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Electromechanical contactors for household and similar purposes

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FOR HOUSEHOLD AND SIMILAR PURPOSES****FOREWORD**

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IEC 61095 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, in conjunction with subcommittee 23E: Circuit-breakers and similar equipment for household use, of IEC technical committee 23: Electrical accessories. It is an International Standard.

This third edition cancels and replaces the second 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) addition of requirements for screwless terminals;
- b) addition of requirements for the switching of LED lamps. Contactors for domestic and similar applications can be used for controlling lighting loads which is increasingly using LED lamp technology. A specific category for contactors is created: AC-7d. Requirements and tests are added to cover this market development, mainly for making and breaking and conventional operational performance;
- c) addition of requirements for contactors with electronically controlled electromagnet. Household contactors with electronically controlled electromagnet are available for years on the market. To fully cover such device, requirements and tests are added, dealing mainly with operating limits, behaviour in abnormal conditions, breakdown of components, EMC tests, etc.
- d) Embedded software. More and more contactors are incorporating electronic circuits with embedded software. A reference is provided to guide the design of the software.

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

Draft	Report on voting
121A/566/FDIS	121A/573/RVD

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

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## INTRODUCTION

This document gives requirements for contactors household and similar purposes, including contactors for distribution control in buildings.

Contactors for such purposes have particular requirements which include test sequences and sampling plans to facilitate testing.

Contactors according to this document are limited in the range of operational currents and operational voltages to values appropriate to the applications. Such contactors are for use in circuits of limited prospective short-circuit fault current for which they ~~need to be~~ are co-ordinated with an appropriate short-circuit protective device to provide suitable co-ordination.

This document defines in a single document the specific utilization category for a described application and states the relevant requirements. As far as possible, it is in line with the requirements contained in IEC 60947-4-1.

This document also applies to contactors which are components of an appliance, unless otherwise stated in the standard covering the relevant appliance.

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# ELECTROMECHANICAL CONTACTORS FOR HOUSEHOLD AND SIMILAR PURPOSES

## 1 Scope

This document applies to electromechanical air break contactors for household and similar purposes provided with main contacts intended to be connected to circuits the rated voltage of which does not exceed 440 V AC (between phases) with rated operational currents less than or equal to 63 A for utilization category AC-7a, and 32 A for utilization categories AC-7b, AC-7c and AC-7d (expressed in rated power), and rated conditional short-circuit current less than or equal to 6 kA.

~~The contactors dealt with in this standard are not normally designed to interrupt short circuit currents. Therefore, suitable short circuit protection (see 9.3.4) shall form part of the installation.~~

NOTE Today, most LED lamp manufacturers provide information in Watt. So, the main contactor characteristic for utilization category AC-7d is expressed in Watt to be directly applicable to the corresponding LED lamp load.

Specific requirements apply to contactors equipped with screwless-type terminals.

This document does not apply to

- contactors complying with IEC 60947-4-1;
- semiconductor contactors;
- contactors designed for special applications;
- auxiliary contacts of contactors. These are dealt with in IEC 60947-5-1.

This document states

- 1) the characteristics of contactors.
- 2) the conditions with which contactors ~~shall~~ comply with reference to:
  - a) their operation and behaviour;
  - b) their dielectric properties;
  - c) the degrees of protection provided by their enclosures, where applicable;
  - d) their construction;
  - e) their electromagnetic compatibility characteristics.
- 3) the tests intended for confirming that these conditions have been met, and the methods to be adopted for these tests.
- 4) the test sequences and the number of samples.
- 5) the information to be given with contactors or in the manufacturer's literature.

## 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 60028:1925, *International standard of resistance for copper*

~~IEC 60050-151:2001, International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices~~

~~IEC 60050-441:1984, International Electrotechnical Vocabulary (IEV) – Chapter 441: Switchgear, controlgear and fuses  
Amendment 1 (2000)~~

~~IEC 60050-604:1987, International Electrotechnical Vocabulary (IEV) – Chapter 604: Generation, transmission and distribution of electricity – Operation  
Amendment 1 (1998)~~

~~IEC 60050-826:2004, International Electrotechnical Vocabulary (IEV) – Part 826: Electrical installations~~

IEC 60068-2-78:2004/2012, Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state

IEC 60073:2002, Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators

IEC 60085:2007, Electrical insulation – Thermal evaluation and designation

~~IEC 60099-1:1991, Surge arresters – Part 1: Non-linear resistor type gapped surge arresters for a.c. systems  
Amendment 1 (1999)~~

IEC 60112:2003/2020, Method for the determination of the proof and the comparative tracking indices of solid insulating materials

~~IEC 60216 (all parts), Electrical insulating materials – Properties of thermal endurance~~

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

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IEC 60417-DB:2007<sup>4</sup>, Graphical symbols for use on equipment, available at <https://www.graphical-symbols.info/equipment>

IEC 60445:2006/2021, Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors

IEC 60447:2004, Basic and safety principles for man-machine interface, marking and identification – Actuating principles

IEC 60529:1989, Degrees of protection provided by enclosures (IP Code)

IEC 60529:1989/AMD1:1999

IEC 60529:1989/AMD2:2013

IEC 60664-1:2007/2020, Insulation coordination for equipment within low-voltage supply systems – Part 1: Principles, requirements and tests

IEC 60695-2-10:2000/2021, Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure

<sup>4</sup>—“DB” refers to the IEC on-line database.