

INTERNATIONAL STANDARD

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Safety requirements for electrical equipment for measurement, control, and laboratory use –

Part 2-033: Particular requirements for hand-held multimeters and other meters for domestic and professional use, capable of measuring mains voltage

[IEC 61010-2-033:2023 ED3](#)

Exigences de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire –

[61010-2-033-2023-ed3](#)

Partie 2-033: Exigences particulières pour les multimètres portatifs pour usage domestique et professionnel, capables de mesurer la tension réseau



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**Safety requirements for electrical equipment for measurement, control, and laboratory use –
Part 2-033: Particular requirements for hand-held multimeters and other meters for domestic and professional use, capable of measuring mains voltage**

IEC 61010-2-033:2023 ED3

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Partie 2-033: Exigences particulières pour les multimètres portatifs pour usage domestique et professionnel, capables de mesurer la tension réseau

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT
FOR MEASUREMENT, CONTROL, AND LABORATORY USE –****Part 2-033: Particular requirements for hand-held multimeters
and other meters for domestic and professional use,
capable of measuring mains voltage**

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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IEC 61010-2-033 has been prepared by IEC technical committee 66: Safety of measuring, control and laboratory equipment. It is an International Standard.

This third edition cancels and replaces the second 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) Clause 2, all normative references have been dated and new normative references have been added;
- b) 4.4.2.101 is a new subclause about surge protective devices;

- c) 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;
- d) Subclause 6.101 replaces 6.9.101 of the previous edition with modifications;
- e) 9.101 is a new subclause to consider the protection of measuring circuits against the spread of fire and arc flash;
- f) in 9.101.2, relocation of 101.3 of previous edition;
- g) in 9.101.3, relocation of 101.4 of previous edition;
- h) in 101.3, relocation of Clause 102 of previous edition;
- i) in K.2.1, another method for determination of CLEARANCES of secondary circuits is proposed;
- j) in K.3.2, new Table K.15 and Table K.16 for CLEARANCE calculation;
- k) Clause K.4 of the previous edition has been deleted;
- l) Subclause K.101.4 has been reviewed;
- m) Table K.104 of the previous edition has been deleted;
- n) Annex AA: Figure AA.1 has been redesigned;
- o) Annex EE: addition of a new informative annex for determination of CLEARANCES for the purposes of Table 101.

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

Draft	Report on voting
66/787/FDIS	66/797/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 multimeters and other meters for domestic and professional use, capable of measuring mains voltage*.

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.

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
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IEC 61010-2-033:2023 ED3

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

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) IEC 61010-2-032:2023 specifies the safety requirements for hand-held and hand-manipulated current sensors for measuring, detecting, 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 IEC 61010-2-032:2023. Equipment within the scopes of both IEC 61010-2-030:2023 and IEC 61010-2-032:2023 is considered to be covered by the requirements of IEC 61010-2-032:2023.

However, for current sensors in combined equipment with protective bonding and automatic disconnection of the supply, IEC 61010-2-030:2023 and IEC 61010-2-032:2023 are read in conjunction.

- 3) This document 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 61010-2-030:2023 have been included in this document.

- 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 IEC 61010-2-032:2023 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, IEC 61010-2-032, this document, 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.

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

Part 2-033: Particular requirements for hand-held multimeters and other meters for domestic and professional use, capable of measuring mains voltage

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 multimeters and other meters for domestic and professional use, capable of measuring MAINS.

Hand-held multimeters are multi-range multifunction measuring instruments intended to measure voltage and other electrical quantities such as resistance or current. Their primary purpose is to measure voltage on a live MAINS. They are suitable to be supported by one hand during NORMAL USE.

1.1.2 Equipment excluded from scope

Add the following new item to the list and the following paragraph:

- aa) IEC 61557 (all parts), *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures*

HAND-HELD EQUIPMENT such as oscilloscopes, wattmeters, process control multimeters not RATED for measuring voltage on a live MAINS, clamp multimeters and communications test sets are not within the scope of this document.

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 hand-held multimeters (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 and Clause 101.

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 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*

with the following new normative references:

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

Add the following new normative references:

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

IEC 61010-2-030:2023, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-030: Special requirements for testing and measuring circuits*

IEC 61010-2-032:2023, *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 IEC 61180:2016 replaces everywhere IEC 61180, IEC 61180-1 and IEC 61180-2 are referenced in IEC 61010-1.

3 Terms and definitions

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

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

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 hand-held multimeter can be set or, if the hand-held multimeter is RATED for a greater fluctuation, at any supply voltage within the fluctuation range;
- b) the MAINS frequency shall be any RATED frequency;
- c) hand-held multimeters for both a.c. and d.c. shall be connected to an a.c. or d.c. supply;
- d) hand-held multimeters 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. hand-held multimeters 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.

Add the following new subclause:

4.4.2.101 Surge protective devices

Surge protective devices used in MAINS CIRCUITS or in circuits measuring MAINS shall be short-circuited and open-circuited.

5 Marking and documentation

IEC 61010-1:2010, Clause 5 and IEC 61010-1:2010/AMD1:2016, Clause 5 apply except as follows:

5.1.2 Identification

Add the following note after the existing note:

NOTE 101 Some national regulations can require a marking to indicate the name and edition of the standard used for compliance evaluation.

5.1.5 TERMINALS, connections and operating devices

5.1.5.1 General

Replace the first paragraph with the following:

If necessary for safety, an indication shall be given of the purpose of TERMINALS, connectors, controls, and indicators. Where there is insufficient space, symbol 14 from Table 1 may be used.

5.1.5.2 TERMINALS

Replace the existing item d) with the following item d):

- d) TERMINALS supplied from the interior of the hand-held multimeter and which could be HAZARDOUS LIVE, with the voltage, current, charge or energy value or range, or with symbol 12 of Table 1;

Add the following new item to the list:

- aa) TERMINALS supplied from other TERMINALS which could be HAZARDOUS LIVE, with symbol 12 or symbol 14 of Table 1.

Add the following new subclause:

5.1.5.101 Measuring circuit TERMINALS

Measuring circuit TERMINALS are usually arranged in pairs or sets. Each pair or set of TERMINALS may have a RATED voltage or a RATED current, or both, within that set, and each individual TERMINAL will have a RATED voltage to earth. For some hand-held multimeters, the RATED voltage between TERMINALS may be different from the RATED voltage to earth. Markings shall be clear to avoid misunderstanding.

Each pair or set of measuring circuit TERMINALS that are intended to be used together shall be marked with the value of the RATED voltage or the RATED current as applicable to the pair or set of TERMINALS.

TERMINALS of measuring circuits RATED for MAINS voltage measurements shall be marked with "CAT III" or "CAT IV" and its RATED a.c. r.m.s. line-to-neutral or d.c. voltage as applicable. Marking those TERMINALS with these two types of MEASUREMENT CATEGORY is permissible. Marking of MEASUREMENT CATEGORY II is not allowed. Other measuring circuit TERMINALS shall be marked with the value of the RATED voltage to earth.

NOTE CLEARANCES and solid insulation for MEASUREMENT CATEGORIES are specified for a nominal a.c. r.m.s. line-to-neutral or d.c. voltage of MAINS being measured. Neutral is considered to be earthed (see Table K.101 Annex I).

Measuring circuit TERMINALS that do not have a RATING for connection to voltages above the levels of 6.3.1, may be marked with alternative markings.

Measuring circuit TERMINALS which are dedicated only for connection to specific TERMINALS of other equipment need not be marked provided that there is a means of identifying these TERMINALS.

TERMINAL markings shall be visible when the hand-held multimeter is ready for NORMAL USE with connectors and TERMINALS mated and shall reference the applicable TERMINALS.

Conformity is checked by inspection.

5.2 Warning markings

Replace the existing text with the following text:

Warning markings specified in this document shall meet the following requirements.

Warning markings shall be visible when the hand-held multimeter is ready for NORMAL USE. If a warning applies to a particular part of the hand-held multimeter, the marking shall be placed on or near that part.

The size of warning markings shall be as follows.

- a) Symbols shall be at least 2,75 mm high. Text shall be at least 1,5 mm high and contrast in colour with the background.
- b) Symbols or text moulded, stamped or engraved in a material shall be at least 2,0 mm high. If not contrasting in colour, they shall have a depth or raised height of at least 0,5 mm.

If it is necessary for the RESPONSIBLE BODY or OPERATOR to refer to the instruction manual to preserve the protection afforded by the hand-held multimeter, the hand-held multimeter shall be marked with symbol 14 of Table 1. Symbol 14 is not required to be used together with symbols which are explained in the manual.

If the instructions for use state that an OPERATOR is permitted to gain access, using a TOOL, to a part which in NORMAL USE may be HAZARDOUS LIVE, there shall be a warning marking which states that the hand-held multimeter shall be isolated or disconnected from the HAZARDOUS LIVE voltage before access.

NOTE National regulations can require safety markings in a nationally accepted language.

Conformity is checked by inspection.

5.4.1 General

Replace the first paragraph except its list with the following paragraph:

The following documentation necessary for safety purposes, as needed by the OPERATOR or the RESPONSIBLE BODY, shall be provided with the hand-held multimeter, in an accepted language of the country where the product is intended to be placed on the market. The following safety documentation for service personnel authorized by the manufacturer shall be made available to those personnel, in a language selected by the manufacturer:

Add the following two new items to the list and a new paragraph at the end of the list:

- aa) the documentation shall indicate that probe assemblies to be used for MAINS measurements shall be RATED as appropriate for MEASUREMENT CATEGORY III or IV according to IEC 61010-031:2022 and shall have a voltage RATING of at least the voltage of the circuit to be measured;
- bb) information about each relevant MEASUREMENT CATEGORY (see 5.1.5.101).

If the hand-held multimeter is capable of measuring in multiple MEASUREMENT CATEGORY RATINGS for the same measuring circuit, the documentation shall clearly identify the MEASUREMENT CATEGORIES where the hand-held multimeter may be used and where it shall not be used.

6 Protection against electric shock

IEC 61010-1:2010, Clause 6 and IEC 61010-1:2010/AMD1:2016, Clause 6 apply except as follows:

6.5.1 General

Replace the text, the conformity statement, and Figure 4 with the following text, conformity statement and Figure 4:

ACCESSIBLE parts shall be prevented from becoming HAZARDOUS LIVE in SINGLE FAULT CONDITION. The primary means of protection (see 6.4) shall be supplemented by one of a) or b) below. Alternatively, one of the single means of protection c) or d) below shall be used (see Figure 4 and Annex DD).

- a) SUPPLEMENTARY INSULATION (see 6.5.3);
- b) current- or voltage-limiting device (see 6.5.6);
- c) REINFORCED INSULATION (see 6.5.3);
- d) PROTECTIVE IMPEDANCE (see 6.5.4).

Conformity is checked by inspection and as specified in 6.5.3, 6.5.4, or 6.5.6, as applicable.