



IEC 60947-4-2

Edition 4.1 2024-11
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

Corrected version
2026-03



**Low-voltage switchgear and controlgear –
Part 4-2: Contactors and motor-starters – Semiconductor motor controllers,
starters and soft-starters**





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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 4-2: Contactors and motor-starters – Semiconductor motor controllers, starters and soft-starters

AMENDMENT 1

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 consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 60947-4-2 edition 4.1 contains the fourth edition (2020-06) [documents 121A/353/FDIS and 121A/360/RVD], its amendment 1 (2024-11) [documents 121A/615/FDIS and 121A/626/RVD] and its corrigendum 1 (2026-03).

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough

red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 60947-4-2 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.

This fourth edition cancels and replaces the third edition published in 2011. This edition constitutes a technical revision.

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

- scope exclusions;
- editorial correction of notes and hanging paragraphs;
- reference to IEC 62683-1;
- safety aspects related to:
 - general aspects;
 - limited energy circuits;
 - electronic circuits;
- mention of dedicated wiring accessories;
- power consumption measurement;
- alignment to IEC 60947-1:2020.

The provisions of the general rules dealt with IEC 60947-1 are applicable to this part of IEC 60947 series where specifically called for. Clauses and subclauses, tables, figures and annexes of the general rules thus applicable are identified by reference to IEC 60947-1:2020.

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

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

The committee has decided that the contents of this document and its amendment 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, or
- revised.

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.

INTRODUCTION

This document covers low-voltage semiconductor motor controllers, starters and soft-starters that have many capabilities and features beyond the simple starting and stopping of an induction motor, such as controlled starting and stopping, manoeuvring and controlled running.

The generic term “controller” is used in this document wherever reference is made to elements of power semiconductor switching devices.

The generic term “starter” is used in this document wherever reference is made to the elements of power semiconductor switching devices together with suitable overload protective devices.

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 4-2: Contactors and motor-starters – Semiconductor motor controllers, starters and soft-starters

1 Scope

This part of IEC 60947 applies to semiconductor motor controllers, starters and soft-starters which can include a series mechanical switching device, intended to be connected to circuits the rated voltage of which does not exceed 1 000 V AC.

This document characterizes semiconductor motor controllers and starters with and without bypass means.

This document does not apply to:

- semiconductor motor controllers and starters used for continuous operation of AC motors at motor speeds other than the normal speed⁴;
- electromechanical contactors and external overload relays (see IEC 60947-4-1);
- short-circuit protective device associated with semiconductor motor controllers and starters (see IEC 60947-4-1 (MPSD), IEC 60947-2 and IEC 60947-3);
- semiconductor equipment, including semiconductor contactors (3.4.13 of IEC 60947-1:2020) controlling non-motor loads (see IEC 60947-4-3);
- semiconductor motor controllers and starters used for rotor circuits⁴;
- adjustable speed electrical power drive systems (see IEC 61800 series);
- use of the product within explosive atmospheres (see IEC 60079 series);
- software and firmware requirements⁴;

NOTE 1 Guidance on embedded software is given in IEC TR 63201.

- cyber security aspects (see IEC TS 63208).

Contactors, overload relays and control circuit devices used in semiconductor motor controllers and starters are considered compliant with the requirements of their relevant product standard. Where mechanical switching devices are used, they are considered meeting the requirements of their own IEC product standard, and the additional requirements of this document.

The object of this document is to state as follows:

- the characteristics of semiconductor motor controllers, starters and soft-starters and associated equipment;
- the conditions with which semiconductor motor controllers, starters and soft-starters comply with reference to
 - a) their operation and behaviour in normal and abnormal operating conditions including overcurrent operating conditions;
 - b) their dielectric properties;
 - c) the degrees of protection provided by their enclosures where applicable;

⁴ ~~For this subject, the manufacturer is responsible for taking additional safety measures.~~

- d) their construction including safety measures against electric shock, fire hazard and mechanical hazard;
- the tests intended for confirming that these conditions have been met, and the methods to be adopted for these tests;
- the information to be given with the equipment, or in the manufacturer's literature.

NOTE 2 For the purpose of this document, the term "controller" is used instead of "semiconductor motor controller".

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 60034-1:2017, *Rotating electrical machines – Part 1: Rating and performance*

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

IEC 60715, *Dimensions of low-voltage switchgear and controlgear – Standardized mounting on rails for mechanical support of switchgear, controlgear and accessories*

IEC 60730-1, *Automatic electrical controls – Part 1: General requirements*

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

IEC 61000-3-2, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

IEC 61000-3-3, *Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection*

IEC 61000-3-11, *Electromagnetic compatibility (EMC) – Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems – Equipment with rated current ≤ 75 A and subject to conditional connection*

IEC 61000-3-12, *Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase*

IEC 61140:2016, *Protection against electric shock – Common aspects for installation and equipment*

IEC 63404:2024, *Switchgear and controlgear and their assemblies for low voltage – Integration of radiocommunication device above 380 MHz into an equipment*

IEC TS 63058, *Environmental aspects for low-voltage switchgear and controlgear and their assemblies*

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*
CISPR 11:2015/AMD1:2016

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IEC 60034-30-1, *Rotating electrical machines – Part 30-1: Efficiency classes of line operated AC motors (IE code)*

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

IEC 60050-151:2001/AMD1:2013

IEC 60050-151:2001/AMD2:2014

IEC 60050-151:2001/AMD3:2019

IEC 60050-195:1998, *International Electrotechnical Vocabulary (IEV) – Part 195: Earthing and protection against electric shock*

IEC 60050-195:1998/AMD1:2001

IEC 60050-441:1984, *International Electrotechnical Vocabulary (IEV) – Part 441: Switchgear, controlgear and fuses*

IEC 60050-441:1984/AMD1:2000

IEC 60050-442:1998, *International Electrotechnical Vocabulary (IEV) – Part 442: Electrical accessories*

IEC 60050-442:1998/AMD1:2015

IEC 60050-442:1998/AMD2:2015

IEC 60050-442:1998/AMD3:2019

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

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

IEC 60072-1:1991, *Dimensions and output series for rotating electrical machines – Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080*

IEC 60079 (all parts), *Explosive atmospheres*

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

IEC 60269-1:2006, *Low-voltage fuses – Part 1: General requirements*

IEC 60364-1, *Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions*

IEC 60417, *Graphical symbols for use on equipment* (available at <http://www.graphical-symbols.info/equipment>)

IEC 60664 (all parts), *Insulation coordination for equipment within low-voltage systems*

IEC 60947-2, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*

IEC 60947-3, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*