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COMMENTED VERSION

INTERNATIONAL STANDARD

colour inside

Cable cleats for electrical installations

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). 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. 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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This commented version (CMV) of the official standard IEC 61914:2021 edition 3.0 allows the user to identify the changes made to the previous IEC 61914:2015 edition 2.0. Futhermore, comments from IEC SC 23A experts are provided to explain the reasons of the most relevant changes.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

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

This third edition cancels and replaces the second edition published in 2015. This edition constitutes a technical revision.

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

a) requirements for mandrels used in testing rationalised and detailed in the general test requirements (Clause 5);
b) definition of liner added and test requirements where liners and other optional parts are used;
c) definitions for LV, MV and HV cables added and test requirements where MV & HV cable are used ;
d) new corrosion resistance classes for plated products added;
e) new requirements and test for durability and legibility of markings added;
f) new test requirements for axial load testing of cleats for more than one cable added;
g) lateral load test requirements for intermediate restraints added.

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

FDIS	Report on voting
23A/976/FDIS	23A/982/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/standardsdev/publications.

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 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 publication 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.

CABLE CLEATS FOR ELECTRICAL INSTALLATIONS

1 Scope

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

Various types of cable cleats and intermediate restraints are shown in Annex A.

NOTE Requirements for manufacturers in this document also apply to importers and responsible vendors where appropriate.

This document does not apply to ~~cable glands,~~ cable ties.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 60502-1, *Power cables with extruded insulation and their accessories for rated voltages from 1 kV (U_m = 1,2 kV) up to 30 kV (U_m = 36 kV) – Part 1: Cables for rated voltages of 1 kV (U_m = 1,2 kV) and 3 kV (U_m = 3,6 kV)*

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

ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods*

ISO 2081, *Metallic and other inorganic coatings – Electroplated coatings of zinc with supplementary treatments on iron or steel*

ISO 3575, *Continuous hot dip zinc-coated and zinc-iron alloy-coated carbon steel sheet of commercial and drawing qualities*

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 4998, *Continuous hot-dip zinc-coated and zinc-iron alloy-coated carbon steel sheet of structural quality*

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

ISO 14713-1, *Zinc coatings – Guidelines and recommendations for the protection against corrosion of iron and steel in structures – Part 1: General principles of design and corrosion resistance*

ISO 14713-2, *Zinc coatings – Guidelines and recommendations for the protection against corrosion of iron and steel in structures – Part 2: Hot dip galvanizing*

EN 10346, *Continuously hot-dip coated steel flat products for cold forming – Technical delivery conditions*

3 Terms, definitions and abbreviations

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
cable cleat
device provided with a means of attachment to a mounting surface and ~~designed to~~ that provides 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 (see Figure A.8) or rail. ~~Where declared, cable cleats provide resistance to electromechanical forces.~~ Hardware, such as screws or bolts, needed to secure cable cleats to the mounting surface is not necessarily supplied with cable cleats.

Note 2 to entry: Some examples of cable cleats are shown in Annex A (see Figure A.1 to ~~Figure A.9~~ Figure A.10). These examples do not limit the use of other cable cleat designs that conform to the requirements of this document.

3.2
intermediate restraint
cable retaining device ~~designed~~ intended to be used with cable cleats, without being attached to a mounting surface, to hold cables together in ~~order~~ formation and/or 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.

Note 2 to entry: Materials include any materials supplied by the manufacturer as part of a cable cleat or intermediate restraint or with a cable cleat or intermediate restraint in the same packaging. This may include fixings such as nuts, bolts, screws, washers, springs and pins. Fixings supplied by the installer are not considered in this document.

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 7).

~~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 8)

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
capacity for environmental factors to have an effect on the intended function of cable cleats and/or intermediate restraints (e.g. effect of corrosive substances or solar radiation, etc.)

3.17 **1**
LV cables
cables with a rated voltage of 1,0 kV ac, 1,5 kV dc or less

3.18 **1**
MV or HV cables
cables with a rated voltage of more than 1,0 kV ac or 1,5 kV dc

3.19 **2**
liner
polymeric component between the cable and the cable cleat or intermediate restraint

3.20 **3**
product type
group of cable cleats for which only the cable or bundle diameter may be changed

Note 1 to entry: For guidance in determining product types, cable cleats or intermediate restraints having material, design, construction characteristics, and classifications according to Clause 6 below, in common, are considered to be the same product type.

4 General requirements

Products covered by this document shall be so designed and constructed that, when assembled and installed as for normal use according to the manufacturer's instructions, they ensure securing and/or holding in formation 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 document.

5 General notes on tests

5.1 Tests according to this document are type tests.

– Products of all sizes shall comply with Clause 8 and 9.1 a).
– Where cleats or intermediate restraints may be supplied with optional extra parts (e.g. liners), all tests shall be performed on the product without any of the optional parts. Where the addition of any optional part affects the performance of the product (e.g. the axial load performance with the addition of a liner), the tests shall be repeated with the optional parts in place.
– For the requirements in 9.1 b), 9.1 c) and 9.1 d) where there are a number of cable cleats in a range, the range is divided into one or more product types. In this case, the smallest and the largest size of cable cleat of each type are tested.
– The test for compliance with 9.1 e) is performed on the set of samples selected as defined in 9.5.1.

~~NOTE For guidance in determining 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 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 cable cleats and intermediate restraints and any test that includes a liner 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.

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

5.5 Metal mandrels used in testing shall be made from carbon steel, stainless steel, brass or aluminium. Where testing is performed at a temperature below 105 °C, mandrels may be made from polyamide or HDPE. All mandrels shall have a surface roughness less than or equal to 7 µm Ra in accordance with ISO 4287. **4**

5.6 Compliance with this document 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.

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.

6 Classification

6.1 Classification according to material

6.1.1 Metallic

See 3.3 and examples in Annex A.

6.1.2 Non-metallic

See 3.4 and examples in Annex A.

6.1.3 Composite

See 3.5 and examples in Annex A.

6.2 Classification 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

For temperature values above 120 °C and below −60 °C, the manufacturer ~~or responsible vendor~~ may declare temperatures outside the values provided in Table 1 and Table 2 above.

6.3 Classification according to resistance to impact

6.3.1 Very light

See Table 5.

6.3.2 Light

See Table 5.

6.3.3 Medium

See Table 5.

6.3.4 Heavy

See Table 5.

6.3.5 Very heavy

See Table 5.