

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Low-voltage switchgear and controlgear –
Part 4-3: Contactors and motor-starters – AC semiconductor controllers and
contactors for non-motor loads**

**Appareillage à basse tension –
Partie 4-3: Contacteurs et démarreurs de moteurs – Gradateurs et contacteurs à
semiconducteurs pour charges, autres que des moteurs, à courant alternatif**



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CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
2 Normative references	10
3 Terms, definitions, symbols and abbreviations.....	10
3.1 Terms and definitions concerning a.c. semiconductor (non-motor-load) control devices.....	11
3.1.1 AC semiconductor controllers and contactors (solid-state contactors) (see Figure 1).....	11
3.1.2 Hybrid controllers and contactors (see Figure 1).....	14
3.2 Vacant	18
3.3 Symbols and abbreviations	18
4 Classification.....	18
5 Characteristics of a.c. semiconductor controllers and contactors	19
5.1 Summary of characteristics.....	19
5.2 Type of equipment	19
5.3 Rated and limiting values for main circuits	22
5.3.1 Rated voltages	22
5.3.2 Currents	22
5.3.3 Rated frequency	22
5.3.4 Rated duty	22
5.3.5 Normal load and overload characteristics	23
5.3.6 Rated conditional short-circuit current.....	24
5.4 Utilization category	24
5.4.1 Assignment of ratings based on the results of tests	25
5.5 Control circuits.....	26
5.6 Auxiliary circuits.....	26
5.7 Vacant	26
5.8 Coordination with short-circuit protective devices (SCPD)	26
6 Product information	26
6.1 Nature of information	26
6.2 Marking.....	28
6.3 Instructions for installation, operation and maintenance	28
7 Normal service, mounting and transport conditions.....	28
7.1 Normal service conditions	28
7.1.1 Ambient air temperature	28
7.1.2 Altitude	28
7.1.3 Atmospheric conditions.....	28
7.1.4 Shock and vibrations	29
7.2 Conditions during transport and storage.....	29
7.3 Mounting.....	29
7.4 Electrical system disturbances and influences	29
8 Constructional and performance requirements	29
8.1 Constructional requirements	29
8.1.1 General	29

8.1.2	Materials	29
8.1.3	Current-carrying parts and their connections	29
8.1.4	Clearances and creepage distances	29
8.1.5	Actuator	30
8.1.6	Indication of the contact position	30
8.1.7	Additional requirements for equipment suitable for isolation	30
8.1.8	Terminals	30
8.1.9	Additional requirements for equipment provided with a neutral pole	30
8.1.10	Provisions for protective earthing	30
8.1.11	Enclosures for equipment	30
8.1.12	Degrees of protection of enclosed equipment	30
8.1.13	Conduit pull-out, torque and bending with metallic conduits	30
8.2	Performance requirements	30
8.2.1	Operating conditions	30
8.2.2	Temperature rise	32
8.2.3	Dielectric properties	34
8.2.4	Normal load and overload performance requirements	35
8.2.5	Coordination with short-circuit protective devices	42
8.3	EMC requirements	42
8.3.1	General	42
8.3.2	Emission	43
8.3.3	Immunity	43
9	Tests	45
9.1	Kinds of tests	45
9.1.1	General	45
9.1.2	Type tests	45
9.1.3	Routine tests	45
9.1.4	Sampling tests	45
9.1.5	Special tests	46
9.2	Compliance with constructional requirements	46
9.3	Compliance with performance requirements	46
9.3.1	Test sequences	46
9.3.2	General test conditions	47
9.3.3	Performance under no load, normal load and overload conditions	47
9.3.4	Performance under short-circuit conditions	54
9.3.5	Disponible	58
9.4	General	58
9.4.1	EMC emission tests	58
9.4.2	EMC immunity tests	59
9.5	Routine and sampling tests	61
9.5.1	General	61
9.5.2	Operation and operating limits	61
9.5.3	Dielectric tests	61
Annex A (normative)	Marking and identification of terminals	62
A.1	General	62
A.2	Marking and identification of terminals of controller and contactors	62
A.2.1	Marking and identification of terminals of main circuits	62

A.2.2	Marking and identification of terminals of control circuits	62
A.2.3	Marking and identification of auxiliary circuits	62
Annex B (informative)	Typical service conditions for controllers and contactors	65
B.1	Control of resistive heating elements	65
B.2	Switching of electric discharge lamp controls	65
B.3	Switching of incandescent lamps	66
B.4	Switching of transformers.....	66
B.5	Switching of capacitor banks.....	66
Annex C	Vacant.....	67
Annex D	Vacant.....	68
Annex E	Vacant.....	69
Annex F (informative)	Operating capability.....	70
Annex G	Vacant.....	73
Annex H	Vacant.....	74
Annex I (normative)	Modified test circuit for short-circuit testing of semiconductor contactors and controllers.....	75
Annex J (informative)	Flowchart for constructing bypassed semiconductor controllers tests	77
Bibliography	78
Figure 1	– Graphical possibilities of controllers	13
Figure 2	– Methods of connecting	21
Figure F.1	– Thermal stability test profile	70
Figure F.2	– Overload capability test profile	71
Figure F.3	– Blocking and commutating capability test profile	72
Figure I.1	– Modified circuit for short-circuit testing of semiconductor devices.....	75
Figure I.2	– Time line for the short-circuit test of 9.3.4.1.6	76
Table 1	– Functional possibilities of controllers and contactors	14
Table 2	– Utilization categories	25
Table 3	– Relative levels of severity.....	25
Table 4	– Temperature rise limits for insulated coils in air and in oil.....	34
Table 5	– Intermittent duty test cycle data.....	34
Table 6	– Minimum overload current withstand time (T_X) in relation to overload current ratio (X)	36
Table 7	– Minimum requirements for thermal stability test conditions	37
Table 8	– Minimum requirements for overload capability test conditions	38
Table 9	– Minimum requirements and conditions for performance testing, including blocking and commutating capability.....	39
Table 10	– Making and breaking capacity test – Making and breaking conditions according to utilization categories for the mechanical switching device of hybrid semiconductor controller and contactor H4, H5	40
Table 11	– Conventional operational performance – Making and breaking conditions according to utilization categories for the mechanical switching device of hybrid controllers and contactors H4B, H5B	41
Table 12	– Specific performance criteria when EM disturbances are present	44

Table 13 – Thermal stability test specifications	51
Table 14 – Initial case temperature requirements	52
Table 15 – Terminal disturbance voltage limits for conducted radiofrequency emission	59
Table 16 – Radiated emissions test limits	59
Table A.1 – Main circuit terminal markings	62

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –**Part 4-3: Contactors and motor-starters –
AC semiconductor controllers and
contactors for non-motor loads**

FOREWORD

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International Standard IEC 60947-4-3 has been prepared by subcommittee 17B: Low-voltage switchgear and controlgear, of IEC technical committee 17: Switchgear and controlgear.

This second edition cancels and replaces the first edition published in 1999, Amendment 1:2006 and Amendment 2:2011. This edition constitutes a technical revision.

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

- a) Update of the marking requirements (6.1);
- b) Update of the EMC requirements (8.3.2); and
- c) Update of the tests requirements (9.3.1, 9.4, 9.4.1.1, 9.4.1.2, 9.4.2.1, 9.4.2.2, 9.4.2.3, 9.4.2.4, 9.4.2.6).

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

FDIS	Report on voting
121A/2/FDIS	121A/14/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.

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

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

The provisions of the general rules (IEC 60947-1) 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 60947-1, for example 1.2.3 of IEC 60947-1:2007, Amendment 1 (2010), Table 4 of IEC 60947-1:2007, Amendment 1 (2010) or Annex A of IEC 60947-1:2007.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

This part of IEC 60947 covers low-voltage a.c. semiconductor controllers and contactors (solid-state contactors) intended for the use with non-motor loads. As controllers, they have many capabilities beyond the simple switching on and off of non-motor loads. As contactors, they perform the same functions as mechanical contactors, but utilize one or more semiconductor switching devices in their main poles.

The devices may be single-pole or multi-pole (see 2.3.1 of IEC 60947-1:2007,). This standard refers to complete devices rated as a unit incorporating all necessary heat-sinking material and terminals. It includes devices with all necessary terminals, which are supplied with or without heat-sink in knocked-down form for combination by the users, when the manufacturer gives with the device detailed information about choosing the heat-sink and mounting the device on the heat-sink.

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 "contactor" is used in this standard wherever the feature of simple switching on and off is the most significant point of interest. Specific designations (for example, form 4, form HxB, etc.) are used wherever the unique features of various configurations comprise significant points of interest.

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 4-3: Contactors and motor-starters – AC semiconductor controllers and contactors for non-motor loads

1 Scope

This part of IEC 60947 applies to a.c. semiconductor non-motor load controllers and contactors intended for performing electrical operations by changing the state of a.c. electric circuits between the ON-state and the OFF-state. Typical applications are classified by utilization categories given in Table 2.

As controllers, they may be used to reduce the amplitude of the r.m.s. a.c. voltage on the load terminals from that of the applied voltage – either continuously or for a specified period of time. The half-wave period of the a.c. wave form remains unchanged from that of the applied voltage.

They may include a series mechanical switching device and are intended to be connected to circuits, the rated voltage of which does not exceed 1 000 V a.c.

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

The semiconductor controllers and contactors dealt with in this standard are not normally intended 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 itself.

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

This standard does not apply to:

- operation of a.c. and d.c. motors;
- low-voltage a.c. semiconductor motor controllers and starters covered by IEC 60947-4-2;
- electronic a.c. power controllers covered by the IEC 60146 series;
- all-or-nothing solid-state relays.

Contactors and control-circuit devices used in semiconductor controllers and contactors 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

- a) the characteristics of semiconductor controllers and contactors and associated equipment;
- b) the conditions with which semiconductor controllers and contactors should comply with reference to:
 - their operation and behaviour;
 - their dielectric properties;
 - the degrees of protection provided by their enclosures, where applicable;

- their construction;
- c) the tests intended for confirming that these conditions have been met, and the methods to be adopted for these tests;
- d) the information to be given with the equipment or in the manufacturer's literature.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 60410:1973, *Sampling plans and procedures for inspection by attributes*

IEC 60947-1:2007, *Low-voltage switchgear and controlgear – Part 1: General rules*
Amendment 1:2010

IEC 61000-4 (all parts), *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques*

IEC 61000-4-5:2005, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

CISPR 11:2009, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*
Amendment 1:2010

3 Terms, definitions, symbols and abbreviations

For the purposes of this document, the terms and definitions given in Clause 2 of IEC 60947-1:2007, Amendment 1 (2010), as well as the following additional terms and definitions apply:

	Reference
A	
AC semiconductor controller	3.1.1.1
B	
Bypassed controller	3.1.24
C	
Current-limit function	3.1.3
D	
Defined-point switching (of a semiconductor controller)	3.1.14.4.1
F	
Full-on (state of controllers)	3.1.10
H	
Hybrid controllers or contactors, form HxA (where $x = 4$ or 5)	3.1.2.1
Hybrid controllers or contactors, form HxB	3.1.2.2
I	
Instantaneous switching function	3.1.14.3
L	
Load control	3.1.4
M	