

INTERNATIONAL STANDARD



Cable cleats for electrical installations

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CABLE CLEATS FOR ELECTRICAL INSTALLATIONS

FOREWORD

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International Standard IEC 61914 has been prepared by subcommittee 23A: Cable management systems, of IEC technical committee 23: Electrical accessories.

This second edition cancels and replaces the first edition published in 2009. This edition constitutes a technical revision.

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

- a) Additional declaration and test for lateral load retention depending on cleat mounting orientation with associated new figures;
- b) Additional declaration of the distance between the cable centres in any short-circuit test and associated new figures;
- c) Specification of the cable to be used in short-circuit testing and relaxation of the ambient temperature limits for the test;
- d) Additional requirement to photograph the short-circuit test arrangement before and after the test and to record more complete details of the cable used;
- e) Revised parameters for the test of resistance to UV light.

This edition also includes the following editorial changes with respect to the previous edition:

- f) Revised and updated normative references and bibliography;
- g) Editorial clarification of definitions;
- h) Editorial clarification of procedures for selection of test samples and the testing of cleats designed for more than one cable;
- i) Relaxation of some mandrel material requirements;
- j) Clarification of the inspection requirements following a short-circuit test and adding the option of either a.c. or d.c. voltage testing following a second short-circuit;
- k) Clarification that the resistance to corrosion test applies to all types of fixing;
- l) New cleat example illustration;
- m) Limitations of use of the formulae in Annex B added.

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

FDIS	Report on voting
23A/786/FDIS	23A/795/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

In this standard, the following print types are used:

- requirements proper: in roman type;
- *test specifications: in italic type;*
- notes: in smaller roman type.

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

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

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CABLE CLEATS FOR ELECTRICAL INSTALLATIONS

1 Scope

This International Standard specifies requirements and tests for cable cleats and intermediate restraints used for securing cable in electrical installations. Cable cleats provide resistance to electromechanical forces where declared. This standard includes cable cleats that rely on a mounting surface specified by the manufacturer for axial and/or lateral retention of cables.

This standard does not apply to:

- cable glands;
- cable ties.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60060-1:1989 2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60695-11-5:2004, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

~~ISO 868:2003, *Plastics and ebonite – Determination of indentation hardness by means of a durometer (Shore hardness)*~~

ISO 4287:1997, *Geometrical product specifications (GPS) – Surface texture: Profile method – Terms, definitions and surface texture parameters*

ISO 4892-2:2006, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

ISO 9227:2006 2012, *Corrosion tests in artificial atmospheres – Salt spray tests*

3 Terms, definitions and abbreviations

For the purposes of this document, the following terms, definitions and abbreviations apply.

3.1

cable cleat

device designed to provide securing of cables when installed at intervals along the length of cables

Note 1 to entry: A cable cleat is provided with a means of attachment to a mounting surface but does not rely on an unspecified mounting surface for the retention of the cables. Examples of mounting surfaces that may be specified are ladder, tray, strut, ~~wire and beam~~ (see Figures A.8 and A.9) or rail. Where declared, cable cleats provide resistance to electromechanical forces.

Note 2 to entry: See Figure A.1 to Figure A.9 for some examples of cable cleats. These examples do not limit the use of other cable cleat designs that conform to the requirements of this standard.

3.2**intermediate restraint**

cable retaining device designed to be used with cable cleats, without being attached to the mounting surface, to hold the cables together in order to provide resistance to electromechanical forces

3.3**metallic**

consisting of metal only

3.4**non-metallic**

consisting of non-metallic material only

3.5**composite**

consisting of metallic and non-metallic materials

Note 1 to entry: Fibre reinforced resin materials are not considered to be composite under this definition.

3.6**short-circuit current**

overcurrent resulting from a circuit condition in which the current flows through an abnormal or unintended path of negligible impedance between live conductors, or between a live conductor and an earth, having a difference in potential under normal operating conditions

3.7**peak short-circuit current**
 i_p

maximum possible instantaneous value of the short-circuit current (see Annex B)

3.8**initial r.m.s. symmetrical short-circuit current**
 I''_k

r.m.s. value of the a.c. symmetrical component of a short-circuit current, applicable at the instant of the short circuit if the impedance remains at the zero-time value (see Annex B)

3.9**decaying (aperiodic) component of short-circuit current**
 $i_{d.c.}$

mean value between the top and bottom envelope of a short-circuit current decaying from an initial value to zero (see Annex B)

3.10**steady-state short-circuit current**
 I_k

r.m.s. value of the short-circuit current which remains after the decay of the transient phenomena (see Annex B)

3.11**trefoil formation**

formation of three cables so laid as to be mutually equidistant

Note 1 to entry: Viewed in cross-section, the lines joining the cable centres form an equilateral triangle (see Figure 5).

Note 2 to entry: The formation is known as “close trefoil” formation when the cables are touching each other.

3.12

flat formation

formation of a number of cables laid in a plane, usually with equal spacing between adjacent cables (see Figure 6)

3.13

electromechanical forces

induced forces acting on current-carrying conductors

3.14

retention

limiting the lateral and/or axial movement of the cable

3.15

securing

fixing to or from a mounting surface or another product

3.16

environmental influences

effect of corrosive substances or solar radiation, etc.

4 General requirements

Products covered by this standard shall be so designed and constructed that, when assembled and installed as for normal use according to the manufacturer's instructions, they ensure securing of cables as declared in accordance with Clause 6 and shall not cause damage to the cable.

Compliance is checked by the relevant tests specified in this standard.

5 General notes on tests

5.1 Tests according to this standard are type tests.

- Products of all sizes shall comply with Clause 8 and 9.1a).
- For the requirements in 9.1b), 9.1c) and 9.1d) where there are a number of cleats in a range, the range is divided into one or more ~~classes~~ types. In this case, the smallest, and the largest ~~and any critical~~ size of cleat of each ~~class~~ type are tested, ~~except for the test in 9.5. The test in 9.5 is performed on the most critical size in each class.~~
- The test for compliance with 9.1e) is performed on the set of samples selected as defined in 9.5.1.

NOTE For guidance in determining ~~classes~~ types, cable cleats or intermediate restraints having material, construction characteristics, and classifications according to Clause 6 below, in common, are considered to be the same ~~class~~ type.

5.2 Unless otherwise specified, all tests shall be carried out on three new samples of each size selected as specified in 5.1, assembled and installed as for normal use according to the manufacturer's or responsible vendor's instructions. **Where a cable cleat is designed to accommodate more than one cable the number, size and shape of the mandrels used in the test shall represent the number, size and shape of the cables for which the cable cleat is intended.**

5.3 Tests on non-metallic and composite cleats and intermediate restraints shall not commence earlier than 168 h after manufacture.

5.4 Unless otherwise specified, the tests shall be carried out at an ambient temperature of (23^{+5}_{-5}) °C.

5.5 Compliance with this standard is satisfied if all the **applicable** test requirements are achieved. If only one of the samples does not satisfy a test due to a manufacturing fault, then that test and any preceding one which may have influenced the results of the test shall be repeated and also the tests which follow shall be made in the same required sequence on another full set of samples, all of which shall comply with the requirements.

NOTE The applicant, when submitting the first set of samples, may also submit an additional set of samples, which may be necessary should one sample fail. The test house should then, without further request, test the additional set of samples and should only reject if a further failure occurs. If the additional set of samples is not submitted at the same time, a failure of one sample would entail rejection.

5.6 When toxic or hazardous processes are used, due regard shall be taken of the safety of persons within the test area.

6 Classification

6.1 According to material

6.1.1 Metallic

6.1.2 Non-metallic

6.1.3 Composite

6.2 According to maximum and minimum temperature

Table 1 – Maximum temperature for permanent application

A. Maximum temperature °C
+ 40
+ 60
+ 85
+ 105
+ 120

Table 2 – Minimum temperature for permanent application

B. Minimum temperature °C
+ 5
- 5
- 15
- 25
- 40
- 60

NOTE For temperature values above 120 °C and below -60 °C, the manufacturer or responsible vendor may declare temperatures outside the values tabulated above.

6.3 According to resistance to impact

6.3.1 Very light

6.3.2 Light

6.3.3 Medium

6.3.4 Heavy

6.3.5 Very heavy

6.4 According to type of retention or resistance to electromechanical forces or both

6.4.1 General

Manufacturers of cleats shall declare a classification under 6.4.2 and may also declare a classification under 6.4.3. Manufacturers of cleats may also declare a classification under 6.4.4 or 6.4.5.

Manufacturers of intermediate restraints shall declare a classification under 6.4.4 or 6.4.5 in association with cleats.

6.4.2 With lateral retention

6.4.3 With axial retention

NOTE This value is for guidance purposes as it is not possible to replicate cables using mandrels.

6.4.4 Resistant to electromechanical forces, withstanding one short circuit

6.4.5 Resistant to electromechanical forces, withstanding more than one short circuit

NOTE The intent for cable cleats and intermediate restraints classified under 6.4.5 is that after one short circuit application, the cable cleat and intermediate restraints, if used, will continue to perform as designed and tested according to this standard. The physical condition of the cable cleats and intermediate restraints after short circuit application has only been evaluated under laboratory conditions. The continued use of the cable cleats and intermediate restraints, if used, following an actual short circuit incident, is solely at the discretion of the party responsible for the installation.

6.5 According to environmental influences

6.5.1 Resistant to ultraviolet light for non-metallic and composite components

6.5.1.1 Not declared

6.5.1.2 Resistant to ultraviolet light

6.5.2 Resistant to corrosion for metallic and composite components

6.5.2.1 Low

6.5.2.2 High

7 Marking and documentation

7.1 Marking

Each cleat and intermediate restraint shall be marked with

- the manufacturer's or responsible vendor's name or logo or trademark;
- the product identification or type.

Where it is not possible to apply the marking directly onto the product, then the marking shall be placed on the smallest supplied package.

7.2 Durability and legibility

Marking on the product shall be durable and easily legible to normal or corrected vision.

Compliance is checked by inspection and by rubbing the marking by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit.

After the test, the marking shall remain legible to normal or corrected vision.

Marking made by moulding, pressing or engraving is not subjected to the rubbing test.

NOTE Examples of methods for applying marking are by moulding, pressing, engraving, printing, adhesive labels, etc.

7.3 Documentation

The manufacturer or responsible vendor shall provide in their literature:

- the classifications according to Clause 6;
- the maximum and minimum cable or bundle diameters;
- the lateral load for cleats declared under 6.4.2;
- the axial load for cleats if declared under 6.4.3;
- the method of assembly and installation including tightening torques, where appropriate, and any limitation on mounting orientation for lateral retention.

Additionally, for cleats and/or intermediate restraints declared under 6.4.4 or 6.4.5, the manufacturer or responsible vendor shall provide in their literature:

- the peak short-circuit current;
- the initial r.m.s. symmetrical short-circuit current;
- the cable outside diameter and the distance between cable centres, S , used in the test in 9.5;
- the maximum spacing, D , as shown in Figure 4.

Compliance is checked by inspection.

NOTE Some or all of this information may also be required to be provided on packaging or instruction sheets supplied with the product.

8 Construction

The surfaces of cleats and intermediate restraints shall be free from sharp edges, burrs, flash, etc. that are likely to damage cables or inflict injury to the installer or user.

Compliance is checked by visual and manual inspection of the surface.

9 Mechanical properties

9.1 Requirements

Cleats and intermediate restraints shall be: