ANSI/ISA-S82.02.04-1996 (IEC 1010-2-032)

Approved May 31, 1996

Standard

Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

Identical to IEC 1010-2-032:
Particular requirements for hand-held current clamps for electrical measurement and test

ANSI/ISA-S82.02.04-1996 (IEC 1010-2-032), Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

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Preface

This preface as well as all footnotes and annexes are included for informational purposes and is not part of ANSI/ISA-S82.02.04-1996 (IEC 1010-2-032).

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The ISA Standards and Practices Department is aware of the growing need for attention to the metric system of units in general, and the International System of Units (SI) in particular, in the preparation of instrumentation standards, recommended practices, and technical reports. The Department is further aware of the benefits to USA users of ISA standards of incorporating suitable references to the SI (and the metric system) in their business and professional dealings with other countries. Toward this end, this Department will endeavor to introduce SI-acceptable metric units in all new and revised standards to the greatest extent possible. *The Metric Practice Guide*, which has been published by the Institute of Electrical and Electronics Engineers as ANSI/IEEE Std. 268-1992, and future revisions, will be the reference guide for definitions, symbols, abbreviations, and conversion factors.

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Contents

Foreword

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international cooperation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental, and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

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International Standard 1010-2-0301 has been prepared by IEC technical committee No. 66: Safety of measuring, control, and laboratory equipment.

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

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

DIS	Report on Voting
66(CO)52	66(CO)56

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

This Part 2 is intended to be used in conjunction with IEC 1010-1. It was established on the basis of the first edition (1990) and its Amendment 1 (1991). Consideration may be given to future editions of, or amendments to, IEC 1010-1.

This Part 2 supplements or modifies the corresponding clauses in IEC 1010-1 so as to convert that publication into the IEC standard: *Safety requirements for hand-held current clamps for electrical measurement and test.*

Where a particular subclause of Part 1 is not mentioned in this Part 2, that subclause applies as far as is reasonable. Where this Part 2 states “addition,” “modification,” or “replacement,” the relevant requirement, test specification, or note in Part 1 should be adapted accordingly.

In this standard, the following print types are used:

. requirements: in roman type;

. NOTES: in small roman type;

. compliance: in italic type;

. terms used throughout this standard that have been defined in Clause 3:

SMALL ROMAN CAPITALS

1 Scope and object

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

1.1 *Scope*

Replace the text by the following:

This International Standard applies to hand-held and hand-manipulated CURRENT CLAMPS. These manipulated CURRENT CLAMPS are for use in the measurement of current without interruption of the current path of the circuit in which it is measured. They may be stand-alone manipulated CURRENT CLAMPS that are themselves within the scope of Part 1 or accessories to other equipment within the scope of Part 1.

This standard does not apply to current transformers or current transducers intended for fixed installations.

1.4 *Environmental conditions*

Replace the seventh dash by the following:

- primary input circuits with transient overvoltages according to INSTALLATION CATEGORIES (OVERVOLTAGE CATEGORIES) I, II, and IV (see Annex J).

2 Normative references

This clause of Part 1 is applicable with the following addition to the list of IEC Standards:

1010-2-031: 1993, *Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-031: Particular requirements for hand-held probe assemblies for electrical measurement and test.*

3 Definitions

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

Add the following new subclause and three definitions:

3.101 CURRENT CLAMPS and their parts

3.101.1 CURRENT CLAMP: A device for measuring current or indicating current waveforms without interrupting the current path of the circuit in which it is measured or under test.

3.101.2 JAW: The part or parts of a CURRENT CLAMP that surrounds the conductor under test to pick up the magnetic field.

3.101.3 JAW OPENING: The part or parts of the JAW where opening occurs while clamping around a conductor.

NOTE — See Figures 101 and 102 (page 7) for examples of CURRENT CLAMPS and their parts.

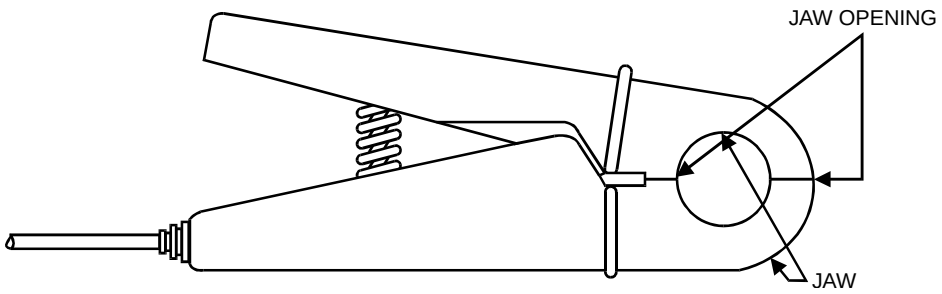

Figure 101 - Example of a CURRENT CLAMP as an accessory to equipment within the scope of Part 1

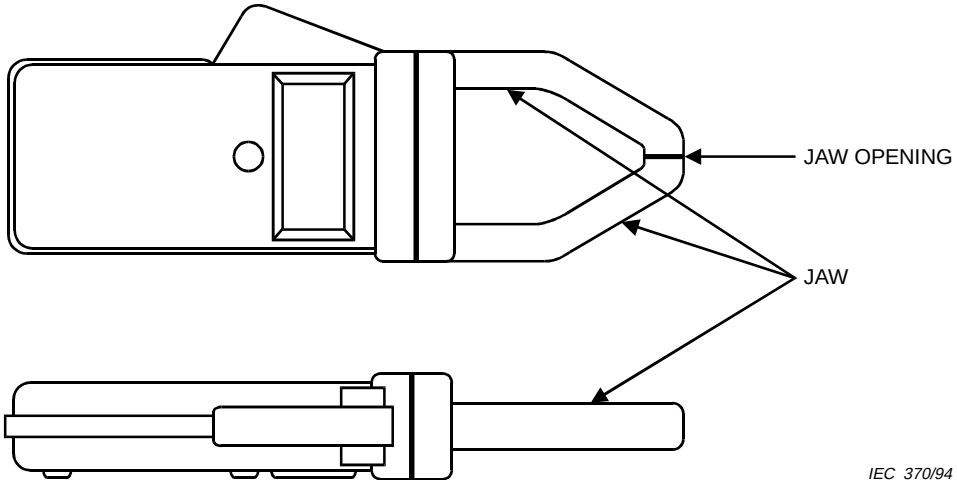

Figure 102 - Example of a CURRENT CLAMP as an instrument within the scope of Part 1

4 Tests

This clause of Part 1 is applicable except as follows:

4.4.2.7 *Outputs*

Replace the text by the following:

Outputs shall be open-circuited or short-circuited (whichever is the less favourable), one output at a time.

5 Marking and documentation

This clause of Part 1 is applicable except as follows:

Add the following new Subclause 5.1.101:

5.1.101 *RATING*

There shall be a marking on the CURRENT CLAMP of the maximum RATED value of the circuit-to-earth voltage for an uninsulated current conductor under test. The nature of the voltage (a.c., d.c., etc.) shall also be marked, unless the marking applies to both a.c. (r.m.s.) and d.c.

The INSTALLATION CATEGORY (OVERVOLTAGE CATEGORY) shall be marked adjacent to the maximum RATED voltage to earth, by adding CAT.@ to the value of the voltage. A roman I, II, III, or IV in place of @ indicates the appropriate INSTALLATION CATEGORY (OVERVOLTAGE CATEGORY) (see Annex J).

The value and nature of the maximum permissible current shall be marked.

Conformity is checked by inspection.

5.1.2 *Identification*

Replace the first dash by the following:

- the name or registered trade mark of the manufacturer or supplier;

Add the following new dash:

- if the CURRENT CLAMP is designed for use only with a specific model of equipment, the identification of the specific model shall be clearly indicated either on the CURRENT CLAMP or in its accompanying documentation. If this information is available only in the documentation, symbol 14 of Table 1 shall be marked on the CURRENT CLAMP.

6 Protection against electric shock

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

6.1.1 *Exceptions*

Add a new dash to the first paragraph:

- conductive parts within a JAW OPENING, provided that they meet the requirements of 6.7 and 13.101.

6.4 *Protection in* NORMAL CONDITION

Add the following new Subclause 6.4.101:

6.4.101 *Hand-held or hand-manipulated parts*

The parts of a CURRENT CLAMP that are hand-held or hand-manipulated during NORMAL USE shall meet the requirements of Annex D for DOUBLE INSULATION or REINFORCED INSULATION.

> **NOTE —** To avoid misunderstanding, these requirements are sufficient to fulfill the requirements specified for additional protection in SINGLE FAULT CONDITION stated in 6.5 of Part 1.

Conformity is checked by inspection, by measurement of CLEARANCES and CREEPAGE DISTANCES, by the voltage tests of 6.8, and by the determination of ACCESSIBLE parts according to 6.2.

6.7 *CLEARANCES* and CREEPAGE DISTANCES

Add the following new Subclause 6.7.101:

6.7.101 *BARRIER or tactile indicator*

Either a BARRIER shall be fitted to provide distance and reduce the danger of touching the JAW OPENING or the conductor under test, or a tactile indicator shall warn the OPERATOR of the limit of safe access.

The CLEARANCE and the CREEPAGE DISTANCE between the BARRIER or indicator and HAZARDOUS LIVE parts shall meet the requirements of Annex D for DOUBLE INSULATION or REINFORCED INSULATION. Figures 103 and 104 give examples of the CLEARANCE “d” from the BARRIER or tactile indicator to the JAWS, the JAW OPENING, and to the conductor under test.

BARRIER or tactile indicator

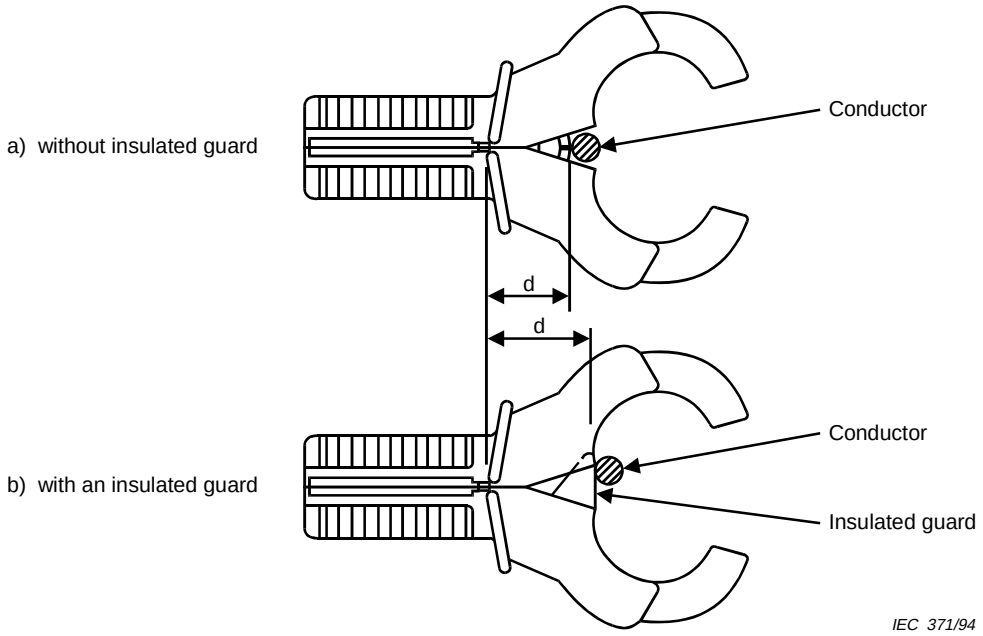

Figure 103 - CLEARANCE between BARRIER and conductor showing extreme positions of the conductor to be considered when the CURRENT CLAMP is in the open position

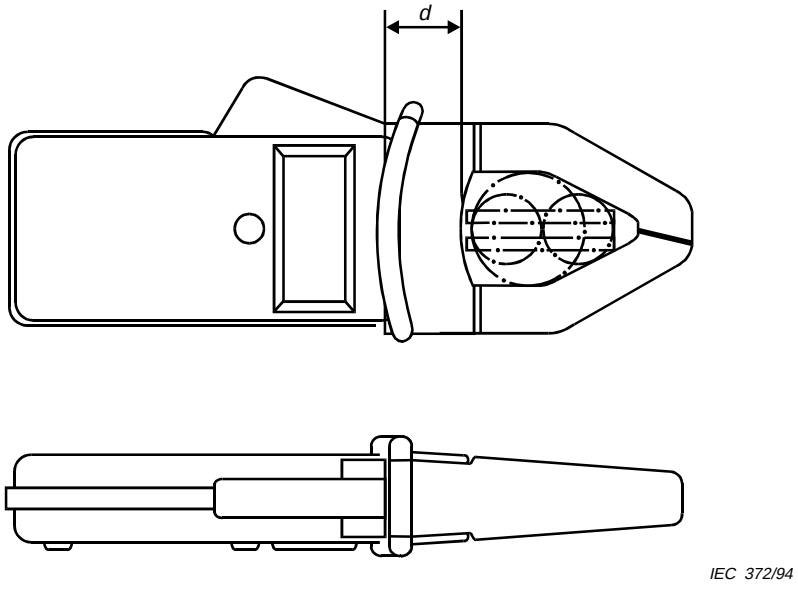

Figure 104 - CLEARANCE between BARRIER and conductor showing the lower limit of CLEARANCE

7 Protection against mechanical hazards

This clause of Part 1 is applicable.

8 Mechanical resistance to shock, vibration, and impact

This clause of Part 1 is applicable.

9 Equipment temperature limits and protection against the spread of fire

This clause of Part 1 is applicable.

10 Resistance to heat

This clause of Part 1 is applicable.

11 Resistance to moisture and liquids

This clause of Part 1 is applicable.

12 Protection against radiation, including laser sources, and against sonic and ultrasonic pressure

This clause of Part 1 is applicable.

13 Protection against liberated gases, explosion, and implosion

This clause of Part 1 is applicable except as follows:

Add the following new Subclause 13.101:

13.101 *Protection against short circuits*

Protection against a short circuit between wires or busbars during clamping or measurement shall be provided at least by BASIC INSULATION.

Conformity is checked by inspection, by measurement of CLEARANCES and CREEPAGE DISTANCES, and by the voltage tests of 6.8.

14 Components

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

Add the following new Subclause 14.101:

14.101 *Input and output signal measuring leads*

Fixed or detachable input and output signal and measuring leads, and their accessories, shall meet the requirements of IEC 1010-2-031.

Conformity is checked in accordance with IEC 1010-2-031.

15 Protection by interlocks

This clause of Part 1 is applicable.

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

Annex D

Add the following new Tables D.101 and D.102:

Table D.101—BASIC INSULATION or SUPPLEMENTARY INSULATION

Working voltage (r.m.s. or d.c.) up to	POLLUTION DEGREE 2 INSTALLATION CATEGORY (OVERVOLTAGE CATEGORY) IV								
	CLEAR-ANCE	CREEPAGE DISTANCE mm					Test voltage V		
		In equipment			On printed wiring board				
		Material group							
		I	II	III	Not coated	Coated	Peak impulse	r.m.s. 50/60 Hz	d.c. or 50/60 Hz peak
V	mm	CTI > 600	CTI > 400	CTI > 100	CTI > 175	CTI > 100	1,2/50 µs	1 min	1 min
50	0,5	0,6	0,85	1,2	0,5	0,5	1 500	820	1 150
100	1,5	1,5	1,5	1,5	1,5	1,5	2 500	1 350	1 900
150	3,0	3,0	3,0	3,0	3,0	3,0	4 000	2 200	3 100
300	5,5	5,5	5,5	5,5	5,5	5,5	6 000	3 250	4 600
600	8,0	8,0	8,0	8,0	8,0	8,0	8 000	4 350	6 150
1 000	14,0	14,0	14,0	14,0	14,0	14,0	12 000	6 530	9 230

Table D.102 — BASIC INSULATION or REINFORCED INSULATION

Working voltage (r.m.s. or d.c.) up to	POLLUTION DEGREE 2 INSTALLATION CATEGORY (OVERVOLTAGE CATEGORY) IV								
	CLEAR-ANCE	CREEPAGE DISTANCE mm					Test voltage V		
		In equipment			On printed wiring board				
		Material group							
		I	II	III	Not coated	Coated	Peak impulse	r.m.s. 50/60 Hz	d.c. or 50/60 Hz peak
V	mm	CTI > 600	CTI > 400	CTI > 100	CTI > 175	CTI > 100	1,2/50 µs	1 min	1 min
50	1,6	1,6	1,7	2,4	1,6	1,6	2 550	1 400	1 950
100	3,3	3,3	3,3	3,3	3,3	3,3	4 250	2 300	3 250
150	6,5	6,5	6,5	6,5	6,5	6,5	6 800	3 700	5 250
300	11,5	11,5	11,5	11,5	11,5	11,5	10 200	5 550	7 850
600	16,0	16,0	16,0	16,0	16,0	16,0	13 600	7 400	10 450
1 000	25,7	25,7	25,7	25,7	25,7	25,7	20 400	11 100	15 700

Annex E

Add a new Clause E.101 as follows:

E.101 Protection between two or more HAZARDOUS LIVE circuits having external TERMINALS or ACCESSIBLE parts (see Figure E.101)

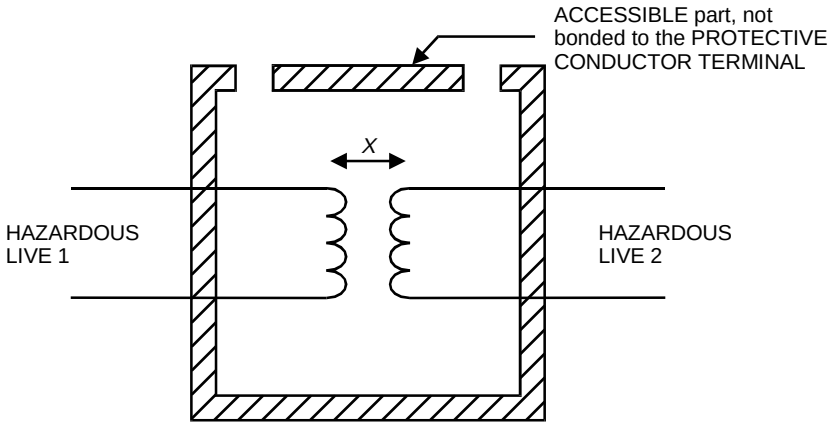

Figure E.101

The insulation between each circuit and the exterior or ACCESSIBLE parts shall be in accordance with the requirements for HAZARDOUS LIVE of E.1.

The test requirements for X shall be determined from the most severe of the following applicable conditions:

B (basic) — where HAZARDOUS LIVE 1 and HAZARDOUS LIVE 2 are both connected, the tests are based on the highest RATED working voltage that stresses the insulation between the circuits in accordance with Annex D;

C (double) — where HAZARDOUS LIVE 1 is connected and the TERMINALS for HAZARDOUS LIVE 2 are ACCESSIBLE for connection purposes, the tests are based on the highest RATED working voltage that stresses the insulation for HAZARDOUS LIVE 1 in accordance with Annex D;

D (double) — where HAZARDOUS LIVE 2 is connected and the TERMINALS for HAZARDOUS LIVE 1 are ACCESSIBLE for connection purposes, the tests are based on the highest RATED working voltage that stresses the insulation for HAZARDOUS LIVE 2 in accordance with Annex D.

Annex J

Delete, in the sixth paragraph, the following sentence:

This category is not relevant to this standard.

Replace Table J.1 by the following new Table J.1:

Table J.1 Impulse withstand voltages

Voltage 3-phase 4-wire systems V	Voltage 3-phase 3-wire systems V	Voltage phase to earth V	Preferred series of impulse withstand voltages for INSTALLATION CATEGORIES (OVERVOLTAGE CATEGORIES) I TO IV V			
			I	II	III	IV
		50	330	500	800	1 500
66/115	120	100	500	800	1 500	2 500
120/208 120/240	240	150	800	1 500	2 500	4 000
230/400 277/480	500	300	1 500	2 500	4 000	6 000
400/690	1 000	600	2 500	4 000	6 000	8 000
		1 000	4 000	6 000	8 000	12 000

Annex M

Add the following three new defined terms:

CURRENT CLAMP	3.101.1
JAW	3.101.2
JAW OPENING	3.101.3

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