# UL 2231-2

## STANDARD FOR SAFETY

Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems

UL Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems, UL 2231-2

Second Edition, Dated September 7, 2012

***Summary of Topics***

***This revision to ANSI/UL 2231-2 dated December 15, 2020 includes revising requirements for Isolated Circuit Systems – Capacitor Switching Transient Test and Harmonic Distortion Immunity Test; 24.1.3A, 24.2.1 and 24.9.2***

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated May 15, 2020.

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# Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems

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Approved American National Standard

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**Commitment for Amendments**

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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. 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 Second Edition including revisions through December 15, 2020. The most recent designation of ANSI/UL 2231-2 as an American National Standard (ANSI) occurred on December 15, 2020. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

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# PREFACE

This is the harmonized ANCE, CSA Group, and UL Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems. It is the Second edition of NMX-J-668-2-ANCE, the First edition of CAN/CSA-C22.2 No. 281.2, and the Second edition of UL 2231-2. This harmonized standard has been jointly revised on December 15, 2020. For this purpose, CSA Group and UL are issuing revision pages dated December 15, 2020, and ANCE is issuing a new edition dated December 15, 2020.

This harmonized standard was prepared by the Association of Standardization and Certification (ANCE), CSA Group, and Underwriters Laboratories Inc. (UL). The efforts and support of the Technical Harmonization Working Group for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits are gratefully acknowledged.

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

The present Mexican Standard was reviewed and approved by the Comité de Normalización de la Asociación de Normalización y Certificación, A.C., CONANCE.

This standard was reviewed by the CSA Subcommittee on Electric Vehicle – Personal Protection Systems for Supply Circuits, under the jurisdiction of the CSA Technical Committee on Industrial Products and 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 specimens 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.**

## Level of harmonization

This standard uses the IEC format but is not based on, nor is considered equivalent to, an IEC standard.

This standard is published as an equivalent standard for ANCE, CSA Group, and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

## Reasons for differences from IEC

This standard provides particular requirements for personnel protection systems for electric vehicle supply circuits for use in accordance with the electrical installation codes of Canada, Mexico, and the United States. At present there is no IEC standard for these products for use in accordance with these codes. Therefore, this standard does not employ any IEC standard for base requirements.

**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.

# Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems

## INTRODUCTION

### 1 Scope

1.1 This Standard is intended to be used in conjunction with the general requirements of Annex A, Ref. No. 1. The requirements of Annex A, Ref. No. 1 apply unless modified by this Standard.

### 2 General

2.1 This Part contains the construction and performance requirements that are applied to a device that is intended to become an integral part of an overall device or charging system.

2.2 Annex A, Ref. No. 1 contains an outline of the features required to provide protection based on voltage and grounding or isolation of the system or part of the system under consideration.

### 3 Components

3.1 Except as indicated in 3.2, a component of a product covered by this standard shall comply with the requirements for that component.

3.2 A component is not required to comply with a specific requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or

b) Is superseded by a requirement in this standard.

3.3 A component shall be used in accordance with its rating established for the intended conditions of use.

3.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

### 4 Units of Measurement

4.1 The values given in SI (metric) units shall be normative. Any other values given shall be for information purposes only.

### 5 Normative References

5.1 Where reference is made to any Standards, such reference shall be considered to refer to the latest editions and revisions thereto available at the time of printing, unless otherwise specified.

5.2 Products covered by this standard shall comply with the referenced installation codes and standards noted in Annex A as appropriate for the country where the product is to be used. When the product is

intended for use in more than one country, the product shall comply with the installation codes and standards for all countries where it is intended to be used.

## CONSTRUCTION

### 6 General

6.1 The design, workmanship, and degree of production uniformity shall be such that the reliability of the device to perform the functions evaluated by the requirements is high.

### 7 Grounding

Note: In Canada, equipment grounding conductors are referred to as bonding conductors.

7.1 A grounding circuit shall comply with Annex A, Ref. No. 2 with respect to the size of the grounding conductors.

7.2 All accessible parts of a device that are likely to become energized when arc-over, insulation failure, or the similar conditions occur, shall be connected together and to the terminals intended for an equipment grounding conductor.

7.3 Except as described in 7.4 the equipment grounding conductor shall be sized in accordance with Annex A, Ref. No. 2.

7.4 When a charging circuit interrupting device is intended for use in a circuit where the voltage to ground is greater than 300 Vrms, the impedance of the grounding circuit shall not be higher than that value which limits the voltage to 150 Vrms on accessible parts with respect to earth at the site of the fault during a low impedance fault.

7.5 The accessible parts of a device intended for use on an isolated supply with not more than 150 Vrms between conductors are not required to be grounded.

7.6 In a portable product, accessible parts that are double insulated from energized parts shall not be grounded unless the grounding path is monitored by use of a ground/monitor interrupter.

7.7 Except as indicated in 16.3, a portable device shall be provided with an equipment grounding conductor that extends to the vehicle connector. On the supply side of the interrupting contacts of the CCID, the equipment grounding conductor shall not be connected to accessible conductive parts. On the load side of the CCID interrupting contacts, the equipment grounding conductor shall be connected to the vehicle connector and shall not be connected to accessible metal unless permitted by the construction and potentials involved. See Table 2 of Annex A, Ref. No. 1.

### 8 Insulation and Protective Features

8.1 An interrupting device such as a charging circuit interrupting device, a grounding monitor/interrupter or an isolation monitor/interrupter, shall have insulation and features or accessories that are required for the voltage rating and type of system where use is intended. See Protective Systems, Section 6, of Annex A, Ref. No. 1 for insulation requirements and features.

8.2 Double insulation or reinforced insulation shall be provided in that part of a grounded circuit between the connections to the supply and the interrupting contacts of the charging circuit interrupting device.