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INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 2
AMENDEMENT 2

Circuit-breakers for equipment (CBE)

Disjoncteurs pour équipement (DPE)

IEC 60934:2000/A2:2013

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FOREWORD

This amendment has been prepared by subcommittee 23E: Circuit-breakers and similar equipment for household use, of IEC technical committee 23: Electrical accessories.

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

FDIS	Report on voting
23E/767/FDIS	23E/774/RVD

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

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

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- withdrawn,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

1 Scope

Replace the entire existing text by the following:

This International Standard is applicable to mechanical switching devices designed as "circuit-breakers for equipment" (CBE) for household and similar applications. CBEs according to this standard are intended to provide protection to circuits within electrical equipment including its components (e.g. motors, transformers, internal wiring). This standard covers also CBEs applicable for protection of electrical equipment in case of undervoltage and/or overvoltage. This standard also covers CBEs which are suitable for isolation.

NOTE The term "equipment" includes appliances.

CBEs are not applicable for overcurrent protection of wiring installations of buildings.

CBEs according to this standard have:

– a rated voltage not exceeding 440 V a.c. (between phases) and/or d.c. not exceeding 250 V;

– a rated current not exceeding 125 A;

– a short-circuit capacity (I_{cn}) of at least $6xI_n$ (a.c types) and $4xI_n$ (d.c.-types) but not exceeding 3 000 A.

CBEs may have a conditional short-circuit current rating in association with a specified short-circuit protective device (SCPD). A guide for coordination of a CBE associated in the same circuit with a SCPD is given in Annex F.

For CBEs having a degree of protection higher than IP20 according to IEC 60529, for use in locations where hazardous environmental conditions prevail (e.g. excessive humidity, heat or cold or deposition of dust) and in hazardous locations (e.g. where explosions are liable to occur), special constructions may be required.

This standard contains all the requirements necessary to ensure compliance with the operational characteristics required for these devices by type tests. It also contains the details relative to test requirements and methods of testing necessary to ensure reproducibility of test results.

This standard states:

a) the characteristics of CBEs;
b) the conditions with which CBEs shall comply, with reference to:
   1) their operation and behaviour in normal service;
   2) their operation and behaviour in case of overload;
   3) their operation and behaviour in case of short-circuits up to their rated short-circuit capacity;
   4) their dielectric properties;
c) the tests intended for confirming that these conditions have been met and the methods to be adopted for the tests;
d) the data to be marked on the devices;
e) the test sequences to be carried out and the number of samples to be submitted for certification purposes (see Annex C);
f) the routine tests to be carried out to reveal unacceptable variations in material or manufacture, likely to affect safety (see Annex J).

3 Terms and definitions

3.1.2
circuit-breaker for equipment (CBE)

Add, after the existing definition, a new note as follows:

NOTE These CBEs are intended for:

– automatic interruption and non-automatic or automatic resetting;

– automatic interruption and non-automatic or automatic resetting and manual switching operation.

3.1.3
E-type CBE

Delete the existing definition – introduced by Amendment 1 – and replace by the following text:

"void"

4.5.3 E-type CBEs

Delete the existing subclause.

5.2.5 Rated conditional short-circuit current (I_{nc}) (optional)

Delete, in the title, "**(optional)**" *– text introduced by Amendment 1.*

Replace the existing text of the subclause by the following:

The value of the conditional short-circuit current (see 3.11.5) if assigned to the CBE by the manufacturer.

*Renumber the existing note as "*NOTE 1"*.*

Add a new "NOTE 2"*, as follows:*

NOTE 2 The manufacturer can decide not to assign a value of I_{nc} to the CBE, in which case the relevant tests are omitted.

5.2.5.1 Rated conditional short-circuit current performance category PC1 (I_{nc1}) (optional) (see 9.12.4.2)

Delete, in the title, "**(optional)**" *– text introduced by Amendment 1.*

Replace the existing text of the subclause by the following:

The value of rated conditional short-circuit current, if assigned by the manufacturer, for which the prescribed conditions do not include the fitness of the CBE for its further use.

5.2.5.2 Rated conditional short-circuit current, performance category PC2 (I_{nc2}) (optional) (see 9.12.4.3)

Delete, in the title, "**(optional)**".

Replace the existing text of the subclause by the following:

The value of rated conditional short-circuit current, if assigned by the manufacturer, for which the prescribed conditions do include the fitness of the CBE for its further use.

8.5.1 Standard time-current zone

Replace the existing text of the listed items in the fourth paragraph by the following:

- the test currents indicated in Table 9, as multiples of the rated current;
- the times (t_1, t_2, t_3, t_4) indicated in Table 9, where applicable.

Table 9 – Time-current operating characteristics

Delete the following line in Table 9:

mI_n [b]	Cold [a]	$t_5 \leq t \leq t_6$	Tripping

Delete footnote [b]*.*

8.6 Electrical performance

Add at the end of the title:

"**and behaviour at rated short-circuit capacity**".

Table 11 – Test conditions for electrical performance for CBEs intended for general use, including inductive circuits

Replace the existing section 3 – modified by Amendment 1 – by a new section 3.1, and add a footnote [c], as follows:

3.1	Rated short-circuit capacity I_{cn}	M, S, R, J	3	300 to 360	1,05 U_e	6 I_n [c]		4 I_n [c]	
						6 I_n < I_{cn} ≤ 1 500 A	0,93 to 0,98	4 I_n < I_{cn} ≤ 1 000 A	2 to 3
						1 500 A < I_{cn} ≤ 3 000 A	0,85 to 0,9	1 000 A < I_{cn} ≤ 3 000 A	4 to 6
[c] Test is covered by section 2									

Add, after the new section 3.1, a new section 3.2 and a footnote [d], as follows:

3.2[d]	Test verifying the suitability for use in IT systems	M, S, R, J	2	300 to 360	*105 % of the rated voltage upper value*	6 I_n	0,93 to 0,98	–	–
						I_{cn} > 6 I_n: 1,2 × I_i	0,93 to 0,98	–	–
[d] Only relevant for CBEs marked with e.g. 230/400, 120/240, …									

Table 12 – Test conditions for electrical performance of CBEs used in essentially resistive circuits only (see Clause 6, item d))

Replace the existing section 3 by a new section 3.1, and add a footnote [c], as follows:

3.1	Rated short-circuit capacity I_{cn}	M, S, R, J	3	300 to 360	1,05 U_e	6 I_n [c]		4 I_n [c]	
						6 I_n < I_{cn} ≤ 3 000 A	0,93 to 0,98	4 I_n < I_{cn} ≤ 1 000 A	1 to 2
								1 000 A < I_{cn} ≤ 3 000 A	2 to 3
[c] Test is covered by section 2									

Add, after the new section 3.1, a new section 3.2, and a footnote [d], as follows:

3.2[d]	Test verifying the suitability for use in IT systems	M, S, R, J	2	300 to 360	*105 % of the rated voltage upper value*	6 I_n	0,95 to 1	-	-
						$I_{cn} > 6\ I_n$: $1{,}2 \times I_i$	0,95 to 1	-	-
[d] Only relevant for CBEs marked with e.g. 230/400, 120/240, etc.									

9.7.2 Insulation resistance of the main circuit

Add, at the end of the existing item b), the following new sentence:

for the test between phases, electronic components connected to the main circuit may be disconnected during the test;

9.11.4 Behaviour at rated short-circuit capacity

Delete the existing first sentence – text introduced by Amendment 1.

Add the following new subclause and move the existing text of 9.11.4 into this new subclause:

9.11.4.1 Short circuit test for CBEs suitable for isolation

Add the following new subclause:

9.11.4.2 Short-circuit test on CBEs for verifying their suitability for use in IT systems

CBEs shall be tested in accordance with the values given in Table 11 or Table 12, section 3.2.

Single-pole CBEs and each protected pole of multipole CBEs are subjected individually to a test in a circuit the connections of which are shown in Figure 3.

The impedance Z_1 (see Figure 3) is adjusted so as to obtain a current as given in Table 11 or Table 12, section 3.2.

The sequence of operations shall be

O – t – CO

For the O operation on the first protected pole the auxiliary switch A is synchronised with respect to the voltage wave so that the circuit is closed on the point 0° on the wave for this operation. For the following O operations on the other protected poles to be tested (see C.2) this point is shifted each time by 30° with respect to the point on wave of the previous test, with a tolerance of ± 5°.

Following the test at $I_{cn} > 6\ I_n$ the samples shall not show:

– undue wear;
– discrepancy between the positions of the moving contacts and the corresponding position of the indicating device;

- damage of the integral enclosure, permitting access to live parts by the test finger (see 9.6);
- loosening of electrical or mechanical connections;
- seepage of sealing compound, if any.

Moreover the CBE shall withstand the dielectric strength test according to 9.7.3 at a voltage of 0,75 times the value prescribed in 9.7.5, without the previous humidity treatment of 9.7.1 and the CBE shall trip within the time t_2, when a current of 2,2 I_n is passed through all poles, starting from cold.

Following the test at I_{cn} = 6 I_n the samples shall not show damage of the integral enclosure, if any, permitting access to live parts by the test finger (see 9.6); the CBE may be inoperable after the first or second operation. If the result of the first operation is such that the CBE is rendered inoperable the remaining operation need not be performed.

Moreover, the CBE shall withstand the dielectric strength test according to 9.7.3 at a voltage of 0,75 times the value prescribed in 9.7.5, without the previous humidity treatment of 9.7.1.

Annex A – Time-current zone

Figures A.1 to A.4

Delete, in the key to the figures:

m = factor, to be stated by the manufacturer (see table 5)

Replace the following existing text:

t_1... t_6 = times, to be stated by the manufacturer

by the following:

t_1... t_4 = times, to be stated by the manufacturer

Figure A.1 – Thermal mode only

Delete markings:

t_5 *and* t_6

Replace, on the x-axis, the description

"*m* x I_n"

by the following:

"I_n"

Figure A.4 – Hydraulic-magnetic mode

Delete markings:

t_5 *and* t_6

Annex C – Test sequences and number of samples to be submitted for certification purposes

C.1 Test sequences

Replace the first sentence as follows:

The tests are made according to Table C.1 of this annex, where the tests in each sequence, A to E, are carried out in the order indicated.

Add the following sentence:

If values for I_{nc1} and/or I_{nc2} are assigned by the manufacturer the test sequences F and/or G are carried out in addition.

Table C.1 – Test sequences

In test sequence E, first column, delete the following text – introduced by Amendment 1:

(optional, except for CBEs suitable for isolation)

In test sequence E, second column, delete the asterisk at the end of "9.11.1.3" *and add the following text after* "9.11.1.3":

L.9.7.7.2

In test sequence E, third column, add the following:

Verification of leakage currents, if applicable.

In test sequence F, first column, delete the following text:

(optional)

In test sequence G, first column, delete the following text:

(optional, except for CBEs suitable for isolation)

In test sequence G, second column, delete the asterisk at the end of "9.11.1.3" *and add the following text after* "9.11.1.3":

L.9.7.7.2

In test sequence G, third column, add the following:

Verification of leakage currents, if applicable

Delete the existing footnote to the table – text introduced by Amendment 1.

Table C.2 – Number of samples for full test procedure

Add a footnote [b] to test sequence E of Table C.2:

b Additional set of samples for verification of suitability of CBE for use in IT systems.

Table C.3 – Reduction of samples for simplified test procedure

Add a footnote [i] to test sequence E of Table C.3:

i Additional set of samples with maximum rating for verification of suitability of CBE for use in IT systems.

Annex G – Electromagnetic behaviour of CBEs

Table G.2.2 – Minimum EMC immunity performances of CBEs

In the first column, second row, change the reference to:

IEC 61000-4-4

In the second column, third row, replace "3" *by* "2".

Annex J – Routine or statistical tests

J.2 Verification of dielectric strength

Replace the existing text of item b) by the following text:

b) with the CBE in the closed position, between each pole of the CBE in turn and the other poles connected together with the CBE not incorporating electronic components, if applicable;

Add the following new item c) after item b):

c) for the CBE incorporating electronic components, with the CBE in the open position, between each pole in turn and the adjacent poles, if applicable, either between incoming terminal of the poles or *outgoing* terminal of the poles, depending on the position of the electronic components and the other poles connected together.

Annex K – Additional requirements for electrical performance of E-type CBEs

Replace the existing text by:

"Void."

_____