

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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

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

<https://standards.iteh.ai/catalog/standards/sist/4669869e-4d44-4dbd-89f1-1e3111111111/iec-61010-2-033-2019>

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

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



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# 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 for domestic and professional use, capable of measuring MAINS voltage**

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

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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 for domestic and professional use, capable of measuring MAINS voltage**

#### FOREWORD

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

This second edition cancels and replaces the first 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) The scope has been reduced to hand-held multimeters. Voltmeters and clamp multimeters have been removed. They are addressed respectively by IEC 61010-2-030 and IEC 61010-2-032. The relevant definitions have been removed.
- b) Subclause 4.4.2.101 has been relocated into Clause 102.

- c) CLEARANCES and CREEPAGE DISTANCES for WET LOCATIONS and for measuring circuit TERMINALS exceeding 1 000 V a.c. or 1 414 V d.c. have been specified.
- d) Subclause 14.101 related to "Circuits or components used as TRANSIENT OVERVOLTAGE limiting devices in measuring circuits used to measure MAINS" has been removed.
- e) References to IEC 61010-031 for probe assemblies and IEC 61010-2-032 for current sensors have been added.
- f) Requirements for protection against MAINS overvoltage measuring circuits have been added.
- g) Clause 102 has been rewritten.
- h) Requirements for measuring circuits from 1 000 V to 3 000 V have been added.
- i) An informative Annex CC about dimensions of 4-mm banana TERMINALS has been added.
- j) A flowchart for insulation according to the type of circuit has been added in a new Annex DD.

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

FDIS	Report on voting
66/692/FDIS	66/694/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 the parts in the IEC 61010 series, published under the general title *Safety requirements for electrical equipment for measurement, control, and laboratory use*, can be found on the IEC website.

This Part 2-033 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 2-033 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 for domestic and professional use, capable of measuring MAINS voltage*.

Where a particular subclause of Part 1 is not mentioned in this Part 2-033, that subclause applies as far as is reasonable. Where this Part 2-033 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,
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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 2-033. Equipment within the scopes of both Part 2-030 and Part 2-033 are considered to be covered by the requirements of this Part 2-033.

Part 2-032 specifies the safety requirements for hand-held and hand-manipulated current sensors. For equipment within the scope of Part 2-032 and Part 2-033, only 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 2-033 and Part 2-034, only Part 2-034 is applicable.

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

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

#### 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 multimeters 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 61557-1 to IEC 61557-12, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – 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

*Add the following two 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 reliance on the displayed value are given in Clause 102.

#### 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*

Add the following new normative reference:

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*

### 3 Terms and definitions

This clause of Part 1 is applicable 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

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.

### 4 Tests

This clause of Part 1 is applicable, except as follows:

#### 4.3.2.5 MAINS supply

Replace the existing title and the 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.
- e) If the means of connection permits reversal, battery-operated and d.c. equipment shall be connected with both reverse and normal polarity.

#### 4.3.2.6 Input and output voltages

*Replace the first paragraph with the following:*

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

## 5 Marking and documentation

This clause of Part 1 is applicable except as follows:

### 5.1.2 Identification

*Add the following note after the existing note:*

NOTE 101 Some national regulations might 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 14 of Table 1.

*Add the following new subclause:*

#### 5.1.5.101 Measuring circuit TERMINALS

Measuring circuit TERMINALS shall be marked with the value of the RATED voltage to earth.

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.

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.

TERMINALS of measuring circuits RATED for MAINS voltage measurements shall be additionally marked "CAT III" and/or "CAT IV" as applicable. Marking those TERMINALS with these two types, and only these two types, of MEASUREMENT CATEGORY and its RATED voltage to earth, is permissible. Marking MEASUREMENT CATEGORY II is not allowed.

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 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 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. 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:*

- 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 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 has 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**

This clause of Part 1 is applicable 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). Alternatively, one of the single means of protection c) or d) 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.*

