



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

Second Edition, Dated January 10, 2020

Summary of Topics

This new edition of ANSI/UL 61010-2-032 dated January 10, 2020 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 (fourth edition, issued by IEC June 2019) as a new IEC-based UL standard with no US Differences.

The requirements are substantially in accordance with Proposal(s) on this subject dated August 30, 2019.

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ANSI/UL 61010-2-032-2020

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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 10, 2020

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

The most recent designation of ANSI/UL 61010-2-032 as an American National Standard (ANSI) occurred on January 10, 2020. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or Preface. The IEC Foreword is 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 UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line 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: 4.0 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 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 latest edition of UL 61010-1. The requirements for hand-held and hand-manipulated current sensors for electrical test and measurement 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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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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8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

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

This fourth edition cancels and replaces the third edition published in 2012. This edition constitutes a technical revision.

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

a) It has been indicated that current sensors used as FIXED EQUIPMENT are not within the scope of this document.

- b) Fork-style current sensors have been added.
- c) Requirements from Part 2-033 applicable to CLAMP MULTIMETERS that have a primary purpose of measuring voltage on live MAINS have been included in the new normative Annex EE.
- d) CLEARANCES and CREEPAGE DISTANCES for measuring circuit TERMINALS exceeding 1 000 V a.c. or 1 414 V d.c. and for WET LOCATIONS have been specified.
- e) Reduced CREEPAGE DISTANCES are allowed to be according to material group I for all insulating materials.
- f) Requirements for input/output circuits of Type A, Type B and Type C current sensors have been detailed in 6.9.102.
- g) Requirements for output circuit leads have been modified.
- h) The JAW impact test has been limited to the front of the JAWS.
- i) The abrasion test for cords of flexible current sensors has been removed and replaced by a pressure test at high temperature.
- j) The voltage source for testing overvoltage limiting components or circuits may be limited to 400 V.
- k) Reference to IEC 61010-031 for probe assemblies has been added.
- l) Requirements for the prevention of TRANSIENT OVERVOLTAGES for MAINS voltage measuring circuits have been added.
- m) Requirements for measuring circuits from 1 000 V to 3 000 V have been added.
- n) An informative Annex CC about the dimensions of banana TERMINALS has been added.
- o) A flowchart for insulation according to the type of circuit has been added in a new Annex DD.

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

FDIS	Report on voting
66/691/FDIS	66/695/RVD

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

This document 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*, can be found on the IEC website.

This Part 2-032 is to be used in conjunction with the latest edition of IEC 61010-1. It was established on the basis of the third edition (2010) of IEC 61010-1 and its Amendment 1 (2016), hereinafter referred to as Part 1.

This Part 2-032 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 Part 1 is not mentioned in this Part 2-032, that subclause applies as far as is reasonable. Where this Part 2-032 states "addition", "modification", "replacement", or "deletion" the relevant requirement, test specification or note in Part 1 should be adapted accordingly.

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 Part 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 "<http://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
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INTRODUCTION

Part 2-030 specifies the safety requirements for equipment with testing and measuring circuits which are connected for test or measurement purposes to devices or circuits outside the measurement equipment itself. Requirements of Part 2-030 have been included in this Part 2-032. Equipment within the scopes of both Part 2-030 and Part 2-032 are considered to be covered by the requirements of this Part 2-032.

Part 2-033 specifies the safety requirements for hand-held multimeters that have the primary purpose of measuring voltage on live MAINS. For equipment within the scope of Part 2-032 and Part 2-033, only this Part 2-032 is applicable.

Part 2-034 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. For equipment within the scope of Part 2-032 and Part 2-034, both documents should be read in conjunction.

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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

This clause of Part 1 is applicable except as follows:

1.1.1 Equipment included in scope

Replace the existing text with the following:

This part of IEC 61010 specifies safety requirements for HAND-HELD and hand-manipulated current sensors described below.

These current sensors are for measuring, detecting or injecting current, or indicating current waveforms on circuits without physically opening the current path of the circuit being measured. They can be stand-alone current sensors or accessories to other equipment or parts of combined equipment (see [Figure 101](#)). These include measurement circuits which are part of electrical test and measurement equipment, laboratory equipment, or process control equipment. These current sensors and circuits need additional protective means between the current sensor, the circuit and an OPERATOR.

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.

Current sensors are hand-manipulated before and/or after a test or measurement, but do not necessarily need to be HAND-HELD during the test or measurement. Current sensors used as FIXED EQUIPMENT are not within the scope of this document.

The following types of current sensors are covered:

a) Type A: a current sensor designed to be applied to or removed from HAZARDOUS LIVE UNINSULATED CONDUCTORS. Type A current sensors have defined HAND-HELD or hand-manipulated parts providing protection against electric shock from the conductor being measured, and also have protection against short-circuits between wires and between busbars during clamping.

b) Type B: a current sensor which has protection against short-circuits between wires or busbars during clamping but without defined HAND-HELD or hand-manipulated parts which provide protection against electric shock during clamping. Additional protective means are necessary to avoid electric shock from HAZARDOUS LIVE conductors which cannot be de-energised during application or removal of the current sensor.

EXAMPLE 1 Flexible current sensors.

c) Type C: a current sensor without protection against short-circuits between wires or busbars during clamping. Type C current sensors are intended to be applied to or removed from HAZARDOUS LIVE UNINSULATED CONDUCTORS or from non-limited-energy circuit conductors only when they are de-energised.

EXAMPLE 2 Split-core transducers.

d) Type D: a current sensor designed to be applied to or removed from insulated conductors or from limited-energy circuit conductors.

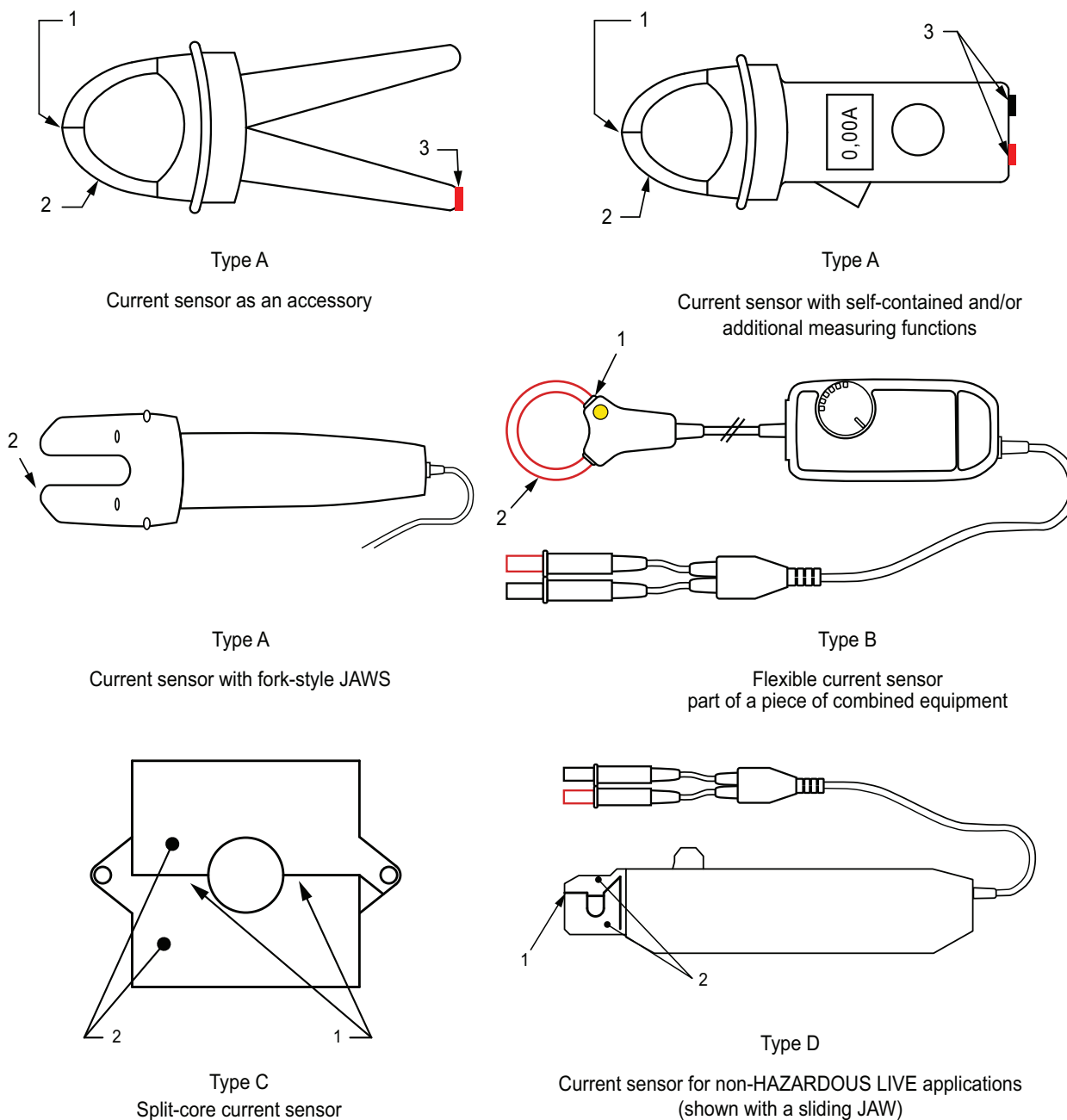
EXAMPLE 3 Current probes for oscilloscopes and earth leakage current detectors.

All current sensors can also be used with insulated conductors. In this case, HAZARDS are limited to acceptable levels by the insulation of the conductors.

Additional requirements for CLAMP MULTIMETERS are given in Annex [EE](#).

[Figure 101](#) shows graphical representations of typical current sensors for illustration purposes. Current sensors can look different depending on the design.

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Key

- 1 JAW END(S)
- 2 JAW
- 3 Measuring circuit TERMINALS

Figure 101**Examples of current sensors and their parts**

1.2.1 Aspects included in scope

Add the following three new paragraphs at the end of the subclause:

Requirements for protection against HAZARDS resulting from NORMAL USE and REASONABLY FORESEEABLE MISUSE of measuring circuits are given in Clause [101](#).

Requirements for prevention of HAZARD from arc flash and short-circuits are given in Clause [102](#).

Requirements for reliance on the displayed value of CLAMP MULTIMETERS are given in Clause [EE.5](#).

2 Normative references

This clause of Part 1 is applicable except as follows:

Replace "IEC 61010-031" with the following new reference:

IEC 61010-031:2015, *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 61010-031:2015/AMD1:2018

Replace "IEC 61180-1 (all parts)", "IEC 61180-1" and "IEC 61180-2", with the following new reference:

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

3 Terms and definitions

This clause of Part 1 is applicable 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 two 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

3.5 Safety terms

Replace the definition of 3.5.4 with the following new definition:

3.5.4

MAINS

electricity supply system

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

Note 1 to entry: MEASUREMENT CATEGORIES take into account OVERVOLTAGE CATEGORIES, short-circuit current levels, the location in the building installation where the test or measurement is to be made and some forms of energy limitation or transient protection included in the building installation. See Annex [AA](#) for more information.

3.6 Insulation

Add the following new term and definition:

3.6.101

UNINSULATED CONDUCTOR

conductor not insulated by solid insulation or insulated by solid insulation which does not meet the requirements for BASIC INSULATION for the relevant voltage to earth

4 Tests

This clause of Part 1 is applicable except as follows:

4.3.2.5 MAINS supply

Replace the existing title and text with:

4.3.2.5 Power supply

The following requirements apply.

a) The MAINS supply voltage shall be between 90 % and 110 % of any RATED supply voltage for which the equipment can be set or, if the equipment is RATED for a greater fluctuation, at any supply voltage within the fluctuation range.

b) The MAINS frequency shall be any RATED frequency.

c) Equipment for both a.c. and d.c. shall be connected to an a.c. or d.c. supply.

d) Equipment powered by single-phase a.c. MAINS supply shall be connected both with normal and reverse polarity.