

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

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

Partie 2-033: Exigences particulières pour les MULTIMÈTRES PORTATIFS et autres MESUREURS, 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

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International Standard IEC 61010-2-33 has been prepared by IEC technical committee 66: Safety of measuring, control and laboratory equipment.

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

FDIS	Report on voting
66/461/FDIS	66/464/RVD

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

This Part 2-033 is to be used in conjunction with third edition of IEC 61010-1 (2010), on the basis of which it was established. Consideration may be given to future editions of, or amendments to, IEC 61010-1.

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 and other METERS, 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 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 test: 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 numbered AA and BB.

This publication 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.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication 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.

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Withhold

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

Replacement:

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.

1.1.2 Equipment excluded from scope

Addition:

Add the following new item to the list:

- aa) IEC 61557 (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 – Parts 1 through 12).

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, and communications test sets is not within the scope of this Part 2-033.

1.2.1 Aspects included in scope

Addition:

Add the following paragraph 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.

2 Normative references

This clause of Part 1 is applicable.

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

Replacement:

Replace definitions 3.5.4 and 3.5.5 with the following new definitions:

3.5.4

MAINS

low voltage electricity supply system to which the METER concerned is designed to be connected for the purposes of measurements

3.5.5

MAINS CIRCUIT

circuit which is intended to be directly connected to the MAINS for measurements

Addition:

Add the following new 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 MEASUREMENT CATEGORIES take into account OVERVOLTAGE CATEGORIES, short-circuit current levels, the location in the building installation at which 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.

5 Marking and documentation

This clause of Part 1 is applicable except as follows:

5.1.2 Identification

Addition:

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

Replacement:

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

Replacement:

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

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

Addition:

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, the measurement RATED voltage (between TERMINALS) is different from the RATED voltage to earth.

Measuring circuit TERMINALS RATED for MAINS CIRCUITS voltage measurements shall be additionally marked "CAT III" or "CAT IV" as applicable.

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 for identifying these TERMINALS.

TERMINALS markings shall be visible when the equipment 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

Replacement:

Replace the existing text with the following text:

Warning markings specified in 5.1.5.2 d), 6.1.2 b), 6.6.2, 7.3.2 b) 3), 7.4, 10.1, and 13.2.2 shall meet the following requirements.

Warning markings shall be visible when the equipment is ready for NORMAL USE. If a warning applies to a particular part of the equipment, the marking shall be placed on or near the 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 equipment, the equipment shall be marked with symbol 14 of Table 1. Symbol 14 is not required to be used 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 equipment must be isolated or disconnected from the HAZARDOUS LIVE voltage before access.

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

Conformity is checked by inspection.

5.4.1 General

Replacement:

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 equipment, 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.

Addition:

Add the two new following 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 METER has multiple MEASUREMENT CATEGORY RATINGS for the same measuring circuit, the documentation shall clearly identify the MEASUREMENT CATEGORIES where the equipment may be used and where it must not be used.

6 Protection against electric shock

This clause of Part 1 is applicable except as follows:

6.5.1 General

Replacement of the text, 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 D.

- 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.

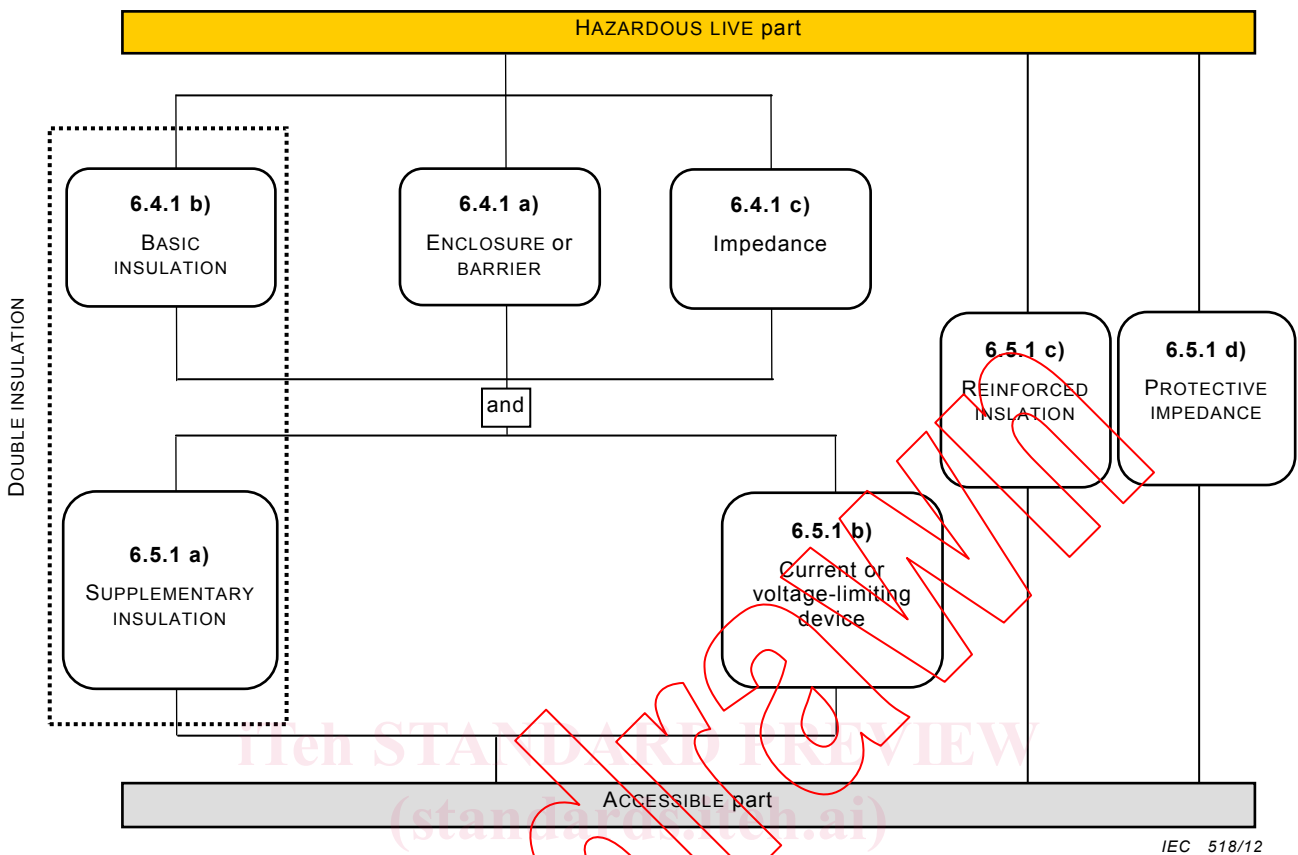


Figure 4 – Acceptable combinations of protective means against electric shock

6.5.2 PROTECTIVE BONDING

Replacement:

Replace the title and text with the following:

6.5.2 Not used

6.5.5 Automatic disconnection of the supply

Replacement:

Replace the title and text with the following:

6.5.5 Not used

6.6 Connections to external circuits

Addition:

Add the following two new subclauses:

6.6.101 Measuring circuit TERMINALS

Conductive parts of each unmated measuring circuit TERMINAL which could become HAZARDOUS LIVE when the highest RATED voltage is applied to other measuring circuit TERMINALS on the equipment shall be separated by at least the applicable CLEARANCE and

CREEPAGE DISTANCE of Table 101 from the closest approach of the test finger touching the external parts of the TERMINAL in the least favourable position (see Figure 1 of Part 1).

Table 101 – CLEARANCES and CREEPAGE DISTANCES for measuring circuit TERMINALS with HAZARDOUS LIVE conductive parts

Voltage on conductive parts of TERMINAL		CLEARANCE and CREEPAGE DISTANCE
V a.c. r.m.s.	V d.c.	mm
300	300	0,8
> 300 ≤ 600	> 300 ≤ 848	1,0
> 600 ≤ 1 000	> 848 ≤ 1 414	2,6

Conformity is checked by inspection and measurement.

6.6.102 Specialized measuring circuit TERMINALS

Components, sensors, and devices intended to be connected to specialized measuring circuit TERMINALS shall not be both ACCESSIBLE and HAZARDOUS LIVE, in either NORMAL CONDITION or SINGLE-FAULT CONDITION, even when the highest RATED voltage is applied to any other measuring circuit TERMINAL.

NOTE These specialized TERMINALS include, but are not limited to, TERMINALS for semiconductor measuring functions, capacitance measurements, and thermocouple sockets.

Conformity is checked by inspection and measurement. Components, sensors, and devices intended to be connected to specialized measuring circuit TERMINALS are connected. The measurements of 6.3 are made to establish that the levels of 6.3.1 and 6.3.2 are not exceeded when each of the following voltages is applied to each other measuring circuit TERMINAL, if applicable:

- a) highest RATED a.c. voltage at any RATED MAINS frequency;
- b) highest RATED d.c. voltage;
- c) highest RATED a.c. voltage at the maximum RATED measurement frequency.

6.7.1.5 Requirements for insulation according to type of circuit

Addition:

Add the following new item to the list:

- aa) in K.101 for measuring circuits of MEASUREMENT CATEGORIES III and IV.

Replacement:

Replace existing Note 2 with the following note:

NOTE 2 Not used.

6.9 Constructional requirements for protection against electric shock

Addition:

Add the following new subclause: