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Interested committees:

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- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



66/842/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER: IEC 61010-2-032 ED6	
DATE OF CIRCULATION: 2025-03-07	CLOSING DATE FOR COMMENTS: 2025-05-02
SUPERSEDES DOCUMENTS: 66/838/RR	

IEC TC 66 : SAFETY OF MEASURING, CONTROL AND LABORATORY EQUIPMENT	
SECRETARIAT: United Kingdom	SECRETARY: Ms Stephanie Lavy
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 38,TC 85	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED: Safety	

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

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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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****FOREWORD**

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

This sixth edition cancels and replaces the fifth edition published in 2023. This edition constitutes a technical revision.

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

- a) IEC 61010-2-130 has been considered relevant to this document;
- b) added a definition for MEASURING CIRCUITS;
- c) impact of amendment 2 to IEC 61010-1:2010/AMD1/2016 has been taken into consideration:
 - 1) Clause 2 and Bibliography have been updated;
 - 2) MAINS definition has been modified

- 3) in 4.3.2.5, specific requirements for power supply have been deleted since Amendment 2 of IEC 61010 1 take them now into account;
- 4) Figure 4 has been updated;
- 5) modifications of 6.8.3.1 and 6.8.3.2 have been deleted since Amendment 2 of IEC 61010 1 take them now into account;
- 6) conformity statements of K.3.2 and K.101.2 have been modified;
- 7) a few conformity statements for constructional requirements of solid insulation have been modified;
- d) in 4.4.2.101, requirements for surge protective devices have been modified;
- e) symbol 101 for Type B and Type C current sensors has been deleted;
- f) in 6.6.101.1, a new requirement for TERMINALS is added;
- g) in 6.6.101.2, the conformity statement has been modified;
- h) in 6.8.1, a precision is given when testing solid insulation;
- i) a new 6.102 for protection against electric shock when opening externally the secondary circuit;
- j) 9.101.1 and 9.101.2.1 have been redrafted for clarification, in particular to take into account the recommendations of new Annex N about REASONABLY FORESEEABLE MISUSE; an exception has been added for MEASURING CIRCUIT not RATED for MEASUREMENT CATEGORIES III or IV
- k) a new 9.101.4 for protection against fire when opening internally the secondary circuit;
- l) 10.5.101 has classified the tests;
- m) a new 14.9 with requirements for capacitors has been added;
- n) Clause 101 has been rephrased and completed with requirements for current sensor injecting voltage and current;
- 1) 101.2 has been deleted; when applicable, reference to IEC 61010-2-030;
- 2) 101.3 has been moved to 16.4 and 16.101.

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

Draft	Report on voting
66/xxx/FDIS	66/xxx/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, IEC 61010-1:2010/AMD1:2016 and IEC 61010-1:2010/AMD2:—¹.

¹ Second amendment under preparation. Stage at the time of publication: IEC CDV 61010-1/12:2025.

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 and hand-manipulated current sensors for electrical test and measurement*.

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
- amended.

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 amendments 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 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) This document specifies the safety requirements for hand-held and hand-manipulated current sensors for measuring, detecting or injecting current, or indicating current waveforms on circuits without physically opening the current path of the circuit being measured, included CLAMP MULTIMETERS.

Most of the requirements of IEC 61010-2-030 have been included in this document. Equipment within the scopes of both IEC 61010-2-030 and this document is considered to be covered by the requirements of this document.

However, for current sensors in combined equipment with PROTECTIVE BONDING and automatic disconnection of the supply, IEC 61010-2-030 and this document are read in conjunction.

3) IEC 61010-2-033 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 have been included in IEC 61010-2-033.

4) IEC 61010-2-034 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.

All relevant requirements of IEC 61010-2-030 have been included in IEC 61010-2-034. However, for equipment within the scope of this document and IEC 61010-2-034, 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, this document, IEC 61010-2-033 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.

IEC 61010-2-130 specifies particular safety requirements for equipment and accessories intended to be used in educational establishment by pupil OPERATORS. Pupil OPERATORS are for the sake of IEC 61010-2-130, children between the ages of 3 years and 16 years operating electrical equipment under supervision of a RESPONSIBLE BODY. For equipment used in educational establishments, the requirements of IEC 61010-2-130 will supplement or modify the requirements of this document.

**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**

All Clauses and their subclauses, all Annexes, their Clauses and subclauses, and Bibliography of IEC 61010-1:2010+AMD1:2016+AMD2:—² apply except as follows.

1.1.1 Equipment included in scope

Replace the existing text with the following new text:

This document specifies safety requirements for HAND-HELD and hand-manipulated current sensors intended for measuring, detecting or injecting current, or indicating current waveforms on circuits without physically opening the current path of the circuit being measured.

These current sensors are hand-manipulated before and/or after a test or measurement, but are not necessarily HAND-HELD during the test or measurement. They can be stand-alone current sensors or accessories to other equipment or parts of combined equipment. These include measurement circuits which are part of electrical test and measurement equipment, laboratory equipment, or process control equipment.

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.

The types of current sensors covered by this document are defined in Annex FF.

1.1.2 Equipment excluded from scope

Add the following new paragraph:

This document does not apply to current sensors used as FIXED EQUIPMENT.

1.2.1 Aspects included in scope

Replace item c) and item h) from the list of the second paragraph with the following new item c) and item h):

² Second amendment under preparation. Stage at the time of publication: IEC CDV 61010-1/12:2025.

- c) spread of fire or arc flash from the current sensor (see Clause 9);
- h) HAZARDS related to the use and REASONABLY FORESEEABLE MISUSE of the current sensor (see Clause 16 and Clause 101).

Insert the following new paragraph between the third paragraph and the Note:

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

Replace the following existing normative reference:

IEC 62262, *Degrees of protection provided by enclosures for electrical equipment against external impacts (IK code)*

with the following new normative references:

IEC 62262:2002, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*
IEC 62262:2002/AMD1:2021

Insert the following five new normative references in alphanumeric order:

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 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 61010-1:2010, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*
IEC 61010-1:2010/AMD1:2016
IEC 61010-1:2010/AMD2:—³

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

IEC 61010-031:2022, *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*

³ Second amendment under preparation. Stage at the time of publication: IEC CDV 61010-1/12:2025.

311

312 *Insert the following two new terms and definitions between the term 3.1.4 and the term 3.1.5:*

313 **3.1.101**

314 **HAND-HELD**

315 intended to be supported by one hand during NORMAL USE

316 **3.1.102**

317 **CLAMP MULTIMETER**

318 HAND-HELD multi-range and multifunction measuring instrument intended to measure current on
319 a live MAINS without physically opening the conductors, voltage on a live MAINS and other
320 electrical quantities such as resistance

321

322 *Add the following three new terms and definitions after item 3.2.5:*

323 **3.2.101**

324 **PROTECTIVE FINGERGUARD**

325 part of the enclosure that indicates the limit of safe access and that reduces the RISK of the
326 operator touching HAZARDOUS LIVE parts

327 **3.2.102**

328 **JAW**

329 part of a current sensor which surrounds or partially surrounds the conductor under test

330 **3.2.103**

331 **JAW END**

332 part of the JAW where opening occurs while clamping around a conductor

333

334 *Replace the definition of 3.5.6 with the following new definition:*

335 **3.5.6**

336 **MAINS**

337 a.c. or d.c. electrical power distribution system (external to the equipment)

338 NOTE 1 to entry: MAINS include public or private electrical utilities and, unless otherwise specified in this document,
339 equivalent sources such as motor-driven generators and uninterruptible power supplies.

340 NOTE 2 to entry: This definition differs from the IEC 61010-1/A2 definition by allowing voltages greater than 1 000 V
341 a.c. and 1 500 V d.c. and can be used to power the equipment or be measured.

342 [IEC 60664-1:2020, 3.1.2 (mains supply) modified]

343

344 *Insert the following two new terms and definitions between the existing terms 3.5.7 and 3.5.8:*

345 **3.5.101**

346 **MEASURING CIRCUIT**

347 testing or measuring circuit (internal to the equipment) which is connected for test or
348 measurement purposes to devices or circuits outside the equipment itself

3.5.102**MEASUREMENT CATEGORY**

classification of MEASURING CIRCUITS according to the type of MAINS to which they are intended to be connected

Insert the following new term and definition definitions between the term 3.6.4 and the term 3.6.5:

3.6.101**UNINSULATED CONDUCTOR**

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

4.3.2.6 Input and output voltages

Replace the existing title and text of 4.3.2.6 with the following new title and text:

4.3.2.6 Input and output voltages or currents

Input and output voltages or currents, including floating voltages but excluding the electrical supply voltage (see 4.3.2.5), shall be set to any voltage or current within their RATED range, in normal and reverse polarity if possible.

4.4.2.1 General

Replace the item 2) of the first paragraph with the following new item 2):

2) Applicable fault conditions specified in 4.4.2.2 to 4.4.2.15 and 4.4.2.101.

4.4.2.8 Outputs

Replace the text with the following:

Outputs shall be open-circuited and short-circuited, one at a time.

Add the following new subclause after 4.4.2.15:

4.4.2.101 Surge protective devices

Surge protective devices used in MAINS CIRCUITS or MEASURING CIRCUITS connected to MAINS shall be short-circuited and open-circuited, only one at a time in turn in any convenient order.

5.1.2 Identification

Add the following new list items and add a new paragraph before the conformity statement:

- aa) for current sensors designed for use only with a specific model of equipment, a clear identification of the equipment, or with symbol 14 of Table 1 if this information is available only in the documentation;
- bb) for Type A current sensors, with symbol 101 of Table 1;
- cc) for Type B, Type C and Type D current sensors, with symbol 14 of Table 1.

The relevant symbol (14 or 101) shall be marked adjacent to the JAWS or adjacent to the marking of the MEASUREMENT CATEGORY for the JAWS, if present (see 5.1.5.101 and 5.1.5.102).

Table 1 – Symbols

Add the following new symbol to Table 1:

Number	Symbol	Reference	Description
101		IEC 60417-6300 (2016-03)	To indicate that the current sensor can safely be used with UNINSULATED HAZARDOUS LIVE CONDUCTORS

Add the following two new subclauses after 5.1.5.2:

5.1.5.101 MEASURING CIRCUIT TERMINALS

5.1.5.101.1 General

Some MEASURING CIRCUIT TERMINALS for the current sensor within the scope of this document also serve as output TERMINALS.

Except as permitted in 5.1.5.104:

- a) the value of the nominal a.c. r.m.s. line-to-neutral or d.c. voltage of MAINS being measured shall be marked for MEASURING CIRCUIT TERMINALS RATED for MEASUREMENT CATEGORIES, or the value of the RATED voltage to earth for other MEASURING CIRCUIT TERMINALS, and

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 Annex I).

- b) the value of the RATED voltage or the RATED current, as applicable, of each pair or set of MEASURING CIRCUIT TERMINALS that are intended to be used together shall be marked, and
- c) the pertinent MEASUREMENT CATEGORY for each individual, pair, or set of MEASURING CIRCUIT TERMINALS, or symbol 14 of Table 1 shall be marked as specified in 5.1.5.101.2 and 5.1.5.101.3, if applicable.

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 may have a RATED voltage to earth. For some current sensors, the RATED

voltage between TERMINALS may be different from the RATED voltage to earth. Markings shall be clear to avoid misunderstanding.

Markings shall be placed adjacent to the TERMINALS. However, if there is insufficient space (as in multi-input current sensor), the marking may be on the RATING plate or scale plate, or the TERMINAL may be marked with symbol 14 of Table 1.

For any set of MEASURING CIRCUIT TERMINALS, symbol 14 of Table 1 does not need to be marked more than once, if it is close to the TERMINALS.

Conformity is checked by inspection and, if applicable, as specified in 5.1.5.101.2 and 5.1.5.101.3, taking the exceptions in 5.1.5.101.4 into account.

5.1.5.101.2 MEASURING CIRCUIT TERMINALS RATED for MEASUREMENT CATEGORIES

The relevant MEASUREMENT CATEGORY shall be marked for TERMINALS of MEASURING CIRCUITS RATED for MEASUREMENT CATEGORIES. The MEASUREMENT CATEGORY markings shall be "CAT II", "CAT III" or "CAT IV" as applicable.

The RATED voltage of the TERMINALS of a MEASURING CIRCUIT intended for MAINS voltage measurements shall be equal to or higher than their RATED a.c. r.m.s. line-to-neutral or d.c. voltage.

Marking those TERMINALS with more than one type of MEASUREMENT CATEGORY and its RATED voltage is permissible.

Conformity is checked by inspection.

5.1.5.101.3 MEASURING CIRCUIT TERMINALS RATED for connection to voltages above the levels of 6.3.1

Symbol 14 of Table 1 shall be marked adjacent to the TERMINALS for MEASURING CIRCUIT TERMINALS RATED for connection to voltages above the levels of 6.3.1, but that are not RATED for MEASUREMENT CATEGORIES (see also 5.4.1 bb).

Conformity is checked by inspection.

5.1.5.101.4 MEASURING CIRCUIT TERMINALS which are permanently connected, dedicated, or for non-HAZARDOUS LIVE voltages

It is not necessary to mark MEASURING CIRCUIT TERMINALS if:

- a) they are intended to be permanently connected and not ACCESSIBLE (see 5.4.3 aa) and bb)), or
- b) they are dedicated only for connection to specific TERMINALS of other equipment, or
- c) it is obvious from other indications that the RATED voltage does not exceed the levels of 6.3.1.

NOTE Examples of acceptable indications that the RATED voltage of the inputs are intended to not exceed the levels of 6.3.1 include:

- the full scale deflection marking of a single-range indicating voltmeter or ammeter or maximum marking of a multi-range CLAMP MULTIMETER;
- the maximum range marking of a voltage selector switch;
- a marked voltage or power RATING expressed in dB, mW or W, where the equivalent value, as explained in the documentation, does not exceed 30 V a.c.

Conformity is checked by inspection.

5.1.5.102 Voltage and current RATINGS of JAWS

Current sensors that are intended to be used on UNINSULATED CONDUCTORS shall be marked with the value of the nominal a.c. r.m.s. line-to-neutral or d.c. voltage of MAINS being measured when JAWS are RATED for MEASUREMENT CATEGORIES, otherwise with the value of the RATED voltage to earth of the JAWS.

JAWS of Type A, Type B or Type C current sensors RATED for MEASUREMENT CATEGORIES, shall be marked with the relevant MEASUREMENT CATEGORY adjacent to the a.c. r.m.s. line-to-neutral or d.c. voltage marking (see also note of 5.1.5.101.1). The MEASUREMENT CATEGORY markings shall be "CAT II", "CAT III" or "CAT IV" as applicable.

JAWS and output circuit TERMINALS of Type D current sensors shall not be marked with any MEASUREMENT CATEGORY.

The value of the RATED current shall be marked on or close to the JAWS. The nature of the current shall also be marked unless the marked value applies to both a.c. and d.c.

Conformity is checked by inspection.

5.4.1 General

Add the following two new items to the list of the first paragraph after item k):

- aa) information about each relevant MEASUREMENT CATEGORY if the MEASURING CIRCUIT is RATED for MEASUREMENT CATEGORIES (see 5.1.5.101.2 and 5.1.5.102);
- bb) for Type A, Type B and Type C current sensors that are not RATED for MEASUREMENT CATEGORIES, but that could be misused by connection to such circuits, a warning not to use the current sensor for measurements on MAINS, and a detailed RATING including TRANSIENT OVERVOLTAGES (see AA.2.4 for more information).

Add a new paragraph between the first and the second paragraph:

Some current sensors may have multiple MEASUREMENT CATEGORY RATINGS for the same MEASURING CIRCUIT. For such current sensors, the documentation shall clearly identify the MEASUREMENT CATEGORIES where the current sensor is intended to be used and where it shall not be used.

5.4.3 Equipment installation

Add the following two new items to the list of the first paragraph after item i):

- aa) for MEASURING CIRCUIT TERMINALS intended for permanent connection and that are RATED for MEASUREMENT CATEGORIES, information regarding the MEASUREMENT CATEGORY, RATED voltages or RATED currents as applicable (see 5.1.5.101.2 and 5.1.5.102);
- bb) for MEASURING CIRCUIT TERMINALS intended for permanent connection and that are not RATED for MEASUREMENT CATEGORIES, information regarding the RATED voltages, RATED currents, and RATED TRANSIENT OVERVOLTAGES as applicable (see 5.1.5.101.4 and 5.1.5.102).

5.4.4 Equipment operation

Replace the existing text with the following:

Instructions for use shall include, if applicable:

- a) identification and description of operating controls and their use in all operating modes;
- b) for current sensors designed for use only with a specific model of equipment, a clear identification of the equipment;
- c) specifications of limits for intermittent operation;
- d) specifications of limits of the current versus the frequency if the magnetic circuit can reach a hazardous temperature;
- e) explanations of symbols related to safety which are used on the current sensor;
- f) instructions for interconnection to accessories and other equipment, including indication of suitable accessories and detachable parts;
- g) instructions for replacement of consumable materials;
- h) instructions for cleaning and decontamination;
- i) instructions for the application and removal of the current sensor;
- j) instructions to de-energise the installation on which the current is measured, or to adopt safe operating procedures when working on HAZARDOUS LIVE installations, during application and removal of Type B current sensors;
- k) instructions to de-energise the installation on which the current is measured, when working on HAZARDOUS LIVE installations, or non-limited-energy installations during application and removal of Type C current sensors;
- l) instructions about the function of the PROTECTIVE FINGERGUARD, indicating the limit of safe access of the HAND-HELD part;
- m) a warning to the OPERATOR that Type D current sensors are only for use around insulated conductors or limited energy circuit conductors;
- n) a warning to the OPERATOR that individual protective equipment should be used if HAZARDOUS LIVE parts in the installation where measurement is to be carried out could be ACCESSIBLE;
- o) a warning to the OPERATOR not to use a flexible current sensor if the wear indicator of the flexible cord used for the JAW of the flexible current sensor is visible (see 8.103);
- p) a warning to the OPERATOR not to use a current sensor if the wear indicator in the JAW END is visible (see 8.104);
- q) a warning to the OPERATOR not to use a current sensor above its RATED frequency, if the magnetic circuit can reach a hazardous temperature (see 10.101).

There shall be a statement in the instructions that, if the current sensor is used in a manner not specified by the manufacturer, the protection provided by the current sensor may be impaired.

Conformity is checked by inspection.

6.1.2 Exceptions

Add the following new item to the list after item b):

- aa) conductive parts of a JAW END, provided that they meet the requirements of 6.101.

6.2.1 General

Insert the following NOTE 101 after the third paragraph:

NOTE 101 For determination of ACCESSIBLE parts of current sensor intended to be used in educational establishment by pupil OPERATORS, see IEC 61010-2-130.

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 by one of the following means: Items a) and b) are applied in conjunction with the primary means of protection identified in 6.4. Items c) and d) are applied as single means of protection. (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.

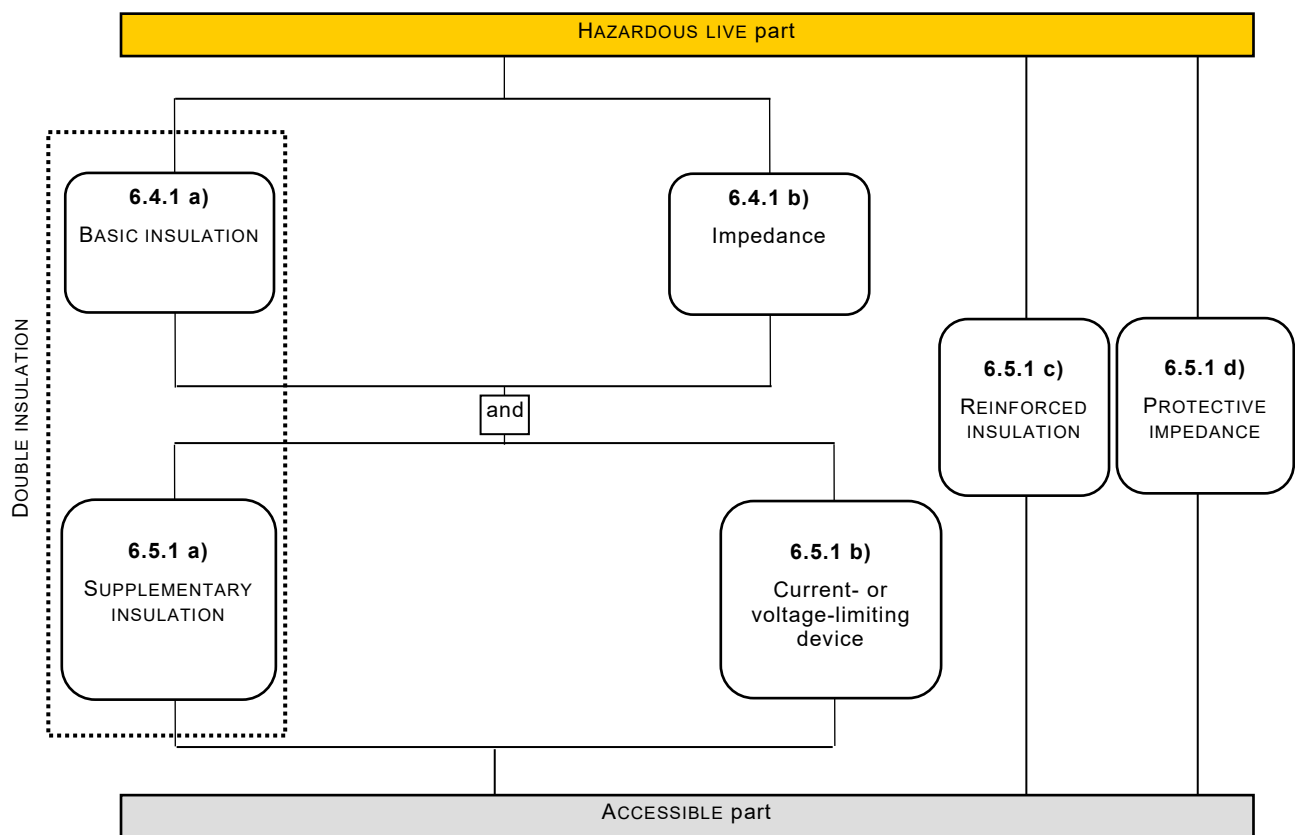


Figure 4 – Acceptable arrangement of protective means against electric shock

IEC 1010/10

6.5.2 PROTECTIVE BONDING

Replace the existing title of 6.5.2 with the following title and delete the text:

6.5.2 Not used**6.5.5 Automatic disconnection of the supply**

Replace the existing title of 6.5.5 with the following title and delete the text:

6.5.5 Not used

Add the following two new subclauses and new Table 101 after 6.6.4:

6.6.101 MEASURING CIRCUIT TERMINALS**6.6.101.1 General**

HAZARDOUS LIVE TERMINALS shall be anchored, fitted or designed so that internal conductors and TERMINAL mechanical mountings will not work loose when the TERMINALS are tightened or loosened, or when connections are made.

When determining the values of CREEPAGE DISTANCES for MEASURING CIRCUIT TERMINALS of a HAND-HELD current sensor intended to be connected only to a HAND-HELD probe assembly complying with IEC 61010-031, the applicable values of CREEPAGE DISTANCES from material group I are allowed to be applied to all material groups.

Requirements for MEASURING CIRCUIT TERMINALS in unmated position, partially mated or mated position are defined respectively in 6.6.101.2, 6.6.101.3 and 6.6.101.4. Requirements for specialized MEASURING CIRCUIT TERMINALS are defined in 6.6.101.5.

Annex CC provides information regarding the recommended dimensions of 4 mm "banana" TERMINALS.

6.6.101.2 MEASURING CIRCUIT TERMINALS in unmated position

The following requirements apply to MEASURING CIRCUITS TERMINALS in unmated position when RATED voltages are applied to any other TERMINALS of the current sensor.

1) ACCESSIBLE parts of locking-type or screw-held-type TERMINALS in unmated position including TERMINALS which do not require the use of a TOOL for unlocking or unscrewing shall not be HAZARDOUS LIVE.

Conformity is checked by inspection.

2) ACCESSIBLE parts of other unmated TERMINALS shall be insulated from HAZARDOUS LIVE parts by PROTECTIVE IMPEDANCE or CLEARANCES and CREEPAGE DISTANCES meeting the requirements of 2 a) and 2 b) of this subclause 6.6.101.2.

a) For TERMINALS with a voltage RATING up to 3 000 V, the CLEARANCES shall be at least the applicable values of Table 101.

Table 101 – CLEARANCES for unmated MEASURING CIRCUIT TERMINALS

Maximum voltage applied to the conductive parts of the TERMINAL V	CLEARANCE	
	a.c. r.m.s. mm	d.c. mm
600	0,8	0,8
1 000	1,0	0,8
1 500	2,0	1,1
2 000	3,2	1,8
3 000	6,4	3,5
For maximum voltages above 30 V a.c. r.m.s. or 60 V d.c. up to 600 V, CLEARANCES are 0,8 mm. Linear interpolation is allowed above 600 V. NOTE See Annex EE for determination of the CLEARANCES.		

For TERMINALS with a voltage RATING above 3 000 V, the CLEARANCE shall be at least the D_2 value of Table K.15 with U_m equal to 1,25 times the peak value of the voltage (see K.3.2).

If the current sensor is RATED to operate at an altitude greater than 2 000 m, the value of the CLEARANCE shall be multiplied by the applicable factor of Table 3.

Conformity is checked by inspection and measurement of CLEARANCE from the closest approach of the test finger touching the external parts of the TERMINAL in the least favourable position (see Figure 1).

If the CLEARANCES are less than the minimum required, they shall be verified by the a.c. voltage test.

Conformity is checked by the a.c. voltage test of 6.8.3.1 with a duration of at least 3 cycles using the applicable test voltage for impulse of Table K.16 for the required CLEARANCE.

Correction factors of Table 10 are applicable to the values of test voltages for CLEARANCES given in Table K.16.

- b) The CREEPAGE DISTANCE values shall be at least the applicable CLEARANCE values defined in 2 a) of this subclause 6.6.101.2.

Conformity is checked by inspection and measurement of CREEPAGE DISTANCES from the closest approach of the test finger touching the external parts of TERMINAL in the least favourable position.

In addition for current sensors RATED for WET LOCATIONS, conductive parts of TERMINALS with voltage RATINGS above 16 V a.c. r.m.s., 22,6 V a.c. peak and 35 V d.c. shall not be ACCESSIBLE.

Conformity is checked by inspection and measurement.

6.6.101.3 MEASURING CIRCUIT TERMINALS in partially mated position

ACCESSIBLE parts of MEASURING CIRCUIT TERMINALS in partially mated position shall be insulated from HAZARDOUS LIVE parts by BASIC INSULATION.

Conformity is checked by inspection and measurement.

6.6.101.4 MEASURING CIRCUIT TERMINALS in mated position

ACCESSIBLE parts of MEASURING CIRCUIT TERMINALS in mated position which are not intended to be HAND-HELD or touched during the measurement operation shall be insulated from HAZARDOUS LIVE parts by BASIC INSULATION.

625 ACCESSIBLE parts of TERMINALS of other MEASURING CIRCUITS in mated position shall be insulated
626 from HAZARDOUS LIVE parts by DOUBLE INSULATION or REINFORCED INSULATION.

627 *Conformity is checked by inspection and measurement.*

628 **6.6.101.5 Specialized MEASURING CIRCUIT TERMINALS**

629 Specialized MEASURING CIRCUIT TERMINALS are TERMINALS intended to be connected to
630 components, sensors, and devices.

631 NOTE These specialized TERMINALS include, but are not limited to, TERMINALS for thermocouple sockets.

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

636 *Conformity is checked by inspection and measurement. Components, sensors, and devices*
637 *intended to be connected to specialized MEASURING CIRCUIT TERMINALS are connected. The*
638 *measurements of 6.3 are made to establish that the levels of 6.3.1 and 6.3.2 are not exceeded*
639 *when each of the following voltages is applied to each of the other MEASURING CIRCUIT*
640 *TERMINALS, if applicable:*

641 *a) highest RATED a.c. voltage at any RATED MAINS frequency;*

642 *b) highest RATED d.c. voltage;*

643 *c) highest RATED a.c. voltage at the related maximum RATED measurement frequency.*

644 **6.6.102 Input/output circuit leads**

645 **6.6.102.1 General**

646 Input/output circuit leads are used to connect the current sensor to external equipment for the
647 purpose of measuring the current on the secondary circuit or powering the current sensor.

648 Input/output circuit leads shall meet the requirements of 6.6.102.2 and 6.6.102.3, and
649 attachment of the output circuit leads shall meet the requirements of 8.105 (see also
650 Table D.101, column with heading "2 and 3").

651 **6.6.102.2 Protection against HAZARDOUS LIVE installation**

652 When current sensors are connected by a cord or a test lead to a measuring instrument and/or
653 an external power supply, the outer surfaces of the input/output circuit leads can easily touch
654 HAZARDOUS LIVE parts of the installation under test.

655 The input/output circuit leads and the mated TERMINALS which can be in contact with parts of
656 the installation shall have DOUBLE INSULATION or REINFORCED INSULATION between their outer
657 surfaces and their conductors.

658 For Type A, Type B and Type C current sensors, the insulation of the input/output circuit leads
659 and the mated TERMINALS is based on the requirements of Clause K.101 for the higher of the
660 voltage RATING and the MEASUREMENT CATEGORY RATING of the JAWS or this RATING of the
661 input/output circuit but not less than 300 V in MEASUREMENT CATEGORY II.

662 For Type D current sensors, the insulation of the input/output circuit leads and of the mated
663 TERMINALS is based on the requirements of Clause K.101 for 300 V in MEASUREMENT
664 CATEGORY II.

Conformity is checked by inspection, by measurement of the applicable value or the voltage test of K.101.2 for CLEARANCES, by measurement of the applicable value of K.101.3 for CREEPAGE DISTANCES, and by the voltage tests of K.101.4.1 a) and b) for solid insulation.

6.6.102.3 Protection against rise of potential from measuring or control equipment

When connected to measuring or control equipment (wattmeter, power quality analyser, etc.), the inner conductors of input/output circuit leads of current sensors can be held at a HAZARDOUS LIVE voltage, when the internal ground of the measuring or control equipment is at the potential of a HAZARDOUS LIVE conductor.

The manufacturer shall assign a voltage value and specify if a MEASUREMENT CATEGORY is RATED for this connection.

No minimum voltage RATINGS are required by this document for the current sensor TERMINALS dedicated for connection to measuring or control equipment.

The unmated TERMINALS shall comply with the requirements of 9.101.2.

If the current sensor has been designed for use only with a specific model of equipment, the current sensor TERMINAL RATING shall be consistent with the TERMINAL RATING of this specific measuring or control equipment.

Conformity is checked as specified in 9.101.2, by inspection and,

a) if the current sensor is RATED for MEASUREMENT CATEGORIES, by measurement of the applicable value or the voltage test of K.101.2 for CLEARANCES, by measurement of the applicable value of K.101.3 for CREEPAGE DISTANCES, and by the voltage tests of K.101.4.1 a) and b) for solid insulation;

b) if the current sensor is not RATED for MEASUREMENT CATEGORIES, by measurement of the applicable values of K.3.2, K.3.3 or K.3.101 for CLEARANCES and of K.3.4 for CREEPAGE DISTANCES, and by the voltage tests of K.3.5 for solid insulation.

6.7.1.3 Creepage distances

Insert the following new paragraph between the third paragraph and the fourth paragraph:

For current sensors not powered from the MAINS or from the MEASURING CIRCUIT, the applicable values of CREEPAGE DISTANCES from material group I are allowed to be applied to all materials.

6.7.1.5 Requirements for insulation according to type of circuit

Replace the text of the subclause with the following new text:

Requirements for insulation in particular types of circuits are specified as follows:

a) in 6.7.2 for MAINS CIRCUITS of OVERVOLTAGE CATEGORY II with a nominal supply voltage up to 300 V;

b) in 6.7.3 for secondary circuits separated from the circuits in a) by means of a transformer only;

c) in Clause K.1 for MAINS CIRCUITS of OVERVOLTAGE CATEGORY III or IV or for OVERVOLTAGE CATEGORY II over 300 V;

- d) in Clause K.2 for secondary circuits separated from the circuits in c) by means of a transformer only;
- e) in Clause K.3 for circuits that have one or more of the following characteristics:
- 1) the maximum possible TRANSIENT OVERVOLTAGE is limited by the supply source or within the current sensor to a known level below the level assumed for the MAINS CIRCUIT;
 - 2) the maximum possible TRANSIENT OVERVOLTAGE is above the level assumed for the MAINS CIRCUIT;
 - 3) the WORKING VOLTAGE is the sum of voltages from more than one circuit, or is a mixed voltage;
 - 4) the WORKING VOLTAGE includes a recurring peak voltage that may include a periodic non-sinusoidal waveform or a non-periodic waveform that occurs with some regularity;
 - 5) the WORKING VOLTAGE has a frequency above 30 kHz;
 - 6) the circuit is a MEASURING CIRCUIT where MEASUREMENT CATEGORIES do not apply;
- f) in Clause K.101 for MEASURING CIRCUITS RATED for MEASUREMENT CATEGORIES.

NOTE 1 See Annex I for line-to-neutral voltage pertinent to MAINS type and nominal voltage.

NOTE 2 These requirements are illustrated in the flowchart of Annex DD, Figure DD.1.

NOTE 3 See Clause K.3 for requirements for switching circuits such as a switching power supply.

The TRANSIENT OVERVOLTAGE levels for the MAINS correspond to the impulse voltage values specified in Table K.101.

6.8.1 General

Delete the third paragraph and insert between the second and the third paragraph the following two new paragraphs:

For measuring the CLEARANCES of unmated TERMINALS (see 6.6.101.2 2) a) ii)), the reference point for application of the test voltage is determined using the test finger applied to the external parts of the TERMINAL in the least favourable position with the closest approach. If the a.c. voltage test of 6.8.3.3 is selected to test CLEARANCES, a test probe with a tip in the shape of the test finger can be used for application of the test voltage.

For other testing, ACCESSIBLE insulating parts of the ENCLOSURE are covered with metal foil everywhere except around unmated TERMINALS. For test voltages up to 10 kV a.c. peak or 10 kV d.c., the distance from foil to TERMINAL is not more than 20 mm. For higher voltages it is the minimum to prevent flashover. For guidance on these minimum distances, see Table 9.

Add the following new paragraph after the last paragraph of 6.8.1:

When testing solid insulation, using the a.c. voltage test of 6.8.3.1 or the d.c. voltage test of 6.8.3.2, the test is conducted using a.c. for a.c. supplied equipment and d.c. for d.c. supplied equipment. If the a.c. supplied equipment is tested and exceeds the trip current limit of the test equipment without flashover or breakdown, the d.c. test may be conducted. There is no limit to the allowable current draw during these tests.

Add the following two new subclauses after 6.11:

6.101 Protection against HAZARDOUS LIVE conductors

6.101.1 General

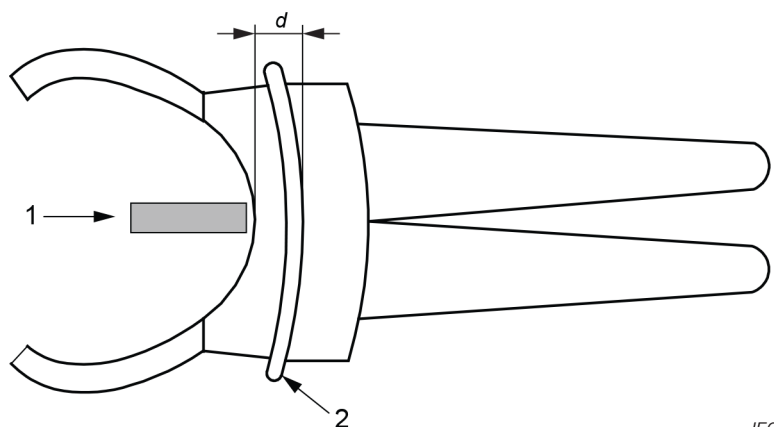
Current sensors need additional protective means against HAZARDOUS LIVE conductors. They shall meet the requirements of the following subclauses when applicable, 6.101.2 (for Type A current sensors, protection by a PROTECTIVE FINGERGUARD), 6.101.3 (for Type A current sensors, insulation of HAND-HELD or hand-manipulated parts) or 6.101.4 (for Type A, Type B and Type C current sensors, insulation of input/output circuits).

6.101.2 Protection by a PROTECTIVE FINGERGUARD

To reduce the RISK of the OPERATOR touching the HAZARDOUS LIVE conductor during clamping or measurement, Type A current sensors shall have a PROTECTIVE FINGERGUARD to warn the OPERATOR of the limit of safe access. The PROTECTIVE FINGERGUARD shall cover at least 50 % of the perimeter, and shall at least extend along two opposite sides of the HAND-HELD part.

The CLEARANCE and CREEPAGE DISTANCE between HAZARDOUS LIVE parts and the PROTECTIVE FINGERGUARD shall meet the requirements for REINFORCED INSULATION for the RATING of the JAWS. Figure 101 gives an example of the CLEARANCE d from the PROTECTIVE FINGERGUARD to the JAWS and to the HAZARDOUS LIVE conductor.

Conformity is checked by inspection and measurement of CLEARANCES and CREEPAGE DISTANCES.



Key

- 1 HAZARDOUS LIVE conductor
- 2 PROTECTIVE FINGERGUARD
- d distance between PROTECTIVE FINGERGUARD and HAZARDOUS LIVE conductor

Figure 101 – CLEARANCE between the PROTECTIVE FINGERGUARD to the JAWS and to the HAZARDOUS LIVE conductor

6.101.3 Insulation of HAND-HELD or hand-manipulated parts for Type A current sensors

HAND-HELD or hand-manipulated parts of Type A current sensors shall be separated by DOUBLE INSULATION or REINFORCED INSULATION from the parts of the JAWS which can be touched by an UNINSULATED CONDUCTOR, in open and in closed position (see Table D.101, column with heading "1 and 3").

If conductive parts of the magnetic circuit can touch a conductor, the magnetic circuit is considered to be held at the RATED voltage to earth of the JAWS (see Table D.101, column with heading "3 and 5").