AMERICAN NATIONAL STANDARD

ANSI/ISA-61010-1 (82.02.01)

Formerly ANSI/ISA-S82.02.01-1999 (IEC 61010-1 Mod)
Updated with Annex DV US 22 July 2005
Second Update Approved 28 October 2008

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

Approved 12 July 2004
Second Printing: 22 July 2005
Third Printing: 28 October 2008

Commitment for Amendments

This Standard is issued jointly by the Canadian Standards Association (CSA), the Instrumentation, Systems, and Automation Society (ISA) and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to CSA, ISA, or UL at any time. Revisions to this standard will be made only after processing according to the standards development procedures of CSA, ISA, and UL. CSA and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue. ISA will incorporate the same revisions into a new edition of the standard bearing the same date of issue as the CSA and UL pages.

CSA, ISA, and UL are separate and independent entities and each is solely responsible for its operations and business activities. The CSA trade names and trademarks depicted in this document are the sole property of the

ISBN 1-55397-555-3 © 2004 Canadian Standards Association

ISBN 978-1-55617-900-6 Copyright © 2004, 2005, 2008 ISA — The Instrumentation, Systems, and Automation Society.

ISBN 0-7629-0958-7

Revisions of this Standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

The most recent designation of ANSI/UL 61010-1 and ANSI/ISA-61010-1 (82.02.01) as an American National Standard (ANSI) occurred on 28 October 2008.

This ANSI/UL Standard for Safety, which consists of the Second Edition with revisions through 28 October 2008 is under continuous maintenance, whereby each revision is ANSI approved upon publication. 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 http://csds.ul.com.

Canadian Standards Association
CAN/CSA-C22.2 No. 61010-1 Second Edition
(IEC 61010-1:2001, Mod)

ISA - The Instrumentation, Systems, and

Underwriters Laboratories Inc.
ANSI/UL 61010-1 Second Edition

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

12 July 2004 (Updated with Annex DV US, Second Printing: 22 July 2005)
(Second Update Approved, Third Printing: 28 October 2008)

This standard is based on IEC 61010-1, Second Edition (2001).

Approved by Standards Council of Canada

ANSI/UL 61010-1-2008

This page intentionally left blank.

Revisions Statement

ANSI/ISA-61010-1 (82.02.01)-2004, Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements

Second Edition: dated 12 July 2004

Revisions: This standard contains revisions through and including 28 October 2008.

Summary of Topics: The revisions dated 22 July 2005 include the addition of a new U.S. annex, Annex DV US, for the adoption of IEC 61010, Part 2 standards for particular requirements. The revisions dated 28 October 2008 include replacement of references to IEC 61010-2-041, IEC 61010-2-042, IEC 61010-2-043, and IEC 61010-2-

As noted in the Commitment for Amendments statement, CSA, ISA, and UL are committed to updating this standard jointly. However, Annex DV US is being adopted by the U.S. only, in the ISA and UL standards. CSA has adopted all of the IEC 61010 series standards as National Standards of Canada and, therefore, will not be issuing revision pages. Regarding the revisions dated 28 October 2008, the revisions to Annex DV US do not affect the CSA standard; and the “in Canada only” clauses, although included in the ISA and UL standards for reference, apply only to the CSA standard.

The adoption of Annex DV US as an addition to ANSI/ISA-61010-1 (82.02.01)-2004 was balloted and approved by the ISA82.02 Subcommittee, ISA82 Committee, and ISA Standards & Practices Board, and circulated for public review. ANSI approved the adoption of Annex DV US as an addition to ANSI/ISA-61010-1 (82.02.01)-2004 on 22 July 2005.

The revisions to Annex DV US and the inclusion of “in Canada only” clauses within ANSI/ISA-61010-1 (82.02.01)-2004 was balloted and approved by the ISA82 Committee and the ISA Standards & Practices Board, and circulated for public review. ANSI approved the revisions to Annex DV US and the inclusion of “in Canada only” clauses within ANSI/ISA-61010-1 (82.02.01)-2004 on 28 October 2008.

This page intentionally left blank.

Preface

This is the common CSA, ISA, and UL standard for *Electrical Equipment for Measurement, Control, and Laboratory Use*. It is the second edition of CAN/CSA-C22.2 No. 61010-1, the second edition of ANSI/ISA-61010-1 (82.02.01), and the second edition of ANSI/UL 61010-1. This edition of CAN/CSA-C22.2 No. 61010-1 supersedes the previous edition published in 1992. This edition of ANSI/ISA-61010-1 (82.02.01) supersedes the previous edition of ANSI/ISA-82.02.01 published in 1999. This edition of ANSI/UL 61010-1 will supersede the first edition of UL 61010A-1 published in 2002, UL 61010B-1 published in 2003, and UL 61010C-1 published in 2002. This standard is based on IEC 61010-1, second edition.

CAN/CSA-C22.2 No. 61010-1, 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 common standard was prepared by the Canadian Standards Association (CSA), The Instrumentation, Systems, and Automation Society (ISA), and Underwriters Laboratories Inc. (UL).

This standard was reviewed by the CSA Subcommittee on Safety Requirements for Electric 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.

> **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 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 illustrates 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.

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 the date of publication. However, the first editions of UL 61010A-1, UL 61010B-1, and UL 61010C-1 will also be effective until January 1, 2014.

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

Foreword (ISA)

The suffix "Mod" indicates the document is a modification of the IEC document and includes national differences encompassing both additions and deletions of information.

All text of IEC 61010-1:2001 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 eleven annexes in this standard. Annexes G, H, DVA, DVB, and DVC are informative and are not considered part of this Standard. The remaining Annexes are normative and are considered part of this standard.

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 - The Instrumentation, Systems, and Automation Society - 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.

It is the policy of ISA to encourage and welcome the participation of all concerned individuals and interests in the development of ISA standards, recommended practices, and technical reports. Participation in the ISA standards-making process by an individual in no way constitutes endorsement by the employer of that individual, of ISA, or of any of the standards, recommended practices, and technical reports that ISA develops.

CAUTION - ISA ADHERES TO THE POLICY OF THE AMERICAN NATIONAL STANDARDS INSTITUTE WITH REGARD TO PATENTS. IF ISA IS INFORMED OF AN EXISTING PATENT THAT IS REQUIRED FOR USE OF THE DOCUMENT, IT WILL REQUIRE THE OWNER OF THE PATENT TO EITHER GRANT A ROYALTY-FREE LICENSE FOR USE OF THE PATENT BY USERS COMPLYING WITH THE DOCUMENT OR A LICENSE ON REASONABLE TERMS AND CONDITIONS THAT ARE FREE FROM UNFAIR DISCRIMINATION.

EVEN IF ISA IS UNAWARE OF ANY PATENT COVERING THIS DOCUMENT, THE USER IS CAUTIONED THAT IMPLEMENTATION OF THE DOCUMENT MAY REQUIRE USE OF TECHNIQUES, PROCESSES, OR MATERIALS COVERED BY PATENT RIGHTS. ISA TAKES NO POSITION ON THE EXISTENCE OR VALIDITY OF ANY PATENT RIGHTS THAT MAY BE INVOLVED IN IMPLEMENTING THE DOCUMENT. ISA IS NOT RESPONSIBLE FOR IDENTIFYING ALL PATENTS THAT MAY REQUIRE A LICENSE BEFORE IMPLEMENTATION OF THE DOCUMENT OR FOR INVESTIGATING THE VALIDITY OR SCOPE OF ANY PATENTS BROUGHT TO ITS ATTENTION. THE USER SHOULD CAREFULLY INVESTIGATE RELEVANT PATENTS BEFORE USING THE DOCUMENT FOR THE USER'S INTENDED APPLICATION. HOWEVER, ISA ASKS THAT ANYONE REVIEWING THIS DOCUMENT WHO IS AWARE OF ANY PATENTS THAT MAY IMPACT IMPLEMENTATION OF THE DOCUMENT NOTIFY THE ISA STANDARDS AND PRACTICES DEPARTMENT OF THE PATENT AND ITS OWNER.

ADDITIONALLY, THE USE OF THIS DOCUMENT MAY INVOLVE HAZARDOUS MATERIALS, OPERATIONS OR EQUIPMENT. THE DOCUMENT CANNOT ANTICIPATE ALL POSSIBLE APPLICATIONS OR ADDRESS ALL POSSIBLE SAFETY ISSUES ASSOCIATED WITH USE IN HAZARDOUS CONDITIONS. THE USER OF THIS DOCUMENT MUST EXERCISE SOUND PROFESSIONAL JUDGMENT CONCERNING ITS USE AND APPLICABILITY UNDER THE USER'S PARTICULAR CIRCUMSTANCES. THE USER MUST ALSO CONSIDER THE APPLICABILITY OF ANY GOVERNMENTAL REGULATORY LIMITATIONS AND ESTABLISHED SAFETY AND HEALTH PRACTICES BEFORE IMPLEMENTING THIS DOCUMENT.

THE USER OF THIS DOCUMENT SHOULD BE AWARE THAT THIS DOCUMENT MAY BE IMPACTED BY ELECTRONIC SECURITY ISSUES. THE COMMITTEE HAS NOT YET ADDRESSED THE POTENTIAL ISSUES IN THIS VERSION.

The following people served as members of ISA Subcommittee ISA82.02:

NAME	COMPANY
R. Masek, Chairman	CSA International
D. Bishop, Managing Director	Consultant
R. Allen	Honeywell Inc.
R. Corson	Agilent Technologies
L. Eccleston	Fluke Corp.
P. Fabry	CSA International
J. Freudenberg	Teradyne Inc.
C. Gagliardi	FM Approvals
D. Hanson	Tektronix Inc.
T. Kimble	Dade Behring Inc.
D. Madsen	Underwriters Laboratories
C. Oleksak	Abbott Laboratories
H. O'Neil	Ridgewater College
P. Painchaud	Painchaud Consultants
R. Strube	INTERTEK
J. Tuthill	Proteus Industries Inc.

The following people service as members of ISA Committee ISA82:

NAME	COMPANY
R. Masek, Chairman	CSA International
D. Bishop, Managing Director	Consultant
D. Braudaway	Consultant
E. Child	Honeywell Inc.
B. Gibson	Detection Systems Inc.
W. Howard	Gulton Graphic Instruments
T. Kimble	Dade Behring Inc.
D. Madsen	Underwriters Laboratories Inc.
H. O'Neil	Ridgewater College
P. Painchaud	Painchaud Consultants
P. Perkins	PE Perkins PE
R. Strube	INTERTEK

This document was approved for publication by the ISA Standards and Practices Board on 16 February 2004.

NAME	COMPANY
V. Maggioli, Chair	Feltronics Corp.
K. Bond	Consultant
D. Bishop	David N. Bishop, Consultant
D. Bouchard	Paprican
M. Cohen	Consultant
M. Coppler	Ametek, Inc.
B. Dumortier	Schneider Electric
W. Holland	Consultant
E. Icayan	ACES, Inc.
A. Iverson	Ivy Optiks
R. Jones	Dow Chemical Co.
T. McAvinew	I&C Engineering, LLC
A. McCauley, Jr.	Chagrin Valley Controls, Inc.
G. McFarland	Emerson Process Management
D. Rapley	Rapley Consulting Inc.
R. Reimer	Rockwell Automation
J. Rennie	Factory Mutual Research Corp.
H. Sasajima	Yamatake Corp.
I. Verhappen	Syncrude Canada Ltd.
R. Webb	Consultant
W. Weidman	Parsons Energy & Chemicals Group
J. Weiss	KEMA Inc.
M. Widmeyer	Stanford Linear Accelerator Center
R. Wiegle	CANUS Corp.
C. Williams	Eastman Kodak Co.
M. Zielinski	Emerson Process Management

This page intentionally left blank.

Foreword (CSA)

The Canadian Standards Association (CSA) develops standards under the name Canadian Standards Association, and provides certification and testing under the name CSA International. CSA International provides certification services for manufacturers who, under license from CSA, wish to use the appropriate registered CSA Marks on certain products of their manufacture to indicate conformity with CSA Standards.

CSA Certification for a number of products is provided in the interest of maintaining agreed-upon standards of quality, performance, interchangeability and/or safety, as appropriate. Where applicable, certification may form the basis for acceptance by inspection authorities responsible for enforcement of regulations. Where feasible, programs will be developed for additional products for which certification is desired by producers, consumers, or other interests. In performing its functions in accordance with its objectives, CSA does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of the Association represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed.

Products in substantial accord with this Standard but which exhibit a minor difference or a new feature may be deemed to meet the Standard providing the feature or difference is found acceptable utilizing appropriate CSA International Operating Procedures. Products that comply with this Standard shall not be certified if they are found to have additional features which are inconsistent with the intent of this Standard. Products shall not be certifiable if they are discovered to contravene applicable laws or regulations.

Testing techniques, test procedures, and instrumentation frequently must be prescribed by CSA International in addition to the technical requirements contained in Standards of CSA. In addition to markings specified in the Standard, CSA International may require special cautions, markings, and instructions that are not specified by the Standard.

Some tests required by CSA Standards may be inherently hazardous. The Association neither assumes nor accepts any responsibility for any injury or damage that may occur during or as the result of tests, wherever performed, whether performed in whole or in part by the manufacturer or the Association, and whether or not any equipment, facility, or personnel for or in connection with the test is furnished by the manufacturer or the Association.

Manufacturers should note that, in the event of the failure of CSA International to resolve an issue arising from the interpretation of requirements, there is an appeal procedure: the complainant should submit the matter, in writing, to the Secretary of the Canadian Standards Association.

If this Standard is to be used in obtaining CSA Certification please remember, when making application for certification, to request all current Amendments, Bulletins, Notices, and Technical Information Letters that may be applicable and for which there may be a nominal charge. For such information or for further information concerning CSA Certification, please address your inquiry to Applications and Customer Service, CSA International, 178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3

This page intentionally left blank.

NATIONAL DIFFERENCES

In the CSA and UL publications of this standard, National Differences from the text of International Electrotechnical Commission (IEC) Publication 61010-1, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements copyright 2001 are indicated by notations (differences) and are presented in bold text. The national difference type is included in the body.

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 based on **safety practices**. These are differences for IEC requirements that may be acceptable, but adopting the IEC requirements would require considerable retesting or redesign on the manufacturer's part.

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**.

This page intentionally left blank.

CONTENTS

This page intentionally left blank.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 1: General requirements

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The 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 second edition cancels and replaces the first edition published in 1990, amendment 1 (1992) and amendment 2 (1995). It constitutes a technical revision.

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

FDIS	Report on voting
66/233/FDIS	66/244/RVD

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 3.

Annexes A to H form an integral 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: 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 2002. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

This part 1 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.

This page intentionally left blank.

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 electrical equipment intended for professional, industrial process, and educational use, any of which may incorporate computing devices, as defined in a) to d) below, when used under the environmental conditions of 1.4.

a) Electrical test and measurement equipment

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

NOTE All indicating and recording electrical measuring instruments (except those excluded in 1.1.2) fall within the scope of IEC 61010 unless they are panel meters designed only for building-in to other equipment. Built-in panel meters are considered to be components and only need to meet the relevant requirements of IEC 61010, or other standards, as part of the equipment into which they are built.

This Part 1 applies to test equipment integrated into manufacturing facilities intended for testing electronic devices, including silicon wafers and other semiconductor devices.

Note: This equipment is likely to be installed adjacent to and interconnected with industrial machinery in this application.

b) Electrical 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 or analyses substances, or is used to prepare materials, and includes in vitro diagnostic (IVD) equipment

This equipment may also be used in areas other than laboratories, for example self-test IVD equipment may be used in the home.

d) Accessories intended for use with the above (for example, sample handling equipment)

1.1.2 Equipment excluded from scope

This standard does not apply to equipment within the scope of

a) IEC 60065 (Safety requirements for audio, video and similar electronic apparatus);

b) IEC 60204 (Controls for electrical machines);

c) IEC 60335 (Safety of household and similar electrical appliances);

d) IEC 60364 (Electrical installations of buildings);

e) IEC 60439-1 (Low-voltage switchgear and controlgear assemblies);