

High-voltage switchgear and controlgear —

**Part 107: Alternating current fused
circuit-switchers for rated voltages
above 1 kV up to and including 52 kV**

The European Standard EN 62271-107:2005 has the status of a
British Standard

ICS 29.130.10

National foreword

This British Standard is the official English language version of EN 62271-107:2005. It is identical with IEC 62271-107:2005.

The UK participation in its preparation was entrusted to Technical Committee PEL/17/1, High-voltage switchgear and controlgear, which has the responsibility to:

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- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;
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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 45 and a back cover.

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Amendments issued since publication

Amd. No.	Date	Comments

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2006

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High-voltage switchgear and controlgear
Part 107: Alternating current fused circuit-switchers for rated voltages
above 1 kV up to and including 52 kV
(IEC 62271-107:2005)

Appareillage à haute tension
Partie 107: Circuits-switchers fusibles
pour courant alternatif de tension
assignée supérieure à 1 kV et jusqu'à
52 kV inclus
(CEI 62271-107:2005)

Hochspannungs-Schaltgeräte und
-Schaltanlagen
Teil 107: Wechselstrom-
Leistungsschalter-Sicherungs-
Kombinationen für
Bemessungsspannungen über 1 kV
bis einschließlich 52 kV
(IEC 62271-107:2005)

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CENELEC

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

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Foreword

The text of document 17A/732/FDIS, future edition 1 of IEC 62271-107, 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 was approved by CENELEC as EN 62271-107 on 2005-10-01.

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) 2006-07-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2008-10-01

This European Standard should be read in conjunction with EN 60694:1996, to which it refers and which is applicable, unless otherwise specified. In order to simplify the indication of corresponding requirements, the same numbering of clauses and subclauses is used as in EN 60694. Additional subclauses are numbered from 101.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62271-107:2005 was approved by CENELEC as a European Standard without any modification.

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 107: Alternating current fused circuit-switchers for rated voltages above 1 kV up to and including 52 kV

1 General

1.1 Scope

This part of IEC 62271 applies to three-pole operated units for distribution systems that are functional assemblies of a circuit-switcher and current-limiting fuses designed so as to be capable of:

- breaking, at the rated recovery voltage, any load or fault current up to and including the rated short-circuit breaking current;
- making, at the rated voltage, circuits to which the rated short-circuit breaking current applies.

They are intended to be used for circuits or applications requiring only a normal mechanical and electrical endurance capability. Such applications cover protection of HV/LV transformers for instance, but exclude distribution lines or cables, as well as motor circuits and capacitor bank circuits.

Short-circuit conditions with low currents, up to the fused circuit-switcher rated take-over current, are dealt with by supplementary devices (strickers, relays, etc.), properly arranged, tripping the circuit-switcher. Fuses are incorporated in order to ensure that the short-circuit breaking capacity of the device is above that of the circuit-switcher.

NOTE 1 In this standard the term "fuse" is used to designate either the fuse or the fuse-link where the general meaning of the text does not result in ambiguity.

This standard applies to fused circuit-switchers designed with rated voltages above 1 kV up to and including 52 kV for use on three-phase alternating current systems of either 50 Hz or 60 Hz. Comparison with other existing switching devices is provided in Clause 8.

NOTE 2 Other circuit-switchers exist; see reference [1] of the bibliography.

Fuses are covered by IEC 60282-1.

Earthing switches forming an integral part of a circuit-switcher are covered by IEC 62271-102.

Installation in enclosure, if any, is covered either by IEC 62271-200 or by IEC 60466.

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

IEC 60265-1: *High-voltage switches – Part 1: Switches for rated voltages above 1 kV and less than 52 kV*

IEC 60282-1: 2002, *High-voltage fuses – Part 1: Current-limiting fuses*

IEC 60466: *A.C. insulation-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 38 kV*

IEC 60694: *Common specifications for high-voltage switchgear and controlgear standards*

IEC 60787: *Application guide for the selection of fuse-links of high-voltage fuses for transformer circuit applications*

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

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

IEC 62271-105: *High-voltage switchgear and controlgear – Part 105: Alternating current switch-fuse combinations*

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

2 Normal and special service conditions

Clause 2 of IEC 60694 is applicable.

3 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 60050(441) and IEC 60694 apply. Some of them are recalled here for ease of reference.

The definitions given below are also applicable. Additional definitions are classified so as to be aligned with the classification used in IEC 60050(441). The definitions of IEC 60050(441) are not repeated but reference is made to their specific number.

3.1 General terms

None

3.2 Assemblies of switchgear and controlgear

None.

3.3 Parts of assemblies

None.

3.4 Switching devices

3.4.101

circuit-switcher

mechanical switching device suitable for making, carrying and interrupting currents under normal circuit conditions. It is also suitable for interrupting specified fault currents that may be less than its short-time withstand current.

NOTE Other circuit-switchers exist; see reference [1] of the bibliography.

3.4.102

fused circuit-switcher

device comprising a three-pole circuit-switcher and three current limiting fuses, capable of making and breaking any load or fault current up to its short-circuit breaking current, under TRV and power factor conditions defined in this standard

3.4.103

fused circuit-switcher base (or device base)

fused circuit-switcher without fuse-links mounted

3.4.104

non-sustained disruptive discharge (NSDD)

disruptive discharge associated with current interruption, that does not result in the resumption of power frequency current or, in the case of capacitive current interruption does not result in current at the natural frequency of the circuit

3.5 Parts of switchgear and controlgear

3.5.101

release

[IEV 441-15-17]

3.5.102

over-current release

[IEV 441-16-33]

3.5.103

shunt release

[IEV 441-16-41]

3.6 Operation

3.6.101

independent manual operation (of the fused circuit-switcher)

[IEV 441-16-16]

3.6.102

stored energy operation (of the fused circuit-switcher)

[IEV 441-16-15]

3.7 Characteristic quantities

3.7.101

prospective current (of a circuit and with respect to a switching device or a fuse)

[IEV 441-17-01]

3.7.102

prospective peak current

[IEV 441-17-02]

3.7.103

maximum prospective peak current

[IEV 441-17-04]

3.7.104

prospective breaking current

[IEV 441-17-06]

3.7.105

breaking current

[IEV 441-17-07]

3.7.106

minimum breaking current

[IEV 441-18-29]

3.7.107

short-circuit making capacity

[IEV 441-17-10]

3.7.108

take-over current

[IEV 441-17-16]

3.7.109

thermal current

I_{th}

maximum current carried continuously without the temperature rise of the various parts exceeding the limits specified

3.7.110

fused short-circuit current

[IEV 441-17-21]

3.7.111

applied voltage

[IEV 441-17-24]

3.7.112

recovery voltage

[IEV 441-17-25]

3.7.113

transient recovery voltage (TRV)

[IEV 441-17-26]

3.7.114

power frequency recovery voltage

[IEV 441-17-27]

3.7.115

prospective transient recovery voltage

[IEV 441-17-29]

3.7.116

minimum opening time (of the fused circuit-switcher)

minimum interval of time between the initiation of the opening, from an external source, and the first instant of the separation of the arcing contacts in any one pole

3.7.117**fuse-initiated opening time** (of a fused circuit-switcher)

time taken from the instant at which arcing in the fuse commences to the instant when the arcing contacts have separated in all poles. This definition applies only for fused circuit-switchers fitted with fuse-striker release

3.101 Fuses**3.101.1****fuse-base, fuse mount**

[IEV 441-18-02]

3.101.2**striker**

[IEV 441-18-18]

3.101.3**cut-off current**

[IEV 441-17-12]

3.101.4 **I^2t – Joule integral**

[IEV 441-18-23]

4 Ratings

Clause 4 of IEC 60694 is applicable with the additions and exceptions indicated below.

In addition to the ratings listed in IEC 60694 the following ratings apply:

- a) rated short-circuit breaking current;
- b) rated transient recovery voltage;
- c) rated short-circuit making current;
- d) rated take-over current;
- e) rated maximal thermal current.

4.1 Rated voltage (U_r)

IEC 60694, 4.1 is applicable.

4.2 Rated insulation level

IEC 60694, 4.2 is applicable.

4.3 Rated frequency (f_r)

IEC 60694, 4.3 is applicable.

4.4 Rated normal current and temperature rise**4.4.1 Rated normal current (I_r)**

IEC 60694, 4.4.1 does not apply.

A rated normal current is normally not assigned to the fused circuit-switcher. When fused circuit-switchers are combined into larger enclosed assemblies, the rated normal current of the connecting busbars shall be in accordance with IEC 62271-200 or IEC 60466.

See also thermal current (4.4.101).

4.4.2 Temperature rise

IEC 60694, 4.4.2 is applicable and, as far as fuses are concerned, Clause 6 of IEC 60282-1.

4.4.101 Rated maximum thermal current (I_{th})

The rated maximum thermal current is the maximum value of the thermal current for the fused circuit-switcher.

It is not required that the thermal current is selected from the R10 series.

NOTE The actual thermal current depends on the fuses installed.

4.5 Rated short-time withstand current (I_k)

IEC 60694, 4.5 is not applicable.

4.6 Rated peak withstand current (I_p)

IEC 60694, 4.6 is not applicable.

4.7 Rated duration of short circuit (t_k)

IEC 60694, 4.7 is not applicable.

4.8 Rated supply voltage of closing and opening devices and of auxiliary and control circuits (U_a)

IEC 60694, 4.8 is applicable.

4.9 Rated supply frequency of closing and opening devices and of auxiliary circuits

IEC 60694, 4.9 is applicable.

4.10 Rated pressure of compressed gas supply for insulation and/or operation

IEC 60694, 4.10 is applicable.

4.101 Rated short-circuit breaking current

The rated short-circuit breaking current is the highest prospective short-circuit current which the fused circuit-switcher shall be capable of breaking under the conditions of use and behaviour prescribed in this standard in a circuit having a power-frequency recovery voltage corresponding to the rated voltage of the fused circuit-switcher and having a prospective transient recovery voltage equal to the rated value specified in 4.102.

The rated short-circuit breaking current is expressed by the r.m.s. value of its a.c. component.

The rated short-circuit breaking currents shall be selected from the R10 series as follows:

8 – 10 – 12,5 – 16 – 20 – 25 – 31,5 – 40 – 50 – 63 – 80 – 100 kA

NOTE It is recognized that the series impedance of the fused circuit-switcher or rapid operation of the fuse or fused circuit-switcher may cause one or both of the following effects:

- a) a reduction of short-circuit current to a value appreciably below that which would otherwise be reached.
- b) such rapid operation that the short-circuit current wave is distorted from its normal form.

This is why the term "prospective current" is used when assessing breaking and making performances.

4.102 Rated transient recovery voltage

The rated transient recovery voltage related to the rated short-circuit breaking current (in accordance with 4.101) is the reference voltage which constitutes the upper limit of the prospective transient recovery voltage of circuits which the fused circuit-switcher shall be capable of breaking in the event of a short circuit.

4.103 Rated short-circuit making current

The rated short-circuit making current is the highest prospective peak current which the fused circuit-switcher shall be capable of making under the conditions of use and behaviour defined in this standard in a circuit having a power-frequency voltage corresponding to the rated voltage of the fused circuit-switcher. It shall be 2,5 times (50 Hz) or 2,6 (60 Hz) the value of the rated short-circuit breaking current.

NOTE See also note in 4.101.

4.104 Rated take-over current

The rated take-over current is the maximum r.m.s. value of the take-over current which the circuit-switcher in the fused circuit-switcher is able to interrupt under the conditions of use and behaviour prescribed in this standard in a circuit having a power-frequency recovery voltage corresponding to the rated voltage of the fused circuit-switcher and having a prospective transient recovery voltage equal to the value specified.

The rated value declared by the manufacturer shall be higher than the value of the take-over current, determined according to Figure 5, given by the fuses used to demonstrate the rated maximum thermal current.

5 Design and construction

5.1 Requirements for liquids in fused circuit-switchers

IEC 60694, 5.1 is applicable.

5.2 Requirements for gases in fused circuit-switchers

IEC 60694, 5.2 is applicable.

5.3 Earthing of fused circuit-switchers

IEC 60694, 5.3 is applicable.

5.4 Auxiliary and control equipment

IEC 60694, 5.4 is applicable.

5.5 Dependent power operation

IEC 60694, 5.5 is applicable with the following addition:

Dependent manual operation is not allowed.

5.6 Stored energy operation

IEC 60694, 5.6 is applicable.

5.7 Independent manual operation

IEC 60694, 5.7 is not applicable.

5.8 Operation of releases

IEC 60694, 5.8 is applicable.

5.9 Low- and high- pressure interlocking and monitoring devices

IEC 60694, 5.9 is applicable.

5.10 Nameplates

The table in IEC 60694, 5.10 is replaced by the table provided in this standard.

The nameplate of a fused circuit-switcher shall contain information according to Table 1.

Table 1 – Nameplate markings

	Abbreviation	Unit	Fused circuit-switcher	Operating device	Condition for marking required
(1)	(2)	(3)	(4)	(5)	(6)
Manufacturer			X	Y	Only if not integral with the device and/or manufacturers are different
Type designation			X	Y	Only if not integral with the device and/or manufacturers are different
Instruction manual reference			X		
Serial number			X	(Y)	Required for operating device if different from those of the circuit-switcher
Year of manufacture			X		
Number of this standard			X		
Rated voltage	U_r	kV	X		
Rated lightning impulse withstand voltage	U_p	kV	X		
Rated frequency	f_r	Hz	X		
Rated maximum thermal current	I_{th}	A	X		
Acceptable fuse-links and thermal current with fuses			X		Mandatory marking: "Fuse-links: see instruction manual"