which is electrically separated from the output winding by an insulation at least equivalent to **double insulation** or **reinforced insulation**, that is intended to supply a battery charging circuit having an output voltage not exceeding 120 V ripple-free direct current

Note 1 to entry: Ripple-free means an r.m.s. ripple voltage not exceeding 10 % of the DC component.

## 3.5 Definitions relating to types of appliances

3.5.101
**DC distribution board**
panel having circuits for distributing DC power to socket-outlets or terminals

**3.5.101DV D2** ***Delete 3.5.101 of the Part 2:***

**This definition does not apply.**

3.5.102
**type 1 battery charger**
battery charger the output circuit of which is supplied through a **safety isolating transformer**

3.5.103
**type 2 battery charger**
battery charger the output circuit of which is supplied through an **isolating transformer**

## 3.6 Definitions relating to parts of an appliance

3.6.101
**isolating transformer**
transformer, the input winding of which is electrically separated from the output winding by an insulation at least equivalent to **double insulation** or **reinforced insulation**, that is intended to supply a battery charging circuit having an output voltage not exceeding 250 V ripple free DC

Note 1 to entry: Ripple-free means an RMS ripple voltage not exceeding 10 % of the DC component.

## 4 General requirement

This clause of Part 1 is applicable.

## 5 General conditions for the tests

This clause of Part 1 is applicable except as follows.

5.2 *Addition:*

*If the test of 21.101 is carried out, two additional battery chargers are required.*

5.101 Battery chargers are tested as **motor-operated appliances**.

## 6 Classification

This clause of Part 1 is applicable except as follows.

**6.1DV DR** ***Modification to replace 6.1DV of the Part 1 with the following:***

**CLASS 0 APPLIANCES and CLASS 01 APPLIANCES are not allowed.**

6.2 *Addition:*

Battery chargers for outdoor use shall be at least IPX4.

**6.2DV D2 *Delete 6.2 of the Part 2:***

**This addition does not apply.**

## 7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 *Addition:*

Battery chargers shall be marked with

– **rated DC output voltage**, in volts;

– **rated DC output current**, in amperes, however no other output current shall be marked;

– the rated current, in amperes, of **protective devices** incorporated in a **DC distribution board**;

– the polarity of the output terminals unless incorrect polarity connection is prevented. The positive terminal shall be indicated by symbol IEC 60417-5005 (2002-10) and the negative terminal by symbol IEC 60417-5006 (2002-10);

– the time-current characteristic of fuse-links of the time-lag type;

– “Before charging, read the instructions” or symbol ISO 7000-0790 (2004-01); (not required if the battery charger output is less than 20 VA);

– “For indoor use” or symbol IEC 60417-5957 (2004-12) or “Do not expose to rain” or symbol IEC 60417-6062 (2011-05); (not required if the battery charger output is less than 20 VA or the battery charger has a degree of protection against harmful ingress of water of at least IPX4);

– the substance of the following, if the output is at least 20 VA and the battery charger is for charging lead-acid batteries:

- disconnect the supply before making or breaking the connections to the battery;
- WARNING: Explosive gases. Prevent flames and sparks. Provide adequate ventilation during charging.

Battery chargers incorporating an engine-cranking switch that allows the battery charger to supply a supplementary starting current for the engine shall be marked with

– the maximum "on" time;

– the minimum "off" time or the maximum ratio between the "on" time and the "off" time.

**7.1DV.1 D2** ***Modification to add the following after the first paragraph of the "Addition" to 7.1 of the Part 2:***

**The RATED DC OUTPUT VOLTAGE and the RATED DC OUTPUT CURRENT need not be marked if the battery charger is intended to be used with a specific model or series of battery as specified in 7.12.**

**7.1DV.2 D2** ***Modification to delete the third dashed item from the list in the first paragraph of the "Addition" to 7.1 of the Part 2.***

**7.1DV.3 D2** ***Modification to replace the sixth dashed item in the list in the first paragraph of the "Addition" to 7.1 of the Part 2 with the following:***

**– "Before charging, read the instructions" or symbol ISO 7000-0790 (2004-01) or symbol M002 of ISO 7010; (not required if the battery charger output is less than 20 VA);**

**7.1DV.4 D2** ***Modification to replace the seventh dashed item in the list in the first paragraph of the "Addition" to 7.1 in the Part 2 with the following:***

**– "For indoor use" or symbol IEC 60417-5957 (2004-12) or "Do not expose to rain" or symbol IEC 60417-6062 (2011-05); (not required if the battery charger output is less than 20 VA or the battery charger complies with 15.101DV);**

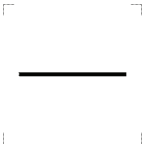
**7.1DV.5 D2** ***Modification to delete the last paragraph of the "Addition" to 7.1 in the Part 2.***

7.4 *Addition:*

If the battery charger can be adjusted to different **rated DC output voltages**, the output voltage to which the battery charger is adjusted shall be clearly discernible.

7.6 *Addition:*

[symbol IEC 60417-5005 (2002-10)] plus; positive polarity



[symbol IEC 60417-5006 (2002-10)] minus; negative polarity

[symbol IEC 60417-5957 (2004-12)] for indoor use only

[symbol IEC 60417-6062 (2011-05)] do not expose to moisture

su3771 *IEC*

**7.6DV D2** ***Modification to add the following symbol and text:***

**[symbol M002 of ISO 7010]** **read the instructions**

su3772 *IEC*



7.12 *Addition:*

The instructions shall

– state that during charging, the battery must be placed in a well-ventilated area (for chargers for batteries that release gases into the atmosphere during normal charging);

– state that the battery charger must only be plugged into an earthed socket-outlet (for **portable class I battery chargers** for outdoor use);

– explain the automatic function, stating any limitation (for automatic battery chargers).

The instructions for **type 1 battery chargers** shall also

– specify the types, the number of batteries and the rated capacity of the batteries that can be charged;

– include a warning against recharging non-rechargeable batteries.

The instructions for **type 2 battery chargers** shall also

– specify the batteries intended to be charged, such as by a catalogue number, series identification or the equivalent;

– specify the ambient temperature range for the charger during charging.

The instructions for battery chargers for charging automobile batteries shall include the substance of the following:

– the battery terminal not connected to the chassis has to be connected first. The other connection is to be made to the chassis, remote from the battery and fuel line. The battery charger is then to be connected to the supply mains;

– after charging, disconnect the battery charger from the supply mains. Then remove the chassis connection and then the battery connection.

If symbol IEC 60417-5957 (2004-12) or symbol IEC 60417-6062 (2011-05) is used, its meaning shall be explained.

**7.12DV D2 *Modification to delete the fourth paragraph (automobile batteries) of the "Addition" to 7.12 in the Part 2.***

7.12.1 *Addition:*

The instructions for battery chargers for installation in caravans and similar vehicles shall state that the connection to the supply mains is to be in accordance with the national wiring rules.

**7.12.1DV D2 *Delete 7.12.1 of the Part 2:***

**This addition does not apply.**

7.101 DC distribution boards shall be marked with

– the maximum output current, in amperes, for each output circuit;

– the types of any additional power supply that may be connected.

*Compliance is checked by inspection.*

**7.101DV D2 *Delete 7.101 of the Part 2:***

**This marking does not apply.**

## 8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

8.1 *Addition:*

*During insertion or removal of batteries having a battery voltage exceeding 42,4 V, protection against contact with **live parts** of the battery or of the battery charger shall be ensured.*

8.1.4 *Addition:*

*For **type 2 battery chargers**, voltages and currents are also measured between relevant accessible parts of opposite polarity.*

**8.1.4DV D2** ***Modification to replace 8.1.4DV of the Part 1 with the following:***

**• for d.c., the average voltage does not exceed 60 V provided that the peak-to-peak voltage ripple is less than 10%, or 42,4 V peak otherwise;**

## 9 Starting of motor-operated appliances

This clause of Part 1 is not applicable.

## 10 Power input and current

This clause of Part 1 is applicable except as follows.

10.101 The DC output voltage of **type 1 battery chargers** shall not exceed 120 V. The DC output voltage of **type 2 battery chargers** shall not exceed 250 V.

*Compliance is checked by supplying the battery charger at **rated voltage** and measuring the DC output voltage.*

10.102 For **type 1 battery chargers**, the arithmetic mean value of the output current shall not deviate from the **rated DC output current** by more than 10 %.

For **type 2 battery chargers**, the arithmetic mean value of the output current shall not exceed the **rated DC output current** by more than 10 %.

*Compliance is checked by connecting the battery charger to the circuit of Figure 101. The battery charger is supplied at **rated voltage** and the variable resistor is adjusted to obtain the **rated DC output voltage**. The output current is then measured. A battery of the largest voltage and a battery with the largest capacity (if different) for each battery chemistry may be used instead of the circuit of Figure 101.*

## 11 Heating

This clause of Part 1 is applicable except as follows.

11.2 *Modification:*

*Battery chargers are placed in the test corner as specified for **heating appliances**.*

11.7 *Replacement:*

*Battery chargers are operated until steady conditions are established.*

## 12 Void

## 13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable.

## 14 Transient overvoltages

This clause of Part 1 is applicable.

## 15 Moisture resistance

This clause of Part 1 is applicable.

**15DV D2 *Modification to replace the first sentence of Clause 15 of the Part 2 with the following:***

**This clause of Part 1 is applicable except as follows.**

**15.101ADV D1 *Add the following subclause to Clause 15 of the Part 2:***

**Enclosures of battery chargers intended for use outdoors shall comply with the applicable requirements of CSA C22.2 No. 94.2 and UL 50E for Type 3R, 3S, 4, or 4X enclosures.**

## 16 Leakage current and electric strength

This clause of Part 1 is applicable.

## 17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable except as follows.

*Addition:*

*The output terminals of the battery charger are short-circuited.*

## 18 Endurance

This clause of Part 1 is not applicable.

## 19 Abnormal operation

This clause of Part 1 is applicable except as follows.

19.1 *Modification:*

*Instead of the tests specified, battery chargers are subjected to the tests of 19.11, 19.12 and 19.101 to 19.103, as applicable.*

**19.1DV D2 *Modification to replace 19.1 of the Part 2 with the following:***

***Modification:***

***Instead of the tests specified, battery chargers are subjected to the tests of 19.11, 19.12, 19.101, and 19.102, as applicable.***

19.13 *Addition:*

*During the tests, the values of Table 8 apply.*

*There shall be no rupture of the battery.*

19.101 *Battery chargers are supplied at* ***rated voltage*** *and operated under* ***normal operation****, any control that operates during the test of Clause 11 being short-circuited.*

**19.101DV D2** ***Modification to replace 19.101 of the Part 2 with the following:***

**Battery chargers are supplied at RATED VOLTAGE and operated under NORMAL OPERATION with any control that operates during the test of Clause 11 that**

**– regulates the output voltage;**

**– regulates the output current; or**

**– limits the temperature**

**being disabled in turn.**

19.102 *The battery charger is connected to a fully charged battery, the connections being in reverse to normal use. The battery is to have the largest capacity of the types specified in the instructions, the capacity of a lead-acid battery, however, being 70 Ah. The battery charger is operated while supplied at* ***rated voltage****.*

**19.102DV D2** ***Modification to add the following to 19.102 of the Part 2:***

**The test is not conducted if the construction of the battery charger is such that reversal of the connections of the battery is prohibited by design.**

19.103 *Battery chargers intended to be used with a DC* ***distribution board*** *are supplied at* ***rated voltage*** *and operated under* ***normal operation*** *until steady conditions are established. The load is increased to raise the output current by 10 % until steady conditions are again established. This procedure is repeated until the* ***protective device*** *operates or short-circuit conditions are established.*

**19.103DV D2** ***Delete 19.103 of the Part 2:***

**This clause does not apply.**



## 20 Stability and mechanical hazards

This clause of Part 1 is applicable.

## 21 Mechanical strength

This clause of Part 1 is applicable except as follows.

21.1 *Modification:*

*The impact energy is increased to 1,0 J ± 0,05 J.*

*Addition:*

*Compliance is also checked by the test of 21.101.*

**21.1DV D2 *Modification to replace 21.1 of the Part 2 with the following:***

***Modification:***

***For battery chargers that are STATIONARY APPLIANCES, the ball impact test shall be performed and the impact energy is increased to (6,8 ± 0,3) J.***

***Addition:***

***For direct plug-in battery chargers, compliance is also checked by the test of 21.101.***

21.101 *Battery chargers, other than **built-in battery chargers**, having a mass not exceeding 5 kg are subjected to the test free-fall – procedure 1, of IEC 60068-2-31, which is carried out on three appliances.*

*The battery chargers are dropped from a height of 1 m, each appliance being dropped from a different position.*

*After the test the battery chargers shall show no damage that could impair compliance with 8.1, 15.1.1, 16.3 and Clause 29.*

**21.101DV D2 *Modification to replace the first paragraph of 21.101 of the Part 2 with the following:***

**Direct plug-in battery chargers are subjected to the test free-fall – procedure 1, of IEC 60068-2-31, which is carried out on three appliances.**

21.102 *Battery chargers for installing in caravans and similar vehicles shall withstand vibrations to which they may be subjected.*

*Compliance is checked by carrying out the vibration tests specified in IEC 60068-2-6 under the following conditions:*

*– the battery charger is built into an enclosure made from plywood approximately 20 mm thick, the internal dimensions being the minimum stated in the installation instructions;*

*– the enclosure is strapped to the vibration generator with the battery charger in its normal position of use;*

*– the direction of vibration is vertical;*

*– the amplitude of vibration is 0,35 mm;*

*– the sweep frequency range is 10 Hz to 55 Hz;*

*– the duration of the test is 30 min.*

*The battery charger shall show no damage that could impair compliance with 8.1, 15.1.1, 16.3 and Clause 29, and connections shall not have worked loose.*

**21.102DV D2** ***Delete 21.102 of the Part 2:***

**This clause does not apply.**

## 22 Construction

This clause of Part 1 is applicable except as follows.

22.26 *Replacement:*

The output circuit of a **type 1 battery charger** shall be supplied through a **safety isolating transformer** and shall not be connected to **accessible metal parts** or an earthing terminal. The insulation between parts operating at **safety extra-low voltage** and **live parts** shall comply with the requirements for **double insulation** or **reinforced insulation**.

The output circuit of a **type 2 battery charger** shall be supplied through an **isolating transformer** and shall not be connected to **accessible metal parts** or an earthing terminal. The insulation between parts operating at **safety extra-low voltage** and **live parts** shall comply with the requirements for **double insulation** or **reinforced insulation**.

*Compliance is checked by inspection and by the tests specified for* ***double insulation*** *or* ***reinforced insulation****.*

**22.26DV D2** ***Modification to replace 22.26 of the Part 2 with the following:***

***Replacement:***

**The output circuit of a TYPE 1 BATTERY CHARGER shall be supplied through a SAFETY ISOLATING TRANSFORMER and shall not be connected to other ACCESSIBLE METAL PARTS or an earthing terminal. The insulation between parts operating at SAFETY EXTRA-LOW VOLTAGE and LIVE PARTS shall comply with the requirements for DOUBLE INSULATION or REINFORCED INSULATION.**

**The output circuit of a TYPE 2 BATTERY CHARGER shall be supplied through an ISOLATING TRANSFORMER and shall not be connected to other ACCESSIBLE METAL PARTS or an earthing terminal. The insulation between parts operating at SAFETY EXTRA-LOW VOLTAGE and LIVE PARTS shall comply with the requirements for DOUBLE INSULATION or REINFORCED INSULATION.**

***Compliance is checked by inspection and by the tests specified for DOUBLE INSULATION or REINFORCED INSULATION.***

22.101 Each circuit supplied from a **DC distribution board** shall incorporate an overload protective device.

*Compliance is checked by inspection.*

**22.101DV D2** ***Delete 22.101 of the Part 2:***

**This clause does not apply.**

22.102 Battery chargers for installing in caravans and similar vehicles shall be constructed so that they can be securely fixed to a support. Keyhole slots, hooks and similar means, without any further means to prevent the battery charger from being inadvertently lifted off the support, are not considered to be securely fixed.

*Compliance is checked by inspection.*

**22.102DV D2** ***Delete 22.102 of the Part 2:***

**This clause does not apply.**

## 23 Internal wiring

This clause of Part 1 is applicable.

## 24 Components

This clause of Part 1 is applicable except as follows

24.1.2 *Addition:*

*The relevant standard for* ***isolating transformers*** *is IEC 61558-2-4. If they have to be tested, they are tested in accordance with Annex BB.*

**24.1.2DV DC** ***Modification to replace 24.1.2 of the Part 2 and 24.1.2 and 24.1.2DV of the Part 1 with the following:***

**The relevant standard for transformers in associated switch mode power supplies is Annex BB of IEC 61558-2-16. Clause 26 of IEC 61558-1 and Annex H of IEC 61558-1 are not applicable.**

**The relevant standard for ISOLATING TRANSFORMERS is IEC 61558-2-4. If they have to be tested, they are tested in accordance with Annex BB. Alternatively, they may comply the requirements for CLASS II CONSTRUCTION and are tested in accordance with Annex BB.**

**The relevant standard for SAFETY ISOLATING TRANSFORMERS is IEC 61558-2-6. If they have to be tested, they are tested in accordance with Annex G. Alternatively, they may comply the requirements for CLASS II CONSTRUCTION and are tested in accordance with Annex G.**

**24.1.4DV DC** ***Modification to replace the first paragraph of 24.1.4 of the Part 1 with the following:***

**Automatic controls containing electromechanical contacts that cycle in NORMAL OPERATION shall comply with the endurance requirements of CAN/CSA-E60730-1 and UL 60730-1 together with the relevant Part 2 based upon the intended application.**

24.4 *Addition:*

The requirement is also applicable to plugs, connectors, socket-outlets and appliance outlets in the battery charger output circuit.

## 25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

**25.1DV DR** ***Modification to add the following to 25.1 of the Part 1:***

**The rating of the attachment plug shall not be less than the greater of**

**– the RATED CURRENT or for battery chargers marked with RATED POWER INPUT, the current drawn during the test of 10.1; or**

**– 125% of the highest continuous current that is sustained for 3 hours or more by the battery charger under the conditions of 10.2.**

**NOTE The requirement in the second dashed item conforms to requirements in NEC Articles 210, 422.10, and 422.11 which is related to the performance characteristics of common thermal magnetic circuit breakers used in branch circuits.**

***Compliance is checked by inspection and measurement.***

**25.3DV D2** ***Modification to delete the first and second dashed items of 25.3 of the Part 1.***

25.5 *Addition:*

The requirement is also applicable to output flexible cords for battery chargers having a **rated output voltage** exceeding 42,4 V.

**25.5DV D2** ***Modification to replace 25.5 of the Part 2 with the following:***

***Addition:***

**TYPE Z ATTACHMENTS are allowed.**

**The requirement is also applicable to output flexible cords for battery chargers having an output voltage exceeding**

**– 60 V, provided that the peak-to-peak ripple does not exceed 10%; or**

**– 42,4 V peak, otherwise.**

25.7 *Addition:*

The requirement is also applicable to output flexible cords for battery chargers having a **rated output voltage** exceeding 42,4 V.

Battery chargers for charging vehicle batteries shall not be fitted with natural rubber-sheathed **supply cords**.

For battery chargers intended for use at low temperatures, the **supply cord** shall have properties not less than those specified for ordinary polychloroprene sheathed cords (code designation 60245 IEC 57).

**25.7DV DC** ***Modification to replace 25.7 of the Part 2 with the following:***

***Addition:***

**The requirement is also applicable to output flexible cords for battery chargers having an output voltage exceeding**

**– 60 V, provided that the peak-to-peak ripple does not exceed 10%; or**

**– 42,4 V peak, otherwise.**

**Battery chargers for charging vehicle batteries shall not be fitted with natural rubber-sheathed SUPPLY CORDS.**

**The input cord for battery chargers shall be not less than 1,8 m long when measured from the face of the attachment plug to the plane of the cord-entry hole in the battery charger. A battery charger intended for mounting in a fixed location may have a shorter cord length. A battery charger with a mass of 455 g or less shall be acceptable if the total combined length of the input and output cords is 1,8 m or more and the length of the input cord is at least 1 m.**

**The type of SUPPLY CORD shall be in accordance with Table 25.7DV.101.**

**Table 25.7DV.101**
**Supply cord types**

| Appliance | Supply cord type |
|---|---|
| Portable battery charger | SPT-2, SV, SVT, or equivalent. |
| Stationary battery charger | S, SE, SO, SPT-3, ST, STO, SJ, SJO, SJT, SJTO, or equivalent. |
| Battery charger for outdoor use | SOW, SJOW, STOW, SJTOW or equivalent. |

25.8 *Addition:*

The requirement is also applicable to output flexible cords for battery chargers having a **rated output voltage** exceeding 42,4 V.

**25.8DV D2** ***Modification to replace 25.8 of the Part 2 with the following:***

***Addition:***

**The requirement is also applicable to output flexible cords for battery chargers having an output voltage exceeding**

**– 60 V, provided that the peak-to-peak ripple does not exceed 10%; or**

**– 42,4 V peak, otherwise.**

25.15 *Addition:*

The requirement is also applicable to output flexible cords for battery chargers having a **rated output voltage** exceeding 42,4 V.

**25.15DV D2** ***Modification to replace 25.15 of the Part 2 with the following:***

***Addition:***

**The requirement is also applicable to output flexible cords for battery chargers having an output voltage exceeding**

**– 60 V, provided that the peak-to-peak ripple does not exceed 10%; or**

**– 42,4 V peak, otherwise.**

**25.23DV D2** ***Modify 25.23 of the Part 1 by adding the following dashed item after the second dashed item:***

**– for CLASS III CONSTRUCTION, for interconnection cords of a CLASS I APPLIANCE or CLASS II APPLIANCE, the cross-sectional areas of the conductors need not comply with 25.8 if the temperature of the cord insulation specified in Table 3 and Table 9 is not exceeded during the tests of Clause 11 and Clause 19, respectively.**

## 26 Terminals for external conductors

This clause of Part 1 is applicable except as follows.

26.5 *Modification:*

This requirement does not apply to the terminals of the output circuit having a no-load voltage not exceeding 42,4 V.

**26.5DV D2** ***Modification to replace 26.5 of the Part 2 with the following:***

**This requirement does not apply to the terminals of the output circuit having a no-load voltage not exceeding**

**– 60 V, provided that the peak-to-peak ripple does not exceed 10%; or**

**– 42,4 V peak, otherwise.**

## 27 Provision for earthing

This clause of Part 1 is applicable.

## 28 Screws and connections

This clause of Part 1 is applicable.

## 29 Clearances, creepage distances and solid insulation

This clause of Part 1 is applicable except as follows.

29.2 *Addition:*

*For battery chargers for outdoor use, the microenvironment is pollution degree 3 unless the insulation is enclosed or located so that it is unlikely to be exposed to pollution during normal use of the appliance.*

## 30 Resistance to heat and fire

This clause of Part 1 is applicable except as follows.

**30.2DV DC *Modification to add the following to 30.2 of the Part 1:***

**For STATIONARY APPLIANCES, polymeric enclosures that contain uninsulated LIVE PARTS shall have a 5VA flammability rating when tested in accordance with IEC 60695-11-20.**

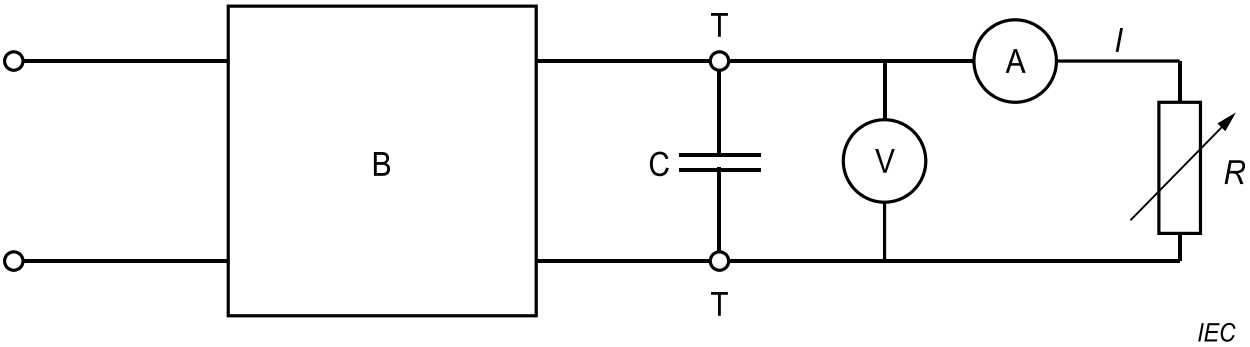
30.2.2 Not applicable.

## 31 Resistance to rusting

This clause of Part 1 is applicable.

## 32 Radiation, toxicity and similar hazards

This clause of Part 1 is applicable.




su2386

**Key**

A mean reading ammeter

B battery charger

C capacitor having a capacitance, in farads, given by: 12,5

$$\frac{I_r}{p \times f \times U_r}$$

where

$I_r$ = **rated DC output current**, in amperes;

$p$ = 1, for half-wave rectification and 2, for full-wave rectification;

$f$ = supply frequency, in hertz;

$U_r$ = **rated DC output voltage**, in volts.

*I* output current

*R* variable resistor

*T* output terminals of the battery charger

*V* mean reading voltmeter

NOTE 1 The capacitor can have a capacitance deviating from the calculated values of ±20 %.

NOTE 2 The capacitor may have to be precharged before the battery charger can operate.

**Figure 101**

**Circuit for testing battery chargers**