UL 61010-2-032

STANDARD FOR SAFETY

Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-032: Particular Requirements for Hand-Held and Hand-Manipulated Current Sensors for Electrical Test and Measurement

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UL Standard for Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-032: Particular Requirements for Hand-Held and Hand-Manipulated Current Sensors for Electrical Test and Measurement, UL 61010-2-032

Third Edition, Dated October 17, 2024

Summary of Topics

This new Third Edition of ANSI/UL 61010-2-032 dated October 17, 2024 is an Adoption of IEC 61010-2-032, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-032: Particular Requirements for Hand-Held and Hand-Manipulated Current Sensors for Electrical Test and Measurement (fifth edition, issued by IEC September 2023) as a new IEC-based UL standard with US National Differences.

The requirements are substantially in accordance with Proposal(s) on this subject dated August 2, 2024.

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UL 61010-2-032

Standard for Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-032: Particular Requirements for Hand-Held and Hand-Manipulated Current Sensors for Electrical Test and Measurement

First Edition – August, 2014
Second Edition – January, 2020

Third Edition

October 17, 2024

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

The most recent designation of ANSI/UL 61010-2-032 as an American National Standard (ANSI) occurred on October 17, 2024. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or 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 ULSE at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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PREFACE (UL)

This UL Standard is based on IEC Publication 61010-2-032: fifth edition Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-032: Particular requirements for hand-held and hand-manipulated current sensors for electrical test and measurement. IEC publication 61010-2-032 is copyrighted by the IEC.

This edition has been issued to satisfy ULSE Standards policy.

This UL Standard 61010-2-032 Standard for Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-032: Particular Requirements for Hand-Held and Hand-Manipulated Current Sensors for Electrical Test and Measurement, is to be used in conjunction with the lastest edition of UL 61010-1. The requirements for measurement equipment for insulation resistance and test equipment for electric strength are contained in this Part 2 Standard and UL 61010-1.

Requirements of this Part 2 Standard, where stated, amend the requirements of UL 61010-1.

Where a particular subclause of UL 61010-1 is not mentioned in UL 61010-2-032, the UL 61010-1 subclause applies.

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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.

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NATIONAL DIFFERENCES

National Differences from the text of International Electrotechnical Commission (IEC) Publication 61010-2-032, Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-032: Particular requirements for hand-held and hand-manipulated current sensors for electrical test and measurement, copyright 2023 are indicated by notations (differences) and are presented in bold text.

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.

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**.

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

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

SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE – Part 2-032: Particular requirements for hand-held and hand-manipulated current sensors for electrical test and measurement

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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IEC 61010-2-032 has been prepared by IEC technical committee 66: Safety of measuring, control and laboratory equipment. It is an International Standard.

This fifth edition cancels and replaces the fourth edition published in 2019. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) In 1.1.1, definitions of current sensor types have been moved to a new Annex FF;

b) Clause 2, all normative references have been dated and new normative references have been added;

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c) 3.2.103, a new definition PROTECTIVE FINGERGUARD has been added which replaces the previous definition of PROTECTIVE BARRIER;

d) 4.4.2.101 is a new subclause about surge protective devices;

e) in 5.1.5.101.2, minimum RATINGS for voltage of measuring TERMINALS are required;

f) Subclause 6.5.1 has been modified;

g) Subclause 6.5.5 is no longer used;

h) Subclause 6.6.101 modifies 6.6.101 and 6.6.102 of previous edition:

1) in 6.6.101.1, insulating material of group I may be allowed for determination of CREEPAGE DISTANCES of measuring circuit TERMINALS;

2) in 6.6.101.2, CLEARANCES and CREEPAGE DISTANCES up to 3 000 V for measuring circuit TERMINALS in unmated position have been defined;

3) in 6.6.101.3, requirements for measuring circuit TERMINALS in partially mated position have been specified;

4) in 6.6.101.4, requirements for measuring circuit TERMINALS in mated position have been specified;

5) Subclause 6.6.101.5 replaces 6.6.102;

i) Subclause 6.6.102 replaces 6.101 of previous edition with modifications;

j) Subclause 6.101.2 replaces 6.9.101.1 of previous edition with modifications;

k) Subclause 6.101.3 replaces 6.9.101.2 of previous edition with modifications;

l) Subclause 6.101.4 replaces 6.9.102 of previous edition with modifications;

m) in 8.101, JAW ENDS abrasion test has been modified;

n) 8.105 is a new subclause for input/output leads attachment has been added;

o) in 9.101.2, relocation of 101.3 of previous edition;

p) in 9.101.3, relocation of 101.4 of previous edition, extension to MEASUREMENT CATEGORY II and reference to IEC 61000-4-5 for tests;

q) Table 104 has been replaced by Table K.101;

r) in 9.102, relocation of Clause 102 of previous edition;

s) in 14.101, relocation of 14.102. Subclause 14.101 of previous edition has been deleted;

t) 101.3 is a new subclause for protections against HAZARD occurring from reading a voltage value in replacement of Clause EE.5 of previous edition;

u) in Table D.101, transients are disregarded for insulation between JAW ENDS and input/output circuits;

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v) in Clause F.101, test voltages for routine test of JAWS have been modified;

w) in K.2.1, another method for determination of CLEARANCES of secondary circuits is proposed;

x) in K.3.2, new Table K.15 and Table K.16 for CLEARANCE calculation;

y) K.3.101 is a new clause;

z) Clause K.4, redraft of the clause to propose a method for determination of U_t for circuits which reduce TRANSIENT OVERVOLTAGES;

aa) Table K.101 replaces Table 104;

bb) Subclause K.101.4 has been reviewed and tables and tests for solid insulation have been modified;

cc) Table K.104 of previous edition has been deleted;

dd) Annex AA: Figure AA.1 has been redesigned;

ee) Annex EE: addition of a new informative annex for determination of CLEARANCES for Table 101;

ff) Annex GG: this annex was Annex EE of previous edition and the current sensor type of a CLAMP MULTIMETER is type A or type B.

The text of this International Standard is based on the following documents:

Draft	Report on voting
66/788A/FDIS	66/798/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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*, can be found on the IEC website.

This document is to be used in conjunction with IEC 61010-1:2010 and IEC 61010-1:2010/AMD1:2016.

This document supplements or modifies the corresponding clauses in IEC 61010-1 so as to convert that publication into the IEC standard: *Particular requirements for hand-held and hand-manipulated current sensors for electrical test and measurement*.

Where a particular subclause of IEC 61010-1 is not mentioned in this document, that subclause applies as far as is reasonable. Where this document states "addition", "modification", "replacement", or "deletion", the relevant requirement, test specification or note in IEC 61010-1 should be adapted accordingly.

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In this standard:

a) the following print types are used:

– requirements: in roman type;

– NOTES: in small roman type;

– *conformity and tests: in italic type;*

– terms used throughout this standard which have been defined in Clause 3: SMALL ROMAN CAPITALS;

b) subclauses, figures, tables and notes which are additional to those in IEC 61010-1 are numbered starting from 101. Additional annexes are lettered starting from AA and additional list items are lettered from aa).

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

• reconfirmed,

• withdrawn,

• replaced by a revised edition, or

• amended.

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101DV DE *Modification to add the following to 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.

102DV DE *Modification to add the following to the IEC Foreword:*

For this Standard, all references to “IEC 61010-1:2010” or “IEC 61010 1:2010/AMD1:2016” refer to UL 61010-1.

For this Standard, all references to IEC 61010-2-030, IEC 61010-2-033 and IEC 61010-2-034 refer to UL versions of the particulars.

For this Standard, all references to IEC 61010-031 refer to UL 61010-031.

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INTRODUCTION

IEC 61010-1 specifies the safety requirements that are generally applicable to all equipment within its scope. For certain types of equipment, the requirements of IEC 61010-1 and its amendment will be supplemented or modified by the special requirements of one or more standard from the IEC 61010-2 series which is/are read in conjunction with the requirements of IEC 61010-1.

1) IEC 61010-2-030:2023 specifies the safety requirements for equipment with testing or measuring circuits which are connected for test or measurement purposes to devices or circuits outside the measurement equipment itself.

2) This document specifies the safety requirements for hand-held and hand-manipulated current sensors for measuring, detecting or injecting current, or indicating current waveforms on circuits without physically opening the current path of the circuit being measured.

Most of the requirements of IEC 61010-2-030:2023 have been included in this document. Equipment within the scopes of both IEC 61010-2-030:2023 and this document is considered to be covered by the requirements of this document.

However, for current sensors in combined equipment with protective bonding and automatic disconnection of the supply, IEC 61010-2-030:2023 and this document are read in conjunction.

3) IEC 61010-2-033:2023 specifies the safety requirements for hand-held multimeters and other meters for domestic and professional use, capable of measuring mains voltage, intended to measure voltage and other electrical quantities such as resistance or current.

All relevant requirements of IEC 61010-2-030 have been included in IEC 61010-2-033:2023.

4) IEC 61010-2-034:2023 specifies the safety requirements for measurement equipment for insulation resistance and test equipment for electric strength which are connected to units, lines or circuits for test or measurement purposes.

All relevant requirements of IEC 61010-2-030:2023 have been included in IEC 61010-2-034:2023. However, for equipment within the scope of this document and IEC 61010-2-034:2023, these standards are read in conjunction.

IEC 61010-031 specifies the safety requirements for hand-held and hand-manipulated probe assemblies and their related accessories intended to be used in particular with equipment in the scope of IEC 61010-2-030, this document, IEC 61010-2-033 and IEC 61010-2-034. These probe assemblies are for non-contact or direct electrical connection between a part and electrical test and measurement equipment. They may be fixed to the equipment or be detachable accessories for the equipment.

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SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE – Part 2-032: Particular requirements for hand-held and hand-manipulated current sensors for electrical test and measurement

1 Scope and object

IEC 61010-1:2010, Clause 1 and IEC 61010-1:2010/AMD1:2016, Clause 1 apply except as follows:

1.1.1 Equipment included in scope

Replace the existing text with the following:

This document specifies safety requirements for HAND-HELD and hand-manipulated current sensors intended for measuring, detecting or injecting current, or indicating current waveforms on circuits without physically opening the current path of the circuit being measured.

These current sensors are hand-manipulated before and/or after a test or measurement, but are not necessarily HAND-HELD during the test or measurement. They can be stand-alone current sensors or accessories to other equipment or parts of combined equipment. These include measurement circuits which are part of electrical test and measurement equipment, laboratory equipment, or process control equipment.

NOTE 1 Combined equipment is equipment that is electrically connected to a current sensor by means of a permanent connection which can be detached only by the use of a TOOL.

NOTE 2 Some current sensors are also known as current clamps, CLAMP MULTIMETERS and current probes.

The types of current sensors covered by this document are defined in Annex FF.

1.1.2 Equipment excluded from scope

Add the following new paragraph:

This document does not apply to current sensors used as FIXED EQUIPMENT.

1.2.1 Aspects included in scope

Replace item c) of the second paragraph with the following new item c):

c) spread of fire or arc flash from the current sensor (see Clause 9);

Replace the third paragraph with the following two new paragraphs:

Requirements for protection against HAZARDS arising from NORMAL USE, REASONABLY FORESEEABLE MISUSE and ergonomic factors are specified in Clause 16, Clause 101 and Annex GG.

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Annex BB provides guidance to equipment manufacturers on HAZARDS that should be considered for equipment intended for performing tests and measurements on hazardous conductors, including MAINS conductors and telecommunication network conductors.

2 Normative references

IEC 61010-1:2010, Clause 2 and IEC 61010-1:2010/AMD1:2016, Clause 2 apply except as follows:

Replace the following existing normative references:

IEC 60068-2-75, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60364-4-44:2007, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*
IEC 60364-4-44:2007/AMD1:2015

IEC 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*

IEC 61180 (all parts), *High-voltage test techniques for low-voltage equipment*

IEC 61180-1, *High-voltage test techniques for low-voltage equipment – Part 1: Definitions, test and procedure requirements*

IEC 61180-2, *High-voltage test techniques for low-voltage equipment – Part 2: Test equipment*

IEC 62262, *Degrees of protection provided by enclosures for electrical equipment against external impacts (IK code)*

with the following new normative references:

IEC 60068-2-75:2014, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60364-4-44:2007, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*
IEC 60364-4-44:2007/AMD1:2015
IEC 60364-4-44:2007/AMD2:2018

IEC 61010-031:2022, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 031: Safety requirements for hand-held and hand-manipulated probe assemblies for electrical test and measurement*

IEC 61180:2016, *High-voltage test techniques for low-voltage equipment – Definitions, test and procedure requirements, test equipment*[1]

[1] "IEC 61180:2016" replaces everywhere IEC 61180, IEC 61180-1 and IEC 61180-2 are referenced in IEC 61010-1.

IEC 62262:2002, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*
IEC 62262:2002/AMD1:2021

Add the following new normative reference:

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IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*
IEC 61000-4-5:2014/AMD1:2017

2DV DR *Modification: Add the following*

The requirements of this UL Standard shall take precedence over the International Standard on which it is based; any reference within this standard to the International Standard shall be replaced by a reference to the equivalent US Standard.

3 Terms and definitions

IEC 61010-1:2010, Clause 3 and IEC 61010-1:2010/AMD1:2016, Clause 3 apply except as follows:

3.1 Equipment and states of equipment

Add the following two new terms and definitions:

3.1.101
HAND-HELD
intended to be supported by one hand during NORMAL USE

3.1.102
CLAMP MULTIMETER
HAND-HELD multi-range and multifunction measuring instrument intended to measure current on a live MAINS without physically opening the conductors, voltage on a live MAINS and other electrical quantities such as resistance

3.2 Parts and accessories

Add the following three new terms and definitions:

3.2.101
JAW
part of a current sensor which surrounds or partially surrounds the conductor under test

3.2.102
JAW END
part of the JAW where opening occurs while clamping around a conductor

3.2.103
PROTECTIVE FINGERGUARD
part of the enclosure that indicates the limit of safe access and that reduces the risk of the operator touching HAZARDOUS LIVE parts

3.5 Safety terms

Replace the definition of 3.5.4 with the following new definition:

3.5.4
MAINS
electricity supply system

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Add the following new term and definition:

3.5.101
MEASUREMENT CATEGORY
classification of testing and measuring circuits according to the type of MAINS to which they are intended to be connected

3.6 Insulation

Add the following new term and definition:

3.6.101
UNINSULATED CONDUCTOR
conductor which is not insulated by solid insulation or which is insulated by solid insulation that does not meet the requirements for BASIC INSULATION for the relevant voltage to earth

4 Tests

IEC 61010-1:2010, Clause 4 and IEC 61010-1:2010/AMD1:2016, Clause 4 apply except as follows:

4.3.2.5 MAINS supply

Replace the existing title and text with the following:

4.3.2.5 Power supply

The following requirements apply:

a) the voltage of the power supply connected to the MAINS shall be between 90 % and 110 % of any RATED supply voltage for which the current sensor can be set or, if the current sensor is RATED for a greater fluctuation, at any supply voltage within the fluctuation range;

b) the MAINS frequency shall be any RATED frequency;

c) current sensors for both a.c. and d.c. shall be connected to an a.c. or d.c. supply;

d) current sensors powered from MAINS by single-phase a.c. shall be connected both with normal and reverse polarity;

e) if the means of connection permit reversal, battery-operated and d.c. current sensors shall be connected with both reverse and normal polarity.

4.3.2.6 Input and output voltages

Replace the existing title and text with the following:

4.3.2.6 Input and output voltages or currents

Input and output voltages or currents, including floating voltages but excluding the supply voltage connected to the MAINS, shall be set to any voltage or current within their RATED range, in normal and reverse polarity if possible.

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