

# TECHNICAL SPECIFICATION

## SPECIFICATION TECHNIQUE



**Low-voltage switchgear and controlgear –  
Part 7-5: Ancillary equipment – Terminal blocks for aluminium conductors**

**Appareillage à basse tension –  
Partie 7-5: Matériels accessoires – Blocs de jonction pour conducteurs en  
aluminium**



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –****Part 7-5: Ancillary equipment –  
Terminal blocks for aluminium conductors**

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IEC TS 60947-7-5 has been prepared by subcommittee 121A: Low-voltage switchgear and controlgear, of IEC technical committee 121: Switchgear and controlgear and their assemblies for low voltage. It is a Technical Specification.

This publication shall be read in conjunction with the sixth edition of IEC 60947-1:2020 and the third edition of IEC 60947-7-1:2009. The provisions of the general rules dealt with in IEC 60947-1:2020 and the requirements for terminal blocks of IEC 60947-7-1:2009 are applicable to this publication, where specifically called for. Clauses and subclauses, tables, figures and annexes thus applicable are identified by reference to IEC 60947-1:2020 or IEC 60947-7-1:2009.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
121A/418/DTS	121A/428A/RVDTS

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 Technical Specification is English.

A list of all parts in the IEC 60947 series, published under the general title *Low-voltage switchgear and controlgear*, can be found on the IEC website.

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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

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- replaced by a revised edition, or
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## INTRODUCTION

The connection of aluminium conductors, as defined in IEC 60228, and suitable terminations for such conductors has been deemed relevant such that a specific test program for aluminium-suited terminals and the development of a new publication under the scope of IEC SC121A are appropriate.

Additional tests were deemed necessary due to experience showing that reliable electrical connections for aluminium conductors require more consideration than those with copper mainly due to different oxidative behaviour and mechanical characteristics of the materials.

It is well known that when two different metals come into contact; galvanic corrosion is likely to occur. This is an electrochemical process where electrons will flow from the less noble metal to the more noble metal. This effect will be sped up by additional DC current flow and the presence of an electrolyte. In an electrical contact situation this process shall be considered, as it may result in contamination of the contact area with corrosion products and reduction of contact pressure and contact area when the termination is affected.

This document is based on the well-known test program for copper conductors as defined in IEC 60947-7-1. However, further tests have been modified and added to those for copper conductors. These additional tests were derived from those already defined in IEC 61545, IEC 60269-2, IEC 60947-7-1 and IEC 60947-1.

There is a new current-cycling ageing test which includes pre-conditioning of the specimens by storage in a cold environment followed by dry heat with AC for AC terminal blocks or damp heat with DC for AC and/or DC terminal blocks, inspired by tests of Annex Q of IEC 60947-1:2020.

The current-cycling ageing test comprises a total of 768 on-off cycles. For testing the reference value  $I_{al}$  is established from Table 2 becoming the base test current with an additional safety margin of 1,25. The manufacturer is required to provide the  $I_{al}$  value to the user in his documentation.

Therefore, in contrast to IEC 60947-7-1, it was necessary to introduce additional marking, which is similar that of IEC 61545.

## LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

### Part 7-5: Ancillary equipment – Terminal blocks for aluminium conductors

#### 1 Scope

This part of IEC 60947 specifies requirements for terminal blocks with screw-type or screwless-type clamping units primarily intended for industrial or similar use and to be fixed to a support to provide electrical and mechanical connection. This document can be used for terminal blocks for connection between aluminium conductors or aluminium to copper conductors. It applies to terminal blocks intended to connect round conductors, with or without special preparation, having a cross-section between 2,5 mm<sup>2</sup> and 300 mm<sup>2</sup> (AWG 12 to 600 kcmil), intended to be used in circuits of a rated voltage not exceeding 1 000 V AC (up to 1 000 Hz) or 1 500 V DC.

This document can be used as a guide to qualify terminal blocks for conductors out of aluminium not complying with IEC 60228 (e.g. smaller than 10 mm<sup>2</sup>, flexible or other materials). This document can also be used as a guide to qualify other types of terminal blocks for conductors out of aluminium other than feed through terminal blocks (e.g. partially insulated terminal blocks).

NOTE 1 AWG is the abbreviation of “American Wire Gage” (Gage (US) = Gauge (UK)).

kcmil = 1 000 cmil;

1 cmil = 1 circular mil = surface of a circle having a diameter of 1 mil;

1 mil = 1/1 000 inch.

This document does not apply to clamping units:

- dedicated to any other types of switchgear and controlgear;
- for connection by crimping, brazing, soldering or welding;
- for data and signalling circuits;
- for flat quick-connect terminations, insulation-piercing connecting devices and twist-on connecting devices, for which separate parts are under consideration.

NOTE 2 In case of use of special types of conductors (e.g. clad conductors) which require a special preparation, this document can be used as a guide.

NOTE 3 In some countries, national regulation for installation rules can allow different cross-sections. For internal wiring (inside enclosures), other rules or product standards can be applicable.

NOTE 4 For connections to copper conductors only, IEC 60947-7-1:2009 is applicable.

NOTE 5 In USA, UL 1059 applies and in Canada, CSA C22.2 No. 158 applies.

Where applicable in this document, the term “clamping unit” is used instead of the term “terminal”. This is taken into account in case of reference to IEC 60947-1:2020.

## 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 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-78:2012, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60228, *Conductors of insulated cables*

IEC 60364-5-52:2009, *Low-voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

IEC 60695-11-5:2016, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

IEC 60947-1:2020, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-7-1:2009, *Low-voltage switchgear and controlgear – Part 7-1: Ancillary equipment – Terminal blocks for copper conductors*

ISO 4046-4:2016, *Paper, board, pulps and related terms – Vocabulary – Part 4: Paper and board grades and converted products*

## 3 Terms and definitions

Clause 2 of IEC 60947-7-1:2009 applies with the following additions.

For the purposes of this document, the following terms and definitions 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

#### **treated conductor**

contact area of a conductor that has had its oxide layer on the outside strands scraped away and/or has had a compound added to improve connectability and/or prevent corrosion

Note 1 to entry: In the USA and Canada, treatment of the specimens and conductors to be tested is not acceptable.

[SOURCE: IEC 61545:1996, 3.13, modified – Insertion of Note 1 to entry.]

### 3.2

#### **prefilled clamping unit**

<terminal block> clamping unit of a terminal block that is prefilled by the manufacturer with an oxide-inhibiting compound