

© Copyright SEK. Reproduction in any form without permission is prohibited.

Kopplingsapparater för spänning över 1 kV – Del 106: Kontakter och kontaktbaserade startkopplare för växelström

High-voltage switchgear and controlgear –

Part 106: Alternating current contactors, contactor-based controllers and motor-starters

Som svensk standard gäller europastandarden EN 62271-106:2011. Den svenska standarden innehåller den officiella engelska språkversionen av EN 62271-106:2011.

Nationellt förord

Europastandarden EN 62271-106:2011

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 62271-106, First edition, 2011 - High-voltage switchgear and controlgear - Part 106: Alternating current contactors, contactor-based controllers and motor-starters**

utarbetad inom International Electrotechnical Commission, IEC.

Standarden ska användas tillsammans med SS-EN 62271-1, utgåva 1, 2009.

Tidigare fastställd svensk standard SS-EN 60470, utgåva 1, 2001, gäller ej fr o m 2014-09-23.

ICS 29.130.10

Denna standard är fastställd av SEK Svensk Elstandard, som också kan lämna upplysningar om **sakinnehållet** i standarden.
Postadress: SEK, Box 1284, 164 29 KISTA
Telefon: 08 - 444 14 00. Telefax: 08 - 444 14 30
E-post: sek@elstandard.se. Internet: www.elstandard.se

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a säkerhet, prestanda, dokumentation, utförande och skötsel av elprodukter, elanläggningar och metoder. Genom att utforma sådana standarder blir säkerhetskraven tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

English version

**High-voltage switchgear and controlgear -
Part 106: Alternating current contactors, contactor-based controllers and
motor-starters
(IEC 62271-106:2011)**

Appareillage à haute tension -
Partie 106: Contacteurs, combinés de
démarrage à contacteurs et démarreurs
de moteurs, pour courant alternatif
(CEI 62271-106:2011)

Hochspannungs-Schaltgeräte und -
Schaltanlagen -
Teil 106: Wechselstrom-Schütze,
Kombinationsstarter und Motorstarter mit
Schützen
(IEC 62271-106:2011)

This European Standard was approved by CENELEC on 2011-09-23. 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.

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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 17A/971/FDIS, future edition 1 of IEC 62271-106, prepared by SC 17A, "High-voltage switchgear and controlgear", of IEC TC 17, "Switchgear and controlgear" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62271-106:2011.

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) 2012-06-23
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2014-09-23

This document supersedes EN 60470:2000 + corrigendum June 2000.

EN 62271-106:2011 includes the following significant technical changes with respect to EN 60470:2000:

- Scope and object: The voltage range covered by the standard was expanded from 12 kV to 24 kV. Overload relay calibration and testing is not covered by this standard.
- 3 Terms and definitions: Added definitions for capacitor switching classes.
- 4.1 Rated voltage: Added 15, 17,5 and 24 kV as standard voltage values.
- 4.109.2 Starting duty of reduced-voltage starters: Added ratings for autotransformer and reactor starters (was in the testing section).
- 4.112 Rated capacitive switching currents: Added capacitor switching current ratings.
- 5.101 Protective relays: Removed the requirements for overload relays. This section is obsolete since there are only a few MV starters fitted with thermal overload relays and electronic relays have their own standards.
- 6.2.5 Application of the test voltage and test conditions (former 6.2.2 b)): Changed wording of requirement for impulse across the open gap of vacuum contactors.
- 6.4.2 Auxiliary circuits: The requirement for resistance checks of auxiliary circuits was deleted.
- 6.5.5.104 Temperature rise of the auto-transformer or reactor for two-step auto-transformer or reactor starters: Reworded to transfer ratings to subclause 4.109.2.
- 6.102.9 Condition following making and breaking tests: Gave specific direction as to what the tolerance should be based on where the resistance was to be checked.
- 6.104 Short-circuit current making and breaking tests: Clarified test conditions for shortcircuit testing.
- 6.109 Capacitive current switching tests: Added capacitive current switching tests.
- Annex B: Added Table B.1 – Tolerances on test quantities for type test.

This standard is to be read in conjunction with EN 62271-1:2008, to which it refers and which is applicable unless otherwise specified in this standard. In order to simplify the indication of corresponding requirements, the same numbering of clauses and subclauses is used as in EN 62271-1. Amendments to these clauses and subclauses are given under the same references whilst additional subclauses are numbered from 101.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 62271-106:2011 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 60034-11	NOTE	Harmonized as EN 60034-11.
IEC 60060 series	NOTE	Harmonized in EN 60060 series.
IEC 60060-1	NOTE	Harmonized as EN 60060-1.
IEC 60060-2	NOTE	Harmonized as EN 60060-2.
IEC 60076-11:2004	NOTE	Harmonized as EN 60076-11:2004 (not modified).
IEC 60076-2	NOTE	Harmonized as EN 60076-2.
IEC 60255-8	NOTE	Harmonized as EN 60255-8.
IEC 60947-5-1	NOTE	Harmonized as EN 60947-5-1.
IEC 61230	NOTE	Harmonized as EN 61230.
IEC 61812-1	NOTE	Harmonized as EN 61812-1.
IEC 62271-103	NOTE	Harmonized as EN 62271-103.
IEC 62271-110:2009	NOTE	Harmonized as EN 62271-110:2009 (not modified).

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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 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 60282-1	-	High-voltage fuses - Part 1: Current-limiting fuses	EN 60282-1	-
IEC 60417	Data- base	Graphical symbols for use on equipment	-	-
IEC 60644	-	Specification for high voltage fuse-links for motor circuit application	EN 60644	-
IEC 62271-1	2007	High-voltage switchgear and controlgear - Part 1: Common specifications	EN 62271-1	2008
IEC 62271-100	2008	High-voltage switchgear and controlgear - Part 100: Alternating current circuit-breakers	EN 62271-100	2009
IEC 62271-102	-	High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches	EN 62271-102	-
IEC 62271-200	2003	High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV	EN 62271-200	2004

CONTENTS

1	General	5
2	Normal and special service conditions	7
3	Terms and definitions	7
4	Ratings.....	19
5	Design and construction	32
6	Type tests	36
7	Routine tests	57
8	Guide to the selection of contactors and motor-starters for service.....	58
9	Information to be given with enquiries, tenders and orders	62
10	Transport, storage, installation, operation and maintenance	63
11	Safety.....	63
	Annex A (normative) Records and reports of type tests for making, breaking and short-time current performance	70
	Annex B (normative) Tolerances	73
	Annex C (informative) List of symbols and abbreviations	79
	Bibliography.....	80
	Figure 1 – Examples of speed/time curves.....	64
	Figure 2 – Test duties A and B – preferred earth point	65
	Figure 3 – Test duties A and B – alternative earth point.....	65
	Figure 4 – Test duty C – preferred earth point.....	66
	Figure 5 – Test duty C – alternative earth point.....	66
	Figure 6 – Representation by two parameters of a prospective TRV of a circuit	67
	Figure 7 – Representation of the specified TRV by a two-parameter reference line and a delay line	67
	Figure 8 – Determination of power frequency recovery voltage	68
	Figure 9 – Characteristics for determining take-over current	69
	Table 1 – Ratings and characteristics	20
	Table 2 – Utilization categories	26
	Table 3 – Characteristics dependent on starter type	31
	Table 4 – Applicable type tests	37
	Table 5 – Intermittent duty operating cycles.....	40
	Table 6 – Verification of rated making and breaking capacities – Conditions for making and breaking corresponding to the several utilization categories at rated voltage U_r	44
	Table 7 – Relationship between current broken I_C and OFF time	47
	Table 8 – Overload current withstand requirements	48
	Table 9 – Transient recovery voltage characteristics.....	53
	Table 10 – Verification of the number of on-load operating cycles – Conditions for making and breaking corresponding to the several utilization categories.....	55
	Table B.1 – Tolerances on test quantities for type test.....	73

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 106: Alternating current contactors, contactor-based controllers and motor-starters

1 General

1.1 Scope and object

This part of IEC 62271 is applicable to a.c. contactors and/or contactor-based controllers and motor-starters designed for indoor installation and operation at frequencies up to and including 60 Hz on systems having voltages above 1 000 V but not exceeding 24 000 V.

It is applicable only to three-pole devices for use in three-phase systems, and single-pole devices for use in single-phase systems. Two-pole contactors and starters for use in single-phase systems are subject to agreement between manufacturer and user.

Contactors and/or starters dealt with in this standard typically do not have adequate short-circuit interruption capability. In this context, this standard gives requirements for

- motor starters associated with separate short-circuit protective devices;
- controllers - contactors combined with short-circuit protective devices (SCPD).

Contactors intended for closing and opening electric circuits and, if combined with suitable relays, for protecting these circuits against operating overloads are covered in this standard.

This standard is also applicable to the operating devices of contactors and to their auxiliary equipment.

Motor-starters intended to start and accelerate motors to normal speed, to ensure continuous operation of motors, to switch off the supply from the motor and to provide means for the protection of motors and associated circuits against operating overloads are dealt with.

Motor-starter types included are

- direct-on-line starters;
- reversing starters;
- two-direction starters;
- reduced kVA (voltage) starters;
 - auto-transformer starters;
 - rheostatic starters;
 - reactor starters.

This standard does not apply to

- circuit-breaker-based motor-starters;
- single-pole operation of multi-pole contactors or starters;
- two-step auto-transformer starters designed for continuous operation in the starting position;
- unbalanced rheostatic rotor starters, i.e. where the resistances do not have the same value in all phases;

- equipment designed not only for starting, but also for adjustment of speed;
- liquid starters and those of the "liquid-vapour" type;
- semiconductor contactors and starters making use of semiconductor contactors in the main circuit;
- rheostatic stator starters;
- contactors or starters designed for special applications.

This standard does not deal with components contained in contactors and contactor-based motor-starters, for which individual specifications exist.

NOTE 1 Thermal electrical relays are covered by IEC 60255-8.

NOTE 2 High-voltage current-limiting fuses are covered by IEC 60282-1 and IEC 60644.

NOTE 3 Metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV are covered by IEC 62271-200.

NOTE 4 Disconnectors and earthing switches are covered by IEC 62271-102.

NOTE 5 High-voltage switches above 1 kV and less than 52 kV are covered by IEC 62271-103¹.

The object of this standard is to state

- a) the characteristics of contactors and starters and associated equipment;
- b) the conditions with which contactors or starters shall comply with reference to:
 - 1) their operation and behaviour,
 - 2) their dielectric properties,
 - 3) the degrees of protection provided by their enclosures, where applicable,
 - 4) their construction,
 - 5) for controllers, interactions between the various components, for example SCPD co-ordination;
- 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.

1.2 Normative references

The following referenced documents are indispensable for the application 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 60282-1, *High-voltage fuses – Part 1: Current-limiting fuses*

IEC 60417, *Graphical symbols for use on equipment*

IEC 60644, *Specification for high-voltage fuse-links for motor circuit applications*

IEC 62271-1:2007, *High-voltage switchgear and controlgear – Part 1: Common specifications*

IEC 62271-100:2008, *High-voltage switchgear and controlgear – Part 100: Alternating-current circuit-breakers*

¹ To be published

IEC 62271-102, *High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches*

IEC 62271-200:2003, *High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*