

INTERNATIONAL STANDARD



**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 61010-2-033:2019

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CONTENTS

FOREWORD.....	4
INTRODUCTION.....	7
1 Scope and object.....	8
2 Normative references	9
3 Terms and definitions	9
4 Tests	10
5 Marking and documentation.....	11
6 Protection against electric shock	14
7 Protection against mechanical HAZARDS	17
8 Resistance to mechanical stresses	17
9 Protection against the spread of fire	18
10 Equipment temperature limits and resistance to heat.....	18
11 Protection against HAZARDS from fluids and solid foreign objects	18
12 Protection against radiation, including laser sources, and against sonic and ultrasonic pressure	18
13 Protection against liberated gases and substances, explosion and implosion	18
14 Components and subassemblies	18
15 Protection by interlocks	19
16 HAZARDS resulting from application.....	19
17 RISK assessment	20
101 Measuring circuits.....	20
102 Indicating devices.....	25
Annexes	28
Annex K (normative) Insulation requirements not covered by 6.7	28
Annex L (informative) Index of defined terms	36
Annex AA (normative) Measurement categories	37
Annex BB (informative) HAZARDS pertaining to measurements performed in certain environments.....	40
Annex CC (informative) 4-mm "banana" TERMINALS	43
Annex DD (informative) Flowchart for insulation according to the type of circuit.....	45
Bibliography.....	48
Figure 4 – Acceptable arrangement of protective means against electric shock	14
Figure AA.1 – Example to identify the locations of measuring circuits	38
Figure CC.1 – Recommended dimensions of 4-mm TERMINALS	44
Figure DD.1 – Requirements for CLEARANCE, CREEPAGE DISTANCE and solid insulation.....	47
Table 101 – CLEARANCES and CREEPAGE DISTANCES for measuring circuit TERMINALS with HAZARDOUS LIVE conductive parts up to 1 000 V a.c. or 1 500 V d.c.....	15
Table 102 – Impulse voltages	25
Table K.101 – CLEARANCES of measuring circuits RATED for MEASUREMENT CATEGORIES III and IV.....	29

Table K.102 – a.c. test voltages for testing electric strength of solid insulation in measuring circuits RATED for MEASUREMENT CATEGORIES III and IV.....	31
Table K.103 – Impulse test voltages for testing electric strength of solid insulation in measuring circuits RATED for MEASUREMENT CATEGORIES III and IV.....	31
Table K.104 – Test voltages for testing long-term stress of solid insulation in measuring circuits RATED for MEASUREMENT CATEGORIES III and IV	32
Table K.105 – Minimum values for distance or thickness of solid insulation in measuring circuits RATED for MEASUREMENT CATEGORIES III and IV.....	34
Table AA.1 – Characteristics of MEASUREMENT CATEGORIES	39

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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

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

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,
- replaced by a revised edition, or
- amended.

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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 will be supplemented or modified by the special requirements of one, or more than one, particular part 2's of the standard which must be read in conjunction with the Part 1 requirements.~~

~~This Part 2-033 specifies the safety requirements for HAND HELD METERS that have a primary purpose of measuring voltage on a live MAINS CIRCUIT.~~

~~Part 2-032 specifies the safety requirements that are generally applicable to HAND HELD and hand-manipulated current sensors.~~

~~Part 2-030 specifies the safety requirements for testing and measuring circuits which are connected for test or measurement purposes to devices or circuits outside the measurement equipment itself.~~

~~VOLTMETER and similar equipment that are not within the scope of Part 2-033 are considered to be covered by the requirements of Part 2-030 or Part 2-032. But for equipment within the scopes of both Part 2-032 and Part 2-033, the two standards must be read in conjunction.~~

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.

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

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 METERS.~~

~~The METERS that have a primary purpose of measuring voltage on a live MAINS CIRCUIT are within the scope of this standard. They have various names, but all of them have capability for measurements of voltages on a live MAINS CIRCUIT. Some of the names given to this equipment are as follows:~~

- ~~— MULTIMETER;~~
- ~~— digital MULTIMETER;~~
- ~~— VOLTMETER;~~
- ~~— clamp METER (see also Part 2-032).~~

~~For the purpose of this standard, the term METER is used for these HAND-HELD measuring instruments.~~

~~NOTE Parts of the equipment that are not within the scope of this Part 2-033 are considered to be covered by the requirements of Part 1 or other part 2's of IEC 61010 and then will also need to meet the requirements of these other parts.~~

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*

Addition:

~~Add the two following paragraphs at the end of the subclause:~~

~~Equipment that is not capable of measuring MAINS voltages is not within the scope of this Part 2-033. See IEC 61010-2-030 for requirements pertaining to such equipment.~~

~~Such equipment, including other~~ 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 ~~is~~ 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:

~~3.1 Equipment and states of equipment~~

~~Addition:~~

~~Add the following new definitions:~~

~~3.1.101~~

~~MULTIMETER~~

~~multirange multifunction measuring instrument intended to measure voltage and sometimes other electrical quantities such as current and resistance~~

~~[SOURCE: IEC 60050-300:2001, 312-02-24, modified]~~

3.1.102

VOLTMETER

~~instrument intended to measure the value of a voltage~~

~~[SOURCE: IEC 60050-300:2001, 313-01-03]~~

3.1.103

METER

~~voltage measuring instrument which is either a HAND-HELD VOLTMETER or a HAND-HELD MULTIMETER~~

3.1.104

HAND-HELD (equipment)

~~intended to be supported by one hand during NORMAL USE~~

3.5 Safety terms

Replace the definitions of 3.5.4 and 3.5.5 with the following new definitions:

3.5.4

MAINS

~~low-voltage electricity supply system to which the current sensor concerned is designed to be connected for the purpose of powering the current sensor or for measurements~~
electricity supply system

3.5.5

MAINS CIRCUIT

~~circuit which is intended to be directly connected to the MAINS for the purpose of powering the current sensor or for measurements~~

Add the following new term and definition:

3.5.101

MEASUREMENT CATEGORY

classification of testing and measuring circuits according to the type of MAINS ~~CIRCUITS~~ 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 ~~at which~~ 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:

4.4.2 — Application of fault conditions

4.4.2.1 — General

Replacement:

Replace the first sentence with the following text:

~~Fault conditions shall include those specified in 4.4.2.2 to 4.4.2.14 and in 4.4.2.101.~~

Addition:

Add the following new subclause:

4.4.2.101 Input voltages

~~For measuring circuit TERMINALS RATED for MAINS CIRCUITS voltage measurements:~~

- ~~a) up to 600 V a.c. r.m.s., the voltage applied to the TERMINALS is the RATED voltage multiplied by 1,90 but not to exceed 920 V a.c. r.m.s.;~~
- ~~b) above 600 V a.c. r.m.s. and up to 1 000 V a.c. r.m.s., the voltage applied to the TERMINALS is 1 100 V a.c. r.m.s.;~~
- ~~c) above 1 000 V a.c. r.m.s., the voltage applied to the TERMINALS is the RATED voltage multiplied by 1,1;~~
- ~~d) of d.c. voltage, the d.c. voltage applied to the TERMINALS is the RATED voltage multiplied by 1,1.~~

~~These voltages are applied with the METER set to each voltage measurement range capable of MAINS voltage measurements.~~

~~NOTE—The 1,9 multiplication factor is derived from phase-to-phase voltage measurements with a 10 % overvoltage condition.~~

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 ~~equipment or from other TERMINALS~~ 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.

NOTE 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 ~~equipment~~ hand-held multimeters, the ~~measurement~~ RATED voltage (between TERMINALS) ~~is~~ may be different from the RATED voltage to earth. Markings shall be clear to avoid misunderstanding.

~~Measuring circuit~~ TERMINALS of measuring circuits RATED for MAINS ~~CIRCUITS~~ 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.

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