BS EN 60549:2013

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High-voltage fuses for the external protection of shunt capacitors

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National foreword

This British Standard is the UK implementation of EN 60549:2013. It is identical to IEC 60549:2013. It supersedes BS 5564:1978, which will be withdrawn on 28 May 2016.

The UK participation in its preparation was entrusted to Technical Committee PEL/32, Fuses.

A list of organizations represented on this committee can be obtained on request to its secretary.

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EUROPEAN STANDARD

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English version

High-voltage fuses for the external protection of shunt capacitors
(IEC 60549:2013)

Coupe-circuit à fusibles haute tension destinés à la protection externe des condensateurs shunt
(CEI 60549:2013)

Hochspannungssicherungen für den externen Schutz von Parallelkondensatoren
(IEC 60549:2013)

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European Committee for Electrotechnical Standardization
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Foreword

The text of document 32A/294/CDV, future edition 2 of IEC 60549, prepared by SC 32A, "High voltage fuses", of IEC/TC 32, "Fuses" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60549:2013.

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)	2014-02-28
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2016-05-28

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

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

Publication	Year	Title	EN/HD	Year
IEC 60282-1	2009	High-voltage fuses - Part 1: Current-limiting fuses	EN 60282-1	2009
IEC 60282-2	-	High-voltage fuses - Part 2: Expulsion fuses	-	-
IEC 60871-1	-	Shunt capacitors for a.c. power systems having a rated voltage above 1 000 V - Part 1: General	EN 60871-1	-

CONTENTS

HIGH-VOLTAGE FUSES FOR THE EXTERNAL PROTECTION OF SHUNT CAPACITORS

1 Scope

This standard applies to external fuses used with high-voltage capacitors according to IEC 60871-1, Shunt capacitors for a.c. power systems having a rated voltage above 1 000 V – Part 1: General. IEC 60871-1 is applicable to both capacitor units and capacitor banks intended to be used, particularly, for power-factor correction of a.c. power systems, and also to capacitors intended for use in power filter circuits.

Fuses according to this standard are intended to clear either faults inside a capacitor unit to permit continued operation of the remaining parts of the bank in which the unit is connected (unit fuses) or faults on the whole capacitor bank to isolate the bank from the system (line fuses).

In this standard the terms “capacitive current” and “inductive current” are used to indicate test currents that have a leading or lagging power factor, respectively, and in which the circuit contains predominantly capacitive or inductive components. The word "capacitor" is used when it is not necessary to lay particular stress upon the different meanings of the word "capacitor unit" or "capacitor bank".

In some cases, fuses tested only to IEC 60282-1 or IEC 60282-2 may be suitable for use with capacitors if they are not required to interrupt capacitive currents (e.g. if capacitive currents cannot flow, or if they are acting as a “back-up”, to provide high inductive current breaking, to other devices that will clear capacitive currents).

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 60282-1:2009, *High-voltage fuses – Part 1: Current-limiting fuses*

IEC 60282-2, *High-voltage Fuses – Part 2: Expulsion Fuses*

IEC 60871-1, *Shunt capacitors for ac power systems having a rated voltage above 1 000 V – Part 1: General*

3 Terms and definitions

For the purposes of this document, the following definitions apply.

3.1
(capacitor) element
a device consisting essentially of two electrodes separated by a dielectric

[SOURCE: IEC 60050-436:1990, 436-01-03]

3.2
(capacitor) unit
an assembly of one or more capacitor elements in the same container with terminals brought out

[SOURCE: IEC 60050-436:1990, 436-01-04]

3.3
(capacitor) bank
a number of capacitor units connected so as to act together

[SOURCE: IEC 60050-436:1990, 436-01-06]

3.4
unit fuse
fuse intended to be used for the protection of a capacitor unit which forms a part of a capacitor bank

3.5
line fuse
fuse intended to be used for the overall protection of a capacitor connected to a given point of a system

3.6
rated voltage of a capacitor
U_r
the r.m.s. value of the alternating voltage for which the capacitor has been designed

Note 1 to entry: In the case of capacitors consisting of one or more separate circuits (for example single phase units intended for use in polyphase connection, or polyphase units with separate circuits), U_r refers to the rated voltage of each circuit.

Note 2 to entry: For polyphase capacitors with internal electrical connections between phases, and for polyphase capacitor banks, U_r refers to the phase-to-phase voltage.

[SOURCE: IEC 60050-436:1990, 436-01-15, modified by addition of symbol and notes to entry]

3.7
refill unit
a set of replacement parts sufficient to restore a fuse-link to its original condition after an operation

[SOURCE: IEC 60050-441:2007, 441-18-15]

3.8
capacitive breaking current
current for which the specified conditions of use and behaviour include the opening of the circuit that includes capacitor elements and/or capacitor units in series with the fuse

3.9
rated maximum capacitive breaking current
maximum capacitive breaking current that the fuse shall be capable of breaking under the conditions of use and behaviour prescribed in this standard

3.10
rated capacitor discharge energy
Joule rating
stored energy in a capacitor that a fuse has been shown to be capable of withstanding during a capacitor discharge breaking test

4 Performance requirements

4.1 General

These fuses are not a substitute for a mechanical switching device, but when forming a part of a mechanical switching device such as a fused switch or a fused disconnector, they shall comply with this standard.

When fuses are used for the external protection of a capacitor unit or a capacitor bank (line fuses), their voltages and breaking ratings shall be adequate for the system.

Fuses according to this standard shall comply with the requirements of IEC 60282-1 or IEC 60282-2, except those which are specifically excluded in this standard.

The fuse is connected in series with the unit(s) that the fuse is intended to isolate if the unit(s) become(s) faulty. The range in currents and voltages for the fuse is therefore dependent on the characteristics of the capacitor and the bank in which the fuse is connected as well as the parameters of the supply circuit.

The operation of an external fuse is, in general, determined by the following two factors:

a) the power-frequency fault current resulting from either a partial or complete capacitor failure;
b) the discharge energy from any units in parallel with the fault.

However, this standard gives a method of separate checking of these factors.

These requirements are valid for capacitors switched by a switching device with a very low probability of restrike during interruption. If this is not the case, other requirements are to be agreed upon.

As used in this standard, U_r is the rated voltage of the capacitor unit and U_{rf} is the rated voltage of the capacitor fuse.

4.2 Breaking requirements

4.2.1 Rated maximum capacitive breaking current

The preferred rated maximum capacitive breaking currents for capacitor fuses are 1 kA r.m.s., 2,5 kA r.m.s., 3,15 kA r.m.s., 4 kA r.m.s., and 5 kA r.m.s.. Other values shall be the subject of an agreement between manufacturer and user.

4.2.2 Rated capacitor discharge energy

A rated capacitor discharge energy (joule rating) is assigned to a fuse based on the energy stored in a capacitor test bank prior to the time it is discharged through the fuse in the capacitor discharge breaking tests (5.5). Values should be selected from R10 series with a minimum of 10 kJ. The preferred value for current-limiting fuses is 40 kJ. To assign an “unlimited” rated capacitor discharge energy see 5.5.2.

The preferred frequency for the capacitor discharge breaking tests of 5.5 is:

– $f = 0{,}8\ U_{rf}$

Where f is in hertz and U_{rf} is the rated voltage of the fuse, in volts.

5 Type tests

5.1 General

To comply with this standard, fuses shall be subjected to the tests specified in Table 1.

For fuses belonging to a homogeneous series as defined in IEC 60282-1 and IEC 60282-2, it is allowed that tests made on a reduced number of current ratings shall be valid for the other current ratings. Detailed information is given in 5.4.1 and 5.5.1.

Table 1 – Type tests required

Tests	Line fuses	Unit fuses	
		Where inductive currents are likely [a]	Where inductive currents are not likely [b]
Power-frequency Inductive currents (5.3)	X	X	–
Power-frequency Capacitive currents [c] (5.4)	X	X	X
Capacitive-discharge (5.5)	– [d]	X	X

[a] Examples of such applications are
- unit fuses in delta-connected banks without units in series;
- unit fuses in star-connected banks without units in series and with earthed neutral.
- unit fuses without capacitor units in series, used on single phase circuits

[b] Examples of such applications are:
- unit fuses in star-connected banks with unearthed neutral;
- banks where capacitor units are used in series.

[c] These tests are not required for fuses where capacitive limited currents are not likely to flow. Examples of such cases are capacitors having only a single internal group of elements, connected in delta or grounded star without capacitor units in series.

[d] Unusual applications, such as back-to-back banks on the same pole with each bank having its own line fuse could require the fuse to be capable of interrupting capacitive discharge currents. Since the size of these banks would generally be small, most line fuses could satisfactorily handle the discharge currents. Consult the fuse manufacturer for these types of applications.

5.2 Test practices

The fuse shall be new, clean and in good condition.

The fuse-link shall be tested in a fuse-base or directly mounted as specified by the manufacturer of the fuse-link.

In making tests of a test duty within a series of renewable fuse-links, only the fuse-elements, refill units and parts normally replaceable shall be replaced. A new fuse-carrier shall be used for tests of the other test duty.

5.3 Power frequency inductive current tests

These tests shall comprise the following: Test duties 1 and 2 according to IEC 60282-1 or Test duties 1, 2, 3 and 4 according to IEC 60282-2.

For the inductive current interrupting tests for capacitor unit fuses, a capacitor shall be placed in parallel with the fuse under test. This parallel capacitor shall be sized to draw a current at the test voltage of between 25 % and 75 % of the rated current of the fuse under test. The transient recovery voltage requirements of IEC 60282-1 do not apply to the tests on capacitor unit fuses when parallel capacitors are used in the test circuit.

Capacitor unit fuses that have met the interrupting requirements when tested without parallel capacitors need not be retested with parallel capacitors in the test circuit.

5.4 Capacitive breaking current tests

5.4.1 Description of tests to be made

For both current-limiting fuses and expulsion fuses belonging to a homogeneous series as defined in IEC 60282-1 and IEC 60282-2, tests shall be made on the fuse-links with the highest current rating. For expulsion fuses, test duty A shall also be made on the fuse-links with the lowest current rating of the series. A 6,3 A type K link (or the equivalent) may be used for the lowest current rating requirement.

These tests are intended to prove the ability of the fuse to break capacitive currents and shall include two test duties.

– *Test duty A*: verification of the rated maximum capacitive breaking current (see 4.2.2).
– *Test duty B*: verification of the operation with a current value resulting in a pre-arcing time of 10 s or more.

The test circuits specified in 5.4.2 and the parameters specified in 5.4.5 have been so chosen as to reproduce as closely as possible the duty which the fuses experience in actual applications.

When applied as capacitor fuses, the mode of failure of the capacitor units determines the magnitude and nature (capacitive or inductive) of the current that the fuse must break. Test duty A simulates the condition where the fuse breaks high capacitive current due to significant capacitor failure. For progressive element failure in the capacitor unit, the current increases until it reaches a magnitude that will just cause operation of the fuse. Test duty B simulates this condition.

5.4.2 Test circuits

5.4.2.1 General

The tests shall be made with single-phase alternating current and with single fuses.

The source impedance shall be such that the variation in the source voltage caused by switching the capacitive load current shall not exceed 10 % (i.e. in Figures 1 and 2, $U_{sc}/U_{so} \leq 1{,}1$). The power factor of the source circuit shall not exceed 0,15 lagging and its capacitance shall be as low as possible.

The waveform of the current to be broken should, as nearly as possible, be sinusoidal. This condition is considered to be complied with if the ratio of the r.m.s. value of the current to the r.m.s. value of the fundamental component does not exceed 1,2.

The current to be broken shall not pass through zero more than once per half-cycle.

5.4.2.2 Unit fuses

For test duty A, the load circuit shall be as shown in Figure 1.

Operation of the fuse is initiated by closing the switch S2 in series with the fuse, in order to simulate the total failure of a capacitor unit protected by the fuse.

C_T represents the capacitance in the bank that limits the fault current and C_P represents the capacitors which are in parallel with the failed unit. The value of C_P in microfarads shall be $C_p \geq 1\,000 / U_{rf}^2$, U_{rf} being expressed in kilovolts.

NOTE 1 In order to achieve the specified recovery voltage in Table 2, the open circuit source voltage U_{SO} has to be of a higher value. It may be determined by considering the ratio of the capacitances, approximately $U_{SO} = (C_T + C_p)/C_T \times U_{rf}$.

For test duty B the load circuit shall be as shown in Figure 2.

Operation of the fuse is initiated by opening the switch S in parallel with the fuse.

C_T represents the remaining healthy elements of the capacitor unit and C_P represents the other units in the bank which are in parallel with the failed unit. The value of C_P in microfarads shall be $C_p \geq 1\,000 / U_{rf}^2$, U_{rf} being expressed in kilovolts.

NOTE 2 In both circuits, the effect of capacitance on the recovery voltage appearing across the fuse when it operates is taken into account by C_P. The minimum value specified represents between 300 kVAr and 400 kVAr (depending on frequency), i.e. the size of the smallest capacitor bank on which individual fuses would normally be applied. Experience has shown that the value of C_P is not critical in its effect on the capacitive current-breaking performance of fuses, and therefore only a minimum value is specified.

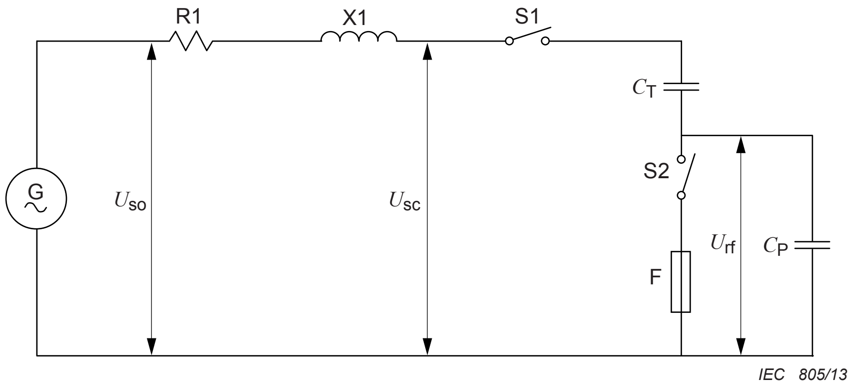
5.4.2.3 Line fuses

For test duties A and B on line fuses, the load circuit shall be as shown in Figure 1, except that capacitance C_P shall be omitted.

5.4.3 Arrangement of the equipment

Expulsion and current-limiting fuses that automatically provide an isolating gap after operation shall be mounted as they will be in a capacitor bank. An energized fuse shall be placed on each side of the fuse under test to determine adequately that any expulsion of gas or reduction of clearance does not cause flashovers which might initiate operation of the adjacent fuses. The spacing between fuses shall be recorded.

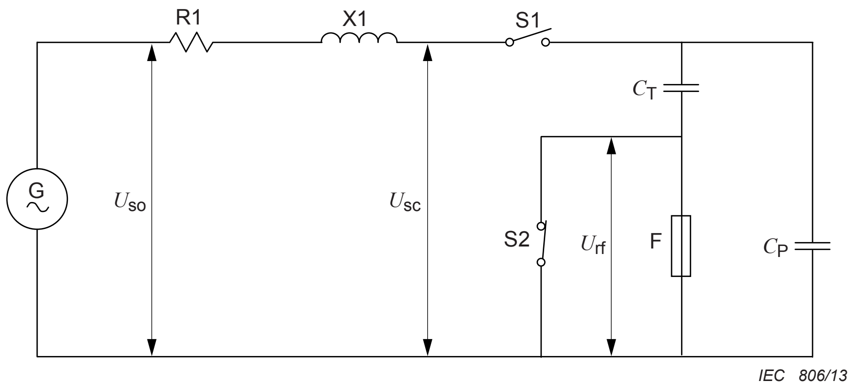
Other current-limiting fuses may be mounted in any convenient manner.



Key

R1	Source resistance	S2	Switch to initiate fuse melting
X1	Source reactance	F	Fuse under test
S1	Laboratory closing switch	U_{SO}	Source voltage (open circuit)
C_T	Capacitors to produce the test current	U_{SC}	Source voltage with capacitive test current
C_P	Capacitors corresponding to the capacitors in parallel with the failed unit	U_{rf}	Fuse recovery voltage

Figure 1 – Test circuit for test duty A



Key

R1	Source resistance	S2	Switch to initiate fuse melting
X1	Source reactance	F	Fuse under test
S1	Laboratory closing switch	U_{SO}	Source voltage (open circuit)
C_T	Capacitors to produce the test current	U_{SC}	Source voltage with capacitive test current
C_P	Capacitors corresponding to the capacitors in parallel with the failed unit	U_{rf}	Fuse recovery voltage

Figure 2 – Test circuit for test duty B

5.4.4 Test procedure

The test procedure to obtain the specified prospective current shall be that specified for the breaking tests in IEC 60282-1 or IEC 60282-2.

5.4.5 Parameters to be used for tests

The parameters to be used when making the tests are given in Table 2.

Table 2 – Capacitive current breaking tests

Parameters		Test duty A	Test duty B
Power-frequency recovery voltage (i.e. excluding d.c. voltage component)		$1{,}0\ U_{rf}\ ^{+5}_{\ 0}\%$	$1{,}0\ U_{rf}\ ^{+5}_{\ 0}\%$
Source power factor (lagging)		≤0,15	
Total circuit power factor (leading)		≤0,15	
Prospective current		Rated maximum capacitive breaking current	Current value resulting in a pre-arcing time of 10 s or more [b]
Making angle after voltage zero		From 0 ° to 20 ° [a]	Random timing
Number of tests		3	2
Duration of power frequency recovery voltage after interruption	Dropout and isolating gap fuses	Not less than the dropout time or 0,5 s, whichever is greater	
	Fuses that do not provide an isolating gap after operation	Not less than 60 s	

[a] This produces the most severe condition for the fuse since closing the circuit near voltage zero minimizes discharge current from the parallel capacitance and its effect on the pre-arcing time of the fuse.

[b] If the fuse being tested is a Back-Up fuse, to be used in series with another device intended to break low currents, the current may be chosen to give a shorter melting time. For fuses intended for applications in which melting times can be long (e.g. using Full-Range fuses) it may be necessary to test with currents that produce longer melting times.

5.4.6 Test I_t for fuse-links that exhibit take-over current(s)

In the case of fuses that incorporate different arc-quenching mechanisms within the same envelope (for example, current-limiting elements and expulsion elements in series) or for “combination” fuses that have an expulsion fuse permanently connected to a current-limiting fuse, Test Duty A and B above shall be augmented by additional tests to prove correct operation in the region(s) of current I_t where the capacitive breaking duty is transferred from one arc-quenching mechanism to another. Since fuse designs differ widely, specifying precise test requirements, applicable to all designs, is not possible. It is the responsibility of the fuse manufacturer to confirm by the I_t breaking test that the breaking mechanisms are operating correctly to effect proper current interruption within the transitional current region. Typical criteria used in assessing compliance with this requirement are discussed in Annex G of IEC 60282-1:2009 “Criteria for determining I_t testing validity”.

In general, a minimum of two tests shall be performed at each of the two following values:

$I_{t1} = 1{,}2\ I_t\ (\pm\ 0{,}05\ I_t)$

and

$I_{t2} = 0{,}8\ I_t\ (\pm\ 0{,}05\ I_t)$

where I_t is the value of crossover current provided by the fuse manufacturer.

If it is known that these values do not represent the most onerous conditions for the given design of fuse, then the manufacturer may nominate other values of I_{t1} and I_{t2}.

The parameters to be used when making the tests are given in Table 2, test duty B.

NOTE When a capacitor fuse requires several loops of arcing to break the current, in effect the capacitor is being switched. This can result in a significant increase in current through the capacitor and fuse. Therefore for a particular fuse, the value(s) for I_t in a capacitive circuit may be significantly lower than the value(s) for I_t in an inductive circuit.

5.5 Capacitor Discharge breaking tests

5.5.1 General

These tests are made to verify the energy which the fuse can withstand without bursting.

A calibration test shall be made by replacing the fuse-link under test by a link of negligible impedance compared with that of the test circuit. This test may be made with a reduced voltage

The circuit shall be adjusted to give the specified capacitor discharge energy, oscillatory frequency and decrement. This shall be verified by an oscillographic record. The ratio between successive peaks shall be from 0,8 to 0,95 for the discharge breaking tests.

Tests shall be made on new fuses with the amounts of energy specified by the manufacturer.

For current-limiting fuses belonging to a homogeneous series as defined in IEC 60282-1, tests shall be made on the fuse-link with the highest current rating.

For expulsion type fuses, the tests shall be made on all fuse types where the bore of the fuse tube and/or its length changes, and on any fuses where the materials of the fuse tube are different from other tested devices. For fuses that use replaceable links, the tests shall be made with the smallest and the largest link that is intended to be used in the particular fuse holder and for the specified capacitor discharge energy. The link size used in a fuse holder is a function of the capacitor with which it is to be used, and the capacitor discharge energy requirement is related to the number and size of connected parallel capacitors. However, no link smaller than a 6,3 A type K link (or the equivalent) need be used for the minimum size requirement.

5.5.2 Test circuit

Tests shall be made with a capacitor, the capacitance of which is such that the stored energy has the specified value at the test voltage specified below. This capacitor shall be charged by means of d.c. to one of the following voltages:

– 2,0 $U_{rf}\sqrt{2}$ (+0 %, -10 %) for current-limiting fuses.
– 1,0 $U_{rf}\sqrt{2}$ (+10 %, -0 %) for expulsion fuses unless otherwise specified.

The capacitor shall be discharged through the fuse under test in a circuit having a frequency as close as possible to the preferred value given in 4.2.2 in which the oscillatory frequency is:

$f = 0{,}8\ U_{rf}$ (+20 %, -0 %)

where f is in hertz and U_{rf} is the voltage rating of the fuse in volts.

The actual discharge frequency measured during the tests shall be recorded along with the maximum stored energy (joules) rating in the test report. The "joule rating" that may be assigned to the fuse being tested is the energy stored in the capacitor test bank prior to the time it is discharged through the fuse. If an unlimited "joule rating" is claimed for a current-limiting fuse, then the charge voltage may be increased such that at the instant of interruption, the voltage remaining on the bank shall not be less than 1,80 $U_{rf}\sqrt{2}$ (the minimum charging voltage for a limited joule rating).

5.5.3 Test procedure

Two tests shall be made. For expulsion fuses, the second test shall be made on a completely new fuse.

For fuses that do not introduce a visible air gap in the circuit upon operation, the residual voltage of the capacitor shall remain on the fuse for 10 min after operation. This requires the capacitor used for the test to be without discharge resistance.

For other fuses, no requirements concerning the maintained voltage are specified.

For current-limiting fuses, the residual voltage across the capacitor shall be measured immediately after the discharge to determine the amount of energy dissipated in the fuse-link. The residual voltage shall be recorded in the test report.

5.6 Standard conditions of behaviour with respect to breaking tests

a) Flashover to earth or to adjacent capacitor units shall not occur. A current-limiting fuse-link shall not emit flame or powder, although a minor emission of flame from a striker or indicating device is permissible, provided this does not cause breakdown or significant leakage current to earth.

b) After the fuse has operated, the components of the fuse, apart from those intended to be replaced after each operation, shall be in substantially the same condition as at the beginning of the test except for the erosion of the bore of the fuse tube of expulsion fuses.

   For current-limiting fuses, it shall be possible to remove the fuse-link in one piece after the operation.

   However, after the discharge breaking test, the components of the fuse maybe damaged and require replacement to restore the fuse to operating condition.

6 Information to be given to the user

– rated voltage of the fuse;

– current rating of the fuse-link or refill unit; in addition, the maximum continuous current capability may also be specified;

– current rating of the fuse-base or fuse-carrier contacts;

– time-current characteristics as specified in IEC 60282-1 or IEC 60282-2 for an ambient air temperature of 20 °C;

  NOTE Information should be available on request concerning ambient air temperatures in the range -40 °C to +75 °C.

– rated maximum capacitive breaking current, where appropriate (see Table 1);

– rated maximum breaking current (inductive), where appropriate (see Table 1);

– maximum available capacitor energy which the fuse can withstand at the voltages specified in 5.5.2 without bursting;

– the frequency achieved during the capacitor discharge breaking tests;

– minimum pre-arcing I^2t (under substantially adiabatic conditions) and maximum operating I^2t at inductive and capacitive power-frequency currents;

– external creepage distance along the fuse-link (for other than fuses which automatically provide an isolating gap after operation).

7 Application information

7.1 Operating voltages

Test voltages and methods are chosen based on the following requirements. The fuse should isolate the faulty unit(s) with a minimum disturbance to the system and to the capacitor unit involved under maximum prevailing system conditions occurring at the time of the fault and at the following voltages:

a) Under transient current conditions, e.g. during energisation, the higher limit of the transient voltage between terminals of the unit is 2,0 $U_r \sqrt{2}$, where U_r is the rated voltage of the unit. After operation, the fuse has to be capable of withstanding the above transient voltage.
b) When the fuse is subjected to power-frequency capacitive currents, it is required to operate against a voltage of 1,1 U_r and then withstand this voltage plus any d.c. voltage component resulting from any capacitive charge remaining after the operation of the fuse.

7.2 Rated voltage

Traditional application advice has been to specify a fuse rated voltage at least 10 % higher than the rated voltage U_r of the capacitor unit. This is based on the fact that it is permissible to operate capacitors at 110 % of their rated voltage for as much as 12 hours in every 24 hour period (IEC 60871-1). Consequently, capacitor overvoltage protection is often set at 10 % above rated voltage, so fuses may have to operate at this voltage. However, if system protection does not limit the voltage to this level, a fuse should be chosen to have a rated voltage at least as high as the highest anticipated service voltage, including overvoltages that may be produced by capacitive fault currents or bank unbalance. When a fuse is tested to IEC 60549, the capacitive test current may produce a rise in source voltage of up to 10 % (5.4.2.1). However it cannot be assumed that a particular fuse design has been tested at this 10 % maximum, as the actual rise is dependent on the source impedance and the value of the test current. Therefore, it should not be assumed that a fuse has a capability any higher than its rated voltage (which is equal to the power frequency recovery voltage during testing).

7.3 Rated current

The rated current of the fuse shall be at least 1,43 times the rated current I_n of the capacitor.

NOTE 1 In principle, the continuous current does not exceed 1,3 times I_n., but as the capacitance may reach 1,1 times the value corresponding to the rated output, the current may have a maximum value of 1,3 × 1,1 = 1,43 times the rated current.

NOTE 2 When the air temperature at the fuse location exceeds 40 °C, it is recommended to consult the manufacturer.

NOTE 3 For certain types of fuse-links having an overload capability, it is recommended to take this property into consideration.

Bibliography

[1] IEC 60050-436:1990, *International Electrotechnical Vocabulary – Chapter 436: Power capacitors*

[2] IEC 60050-441:1984, *International Electrotechnical Vocabulary – Chapter 441: Switchgear, controlgear and fuses*

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