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Responsible committee: EPL/66 Safety of measuring, control and laboratory equipment

Interested committees:

Title: BS EN 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

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

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- ii) affects other national standard(s)
- iii) requires additional national guidance or information

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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

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

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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	Commend (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.	

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: IEC 61010-2-032 ED5	
DATE OF CIRCULATION: 2022-10-14	CLOSING DATE FOR VOTING: 2023-01-06
SUPERSEDES DOCUMENTS: 66/762/RR	

IEC TC 66 : SAFETY OF MEASURING, CONTROL AND LABORATORY EQUIPMENT	
SECRETARIAT: United Kingdom	SECRETARY: Ms Stephanie Lavy
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☒ SAFETY	
☒ SUBMITTED FOR CENELEC PARALLEL VOTING Attention IEC-CENELEC parallel voting The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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.

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

PROPOSED STABILITY DATE: 2025

NOTE FROM TC/SC OFFICERS:

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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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- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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

It has the status of a group safety publication in accordance with IEC Guide 104.

This fifth edition cancels and replaces the fourth edition published in 2019. This edition constitutes a technical revision.

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

Clause 2	All normative references have been dated and new normative references have been added.
3.2.103	A new definition PROTECTIVE FINGERGUARD has been added to replace PROTECTIVE BARRIER
4.4.2.101	Addition of a new subclause about surge protective devices.
5.1.5.101.2	Minimum RATINGS for voltage of measuring TERMINALS are required.
6.5.1	The subclause has been modified
6.5.5	The subclause is no more used
6.6.101.1	Insulating material of group I may be allowed for determination of CLEARANCES of measuring circuit TERMINALS.
6.6.101.2	CLEARANCES and CREEPAGE DISTANCES above 1 000 V a.c. and 1 500 V d.c. for measuring circuit TERMINALS in unmated position have been defined.
6.6.101.3	Requirements for measuring circuit TERMINALS in partially mated position have been specified.
6.6.101.4	Requirements for measuring circuit TERMINALS in mated position have been specified.
6.6.102	This subclause replaces 6.6.101
6.101	This subclause replaces 6.9.101 of previous edition and has been modified.
6.102	The subclause replaces 6.9.102 of previous edition and has been modified.
8.101	JAW ENDS abrasion test has been modified.
8.105	A new subclause for input/output leads attachment has been added
9.101.2	Relocation of 101.3 of previous edition.
9.101.3	Relocation of 101.4 of previous edition, extension to MEASUREMENT CATEGORY II and reference to IEC 61000-4-5 for tests. Table 102 has been replaced by Table K.101.
9.102	Relocation of 102 of previous edition.
14.101	Relocation of 14.102. 14.101 of previous edition has been deleted.
101.3	New subclause for protections against HAZARD occurring from reading a voltage value in replacement of EE.5 of previous edition.
Table D.101	Transients are disregarded for insulation between JAW ENDS and input/output circuits.
F.101	Tests voltage for routine test of JAWS have been modified.
K.2.1	Another method for determination of CLEARANCES of secondary circuits is proposed.
K.3.2	New Table K.15 and Table K.16 for CLEARANCE calculation.
K.3.101	New clause
Clause K.4	Redraft of the clause to propose a method for determination of U_t for circuits which reduce TRANSIENT OVERVOLTAGES. Table K.101 replaces Table K.106.
K.101.4	The subclause has been reviewed. Tables and tests for solid insulation have been modified. Table K.104 of previous edition has been deleted.
Annex AA	Figure AA.1 has been redesigned.
Annex EE	Addition of a new informative annex for determination of CLEARANCES for Table 101.
Annex FF	This Annex was Annex EE of previous edition. The current sensor type of a CLAMP MULTIMETER is type A or type B.

128

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

FDIS	Report on voting
66/xxx/FDIS	66/xxx/RVD

130

131 Full information on the voting for the approval of this International Standard can be found in the
132 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 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.

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 Part 2-032 is to be used in conjunction with IEC 61010-1:2010 and IEC 61010-1:2010/AMD1:2016. It was established on the basis of the third edition (2010) of IEC 61010-1, including its amendment 1 (2016) and its corrigendum 1 (2019), hereinafter referred to as Part 1.

This Part 2-032 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 Part 1 is not mentioned in this Part 2-032, 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 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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174

INTRODUCTION

175 IEC 61010-1 specifies the safety requirements that are generally applicable to all equipment
176 within its scope. For certain types of equipment, the requirements of IEC 61010-1 and its
177 amendment will be supplemented or modified by the special requirements of one, or more than
178 one, particular Part 2 which are read in conjunction with the Part 1 requirements.

179 1) Part 2-030 specifies the safety requirements for equipment with testing or measuring
180 circuits which are connected for test or measurement purposes to devices or circuits outside
181 the measurement equipment itself.

182 2) Part 2-032 specifies the safety requirements for hand-held and hand-manipulated current
183 sensors for measuring, detecting or injecting current, or indicating current waveforms on
184 circuits without physically opening the current path of the circuit being measured.

185 Most of the requirements of Part 2-030 have been included into Part 2-032. Equipment
186 within the scopes of both Part 2-030 and Part 2-032 are considered to be covered by the
187 requirements of Part 2-032.

188 However, for current sensor in combined equipment with protective bonding and automatic
189 disconnection of the supply, Part 2-030 and Part 2-032 are read in conjunction

190 3) Part 2-033 specifies the safety requirements for hand-held multimeters and other meters for
191 domestic and professional use, capable of measuring mains voltage, intended to measure
192 voltage and other electrical quantities such as resistance or current.

193 All relevant requirements of Part 2-030 have been included into Part 2-033.

194 4) Part 2-034 specifies the safety requirements for measurement equipment for insulation
195 resistance and test equipment for electric strength which are connected to units, lines or
196 circuits for test or measurement purposes.

197 All relevant requirements of Part 2-030 have been included into Part 2-034. However, for
198 equipment within the scope of Part 2-032 and Part 034, these standards are read in
199 conjunction.

200 IEC 61010-031 specifies the safety requirements for hand-held and hand-manipulated probe
201 assemblies and their related accessories intended to be used in particular with equipment in
202 the scope of Part 2-030, Part 2-032, Part 2-033 and Part 2-034. These probe assemblies are
203 for non-contact or direct electrical connection between a part and electrical test and
204 measurement equipment. They may be fixed to the equipment or be detachable accessories for
205 the equipment.

206

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

Part 2-032: Particular requirements for hand-held and hand-manipulated current sensors for electrical test and measurement

1 Scope and object

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

1.1.1 Equipment included in scope

Replace the existing text with the following:

This group safety publication is primarily intended to be used as a product safety standard for the products mentioned in the scope, but shall also be used by technical committees in the preparation of their publications for products similar to those mentioned in the scope of this document, in accordance with the principles laid down in IEC Guide 104 and ISO/IEC Guide 51.

This part of IEC 61010 specifies safety requirements for HAND-HELD and hand-manipulated current sensors described below.

These current sensors are for measuring, detecting or injecting current, or indicating current waveforms on circuits without physically opening the current path of the circuit being measured. They can be stand-alone current sensors or accessories to other equipment or parts of combined equipment (see Figure 101). These include measurement circuits which are part of electrical test and measurement equipment, laboratory equipment, or process control equipment. These current sensors and circuits need additional protective means between the current sensor, the circuit and an OPERATOR.

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.

Current sensors are hand-manipulated before and/or after a test or measurement, but do not necessarily need to be HAND-HELD during the test or measurement. Current sensors used as FIXED EQUIPMENT are not within the scope of this document.

The following types of current sensors are covered:

a) Type A: a current sensor designed to be applied to or removed from HAZARDOUS LIVE UNINSULATED CONDUCTORS. Type A current sensors have defined HAND-HELD or hand-manipulated parts providing protection against electric shock from the conductor being measured, and also have protection against short-circuits between wires and between busbars during clamping.

b) Type B: a current sensor which has protection against short-circuits between wires or busbars during clamping but without defined HAND-HELD or hand-manipulated parts which provide protection against electric shock during clamping. Additional protective means are necessary to avoid electric shock from HAZARDOUS LIVE conductors which cannot be de-energised during application or removal of the current sensor.

EXAMPLE 1 Flexible current sensors.

c) Type C: a current sensor without protection against short-circuits between wires or busbars during clamping. Type C current sensors are intended to be applied to or removed from

253 HAZARDOUS LIVE UNINSULATED CONDUCTORS or from non-limited-energy circuit conductors
254 only when they are de-energised.

255 EXAMPLE 2 Split-core transducers.

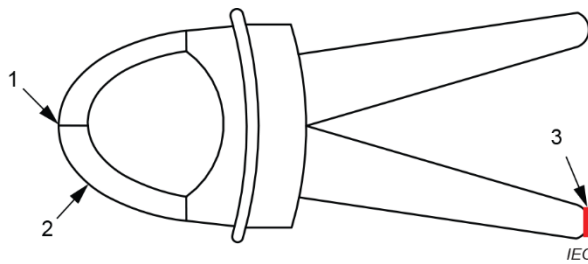
256 d) Type D: a current sensor designed to be applied to or removed from insulated conductors
257 or from limited-energy circuit conductors.

258 EXAMPLE 3 Current probes for oscilloscopes and earth leakage current detectors.

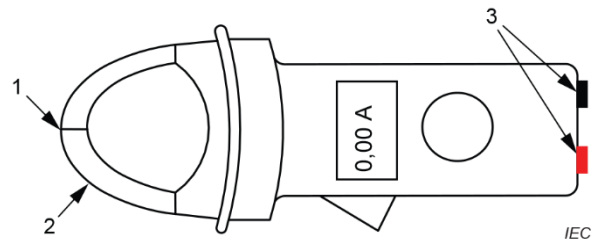
259 Type A, Type B and Type C current sensors can also be applied to or removed from insulated
260 conductors. In this case, HAZARDS are limited to acceptable levels by the insulation of the
261 conductors.

262 Additional requirements for CLAMP MULTIMETERS are given in Annex FF.

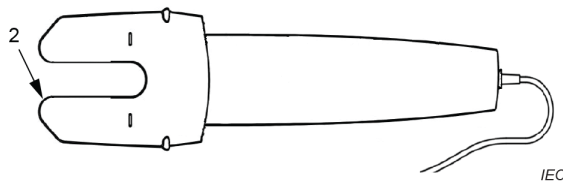
263 Figure 101 shows graphical representations of typical current sensors for illustration purposes.
264 Current sensors can look different depending on the design.



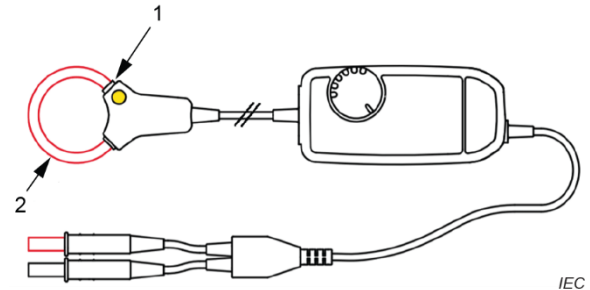
Type A - Current sensor as an accessory



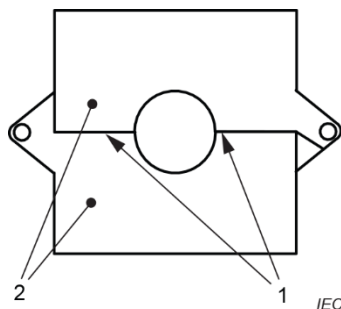
Type A - Current sensor with self-contained and/or additional measuring functions



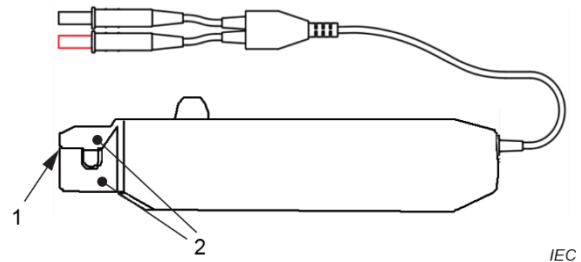
Type A - Current sensor with fork-style JAWS



**Type B - Flexible current sensor
part of a piece of combined equipment**



Type C - Split-core current sensor



**Type D - Current sensor for non-HAZARDOUS LIVE
applications (shown with a sliding JAW)**

Key

- 1 JAW END(S)
- 2 JAW
- 3 measuring circuit TERMINALS

Figure 101 – Examples of current sensors and their parts

1.2.1 Aspects included in scope

Replace item c) of the second paragraph with the following new item:

- c) spread of fire or arc flash from the current sensor (see Clause 9);

Replace the third paragraph with the following two new paragraphs:

Requirements for protection against HAZARDS arising from NORMAL USE, REASONABLY FORESEEABLE MISUSE and ergonomic factors are specified in Clause 16, Clause 101 and Annex FF.

Annex BB provides guidance to equipment manufacturer on HAZARDS that should be considered for equipment intended for performing tests and measurements on hazardous conductors, including MAINS conductors and telecommunication network conductors.

2 Normative references

IEC 61010-1:2010, Clause 2 and IEC 61010-1:2010/AMD1:2016, Clause 2 apply except as follows:

Replace the following existing normative references:

IEC 60068-2-75, *Environmental testing - Part 2-75: Tests - Test Eh: Hammer tests*

IEC 60364-4-44:2007, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*
IEC 60364-4-44:2007/AMD1:2015

IEC 61010-031, *Safety requirements for electrical equipment for measurement, control and laboratory use – Part 031: Safety requirements for hand-held probe assemblies for electrical measurement and test*

IEC 61180 (all parts), *High-voltage test techniques for low-voltage equipment*

IEC 61180-1, *High-voltage test techniques for low-voltage equipment – Part 1: Definitions, test and procedure requirements*

IEC 61180-2, *High-voltage test techniques for low-voltage equipment – Part 2: Test equipment*

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

with the following new normative references:

IEC 60068-2-75:2014, *Environmental testing - Part 2-75: Tests - Test Eh: Hammer tests*

IEC 60364-4-44:2007, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*
IEC 60364-4-44:2007/AMD1:2015
IEC 60364-4-44:2007/AMD2:2018

IEC 61010-031: —1, *Safety requirements for electrical equipment for measurement, control and laboratory use – Part 031: Safety requirements for hand-held and hand-manipulated probe assemblies for electrical test and measurement*

IEC 61180:2016, *High-voltage test techniques for low-voltage equipment – Definitions, test and procedure requirements, test equipment*

NOTE IEC 61180:2016 replaces everywhere IEC 61180, IEC 61180-1 and IEC 61180-2 are referenced in Part 1.

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

Add the following new normative references:

IEC 60695-10-2:2014, *Fire hazard testing - Part 10-2: Abnormal heat - Ball pressure test method*

¹ Third edition under preparation. Stage at the time of publication: IEC FDIS 61010-031:2022

316 IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) - Part 4-5: Testing and*
317 *measurement techniques - Surge immunity test*
318 IEC 61000-4-5:2014/AMD1:2017

319 **3 Terms and definitions**

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

322 **3.1 Equipment and states of equipment**

323 *Add the following two new terms and definitions:*

324 **3.1.101**

325 **HAND-HELD**

326 intended to be supported by one hand during NORMAL USE

327 **3.1.102**

328 **CLAMP MULTIMETER**

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

332 **3.2 Parts and accessories**

333 *Add the following two new terms and definitions:*

334 **3.2.101**

335 **JAW**

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

337 **3.2.102**

338 **JAW END**

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

340 **3.2.103**

341 **PROTECTIVE FINGERGUARD**

342 part of the enclosure that indicates the limit of safe access and that reduces the risk of the
343 operator touching HAZARDOUS LIVE parts

344 **3.5 Safety terms**

345 *Replace the definition of 3.5.4 with the following new definition:*

346 **3.5.4**

347 **MAINS**

348 electricity supply system

349 *Add the following new term and definition:*

350 **3.5.101**

351 **MEASUREMENT CATEGORY**

352 classification of testing and measuring circuits according to the type of MAINS to which they are
353 intended to be connected

354 Note 1 to entry: MEASUREMENT CATEGORIES take into account OVERVOLTAGE CATEGORIES, short-circuit current levels,
355 the location where the test or measurement is to be made and some forms of energy limitation or transient protection
356 included in the building installation (see Annex AA for more information).

3.6 Insulation

Add the following new term and definition:

3.6.101

UNINSULATED CONDUCTOR

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

4 Tests

IEC 61010-1:2010, Clause 4 and IEC 61010-1:2010/AMD1:2016, Clause 4 apply except as follows:

4.3.2.5 MAINS supply

Replace the existing title and text of 4.3.2.5 with the following title and text:

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 current sensor can be set or, if the current sensor is RATED for a greater fluctuation, at any supply voltage within the fluctuation range;
- b) the MAINS frequency shall be any RATED frequency;
- c) current sensor for both a.c. and d.c. shall be connected to an a.c. or d.c. supply;
- d) current sensor powered by single-phase a.c. MAINS supply shall be connected both with normal and reverse polarity;
- e) if the means of connection permit reversal, battery-operated and d.c. current sensor shall be connected with both reverse and normal polarity.

4.3.2.6 Input and output voltages

Replace the existing title and text of 4.3.2.6 with the following 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 MAINS supply voltage, shall be set to any voltage or current within their RATED range, in normal and reverse polarity if possible.

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:

4.4.2.101 Surge protective devices

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

5 Marking, documentation and indicator

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

5.1.2 Identification

Add the following new items and a new paragraph after the Note to item b):

- 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 102 of Table 1;
- cc) for Type B and Type C current sensors, with symbol 101 of Table 1;
- dd) for Type D current sensors, with symbol 101 and symbol 14 of Table 1.

The relevant symbol (14, 101 or 102) shall be marked adjacent to the JAWS or 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 two new symbols:

Number	Symbol	Reference	Description
101			Do not apply current sensor to or remove from HAZARDOUS LIVE UNINSULATED CONDUCTORS, which may render electric shock, electric burn, or arc flash
102		IEC 60417-6300 (2016-03)	Application of current sensor to and removal from HAZARDOUS LIVE UNINSULATED CONDUCTORS is permitted

5.1.5 TERMINALS, connections and operating devices

Add the following new subclause:

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 5.1.5.101.4:

- 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.

Symbol 14 of Table 1 shall be marked if current measuring TERMINALS are not intended for connection to current transformers without internal protection (see 101.2).

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 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

Measuring circuit TERMINALS do not need to be marked 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:

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

470 *Conformity is checked by inspection.*

471 **5.1.5.102 Voltage and current RATINGS of JAWS**

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

476 JAWS of Type A, Type B or Type C current sensors RATED for MEASUREMENT CATEGORIES, shall
477 be marked with the relevant MEASUREMENT CATEGORY adjacent to the a.c. r.m.s. line-to-neutral
478 or d.c. voltage marking (see also note of 5.1.5.101.2). The MEASUREMENT CATEGORY markings
479 shall be "CAT II", "CAT III" or "CAT IV" as applicable.

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

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

484 *Conformity is checked by inspection.*

485 **5.4.1 General**

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

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

493 Some current sensors may have multiple MEASUREMENT CATEGORY RATINGS for the same
494 measuring circuit. For such current sensors, the documentation shall clearly identify the
495 MEASUREMENT CATEGORIES where the current sensor is intended to be used and where it shall
496 not be used.

497 **5.4.3 Equipment installation**

498 *Add the following two new items to the list:*

- 499 aa) for measuring circuit TERMINALS intended for permanent connection and that are RATED
- 500 for MEASUREMENT CATEGORIES, information regarding the MEASUREMENT CATEGORY, RATED
- 501 voltages or RATED currents as applicable (see 5.1.5.101.2 and 5.1.5.102);
- 502 bb) for measuring circuit TERMINALS intended for permanent connection and that are not RATED
- 503 for MEASUREMENT CATEGORIES, information regarding the RATED voltages, RATED currents,
- 504 and RATED TRANSIENT OVERVOLTAGES as applicable (see 5.1.5.101.4 and 5.1.5.102).

505 **5.4.4 Equipment operation**

506 *Replace the existing text with the following:*

507 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 Protection against electric shock

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

6.1.2 Exceptions

Add the following new item to the list:

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

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.

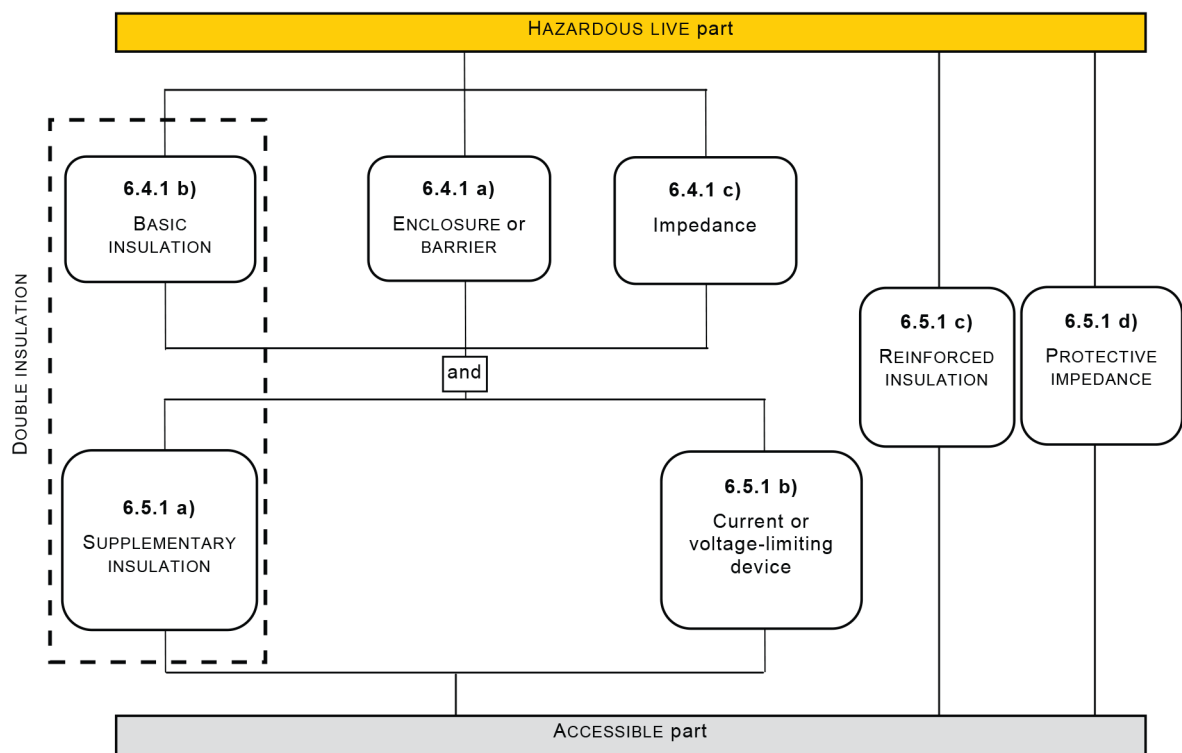


Figure 4 – Acceptable arrangement of protective means against electric shock

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

6.6 Connections to external circuits

Add the following two new subclauses and table:

6.6.101 Measuring circuit TERMINALS

6.6.101.1 General

When determining the values of CREEPAGE DISTANCES for measuring circuit TERMINALS 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 measuring circuit 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).

- a) For measuring circuit 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.	d.c.
	mm	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 measuring circuit 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 one of the following tests:

- i) 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), or
- ii) the a.c. voltage test of 6.8.3.1 or the d.c. voltage test of 6.8.3.2 for TERMINAL stressed only by d.c. with a duration of at least 5 s, or the impulse voltage test of 6.8.3.3, using the applicable test voltage 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).

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.

ACCESSIBLE parts of other measuring circuits TERMINALS in mated position shall be insulated from HAZARDOUS LIVE parts by DOUBLE INSULATION or REINFORCED INSULATION.

Conformity is checked by inspection and measurement.

6.6.101.5 Specialized measuring circuit TERMINALS

Specialized measuring circuit TERMINALS are TERMINALS intended to be connected to components, sensors, and devices.

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

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 in SINGLE FAULT CONDITION, even when the highest RATED voltage is applied to any other measuring circuit TERMINAL.

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 related maximum RATED measurement frequency.*

6.6.102 Input/output circuit leads

6.6.102.1 General

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

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

6.6.102.2 Protection against HAZARDOUS LIVE installation

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

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

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

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

Add the following new paragraph after the third paragraph: