AMERICAN NATIONAL STANDARD

ANSI/ISA-/ CSA / UL 61010-1

SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE –

Part 1: General requirements

Approved 11 May 2012

Commitment for Amendments

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

The most recent designation of ANSI/UL 61010-1 as an American National Standard (ANSI) occurred on 11 May 2012. 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.

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Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements

11 May 2012

This standard is based on IEC 61010-1, Third Edition (2010).

ANSI/UL 61010-1-2012

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Preface

This is the harmonized CSA, ISA, and UL standard for Electrical Equipment for Measurement, Control, and Laboratory Use. It is the third edition of CAN/CSA-C22.2 No. 61010-1, the third edition of ANSI/ISA-61010-1 (82.02.01), and the third edition of ANSI/UL 61010-1. This edition of CAN/CSA-C22.2 No. 61010-1 supersedes the previous edition published as CAN/CSA-C22.2 No. 61010-1 in 2004. This edition of ANSI/ISA-61010-1 (82.02.01) supersedes the previous edition of ANSI/ISA-82.02.01 (IEC 61010-1 Mod) published in 2004. This edition of ANSI/UL 61010-1 will supersede the second edition of ANSI/UL 61010-1 published in 2004. This standard is based on IEC 61010-1, third edition.

CAN/CSA-C22.2 No. 61010-1-12, ANSI/ISA-61010-1 (82.02.01), and ANSI/UL 61010-1 contain identical requirements and identical publication dates. The presentation and format of the standards material may differ between the three published standards.

This harmonized standard was prepared by the Canadian Standards Association (CSA), the International Society of Automation (ISA), and Underwriters Laboratories Inc. (UL).

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

This standard was reviewed by the CSA Subcommittee on Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, under the jurisdiction of the CSA Technical Committee on Consumer and Commercial 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 approved as a National Standard of Canada by the Standards Council of Canada (SCC).

This standard has been approved by the American National Standards Institute (ANSI) as an American National Standard.

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

Level of Harmonization

This standard adopts the IEC text with national differences.

The requirements are presented in different formats. The ISA version of the standard illustrates the national differences from the IEC text through the use of legislative text (strike-out and underline). The CSA and UL versions of the standard illustrate national differences immediately following the IEC text. National differences between the CSA and UL version and the ISA version shall be word for word except for editorial changes.

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 literal interpretation 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.

Reasons for differences from IEC

National Differenes from the IEC are being added in order to address regulatory and safety situations present in Canada and the U.S.

CSA Effective Date

The effective date for CSA International will be announced through CSA Informs or a CSA Certification notice.

ISA Effective Date

The effective date for ISA is the date of publication.

UL Effective Date

The effective date for UL is 1 January 2018.

A UL effective date is one established by Underwriters Laboratories Inc. and is not part of the ANSI approved standard.

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For ISA and UL, the text, figures and tables of IEC publication 61010-1, Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements, are used in this Standard with the consent of the IEC and the American National Standards Institute (ANSI). The IEC copyrighted material has been reproduced with permission from ANSI. ANSI should be contacted regarding the reproduction of any portion of the IEC material. The IEC Foreword and Introduction are not a part of the requirements of this Standard but are included for information purposes only. Copies of IEC Publication 61010-1 may be purchased from ANSI, 25 West 43rd Street, 4th Floor, New York, New York, 10036, (212) 642-4900.

For CSA, the text, figures, and tables of International Electrotechnical Commission Publication 61010-1, Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements, are used in this standard with the consent of the International Electrotechnical Commission. The IEC Foreword is not part of the requirements of this standard but is included for information purposes only.

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.

Foreword (ISA)

All text of IEC 61010-1:2010 is included. National Deviations are shown by ~~strikeout~~ through text deleted and underline under text added. Tables, or portions of tables, that are to be deleted are shown as shaded; figures to be deleted are marked with the overlay "X." There are four annexes in this standard. Annexes A, B, C, D, E, F, G, H, K, and DVD are normative and are considered part of this standard. Annexes I, J, L, DVA, DVB, and DVC are informative and are not considered part of this standard.

In this standard the following print types are used:

- requirements and definitions: in roman type;
- NOTES: in smaller roman type;
- *conformity and tests: in italic type;*
- terms used throughout this standard which have been defined in clause 3: SMALL ROMAN CAPITALS.

The standards referenced within this document may contain provisions which, through reference in this text, constitute requirements of this document. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this document are encouraged to investigate the possibility of applying the most recent editions of the standards indicated within this document. Members of IEC and ISO maintain registers of currently valid International Standards. ANSI maintains registers of currently valid U.S. National Standards.

This document has been prepared as part of the service of ISA toward a goal of uniformity in the field of instrumentation. To be of real value, this document should not be static but should be subject to periodic review. Toward this end, the Society welcomes all comments and criticisms and asks that they be addressed to the Secretary, Standards and Practices Board; ISA; 67 Alexander Drive; P. O. Box 12277; Research Triangle Park, NC 27709; Telephone (919) 549-8411; Fax (919) 549-8288; E-mail: standards@isa.org.

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In the ISA publication of this standard, National Differences are presented using legislative text (strike-out and underline). The national difference type is identified in an informative annex.

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.

NOTE The CSA and UL printed standards include the national difference types within the body of the text. The ISA printed standard includes the national difference types in an annex at the back of the standard.

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.

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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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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE –

Part 1: General requirements

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.
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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.

International Standard IEC 61010-1 has been prepared by IEC technical committee 66: Safety of measuring, control and laboratory equipment.

It has the status of a group safety publication, as specified in IEC Guide 104.

This third edition cancels and replaces the second edition published in 2001. It constitutes a technical revision.

This edition includes the following significant changes from the second edition, as well as numerous other changes.

- The scope of the standard has been expanded to include all locations where these products may be used, so that both professional and non-professional versions of these products are within the scope.

- The requirements for testing and measuring circuits (in various subclauses and the entirety of Clause 16) have been removed and included in a particular standard IEC 61010-2-030.
- Insulation requirements (6.7) have been completely rewritten.
  - Specific requirements have been added for solid insulation and thin-film insulation.
  - Subclause 6.7 now contains only the insulation requirements for MAINS CIRCUITS of OVERVOLTAGE CATEGORY II up to 300 V, and for secondary circuits.
  - The insulation requirements for all other circuits have been moved to a new Annex K.
- Additional requirements for protection against mechanical HAZARDS (Clause 7) have been included.
- Surface temperature limits (Clause 10) have been modified to conform to the limits of EN 563.
- Radiation requirements (Clause 12) have been modified, and take into account a distinction between intended emission and unintended emission.
- Requirements for reasonably foreseeable misuse and ergonomic aspects have been added (Clause 16).
- A new clause (Clause 17) has been added to deal with HAZARDS and environments not covered by the standard, along with a new informative annex (Annex J) dealing with RISK assessment.
- A new informative annex (Annex E) addresses methods of reducing the POLLUTION DEGREE of a micro-environment.
- Requirements for the qualification of coatings for protection against POLLUTION have been added (Annex H).
- A new informative annex (Annex I) has been added to further explain how to determine the WORKING VOLTAGE of a MAINS CIRCUIT.

The text of this standard is based on the following documents:

FDIS / Corrigendum	Report on voting
66/414/FDIS	66/423/RVD
66/440/Q	66/447/RQ

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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

A list of all parts of the IEC 61010 series, under the general title: *Safety requirements for electrical equipment for measurement, control, and laboratory use*, may be found on the IEC website.

In this standard, the following print types are used:

– requirements and definitions: in roman type;
– NOTES: in smaller roman type;
– *conformity and tests: in italic type;*
– terms used throughout this standard which have been defined in Clause 3: SMALL ROMAN CAPITALS.

The committee has decided that the contents of this publication 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.

The contents of the corrigendum of May 2011 have been included in this copy.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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.

This edition incorporates Corrigendum 1 to IEC 61010-1, 3rd edition.

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INTRODUCTION

This International Standard specifies the safety requirements that are generally applicable to all equipment within its scope. For certain types of equipment, these requirements will be supplemented or modified by the special requirements of one, or more than one, particular part 2 of the standard which must be read in conjunction with the part 1 requirements.

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SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE –

Part 1: General requirements

1 Scope and object

1.1 Scope

1.1.1 Equipment included in scope

This part of IEC 61010 specifies general safety requirements for the following types of electrical equipment and their accessories, wherever they are intended to be used.

a) Electrical test and measurement equipment

This is equipment which by electromagnetic means tests, measures, indicates or records one or more electrical or physical quantities, also non-measuring equipment such as signal generators, measurement standards, power supplies for laboratory use, transducers, transmitters, etc.

NOTE 1 This includes bench-top power supplies intended to aid a testing or measuring operation on another piece of equipment. Power supplies intended to power equipment are within the scope of IEC 61558 (see 1.1.2 h)).

This standard also applies to test equipment integrated into manufacturing processes and intended for testing manufactured devices.

NOTE 2 Manufacturing test equipment is likely to be installed adjacent to and interconnected with industrial machinery in this application.

b) Electrical industrial process-control equipment

This is equipment which controls one or more output quantities to specific values, with each value determined by manual setting, by local or remote programming, or by one or more input variables.

c) Electrical laboratory equipment

This is equipment which measures, indicates, monitors, inspects or analyses materials, or is used to prepare materials, and includes in vitro diagnostic (IVD) equipment.

This equipment may also be used in areas other than laboratories; examples include self-test IVD equipment to be used in the home and inspection equipment to be used to check people or material during transportation.

1.1.2 Equipment excluded from scope

This standard does not apply to equipment within the scope of:

a) IEC 60065 (Audio, video and similar electronic apparatus);

b) IEC 60204 (Safety of machinery – Electrical equipment of machines);

c) IEC 60335 (Household and similar electrical appliances);

d) IEC 60364 (Electrical installations of buildings);

e) IEC 60439 (Low-voltage switchgear and controlgear assemblies);

f) IEC 60601 (Medical electrical equipment);