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IEC 60947-4-1:2023-11(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.120.99, 29.130.20

ISBN 978-2-8322-7773-7

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LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters

FOREWORD

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IEC 60947-4-1 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 an International Standard.

This fifth edition cancels and replaces the fourth edition published in 2018. This edition constitutes a technical revision.

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

a) objective in the scope;
b) instantaneous only motor protective switching device IMPSD (3.5.33);
c) kinds of equipment (5.2.1);

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d) methods of overload protection of motors (5.2.6);
e) adoption of the AC-7d from IEC 61095:2023 (in 5.4.2);
f) separately mounted overload relay of a starter (in 5.7.3 b));
g) starter and contactor suitable for use downstream to basic drive module (6.1.2 w));
h) reference to IEC TS 63058 for environmental aspects (in 6.4);
i) wiring subject to movement (in 8.1.3);
j) use of voltage transient limiting device (8.1.18);
k) accessible parts subject to temperature limits (in 8.2.2.3);
l) reference to Annex X of IEC 60947-1:2020 for the co-ordination of MPSD with SCPD (8.2.5.4);
m) reference to IEC TR 63216 with different EMC environments (8.3.1);
n) reference to IEC TR 63201 for the embedded software design (8.4);
o) reference to IEC TS 63208 for cybersecurity aspects (8.5);
p) update and completion of the measurement method of the power consumption of the electromagnet (9.3.3.2.1.2);
q) update of Annex C including rational about AC-3e;
r) determination of the critical load current for photovoltaic applications (M.8.7).

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

Draft	Report on voting
121A/571/FDIS	121A/580/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/publications.

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

This document shall be read in conjunction with IEC 60947-1:2020, *Low voltage switchgear and controlgear – Part 1: General rules*. The provisions of the general rules are applicable to this document, where specifically called for.

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. For example, 5.3.4.1 of IEC 60947-1:2020, Table 4 of IEC 60947-1:2020, or Annex A of IEC 60947-1:2020.

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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.

The content of the corrigendum 1 (2026-03) has been included in this copy.

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

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LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters

1 Scope

This part of IEC 60947 is applicable to the following equipment:

– electromechanical contactors and starters including motor protective switching devices (MPSD and IMPSD);

– actuators of contactor relays;

– contacts dedicated exclusively to the coil circuit of the contactor or the contactor relay;

– dedicated accessories (e.g. dedicated wiring, dedicated latch accessory);

intended to be connected to distribution circuits, motors circuits and other load circuits, the rated voltage of which does not exceed 1 000 V AC or 1 500 V DC.

This document does not apply to:

– starters for DC motors;

– auxiliary contacts of contactors and contacts of contactor relays. These are covered by IEC 60947-5-1;

– the short-circuit protective device integrated within starters, other than MPSDs. This is covered by IEC 60947-2 and IEC 60947-3;

– motor overload protection function performed by control units for built-in thermal protection (PTC). They are covered by IEC 60947-8;

– the use of the equipment with additional measures within explosive atmospheres. These are given in IEC 60079 series;

The objective of this document is to state:

- the characteristics and composition of the equipment (Clause 5);
- the conditions applicable to the equipment with reference to:
  - its operation (5.2.5) and protection functions (5.2.6, 5.7, 5.8),
  - its intended environments (6.5, 8.3.1) and applications (5.4, Annex C, Annex D, Annex G, Annex H, Annex I, Annex M, Annex O) including safety applications (Annex F, Annex K, Annex L),
  - its construction and performance (Clause 8) including requirements to reduce risks of electric shock, thermal hazard, energy hazard, fire hazard and mechanical hazard, reasonably foreseeable misuse, electromagnetic compatibility (EMC) issues, software errors and security issues;
- the tests intended for confirming that these conditions have been met, and the methods to be adopted for these tests (Clause 9);
- the information to be included with the equipment or in the product documentation (Clause 6).

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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 60034-1:2022, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60034-12:2016, *Rotating electrical machines – Part 12: Starting performance of single-speed three-phase cage induction motors*

IEC 60034-30-1:2014, *Rotating electrical machines – Part 30-1: Efficiency classes of line operated AC motors (IE code)*

IEC 60068-2-14:2023, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60079-14, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*

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

IEC 60364-1:2005, *Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions*

IEC 60715:2017, *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 60947-2:2016, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*

IEC 60947-5-1:2016, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

IEC 61051-2, *Varistors for use in electronic equipment – Part 2: Sectional specification for surge suppression varistors*

IEC 61095:2023, *Electromechanical contactors for household and similar purposes*

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

IEC 61439 (all parts), *Low-voltage switchgear and controlgear assemblies*

IEC 61643-331, *Components for low-voltage surge protection – Part 331: Performance requirements and test methods for metal oxide varistors (MOV)*

IEC 61800-5-1:2022, *Adjustable speed electrical power drive systems – Part 5-1: Safety requirements – Electrical, thermal and energy*

IEC 61810-1, *Electromechanical elementary relays – Part 1: General and safety requirements*

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Bibliography

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

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

IEC 60050-421, *International Electrotechnical Vocabulary (IEV) – Part 421: Power transformers and reactors*

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

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

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

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

IEC 60072-1:2022, *Rotating electrical machines – Dimensions and output series – Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080*

IEC 60079 (all parts), *Explosive atmospheres*

IEC 60079-7, *Explosive atmospheres – Part 7: Equipment protection by increased safety "e"*

IEC 60079-29-3:2014, *Explosive atmospheres – Part 29-3: Gas detectors – Guidance on functional safety of fixed gas detection systems*

IEC 60204-1, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

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

IEC 60269-2:2013, *Low-voltage fuses – Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) – Examples of standardized systems of fuses A to K*

IEC 60364-7-712, *Low voltage electrical installations – Part 7-712: Requirements for special installations or locations – Solar photovoltaic (PV) power supply systems*

IEC 60384-17:2019, *Fixed capacitors for use in electronic equipment – Part 17: Sectional specification – Fixed metallized polypropylene film dielectric AC and pulse capacitors*

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

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

IEC 60721-3-3, *Classification of environmental conditions – Part 3-3: Classification of groups of environmental parameters and their severities – Stationary use at weatherprotected locations*

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IEC 60812:2018, *Failure modes and effects analysis (FMEA and FMECA)*

IEC 60947-3:2020, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

IEC 60947-4-2, *Low-voltage switchgear and controlgear – Part 4-2: Contactors and motor-starters – Semiconductor motor controllers, starters and soft-starters*

IEC 60947-6-2, *Low-voltage switchgear and controlgear – Part 6-2: Multiple function equipment – Control and protective switching devices (or equipment) (CPS)*

IEC 60947-8, *Low-voltage switchgear and controlgear – Part 8: Control units for built-in thermal protection (PTC) for rotating electrical machines*

IEC 60990:2016, *Methods of measurement of touch current and protective conductor current*

IEC 61000-6-5, *Electromagnetic compatibility (EMC) – Part 6-5: Generic standards – Immunity for equipment used in power station and substation environment*

IEC 61032, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 61508-2, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems* (see *http://www.iec.ch/functionalsafety*)

IEC 61508-3, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 3: Software requirements* (see *http://www.iec.ch/functionalsafety*)

IEC 61508-4:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 4: Definitions and abbreviations* (see *http://www.iec.ch/functionalsafety*)

IEC 61508-6:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 6: Guidelines on the application of IEC 61508-2 and IEC 61508-3* (see http://www.iec.ch/functionalsafety)

IEC 61557-12:2018, *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 12: Power metering and monitoring devices (PMD)*
IEC 61557-12:2018/AMD1:2021

IEC 61649, *Weibull analysis*

IEC 61915-2:2011, *Low-voltage switchgear and controlgear – Device profiles for networked industrial devices – Part 2: Root device profiles for starters and similar equipment*

IEC 62061, *Safety of machinery – Functional safety of safety-related control systems*

IEC 62443 (all parts), *Security for industrial automation and control systems*

IEC 62477-1:2022, *Safety requirements for power electronic converter systems and equipment – Part 1: General*

IEC 62683-1, *Low-voltage switchgear and controlgear – Product data and properties for information exchange – Part 1: Catalogue data*

IEC 63365, *Industrial process measurement, control and automation – Digital nameplate*

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IEC TR 63054, *Low-voltage switchgear and controlgear – Fire risk analysis and risk reduction measures*

IEC TR 63201:2019, *Low-voltage switchgear and controlgear – Guidance for the development of embedded software*

IEC 63404[3], *Switchgear and controlgear and their assemblies for low voltage – Integration method of radiocommunication device into an equipment*

IEC Guide 104:2019, *The preparation of safety publications and the use of basic safety publications and group safety publications*

IEC Guide 117:2010, *Electrotechnical equipment – Temperatures of touchable hot surfaces*

ISO/IEC 80079-34, *Explosive atmospheres – Part 34: Application of quality systems for ex product manufacture*

ISO/IEC 14762:2009, *Information technology – Functional safety requirements for Home and Building Electronic Systems (HBES)*

ISO/IEEE 82079-1:2012, *Preparation of instructions for use – Structuring, content and presentation – Part 1: General principles and detailed requirements*[4]

ISO/IEC Guide 51:2014, *Safety aspects – Guidelines for their inclusion in standards*

ISO 3534-2:2006, *Statistics – Vocabulary and symbols – Part 2: Applied statistics*

JIS C 4213: 2014, *Low-voltage three-phase squirrel-cage induction motors – Low-voltage top runner motor*

CSA C22.1, *Canadian Electrical Code*

CLC/TR 45550:2020, *Definitions related to material efficiency*

EN 45556, *General method for assessing the proportion of reused components in energy-related products*

EN 50495, *Safety devices required for the safe functioning of equipment with respect to explosion risks*

NFPA 70, *National Electrical Code*

PROFIEnergy profile test specification V1.1:2014

UL 508:2021, *Industrial control equipment*

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[3] Under preparation. Stage at the time of publication: IEC FDIS 63404:2023.

[4] This publication was withdrawn and replaced with IEC/IEEE 82079-1:2019.

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UL 60947-1, *Low-Voltage Switchgear and Controlgear – Part 1: General rules*

UL 60947-4-1, *Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters*

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