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ANSI/ISA-61010-031 (82.02.02)-2007

Replaces ANSI/ISA-82.02.02-1996 (IEC 61010-2-031)

CAN/CSA-C22.2 No. 61010-031-07

ANSI/UL 61010-031

**Safety Requirements for Electrical Equipment
for Measurement, Control, and Laboratory Use –
Part 031: Safety requirements for hand-held probe
assemblies for electrical measurement and test**

Approved 28 March 2007

Commitment for Amendments

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The most recent designation of ANSI/UL 61010-031 and ANSI/ISA-61010-031 (82.02.02) as an American National Standard (ANSI) occurred on 28 March 2007.

This ANSI/UL Standard for Safety, which consists of the first edition, 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. Written comments are to be sent to the UL-Northbrook Standards Department, 333 Pfingsten Road, Northbrook, IL 60062.

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CAN/CSA-C22.2 No. 61010-031-07
First Edition
(IEC 61010-031:2002, Mod)



ISA
ANSI/ISA-61010-031 (82.02.02)
Second Edition



Underwriters Laboratories Inc.
ANSI/UL 61010-031
First Edition

Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 031: Safety requirements for hand-held probe assemblies for electrical measurement and test

28 March 2007

This standard is based on IEC 61010-031, First Edition (2002).



ANSI/UL 61010-031-2007

Approved
by
Standards Council
of Canada



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Preface

This is the common CSA, ISA, and UL standard for *Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 031: Safety requirements for hand-held probe assemblies for electrical measurement and test*. It is the first edition of CAN/CSA-C22.2 No. 61010-031-07, the second edition of ANSI/ISA-61010-031 (82.02.02), and the first edition of ANSI/UL 61010-031. This edition of ANSI/ISA-61010-031 (82.02.01) supersedes the previous edition of ISA-82.02.02-1996 (IEC 61010-2-031) published in 1996. This standard is based on IEC 61010-031, first edition.

CAN/CSA-C22.2 No. 61010-031-07, ANSI/ISA-61010-031 (82.02.02), and ANSI/UL 61010-031 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), ISA and Underwriters Laboratories Inc. (UL).

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

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 was also reviewed and approved by UL's Standards Technical Panel for Electrical Equipment for Measurement, Control, and Laboratory Use, STP 61010.

This standard has been approved as a National Standard of Canada by the Standards Council of Canada (SCC) and approved by the American National Standards Institute (ANSI) for publication 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 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.

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.

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

Foreword (ISA)

All text of IEC 61010-031:2002 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, and C are normative and are considered part of this standard. Annex D is informative and is 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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NATIONAL DIFFERENCES

In the CSA and UL publications of this standard, National Differences from the text of International Electrotechnical Commission (IEC) Publication 61010-031, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use — Part 031: Safety requirements for hand-held probe assemblies for electrical measurement and test, copyright 2002, 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).

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**.

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1 Scope and object

1.1 Scope

This ~~part of IEC 61010 standard~~ applies to hand-held and hand-manipulated PROBE ASSEMBLIES of the types described below, and related accessories which are intended for professional, industrial process, and educational use. These PROBE ASSEMBLIES are for use in the interface between an electrical phenomenon and test or measurement equipment. They may be fixed to the equipment or be detachable accessories for the equipment.

- a) Low-voltage and high-voltage, non-attenuating PROBE ASSEMBLIES (type A). ~~Non-attenuating PROBE ASSEMBLIES that are RATED for direct connection to voltages exceeding 33 V r.m.s. or 46,7 V peak or 70 V d.c., but not exceeding 63 kV. Non-attenuating PROBE ASSEMBLIES that are RATED for direct connection to voltages exceeding 30 V r.m.s. and 42,4 V peak or 60 V d.c., but not exceeding 63 kV.~~ They do not incorporate active components, nor are they intended to provide a voltage divider function or a signal conditioning function, but they may contain passive non-attenuating components such as fuses.
- b) High-voltage attenuating or divider PROBE ASSEMBLIES (type B). Attenuating or divider PROBE ASSEMBLIES that are RATED for direct connection to secondary voltages exceeding 1 kV but not exceeding 63 kV. The divider function may be carried out wholly within the PROBE ASSEMBLY, or partly within the test or measurement equipment to be used with the PROBE ASSEMBLY.
- c) Low-voltage attenuating or divider PROBE ASSEMBLIES (type C). ~~Attenuating, divider or other signal conditioning PROBE ASSEMBLIES for direct connection to voltages exceeding 33 V r.m.s. or 46,7 V peak or 70 V d.c., but not exceeding 1 kV r.m.s. or 1,5 kV d.c.~~ Attenuating, divider, or other signal conditioning PROBE ASSEMBLIES that are RATED for direct connection to voltages exceeding 30 V r.m.s. and 42,4 V peak or 60 V d.c., but not exceeding 1 kV r.m.s. or 1,5 kV d.c. The signal conditioning function may be carried out wholly within the PROBE ASSEMBLY, or partly within the test or measurement equipment intended to be used with the PROBE ASSEMBLY.

NOTE PROBE ASSEMBLIES which

- are not within the definitions of types A, B or C, or,
- which are designed to be powered from a low-voltage mains supply, or
- include other features not specifically addressed in this standard

may also need to meet the relevant requirements of other parts of IEC 61010 [6]¹⁾.

1.2 Object

1.2.1 Aspects included in scope

The object of this standard is to ensure that the design and methods of construction used provide adequate protection for the OPERATOR and the surrounding area against:

- a) electric shock or burn (see clauses 6, 10 and 11);

¹⁾ Figures in square brackets refer to the bibliography.

- b) mechanical HAZARDS (see clauses 7, 8 and 11);
- c) excessive temperature (see clause 9);
- d) spread of fire from the PROBE ASSEMBLY (see clause 9).

NOTE Attention is drawn to the existence of additional requirements which may be specified by national authorities responsible for health and safety of labour forces.

1.2.2 Aspects excluded from scope

This standard does not cover

- a) reliable function, performance or other properties of the PROBE ASSEMBLY;
- b) effectiveness of transport packaging;
- c) servicing (repair);
- d) protection of servicing (repair) personnel.

NOTE Servicing personnel are expected to be reasonably careful in dealing with obvious HAZARDS, but the design should protect against mishap in an appropriate manner, and the service documentation should point out any residual HAZARDS.

1.3 Verification

This standard also specifies methods of verifying, through inspection and TYPE TESTING, that the PROBE ASSEMBLY meets the requirements of this standard.

1.4 Environmental conditions

This standard applies to PROBE ASSEMBLIES designed to be safe at least under the following conditions:

- a) altitude up to 2 000 m, or above 2 000 m if specified by the manufacturer;
- b) temperature 5 °C to 40 °C; or below 5 °C or above 40 °C if specified by the manufacturer;
- c) maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C;
- d) applicable RATED POLLUTION degree.

This standard applies to equipment to be employed in accordance with ANSI/NFPA 70, National Electrical Code® (NEC®); designed to be installed in accordance with the Canadian Electrical Code (CEC), Part I, CSA C22.1, and General Requirements – Canadian Electrical Code, Part II, CSA C22.2 No. 0; or designed to comply with both the NEC and CEC.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this ~~part of IEC 61010 standard~~. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this ~~part of IEC 61010 standard~~ are encouraged to investigate the

possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60060 (all parts), *High-voltage test techniques*

IEC 60417 (all parts), *Graphical symbols for use on equipment*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60664-3, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coatings to achieve insulation coordination of printed board assemblies*

ISO 7000, *Graphical symbols for use on equipment – Index and synopsis*

3 Definitions

For the purpose of this ~~part of IEC 61010 standard~~ standard, the following definitions apply.

Unless otherwise specified, the terms "voltage" and "current" mean the r.m.s. values of an alternating, direct or composite voltage or current. Where the term "mains" is used, it refers to the low-voltage electricity supply system (above the values of 6.3.2.1).

3.1 Parts and accessories

3.1.1

TERMINAL

component provided for the connection of a device (equipment) to external conductors

[IEV 151-01-03, modified]

NOTE TERMINALS can contain one or several contacts and the term includes sockets, pins, connectors, etc.

3.1.2

ENCLOSURE

part providing protection of equipment against certain external influences and, in any direction, protection against direct contact

3.1.3

BARRIER

part providing protection against direct contact from any usual direction of access

NOTE ENCLOSURES and BARRIERS may provide protection against the spread of fire (see 9.1).

3.1.4

PROBE ASSEMBLY

device for making temporary contact between test or measurement equipment and a point on an electrical circuit being measured or tested. It includes the cable and the means for making a connection with the test or measurement equipment

NOTE See figures 1 and 2 for examples of PROBE ASSEMBLIES and an explanation of the function of their parts.

3.1.5

PROBE TIP

part of the PROBE ASSEMBLY which makes the connection to the point being measured or tested

3.1.6

REFERENCE CONNECTOR

device used to connect a reference point in the test or measurement equipment (usually the functional earth TERMINAL) to a reference point on the electrical circuit being measured or tested

3.1.7

TOOL

external device, including a key or coin, used to aid a person to perform a mechanical function

3.2 Electrical quantities

3.2.1

RATED (value)

quantity value assigned, generally by a manufacturer, for a specified operating condition of a component, device or equipment

[IEV 151-04-03]

3.2.2

RATING

set of RATED values and operating conditions

[IEV 151-04-04]

3.2.3

WORKING VOLTAGE

highest voltage which can continuously appear across an insulation during NORMAL USE

NOTE Both open-circuit conditions and normal operating conditions are taken into account.

3.3 Tests

3.3.1

TYPE TEST

test of one or more samples of equipment (or parts of equipment) made to a particular design, to show that the design and construction meet one or more requirements of this standard

NOTE This is an amplification of the IEV 151-04-15 definition to cover both design and construction requirements.

3.4 Safety terms

3.4.1

ACCESSIBLE (of a part)

able to be touched with a standard test finger or test pin, when used as specified in 6.2

3.4.2

HAZARDOUS LIVE

capable of rendering an electric shock or electric burn in NORMAL CONDITION or SINGLE FAULT CONDITION (see 6.3.1 for values applicable to NORMAL CONDITION and 6.3.2 for the higher values deemed to be appropriate in SINGLE FAULT CONDITION)

3.4.3**HIGH INTEGRITY**

not liable to become defective in such a manner as to cause a risk of HAZARD; a HIGH INTEGRITY part is considered as not subject to failure when tests under fault conditions are made

3.4.4**PROTECTIVE IMPEDANCE**

component, assembly of components or the combination of BASIC INSULATION and a current or voltage limiting device, the impedance, construction and reliability of which are such that when connected between parts which are HAZARDOUS LIVE and ACCESSIBLE conductive parts, it provides protection to the extent required by this standard in NORMAL CONDITION and SINGLE FAULT CONDITION

3.4.5**NORMAL USE**

operation, including stand-by, according to the instructions for use or for the obvious intended purpose

NOTE In most cases, NORMAL USE also implies NORMAL CONDITION, because the instructions for use will warn against using the equipment when it is not in NORMAL CONDITION.

3.4.6**NORMAL CONDITION**

condition in which all means for protection against HAZARDS are intact

3.4.7**SINGLE FAULT CONDITION**

condition in which one means for protection against HAZARD is defective or one fault is present which could cause a HAZARD

NOTE If a SINGLE FAULT CONDITION results unavoidably in another SINGLE FAULT CONDITION, the two failures are considered as one SINGLE FAULT CONDITION.

3.4.8**OPERATOR**

person operating equipment for its intended purpose

NOTE The OPERATOR should have received training appropriate for this purpose.

3.4.9**RESPONSIBLE BODY**

individual or group responsible for the use and maintenance of equipment, and for ensuring that OPERATORS are adequately trained

3.4.10**WET LOCATION**

Location where water or another conductive liquid may be present and is likely to cause reduced human body impedance due to wetting of the contact between the human body and the equipment, or wetting of the contact between the human body and the environment

3.4.11**HAZARD**

potential source of harm (see 1.2)

3.5 Insulation

3.5.1

BASIC INSULATION

insulation, the failure of which could cause a risk of electric shock

NOTE BASIC INSULATION may serve also for functional purposes.

3.5.2

SUPPLEMENTARY INSULATION

independent insulation applied in addition to BASIC INSULATION in order to provide protection against electric shock in the event of a failure of BASIC INSULATION

3.5.3

DOUBLE INSULATION

insulation comprising both BASIC INSULATION and SUPPLEMENTARY INSULATION

3.5.4

REINFORCED INSULATION

insulation which provides protection against electric shock not less than that provided by DOUBLE INSULATION

NOTE REINFORCED INSULATION may comprise several layers which cannot be tested singly as SUPPLEMENTARY INSULATION or BASIC INSULATION.

3.5.5

POLLUTION

any addition of foreign matter, solid, liquid or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity

3.5.6

POLLUTION degree

for the purpose of evaluating CLEARANCES one of three degrees of POLLUTION in the micro-environment, which are recognized for use with this International Standard

3.5.6.1

POLLUTION degree 1

no POLLUTION or only dry, non-conductive POLLUTION

NOTE The POLLUTION has no influence.

3.5.6.2

POLLUTION degree 2

only non-conductive POLLUTION. Occasionally, however, a temporary conductivity caused by condensation must be expected

3.5.6.3

POLLUTION degree 3

conductive POLLUTION occurs or dry non-conductive POLLUTION occurs which becomes conductive due to condensation which is to be expected

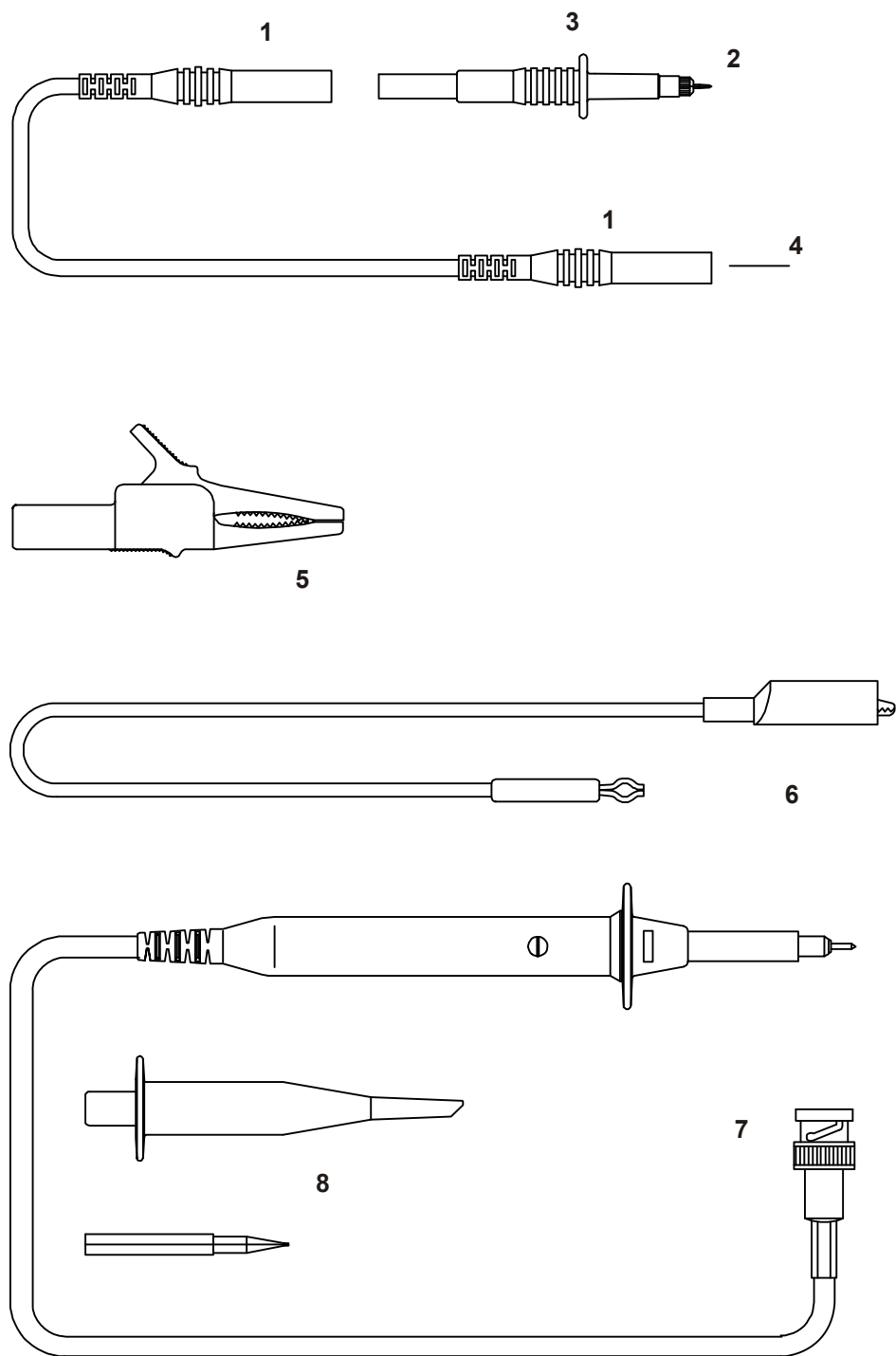
3.5.7**CLEARANCE**

shortest distance in air between two conductive parts

3.5.8**CREEPAGE DISTANCE**

shortest distance along the surface of the insulating material between two conductive parts

[IEV 151-03-37]

**Key**

- | | |
|----------------------|---------------------------|
| 1 Typical connectors | 5 Crocodile clip |
| 2 PROBE TIP | 6 Reference connector |
| 3 Probe body | 7 BNC connector |
| 4 To equipment | 8 Examples of accessories |

IEC 2507/01

Figure 1 – Examples of type A and C PROBE ASSEMBLIES