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Kopplingsapparater för högst 1000 V – Del 4-1: Kontakter och startkopplare – Elektromekaniska kontakter och startkopplare

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

Som svensk standard gäller europastandarden EN IEC 60947-4-1:2019. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 60947-4-1:2019.

Nationellt förord

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Standarden ska användas tillsammans med SS-EN 60947-1, utgåva 5, 2008 och dess separat utgivna tillägg.

Tidigare fastställd svensk standard SS-EN 60947-4-1, utgåva 3, 2010 och SS-EN 60947-4-1/A1, utgåva 1, 2012, gäller ej fr o m 2022-03-22.

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English Version

**Low-voltage switchgear and controlgear - Part 4-1: Contactors
and motor-starters - Electromechanical contactors and motor-
starters
(IEC 60947-4-1:2018)**

Appareillage à basse tension - Partie 4-1: Contacteurs et
démarreurs de moteurs - Contacteurs et démarreurs
électromécaniques
(IEC 60947-4-1:2018)

Niederspannungsschaltgeräte - Teil 4-1: Schütze und
Motorstarter - Elektromechanische Schütze und
Motorstarter
(IEC 60947-4-1:2018)

This European Standard was approved by CENELEC on 2018-11-29. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 121A/224/FDIS, future edition 4 of IEC 60947-4-1, prepared by SC 121A "Low-voltage switchgear and controlgear" of IEC/TC 121 "Switchgear and controlgear and their assemblies for low voltage" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60947-4-1:2019.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2019-09-22
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-03-22

This document supersedes EN 60947-4-1:2010.

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This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directives 2014/30/EU and 2014/35/EU.

For the relationship with the EU Directive 2014/30/EU see informative Annex ZZA and for the relationship with the EU Directive 2014/35/EU see informative Annex ZZB, which are integral parts of this document.

Endorsement notice

The text of the International Standard IEC 60947-4-1:2018 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068-2-2:2007	NOTE	Harmonized as EN 60068-2-2:2007 (not modified)
IEC 60079 (series)	NOTE	Harmonized as EN 60079 (series)
IEC 60079-7	NOTE	Harmonized as EN 60079-7
IEC 60079-29-3	NOTE	Harmonized as EN 60079-29-3
IEC 60269-1:2006	NOTE	Harmonized as EN 60269-1:2007 (not modified)
IEC 60269-2:2013	NOTE	Harmonized as HD 60269-2:2013 (modified)
IEC 60664-1:2007	NOTE	Harmonized as EN 60664-1:2007 (not modified)
IEC 60812:2006	NOTE	Harmonized as EN 60812:2006 (not modified)
IEC 60947-3	NOTE	Harmonized as EN 60947-3
IEC 60947-8	NOTE	Harmonized as EN 60947-8
IEC 60990:2016	NOTE	Harmonized as EN 60990:2016 (not modified)
IEC 61000-6-5	NOTE	Harmonized as EN 61000-6-5
IEC 61032	NOTE	Harmonized as EN 61032
IEC 61095:2009	NOTE	Harmonized as EN 61095:2009 (not modified)
IEC 61508-2	NOTE	Harmonized as EN 61508-2

IEC 61508-3	NOTE	Harmonized as EN 61508-3
IEC 61508-4:2010	NOTE	Harmonized as EN 61508-4:2010 (not modified)
IEC 61508-6:2010	NOTE	Harmonized as EN 61508-6:2010 (not modified)
IEC 61649	NOTE	Harmonized as EN 61649
IEC 61915-2:2011	NOTE	Harmonized as EN 61915-2:2012 (not modified)
IEC 62061	NOTE	Harmonized as EN 62061
IEC 62443 (series)	NOTE	Harmonized as EN 62443 (series)
IEC 62477-1:2012	NOTE	Harmonized as EN 62477-1:2012 (not modified)
IEC 62683-1	NOTE	Harmonized as EN 62683-1
ISO/IEC 80079-34	NOTE	Harmonized as EN ISO/IEC 80079-34

Annex ZA

(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60034-1	2017	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	EN 60034-12	2017
IEC 60034-30-1	-	Rotating electrical machines - Part 30-1: Efficiency classes of line operated AC motors (IE code)	EN 60034-30-1	2014
IEC 60038 (mod)	-	IEC standard voltages	EN 60038	2011
IEC 60068-2-14	2009	Environmental testing - Part 2-14: Tests - Test N: Change of temperature	EN 60068-2-14	2009
IEC 60079-14	-	Explosive atmospheres - Part 14: Electrical installations design, selection and erection	EN 60079-14	2014
IEC 60085	2007	Electrical insulation - Thermal evaluation and designation	EN 60085	2008
IEC 60364-1 (mod)	2005	Low-voltage electrical installations - Part 1: Fundamental principles, assessment of general characteristics, definitions	HD 60364-1	2008
-	-		+ A11	2017
IEC 60364-7-712	-	Electrical installations of buildings -- Part 7-712: Requirements for special installations or locations - Solar photovoltaic (PV) power supply systems	HD 60364-7-712	2005
-	-		+ corrigendum	2006
IEC 60715	2017	Dimensions of low-voltage switchgear and controlgear - Standardized mounting on rails for mechanical support of switchgear, controlgear and accessories	EN 60715	2017
IEC 60730-1 (mod)	-	Automatic electrical controls - Part 1: General requirements	EN 60730-1	2016

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60947-1	2007	Low-voltage switchgear and controlgear - Part 1: General rules	EN 60947-1	2007
+ A1	2010		+ A1	2011
+ A2	2014		+ A2	2014
IEC 60947-2	2016	Low-voltage switchgear and controlgear - Part 2: Circuit-breakers	EN 60947-2	2017
+COR 1	2016			
IEC 60947-5-1	2016	Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices	EN 60947-5-1	2017
+COR 1	2016		-	-
IEC 61000-6-2	-	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments	EN 61000-6-2	2019
IEC 61051-2	1991 ¹	Varistors for use in electronic equipment - Part 2: Sectional specification for surge suppression varistors	-	-
IEC 61140	2016	Protection against electric shock - Common aspects for installation and equipment	EN 61140	2016
IEC 61439	series	Low-voltage switchgear and controlgear assemblies	EN 61439	series
IEC 61810-1	-	Electromechanical elementary relays - Part 1: General and safety requirements	EN 61810-1	2015
CISPR 11 (mod)	2015	Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement	EN 55011	2016
+ A1	2016		+ A1	2017
ISO 2859-1	1999	Sampling procedures for inspection by attributes -- Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection	-	-
ISO 3864-2	2016 ¹	Graphical symbols - Safety colours and safety signs – Part 2: Design principles for product safety labels	-	-

¹ Dated as no equivalent European Standard exists.

CONTENTS

FOREWORD.....	10
INTRODUCTION.....	13
1 Scope.....	14
2 Normative references	15
3 Terms, definitions, symbols and abbreviated terms.....	16
3.1 General.....	16
3.2 Alphabetical index of terms	16
3.3 Terms and definitions concerning contactors	18
3.4 Terms and definitions concerning starters	19
3.5 Terms and definitions concerning characteristic quantities	25
3.6 Terms and definitions concerning safety aspects	26
3.7 Symbols and abbreviated terms	27
4 Classification	28
5 Characteristics of contactors and starters	28
5.1 Summary of characteristics	28
5.2 Type of equipment	29
5.2.1 Kind of equipment.....	29
5.2.2 Number of poles	29
5.2.3 Kind of current (AC or DC).....	29
5.2.4 Interrupting medium (air, oil, gas, vacuum, etc.)	29
5.2.5 Operating conditions of the equipment.....	29
5.3 Rated and limiting values for main circuits	29
5.3.1 Rated voltages	29
5.3.2 Currents or powers	31
5.3.3 Rated frequency	32
5.3.4 Rated duties	32
5.3.5 Normal load and overload characteristics	33
5.3.6 Short-circuit characteristics	35
5.3.7 Pole impedance of a contactor (Z)	36
5.4 Utilization category	36
5.4.1 General	36
5.4.2 Assignment of utilization categories based on the results of tests	36
5.5 Control circuits.....	38
5.6 Auxiliary circuits.....	39
5.7 Characteristics of relay and release of overload relays and motor protective switching device (MPSD)	39
5.7.1 Summary of characteristics.....	39
5.7.2 Types of relay or release	39
5.7.3 Characteristic values	39
5.7.4 Designation and current settings of overload relays	41
5.7.5 Time-current characteristics of overload relays	41
5.7.6 Influence of ambient air temperature.....	42
5.8 Co-ordination with short-circuit protective devices.....	42
5.9 Void	42
5.10 Types and characteristics of automatic change-over devices and automatic acceleration control devices	42

5.10.1	Types	42
5.10.2	Characteristics.....	42
5.11	Types and characteristics of auto-transformers for two-step auto-transformer starters	43
5.12	Types and characteristics of starting resistors for rheostatic rotor starters	43
6	Product information	43
6.1	Nature of information	43
6.1.1	Identification.....	43
6.1.2	Characteristics, basic rated values and utilization	44
6.2	Marking.....	45
6.3	Instructions for installation, operation, maintenance, decommissioning and dismantling	46
6.4	Environmental information	46
7	Normal service, mounting and transport conditions.....	46
8	Constructional and performance requirements	47
8.1	Constructional requirements	47
8.1.1	General	47
8.1.2	Materials	47
8.1.3	Current-carrying parts and their connections	48
8.1.4	Clearances and creepage distances	48
8.1.5	Actuator.....	48
8.1.6	Indication of the contact position	49
8.1.7	Additional requirements for equipment suitable for isolation.....	49
8.1.8	Terminals	49
8.1.9	Additional requirements for equipment provided with a neutral pole	49
8.1.10	Provisions for protective earthing.....	49
8.1.11	Enclosures for equipment	49
8.1.12	Degrees of protection of enclosed equipment	50
8.1.13	Conduit pull-out, torque and bending with metallic conduits	50
8.1.14	Limited energy source	50
8.1.15	Stored charge energy circuit.....	52
8.1.16	Fault and abnormal conditions.....	52
8.1.17	Short-circuit and overload protection of ports.....	53
8.2	Performance requirements	53
8.2.1	Operating conditions.....	53
8.2.2	Temperature-rise	59
8.2.3	Dielectric properties.....	61
8.2.4	Normal load and overload performance requirements	62
8.2.5	Co-ordination with short-circuit protective devices	68
8.3	Electromagnetic compatibility (EMC).....	71
8.3.1	General	71
8.3.2	Immunity.....	71
8.3.3	Emission.....	72
9	Tests	72
9.1	Kinds of test.....	72
9.1.1	General	72
9.1.2	Type tests.....	73
9.1.3	Routine tests	73

9.1.4	Sampling tests	73
9.1.5	Special tests	74
9.2	Compliance with constructional requirements	75
9.2.1	General	75
9.2.2	Electrical performance of screwless-type clamping units	75
9.2.3	Ageing test for screwless-type clamping units	75
9.2.4	Limited energy source test	76
9.2.5	Breakdown of components	76
9.3	Compliance with performance requirements	77
9.3.1	Test sequences	77
9.3.2	General test conditions	78
9.3.3	Performance under no load, normal load and overload conditions	78
9.3.4	Performance under short-circuit conditions	90
9.3.5	Overload current withstand capability of contactors	95
9.3.6	Routine tests and sampling tests	95
9.4	EMC tests	97
9.4.1	General	97
9.4.2	Immunity	97
9.4.3	Emission	99
Annex A (normative) Marking and identification of terminals of contactors, starters and associated overload relays		101
A.1	General	101
A.2	Marking and identification of terminals of main circuits	101
A.3	Marking and identification of terminals of overload relays	101
Annex B (normative) Special tests		103
B.1	General	103
B.2	Mechanical durability	103
B.2.1	General	103
B.2.2	Verification of mechanical durability	103
B.3	Electrical durability	105
B.3.1	General	105
B.3.2	Results to be obtained	106
B.3.3	Statistical analysis of test results for contactors or starters	106
B.4	Coordination at the crossover current between the starter and associated SCPD	107
B.4.1	General and definitions	107
B.4.2	Condition for the test for the verification of co-ordination at the crossover current by a direct method	108
B.4.3	Test currents and test circuits	108
B.4.4	Test procedure and results to be obtained	108
B.4.5	Verification of co-ordination at the crossover current by an indirect method	108
Annex C (informative) Typical characteristics of starters		111
Annex D (informative) Items subject to agreement between manufacturer and user		118
Annex E (Void)		119
Annex F (normative) Requirements for auxiliary contact linked with power contact (mirror contact)		120
F.1	Application and object	120
F.1.1	Application	120

F.1.2	Object.....	120
F.2	Terms and definitions.....	120
F.3	Characteristics.....	120
F.4	Product information.....	120
F.5	Normal service, mounting and transport conditions	121
F.6	Constructional and performance requirements	121
F.7	Tests	121
F.7.1	General	121
F.7.2	Tests on products in a new condition	121
F.7.3	Test after conventional operational performance (defined under Table 13).....	122
Annex G (informative)	Rated operational currents and rated operational powers of switching devices for electrical motors	123
G.1	General.....	123
G.2	Rated operational powers and rated operational currents.....	123
Annex H (normative)	Extended functions to electronic overload relays.....	127
H.1	General.....	127
H.2	Terms and definitions.....	127
H.3	Limits of operation of control functions	127
H.3.1	General	127
H.3.2	Limits of electronic overload relay with main circuit under-voltage restarting function.....	127
H.4	Test of the control functions	128
Annex I (informative)	AC-1 contactors for use with semiconductor controlled motor load	129
Annex J (Void)		130
Annex K (normative)	Procedure to determine data for electromechanical contactors used in functional safety applications.....	131
K.1	General.....	131
K.2	Test requirements	131
K.3	Characterization of a failure mode	131
K.4	Failure ratios of a contactor	131
Annex L (normative)	Assessment procedure for electromechanical overload protection used in safety applications and especially in explosive atmospheres	133
L.1	Application and object.....	133
L.1.1	Application.....	133
L.1.2	Object.....	133
L.2	Terms, definitions and symbols	133
L.2.1	Terms and definitions	133
L.2.2	Symbols and abbreviations	134
L.3	Procedure	135
L.3.1	General	135
L.3.2	Safety design process	135
L.4	Requirements	136
L.4.1	General	136
L.4.2	Safety plan	136
L.4.3	Design	137
L.4.4	Failure mode and effects analysis of the safety function	137
L.4.5	Design plan	138

L.4.6	Verification	138
L.4.7	Function assessed.....	138
L.5	Documentation.....	138
L.5.1	Technical safety documentation.....	138
L.5.2	Safety instructions	138
L.6	Example.....	139
L.6.1	architecture description	139
L.6.2	FMEA	140
Annex M (normative)	DC contactors for use in photovoltaic (PV) applications	148
M.1	Application	148
M.2	Object.....	148
M.3	Terms and definitions.....	148
M.4	Classification	149
M.5	Characteristics.....	149
M.5.1	General	149
M.5.2	Rated impulse withstand voltage.....	149
M.5.3	Utilization category	149
M.6	Product information.....	150
M.7	Normal service, mounting and transport conditions	150
M.7.1	General	150
M.7.2	Ambient air temperature	150
M.7.3	Altitude	150
M.8	Constructional and performance requirements	151
M.8.1	Constructional requirements	151
M.8.2	Performance requirements.....	151
M.8.3	Electromagnetic compatibility (EMC)	152
M.9	Tests	152
M.9.1	General	152
M.9.2	Type tests.....	152
M.9.3	Making and breaking capacities and conventional operational performance	153
M.9.4	Thermal cycling test.....	153
M.9.5	Climatic test.....	153
M.9.6	Dielectric test	153
M.9.7	Critical load current test.....	154
M.9.8	Mechanical properties.....	155
M.9.9	Degree of protection of enclosed contactors	156
M.9.10	EMC	156
M.9.11	Clearance and creepage distances	156
Annex N (normative)	Additional requirements and tests for equipment with protective separation.....	157
N.1	General.....	157
N.2	Definitions.....	157
N.3	Requirements	157
N.3.1	Test method for implementing protective impedance.....	157
N.3.2	Touch current measurement	158
Annex O (informative)	Load monitoring indicators	160
O.1	General.....	160
O.2	Indicators list	160

O.3	Uncertainty	162
O.4	Tests	163
O.4.1	Routine tests	163
O.4.2	Type tests.....	163
Annex P (normative)	Short-circuit breaking tests of MPSD	165
P.1	General test conditions	165
P.2	Rated service short-circuit breaking capacity	165
P.2.1	General	165
P.2.2	Test of rated service short-circuit breaking capacity.....	166
P.2.3	Verification of operational performance capability	166
P.2.4	Verification of dielectric withstand.....	166
P.2.5	Verification of temperature-rise.....	167
P.2.6	Verification of overload releases	167
P.3	Rated ultimate short-circuit breaking capacity	167
P.3.1	General	167
P.3.2	Verification of overload releases	167
P.3.3	Test of rated ultimate short-circuit breaking capacity	168
P.3.4	Verification of dielectric withstand.....	168
P.3.5	Verification of overload releases	168
P.4	Test of MPSD for IT system	168
P.4.1	General	168
P.4.2	Individual pole short-circuit	168
P.4.3	Verification of dielectric withstand.....	169
P.4.4	Verification of overload releases	169
P.4.5	Marking	169
Annex Q (normative)	Co-ordination under short-circuit conditions between a MPSD and another short-circuit protective device associated in the same circuit.....	170
Q.1	Application	170
Q.2	Object.....	170
Q.3	General requirements for the co-ordination of a MPSD with another SCPD	171
Q.3.1	General considerations	171
Q.3.2	Behaviour of C_1 in association with another SCPD	171
Q.4	Type and characteristics of the associated SCPD	171
Q.5	Verification of selectivity	172
Q.5.1	General	172
Q.5.2	Consideration of selectivity by desk study.....	172
Q.5.3	Selectivity determined by test	173
Bibliography.....		178
Figure 1	Multiple of current setting limits for ambient air temperature compensated time-delay overload relays	56
Figure 2	Thermal memory test	57
Figure 3	Examples of co-ordination characteristics of a starter.....	70
Figure 4	Voltage drop measurement at contact point of the clamping terminal	75
Figure 5	Example of a pole impedance measurement for a 3 pole contactor	81
Figure A.1	Main circuit	101
Figure A.2	Overload relays	102

Figure B.1 – Examples of time-current withstand characteristic.....	110
Figure C.1 – Typical curves of currents and torques during a star-delta start (see 3.4.4.1)	111
Figure C.2 – Typical curves of currents and torques during an auto-transformer start (see 3.4.4.2)	112
Figure C.3 – Typical variants of protected starters, combination starters, protected switching devices and combination switching devices	113
Figure C.4 – Example of three-phase diagram of a rheostatic rotor starter with three starting steps and one direction of rotation (in the case when all the mechanical switching devices are contactors)	114
Figure C.5 – Typical methods and diagrams of starting alternating-current induction motors by means of auto-transformers	116
Figure C.6 – Examples of speed/time curves corresponding to cases a), b), c), d), e) and f) of 5.3.5.6.1	117
Figure F.1 – Mirror contact.....	121
Figure L.1 – Safety design process	136
Figure L.2 – Typical structure of a thermal overload relay	139
Figure L.3 – typical structure of MPSD	140
Figure M.1 – Critical current.....	154
Figure N.1 – Protection by means of protective impedance	158
Figure N.2 – Measuring instrument	159
Figure O.1 – Example of quantification of a process change	162
Figure Q.1 – Over-current co-ordination between a MPSD and a fuse or back-up protection by a fuse: operating characteristics	175
Figure Q.2 – Total selectivity between MPSD and circuit-breakers – Case 1	176
Figure Q.3 – Total selectivity between MPSD and circuit-breakers – Case 2	176
Figure Q.4 – Back-up protection by a circuit-breaker – Operating characteristics – Case 1	177
Figure Q.5 – Back-up protection by a circuit-breaker – Operating characteristics – Case 2	177
Table 1 – Utilization categories	38
Table 2 – Trip classes of overload relays	41
Table 3 – Limits of operation of time-delay overload relays when energized on all poles.....	55
Table 4 – Limits of operation of three-pole time-delay overload relays when energized on two poles only	58
Table 5 – Temperature-rise limits for insulated coils in air and in oil	60
Table 6 – Intermittent duty test cycle data.....	61
Table 7 – Making and breaking capacities – Making and breaking conditions according to utilization category	63
Table 8 – Relationship between the test current and off-time for the verification of rated making and breaking capacities	65
Table 9 – Operational current determination for utilization categories AC-6a and AC-6b when derived from AC-3 ratings	65
Table 10 – Conventional operational performance – Making and breaking conditions according to utilization category	66
Table 11 – Overload current withstand requirements	68

Table 12 – Specific acceptance criteria for immunity tests	72
Table 13 – Value of the prospective test current according to the rated operational current	92
Table 14 – Value of the prospective test current according to the rated operational current (harmonized table)	92
Table 15 – Test conditions for I_{cd}	70
Table 16 – EMC immunity tests	97
Table 17 – Terminal disturbance voltage limits for conducted radio-frequency emission (for mains ports)	99
Table 18 – Radiated emission test limits	100
Table 19 – Limits for limited energy sources without an over-current protective device	51
Table 20 – Limits for limited energy sources with an over-current protective device	51
Table 21 – Limits for limited energy source with current limiting impedance	52
Table B.1 – Verification of the number of on-load operating cycles – Conditions for making and breaking corresponding to the several utilization categories	106
Table B.2 – Test conditions	109
Table F.1 – Test voltage according to altitude	122
Table G.1 – Rated operational powers and rated operational currents of motors	124
Table K.1 – Failure mode of contactors	131
Table K.2 – Typical failure ratios for normally open contactors	132
Table L.1 – Severity	140
Table L.2 – Occurrence	141
Table L.3 – Detection levels	141
Table L.4 – Conclusion	142
Table L.5 – Example of failure mode and effects analysis for thermal overload relay	143
Table M.1 – Rated impulse voltage levels for PV contactors	149
Table M.2 – Utilization categories	149
Table M.3 – Ambient air temperature conditions	150
Table M.4 – Verification of rated making and breaking capacities – Conditions for making and breaking corresponding to the DC-PV category	151
Table M.5 – Conventional operational performance – Making and breaking condition corresponding to the DC-PV category	152
Table M.6 – Overall scheme of test sequences	153
Table M.7 – Number of operating cycles corresponding to the critical load current	155
Table M.8 – Critical load current performance	155
Table O.1 – AC monitoring indicators list	161
Table O.2 – Different possibilities authorized for verification of indicators	163
Table O.3 – Reference for verification conditions	164
Table O.4 – Harmonic levels	164

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –**Part 4-1: Contactors and motor-starters –
Electromechanical contactors and motor-starters**

FOREWORD

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International Standard 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.

This fourth edition cancels and replaces the third edition published in 2009 and its Amendment 1:2012. This edition constitutes a technical revision.

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

- Scope structure and exclusions
- Editorial correction of notes and hanging paragraphs
- Reference to IEC 62683-1
- Motor protective switching device (MPSD) with its requirements

- Safety aspects related to:
 - General aspects;
 - Limited energy circuits;
 - Electronic circuits;
 - Assessment procedure for electromechanical overload protection used in safety - applications (new Annex L)
- Introduction of provisions covering the impact of higher locked rotor current to achieve high efficiency class
- Mention of dedicated wiring accessories
- Pickup power measurement
- Alignment to IEC 60947-1:2007, IEC 60947-1:2007/AMD1:2010, and IEC 60947-1:2007/AMD2:2014
- Direct current requirements for covering photovoltaic application (new Annex M)
- Load monitoring indicators (new Annex O)
- Short-circuit breaking tests of MPSD (new Annex P)
- Co-ordination under short-circuit conditions between a MPSD and another short-circuit protective device associated in the same circuit (new Annex Q)

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

FDIS	Report on voting
121A/224/FDIS	121A/233/RVD

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

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

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 60947-1:2007, IEC 60947-1:2007/AMD1:2010, IEC 60947-1:2007/AMD2:2014, *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 60947-1:2007, IEC 60947-1:2007/AMD1:2010, and IEC 60947-1:2007/AMD2:2014. For example, 4.3.4.1 of IEC 60947-1:2007, Table 4 of IEC 60947-1:2007, or Annex A of IEC 60947-1:2007.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://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.

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 introduces the requirements for motor protection switching devices (MPSD).

MPSDs have been available on the market for many years. They are introduced in this document for covering the minimum safety and performance requirements of a manual motor starter with integral electromechanical or electronic short-circuit protection. This device fulfils all requirements of a starter and specific requirements of a circuit-breaker according to IEC 60947-2, mainly I_{cu} and I_{cs} , for protecting the motor and its circuit with control devices e.g. a contactor. An MPSD is not intended to support neutral pole, DC ratings, rated uninterrupted current I_u , backup protection, short-circuit tripping time-delay, selectivity category, withdrawable capability, RCD, recloser, EMC requirements of IEC 60947-2, etc.

Circuit-breakers according to Annex O of IEC 60947-2:2016 with motor overload protection characteristic according to this document but without starter ratings e.g. AC-3 are also available on the market. These devices are not covered by this document.

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 device (MPSD);
- actuators of contactor relays;
- contacts dedicated exclusively to the coil circuit of this contactor or this 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 covers also the assessment procedure for electromechanical overload protection used in safety applications such as protecting a motor located in explosive atmosphere from the outside atmosphere: See Annex L.

This document does not apply to:

- starters for DC motors¹;
NOTE 1 The requirements for DC motor starters are under consideration for the next maintenance cycle.
- auxiliary contacts of contactors and contacts of contactor relays. These are covered by IEC 60947-5-1;
- starter used downstream to frequency drive¹;
NOTE 2 Additional requirements for starter used downstream to frequency drive are under consideration for the next maintenance cycle.
- short-circuit protective device integrated within starters other than MPSDs. This is covered by IEC 60947-2 and IEC 60947-3;
- the use of the product with additional measure within explosive atmospheres. These are given in IEC 60079 series;
- embedded software design rules¹;
- cyber security aspects. These are covered by IEC 62443 series.

The objective of this document is to state:

- a) the characteristics of the equipment;
- b) the conditions applicable to the equipment with reference to:
 - 1) its operation and behaviour,
 - 2) its dielectric properties,
 - 3) its degree of protection,

¹ For this subject the manufacturer is responsible for taking additional safety measures.

- 4) its construction including safety measures against electric shock, fire hazard and mechanical hazard;
- 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 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 60034-12:2016, *Rotating electrical machines – Part 12: Starting performance of single-speed three-phase cage induction motors*

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

IEC 60038, *IEC standard voltages*

IEC 60068-2-14:2009, *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 60364-7-712, *Low voltage electrical installations – Part 7-712: Requirements for special installations or locations – Solar photovoltaic (PV) power supply systems*

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

IEC 60947-1:2007/AMD1:2010

IEC 60947-1:2007/AMD2:2014

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 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*

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

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

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

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

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

ISO 2859-1:1999, *Sampling procedures for inspection by attributes – Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 3864-2, *Graphical symbols – Safety colours and safety signs – Part 2: Design principles for product safety labels*