

SLOVENSKI STANDARD
SIST EN 60947-4-2:1998**01-september-1998**

**Low-voltage switchgear and controlgear - Part 4: Contactors and motor-starters -
Section 2: AC semiconductor motor controllers and starters (IEC 60947-4-2:1995,
modified)**Low-voltage switchgear and controlgear -- Part 4: Contactors and motor-starters --
Section 2: A.C. semiconductor motor controllers and startersNiederspannungsschaltgeräte -- Teil 4: Schütze und Motorstarter -- Hauptabschnitt 2:
Halbleiter-Motor-Steuergeräte und -Starter für WechselspannungAppareillage à basse tension -- Partie 4: Contacteurs et démarreurs de moteurs --
Section 2: Gradateurs et démarreurs à semiconducteurs de moteurs à courant alternatif**Ta slovenski standard je istoveten z: EN 60947-4-2:1996****ICS:**

29.130.20 Nizkonapetostne stikalne in krmilne naprave Low voltage switchgear and controlgear

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60947-4-2

July 1996

ICS 29.120.60

Descriptors: Low-voltage switchgear and controlgear, contactors and motor-starters, semiconductor motor controllers and starters

English version

Low-voltage switchgear and controlgear
Part 4: Contactors and motor-starters
Section 2: AC semiconductor motor controllers and starters
(IEC 947-4-2:1995, modified)

Appareillage à basse tension
Partie 4: Contacteurs et démarreurs de
moteurs
Section 2: Gradateurs et démarreurs à
semiconducteurs de moteurs à courant
alternatif
(CEI 947-4-2:1995, modifiée)

Niederspannung-Schaltgeräte
Teil 4: Schütze und Motorstarter
Hauptabschnitt 2:
Halbleiter-Motor-Steuergeräte und
-Starter für Wechselspannung
(IEC 947-4-2:1995, modifiziert)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of the International Standard IEC 947-4-2:1995, prepared by SC 17B, Low-voltage switchgear and controlgear, of IEC TC 17, Switchgear and controlgear, together with common modifications prepared by the Technical Committee CENELEC TC 17B, Low-voltage switchgear and controlgear including dimensional standardization, was submitted to the formal vote and was approved by CENELEC as EN 60947-4-2 on 1996-03-05.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 1997-03-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 1997-03-01

For products which have complied with the relevant national standard before 1997-03-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2002-03-01.

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A, B, C, D and ZA are normative and annexes E, F, G and H are informative.

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 947-4-2:1995 was approved by CENELEC as a European Standard with agreed common modifications as given below.

COMMON MODIFICATIONS**9.3.5.1.1 Conducted radio frequency emission test**

Replace the note by:

The addition of high-frequency common mode filtering in the main power connections may cause unacceptable reductions in motor starting torque, or render invalid the concept of unearthed or high impedance earthed distribution systems, as employed within process industries, with implications for system safety.

Where filters (if any) are not used, other precautions shall be taken not to exceed the emission levels given in table 14.

Replace table 14 by:

Table 14 - Terminal disturbance voltage limits for conducted radio-frequency emission
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Equipment class (network type)		A (industrial)		B (public)	
Rated operational current (I_n)	Frequency MHz	dB (μ V) quasi-peak	dB (μ V) average	dB (μ V) quasi-peak	dB (μ V) average
$I_n \leq 100$ A	0,15 to 0,5	79	66	66 to 56	56 to 46 (Decrease with log of frequency)
	0,5 to 5,0	73	60	56	46
	5 to 30	73	60	60	50
$I_n > 100$ A	0,15 to 0,5	100	90	66 to 56	56 to 46 (Decrease with log of frequency)
	0,5 to 5,0	86	76	56	46
	5 to 30	90 to 70 (Decrease with log of frequency)	80 to 60 (Decrease with log of frequency)	60	50

Annex B Overload relays or releases

B.4 Add the following notes for the standards indicated:

- IEC 34-1 NOTE: Harmonized as EN 60034-1:1995 (modified).
- IEC 269-1 NOTE: Harmonized as EN 60269-1:1989 (not modified).
- IEC 269-2 NOTE: Harmonized as EN 60269-2:1995 (not modified).
- IEC 269-2-1 NOTE: Harmonized as HD 630.2.1 S1:1996 (modified).
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Annex ZA (normative)

Normative references to international publications
with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE: When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 50(161)	1990	International Electrotechnical Vocabulary (IEV) - Chapter 161: Electromagnetic compatibility	-	-
IEC 410	1973	Sampling plans and procedures for inspection by attributes	-	-
IEC 439-1	1992	Low-voltage switchgear and controlgear assemblies Part 1: Type-tested and partially type-tested assemblies	EN 60439-1 ¹⁾ + corr. August + corr. February A11	1994 1994 1995 1996
IEC 801-1	1984	Electromagnetic compatibility for industrial-process measurement and control equipment Part 1 : General introduction	HD 481.1 S1	1987
IEC 801-2	1991	Part 2: Electrostatic discharge requirements	EN 60801-2	1993
IEC 801-3	1984	Part 3: Radiated electromagnetic field requirements	HD 481.3 S1	1987
IEC 801-4	1988	Part 4: Electrical fast transient/burst requirements	-	-
IEC 947-1 (mod) A1	1988 1994	Low-voltage switchgear and controlgear Part 1: General rules	EN 60947-1 + corr. March A1 A11	1991 1993 1996 1994
IEC 1000-2-1	1990	Electromagnetic compatibility (EMC) Part 2: Environment -- Section 1: Description of the environment - Electromagnetic environment for low-frequency conducted disturbances and signalling in public power supply systems	-	-

1) EN 60439-1 includes corrigendum December 1993 to IEC 439-1.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 1000-3-2	1995	Part 3: Limits -- Section 2: Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)	EN 61000-3-2 A12	1995 1996
IEC 1000-4-3	1995	Part 4: Testing and measurement techniques -- Section 3: Radiated, radiofrequency, electromagnetic field immunity test	-	-
IEC 1000-4-5	1995	Part 4: Testing and measurement techniques -- Section 5: Surge immunity test	EN 61000-4-5 ²⁾	1995
IEC 1000-4-6	1996	Part 4: Testing and measurement techniques -- Section 6: Immunity to conducted disturbances, induced by radio-frequency fields	-	-
IEC 1000-4-11	1994	Part 4: Testing and measurement techniques -- Section 11: Voltage dips, short interruptions and voltage variations immunity tests	EN 61000-4-11	1994
CISPR 11 (mod)	1990	Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment	EN 55011	1991
CISPR 14	1993	Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus	EN 55014	1993
CISPR 22	1993	Limits and methods of measurement of radio disturbance characteristics of information technology equipment	EN 55022	1994

2) EN 61000-4-5 includes corrigendum October 1995 to IEC 1000-4-5.

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Appareillage à basse tension

Partie 4:

Contacteurs et démarreurs de moteurs

Section 2: Gradateurs et démarreurs à
semiconducteurs de moteurs à courant alternatif

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Low-voltage switchgear and controlgear

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Part 4:

Contactors and motor-starters

Section 2: AC semiconductor motor controllers
and starters

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International Electrotechnical Commission
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR

Part 4: Contactors and motor-starters
Section 2: AC semiconductor motor controllers and starters

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international cooperation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters, prepared by technical committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 3) They have the form of recommendations for international use published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
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- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.

International Standard IEC 947-4-2 has been prepared by sub-committee 17B: Low-voltage switchgear and controlgear, of IEC technical committee 17: Switchgear and controlgear.

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

FDIS	Report on voting
17B/644/FDIS	17B/711/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table

Annexes A, B, C and D form an integral part of this standard.

Annexes E, F, G and H are for information only.

INTRODUCTION

This standard covers low-voltage a.c. semiconductor motor controllers and 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 standard wherever the unique features of the power semiconductor switching elements are the most significant points of interest. The generic term, starter, is used wherever the consequences of operating the power semiconductor switching elements, together with suitable overload protective means are the most significant points of interest. Specific designations (for example form 1, form HxB, etc.) are used wherever the unique features of various configurations comprise significant points of interest.

The provisions of IEC 947-1, General Rules, are applicable to this standard, where specifically called for. Clauses and subclauses thus applicable, as well as tables, figures, and annexes are identified by reference to IEC 947-1, for example subclause 1.2.3, table 4 of IEC 947-1 or annex A of IEC 947-1.

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LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR

Part 4: Contactors and motor-starters Section 2: AC semiconductor motor controllers and starters

1 Scope and object

This standard applies to controllers and starters, which may include a series mechanical switching device, intended to be connected to circuits, the rated voltage of which does not exceed 1 000 V a.c.

This standard characterizes controllers and starters for use with and without bypass switching devices.

Controllers and starters dealt with in this standard are not normally designed to interrupt short-circuit currents. Therefore, suitable short-circuit protection (see 8.2.5) should form part of the installation, but not necessarily of the controller or starter.

In this context, this standard gives requirements for controllers and starters associated with separate short-circuit protective devices.

This standard does not apply to:

- continuous operation of a.c. motors at motor speeds other than the normal speed;
- semiconductor equipment, including semiconductor contactors (see 2.2.13 of IEC 947-1) controlling non-motor loads;
- electronic a.c. power controllers covered by IEC 146.

Contactors and control circuit devices used in controllers and starters should comply with the requirements of their relevant product standard. Where mechanical switching devices are used, they should meet the requirements of their own IEC product standard, and the additional requirements of this standard.

The object of this standard is to state as follows:

- the characteristics of controllers and starters and associated equipment;
- the conditions with which controllers and starters 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;
- 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.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 947. At the time of publication the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 947 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 50(161): 1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

IEC 410: 1973, *Sampling plans and procedures for inspection by attributes*

IEC 439-1: 1992, *Low-voltage switchgear and controlgear assemblies – Part 1: Type-tested and partially type-tested assemblies*

IEC 801-1: 1984, *Electromagnetic compatibility for industrial-process measurement and control equipment – Part 1: General introduction*

IEC 801-2: 1991, *Electromagnetic compatibility for industrial-process measurement and control equipment – Part 2: Electrostatic discharge requirements*

IEC 801-3: 1984, *Electromagnetic compatibility for industrial-process measurement and control equipment – Part 3: Radiated electromagnetic field requirements*

IEC 801-4: 1988, *Electromagnetic compatibility for industrial-process measurement and control equipment – Part 4: Electrical fast transient/burst requirements*

IEC 947-1: 1988, *Low-voltage switchgear and controlgear – Part 1: General rules*
Amendment 1 (1994)

IEC 1000-2-1: 1990, *Electromagnetic compatibility (EMC) – Part 2: Environment – Section 1: Description of the environment – Electromagnetic environment for low-frequency conducted disturbances and signalling in public power supply systems*

IEC 1000-3-2: 1995, *Electromagnetic compatibility (EMC) – Part 3: Limits – Section 2: Limits for harmonic current emissions (equipment input current $\leq 16\text{A}$ per phase)*

IEC 1000-4-3: 1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 3: Radiated, radio-frequency, electromagnetic fields immunity tests*

IEC 1000-4-5: 1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 5: Surge immunity tests*

IEC/DIS 1000-4-6, *Electromagnetic compatibility (EMC) – Part 4: Testing and measuring techniques – Section 6: Conducted disturbances induced by radio-frequency fields immunity tests*

IEC 1000-4-11: 1994, *Electromagnetic compatibility (EMC) – Part 4: Testing and measuring techniques – Section 11: Voltage dips, short interruptions and voltage variation immunity tests – Basic EMC publication*