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Electrical accessories - Circuit breakers for overcurrent protection for household and similar installations - Part 1: Circuit-breakers for a.c. operation (IEC 60898-1:2002, modified

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English version

Electrical accessories – Circuit breakers for overcurrent protection for household and similar installations Part 1: Circuit-breakers for a.c. operation

(IEC 60898-1:2002, modified)

Petit appareillage électrique – Disjoncteurs pour la protection contre les surintensités pour installations domestiques et analogues Partie 1: Disjoncteurs pour le fonctionnement en courant alternatif (CEI 60898-1:2002, modifiée)

Elektrisches Installationsmaterial – Leitungsschalter für Hausinstallationen und ähnliche Zwecke Teil 1: Leitungsschutzschalter für Wechselstrom (AC) (IEC 60898-1:2002, modifiziert)

This European Standard was approved by CENELEC on 2002-09-24. 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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Foreword

The text of document 23E/470/FDIS, future edition 1 of IEC 60898-1, prepared by SC 23E, Circuit-breakers and similar equipment for household use, of IEC TC 23, Electrical accessories, together with common modifications prepared by the Technical Committee CENELEC TC 23E, Circuit breakers and similar devices for household and similar applications, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 60898-1 on 2002-09-24.

This European Standard supersedes EN 60898:1991 + corrigendum October 1991 + A1:1991 + A11:1994 + A12:1995 + A13:1995 + A14:1995 + A15:1995 + A16:1996 + A17:1998 + A18:1998 + A19:2000.

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)	2003-10-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2008-10-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes B, C, E, H, I, ZA and ZB are normative and annexes A, D and F are informative.
Annexes ZA and ZB have been added by CENELEC.

In this standard, the following print types are used:
- requirements: roman type;
- *test specifications: italic type;*
- notes: smaller roman type.

Endorsement notice

The text of the International Standard IEC 60898-1:2002 was approved by CENELEC as a European Standard with agreed common modifications as given below.

(Sub)clause COMMON MODIFICATIONS

Contents **Add:**

6.1 Standard marking
6.2 Additional marking
6.3 Guidance table for marking

8.13 Power loss
8.14 Electromagnetic immunity
8.15 Electromagnetic emission

Replace the following:

Annex C (normative) Test sequences and number of samples necessary to prove compliance with the standard
Annex G (void)

Figure 3 - Single-pole circuit-breaker or individual pole of multipole circuit-breaker
Figure 7 - Calibration of the test circuit
Figure 13 - Examples of mounting of a flush type circuit-breaker for mechanical impact test

Table 1 – Standard values of rated voltage
Table 3 (void)
Table 8 (void)

1 In the 6th paragraph, **delete** ",with exception of those rated 120 V or 120/240 V (see table 1),".

Replace "IEC 60364-4-473:1977 + A1: 1998" by "HD 384.4.473".

In the 9th paragraph **replace** "IEC 60529" by "EN 60529".

In the 10th paragraph **replace** "IEC 60898-2" by "EN 60898-2".

Replace the paragraph "Requirements for ..." by:

Requirements for circuits breakers which incorporate residual current tripping devices are to be found in EN 61009-1 and EN 61009-2-1.

Add after this paragraph:

Supplementary requirements may be necessary for circuit-breakers of the screw-in types.

After note 3, **add:**

NOTE 4 Recommendations for the dimensional coordination between enclosures and circuit breakers for mounting on rail according to EN 60715 or equivalent means are given in the CENELEC report R023-001.

2 **Replace** the text by:

NOTE Normative references to international standards are given in annex ZB.

3.5.8.1 **Delete** the reference to IEV.

4.6 **Replace** the text by:

Circuit-breakers of B-type and C-type, having rated current up to and including 40 A and having short-circuit breaking capacity of 3 000 A, 4 500 A, 6 000 A and 10 000 A, may be classified according to the limits within which their I^2t characteristics lie, measured according to 9.12.6 (see annex ZA).

5.2 **Add** the following subclause:

5.2.5 Rated making and breaking capacity of an individual pole (I_{cn1})

The RMS value of the limiting short-circuit making and breaking capacity on each individual protected pole of multipole circuit breakers.

NOTE The corresponding rated quantity of RCBOs is the rated residual making and breaking capacity $I_{\Delta m}$ (see 5.2.7 of EN 61009-1).

The standard values are those given in table 1.

5.3.1 **Replace** table 1 by the following:

Table 1 – Standard values of rated voltage

Circuit-breakers	Circuit supplying the circuit-breaker	Rated voltage of circuit-breakers for use in systems 230 V, 230/400 V, 400 V
Single pole	Single phase (phase to neutral or phase to phase)	230 V
	Three-phase 4-wire	230 V
	Single phase (phase to neutral) or three-phase, using 3 single-pole circuit-breakers (3-wire or 4-wire)	230/400 V
Two-pole	Single phase (phase to neutral or phase to phase)	230 V
	Single phase (phase to phase)	400 V
	Three phase (4-wire)	230 V
Three-pole	Three phase (3-wire or 4-wire)	400 V
Four-pole	Three phase (4-wire)	400 V
NOTE 1 In IEC 60038 the network voltage value of 230/400 V has been standardized. This value should progressively supersede the values of 220/380V and 240/415 V.		
NOTE2 Wherever in this standard there is a reference to 230 V or 400 V, they may be read as 220 V or 240 V, 380 V or 415 V, respectively.		

Add after the table:

Two-pole circuit breakers rated 230 V may have one or two protected poles.

Two-pole circuit breakers rated 400 V shall have two protected poles.

Three-pole circuit breakers shall have three protected poles.

Four-pole circuit breakers may have three or four protected poles.

5.3.2 **Delete**, in the second line, the value "8 A".

5.3.4.1 **Add** an asterisk "(*)" after 1 500 A.

Replace the note by:

(*) Only for circuit-breakers incorporated or associated with and in the immediate vicinity of socket-outlets or switches for household and similar applications.

5.3.4.2 **Replace** by:

5.3.4.2 Standard values above 10 000 A up to and including 25 000 A

For values above 10 000 A up to and including 25 000 A the standard values are:

15 000 A, 20 000 A and 25 000 A

The corresponding power factor ranges are given in 9.12.5.

5.3.5 **Table 2**

Delete [a] after 20 I_n.

Delete the note " [a] For special cases values up to ...".

5.3.6 **Replace** the title and the contents of table 3 by:

Table 3 (void)

Add:

The standard value of the rated impulse withstand voltage (U_{imp}) is 4 kV.

6 The text of clause 6 becomes 6.1 with the following modifications

6.1 Standard marking

Replace the text of f) by:

f) rated short-circuit capacity, in A, within a rectangle, without symbol "A";

In h) **replace** "ambient air" by "calibration".

Replace the text of j) by:

j) energy limiting class in a square in accordance with annex ZA, if applied.

I_{cn} and the energy limiting class, when applied, shall be both on the device and combined;

Replace the text of k) by:

k) making and breaking capacity on an individual protected pole of multipole circuit breakers (I_{cn1}), if different from I_{cn}.

In the first paragraph after k), **replace** "a), b), c), e), f), h), i) and j)" by "a), b), c), f), g) and j)".

In the second sentence of this paragraph **replace** "marking g) may be" by "Marking g) alternatively may be".

Delete Notes 1 and 2.

Replace the 5th and 6th paragraphs by:

The manufacturer shall publish in his literature the I^2t characteristic (see 3.5.13).

Add the new subclauses 6.2 and 6.3:

6.2 Additional marking

Additional marking to other standards (EN or IEC or other) is allowed under the following conditions:

- the circuit-breaker shall comply with all the requirements of the additional standard;
- the relevant standard to which the additional marking refers shall be indicated adjacent to this marking and shall be clearly differentiated or separated from the standard marking according to 6.1.

Compliance is checked by inspection and by carrying out all the test sequences required by the relevant standard. Equivalent or less severe test sequences need not be repeated.

6.3 Guidance table for marking

Marking and other product information Each MCB shall be marked in a durable manner with all or, for small apparatus, part of the following data:		Markings may be on the MCB itself			Product information in catalogue
		If, for small devices the space available does not allow all the above data to be marked, at least this information shall be marked and **visible** when the device is installed.	This information may be marked on the **side** or on the back of the device and be visible only before the device is installed.	Alternatively the information may be on the inside of any **cover** which has to be removed in order to connect the supply wires.	Any remaining information not marked shall be given in the manufacturer's **catalogues.**
a)	manufacturer's name or trademark		X		
b)	type designation, catalogue number or serial number		X		
c)	rated voltage, with the symbol ~		X		
d)	rated current without symbol "A" preceded by the symbol of overcurrent instantaneous tripping (B, C or D), for example B 16	X			
e)	rated frequency if the circuit-breaker is designed only for one frequency (see 5.3.3)				X
f)	rated short-circuit capacity in a rectangle, in amperes, without symbol "A"		X(*)		
g)	wiring diagram, unless the correct mode of connection is evident		X	X	
h)	reference calibration temperature, if different from 30 °C				X
i)	the degree of protection (only if different from IP20)				X
j)	energy limiting class (e.g. 3) in a square in accordance with annex ZA, if applied		X(*)		
k)	breaking capacity on one pole of multipole MCBs in case of short-circuit to earth I_{cn1}				X
	the position of use (symbol according to IEC 60051), if necessary;		X		
	indication of the terminal for the neutral with "N"		X		
	additional marking of performance to other standards	X			
(*) I_{cn} and the energy limiting class, if applied, shall be both on the device and combined together.					

7.2 **Delete**, at the end of the first line, the words in brackets "(6600 ft)".

8.1.2 **Delete** Note 1 and **replace** "NOTE 2 " by "NOTE".

8.1.3 **Replace** table 4 by the following:

Table 4 - Minimum clearances and creepage distances

	Minimum clearances mm	Minimum creepage distances [e, f] mm											
		Group IIIa [h] (175V ≤ CTI < 400 V) [d]				Group II (400V ≤ CTI < 600V) [d]				Group I (600V ≤ CTI) [d]			
	Rated voltage V	Working voltage [e] V											
Description	230/400V 230V 400 V	>25 ≤50 [i]	120	250	400	>25 ≤50 [i]	120	250	400	>25 ≤50 [i]	120	250	400
1. between live parts which are separated when the main contacts are in the open position [a]	4,0	1,2	2,0	4,0	4,0	0,9	2,0	4,0	4,0	0,6	2,0	4,0	4,0
2. between live parts of different polarity [a]	3,0	1,2	1,5	3,0	4,0	0,9	1,5	3,0	3,0	0,6	1,5	3,0	3,0
3. between circuits supplied from different sources, one of which being PELV or SELV [g]	8,0		3,0	6,0	8,0		3,0	6,0	8,0		3,0	6,0	8,0
		Rated voltage V											
		230 / 400				230				400			
4. between live parts and - accessible surfaces of operating means - screws or other means for fixing covers which have to be removed when mounting the circuit-breaker - surface on which the circuit-breaker is mounted [b] - screws or other means for fixing the circuit-breaker [b] - metal covers or boxes [b] - other accessible metal parts [c] - metal frames supporting flush-type circuit-breakers	3,0	4,0				3,0				3,0			
5. between metal parts of the mechanism and: - accessible metal parts [c] - screws or other means for fixing the circuit-breaker - metal frames supporting flush-type circuit-breakers													

NOTE 1 The values given for 400 V are also valid for 440 V.

NOTE 2 The parts of the neutral path, if any, are considered to be live parts.

NOTE 3 Care should be taken to provide adequate clearances and creepage distances between live parts of different polarity of circuit-breakers, e.g. of the plug-in type mounted close to one another.

[a] For auxiliary and control contacts the values are given in the relevant standard.

[b] The values are doubled if clearances and creepage distances between live parts of the device and the metallic screen or the surface on which the circuit-breaker is mounted are not dependent on the design of the circuit-breaker only, so that they can be reduced when the circuit-breaker is mounted in the most unfavourable condition.

[c] Including a metal foil in contact with the surfaces of insulating material which are accessible after installation for normal use. The foil is pushed into corners, grooves, etc., by means of a straight unjointed test finger according to 9.6 (see figure 9).

[d] See IEC 60112.

[e] Interpolation is allowed in determining creepage distances corresponding to voltage values intermediate to those listed as working voltage. For determination of creepage distances see annex B.

[f] Creepage distances cannot be less than the associated clearances.

[g] To cover all different voltages including ELV in an auxiliary contact.

[h] For material group IIIb (100 V ≤ CTI < 175 V) the values for material group IIIa multiplied by 1,6 apply.

[i] For working voltages up to and including 25 V reference may be made to IEC 60664-1.

8.1.5.2 **Delete** the note after table 5.

8.1.5.11 **Replace** by "Void"

8.6.1 **Table 7**

Replace the row for test d by:

d	B	3 I_n	Cold [a]	0,1 s < t < 45 s (for $I_n \leq 32$ A) 0,1 s < t < 90 s (for $I_n > 32$ A)	Tripping	Current established by closing an auxiliary switch
	C	5 I_n		0,1 s < t < 15 s (for $I_n \leq 32$ A) 0,1 s < t < 30 s (for $I_n > 32$ A)		
	D	10 I_n		0,1 s < t < 4 s [b] (for $I_n \leq 32$ A) 0,1 s < t < 8 s (for $I_n > 32$ A)		

In the row for test e **delete** "[b]" after "20 I_n".

Replace the text of [b] by:

[b] For $I_n \leq 10$ A, $t < 8$ s is permissible.

8.6.3.2 **Add** in the first line, after the word "ambient" the word "air".

8.11 **Delete** the word "External" in the first line.

Replace the last line by:

Compliance is checked

- *for external parts made of insulating material, by the test of 9.15;*
- *for all other parts made of insulating material, by the test sequences, no additional test being required.*"

Add the new subclauses 8.13, 8.14 and 8.15:

8.13 Power loss

Circuit-breakers must not have excessive power loss.

Compliance is checked by the test of 9.8.5.

8.14 Electromagnetic immunity

Circuit-breakers for overcurrent protection for household and similar installations are not sensitive to normal electromagnetic disturbances and therefore no immunity tests are required.

8.15 Electromagnetic emission

Electromagnetic disturbances can only be generated by circuit breakers for overcurrent protection for household and similar installations during occasional switching or automatic breaking operations. The duration of the disturbances is of the order of milliseconds.

The frequency, the level and the consequences of these emissions are considered as part of the normal electromagnetic environment of low voltage installations. Therefore the requirements for electromagnetic emissions are deemed to be satisfied and no verification is necessary.

9.1 **Delete** the numbering "9.1.1".

Delete the second line and **replace** the title and the contents of table 8 by:

Table 8 (void)

Modify "NOTE" to read "NOTE 1".

Add the following new note:

NOTE 2 Test to verify compliance of additional marking to 6.2, if any, are carried out according to the relevant standard.

9.2 **Delete** the note after table 9.

9.5.2 **Replace** the note by:

Conductors are considered to be unduly damaged if they show both deep and sharp indentations.

9.6 **Replace** the second sentence of the 6th paragraph by:

This finger is applied to all places where yielding of insulating material could impair the safety of the circuit- breaker; in the case of knock-outs it is applied with a force of 10 N.

9.7.2 **Replace** the second sentence of the first paragraph by:

Following this treatment, and after a delay period under normal conditions of temperature and humidity of between 30 min and 60 min, the insulation resistance is measured 5 s after application of a d.c. voltage of approximately 500 V, consecutively as follows:

9.7.6.1 **Replace** the second paragraph before table 13 by:

The test impulse voltage value is corrected for barometric pressure and/or altitude at which the tests are carried out, according to table 13.

In table 13, **delete** the line corresponding to 2,5 kV.

9.7.6.2 **Replace** the fourth paragraph before table 14 by:

The test impulse voltage value is corrected for barometric pressure and/or altitude at which the tests are carried out, according to table 14.

In table 14, **delete** the line corresponding to 2,5 kV.

9.10 **Add** the following paragraph:

If the test is made in a test chamber, it shall be made in still air; the volume of the test chamber shall be such as not to affect the test results.

9.10.2.2 **Replace** the second line by:

The opening time shall be not less than 0,1 s and not more than:
- *45 s for rated currents up to and including 32 A,*
- *90 s for rated currents above 32 A.*

Add at the end:

Moreover the circuit breaker shall perform the test of 9.10.1.2.

9.10.2.3 **Replace** the second line by:

The opening time shall be not less than 0,1 s and not more than:
- *15 s for rated currents up to and including 32 A,*
- *30 s for rated currents above 32 A.*

Add at the end:

Moreover the circuit breaker shall perform the test of 9.10.1.2.

9.10.2.4 **Replace** the second line by:

The opening time shall be not less than 0,1 s and not more than:
- *4 s for rated currents above 10 A up to and including 32 A,*
- *8 s for rated currents up to an including 10 A and above 32 A.*

Replace the third sentence by:

A current equal to 20 I_n is then passed through all poles, again starting from cold.

Add at the end:

Moreover the circuit breaker shall perform the test of 9.10.1.2.

9.11.1 **Replace** the last but one paragraph by:

For single-pole circuit-breakers rated 230/400 V the test shall be made at 230 V.

9.11.3 **Replace** the last paragraph by:

Moreover, the circuit-breaker shall comply with the test of 9.10.1.2 and shall withstand the dielectric strength test according to 9.7.3, but at 900 V and without previous humidity treatment.

9.12.1 **Add** after the second paragraph:

All multipole circuit-breakers are tested according to 8.12.11.4.4.

Add the following row to table 16:

Test at rated making and breaking capacity on one pole (9.12.11.4.4)	*All multipole circuit-breakers*	*9.12.12.2*

9.12.2 **Delete** the fifth paragraph (second dash).

Replace in the 3rd, 4th paragraph "105 %" by "110 %" (three times).

Replace in the note " 105 % (± 5%) " by " 110 % (0, -5 %)".

9.12.3 **Replace** in the second dashed line " ± 5%" by "0, -5 %".

9.12.8.1 **Delete** in the third line the words "and estimated as indicated in figure 7".

9.12.9 **Add** before the note:

A circuit-breaker tested according to 9.12.9.1 needs not be tested according to 9.12.9.2.

9.12.9.1 **Delete** the 4th paragraph before the end "*For circuit-breakers … diameter of 0,12 mm.*"

9.12.11.4 **Add** the following new subclause:

9.12.11.4.4 Test at the making and breaking capacity on an individual pole (I_{cn1}) of multipole circuit-breakers

The test circuit is calibrated according to 9.12.7.

The test is carried out on one pole taken at random which shall not be the switched neutral. This pole is connected according to the diagram of figure 3.

In addition phases which do not carry the short-circuit current during this test shall be connected to their supply voltage at the corresponding terminals.

The sequence of operation is :

O – t – CO

For the " O " operations, the auxiliary switch A is synchronised with respect to the voltage wave so that the circuit is closed on the point 15° on the wave for the " O " operation on the first sample.

This point is then shifted by 30° for the " O " operation on the second sample and by a further 30° for the " O " operation on the third sample.

The synchronisation tolerance shall be ± 5°.

For the three- and four-pole circuit-breakers, the same pole shall be used as reference for the purpose of synchronisation.

9.12.12.2 **Add** after "*9.12.11.4.3* , in the first line "*and 9.12.11.4.4*".

9.13.1 **Introduce** the following note after the title:

NOTE The mechanical shock test is intended to test the latching means of the circuit breaker, not its mounting means.

9.14.3 In Note 1 **delete** the words "surface-type"

9.15 **Replace** in the first paragraph "*60695-2-1*" by "*60695-2-10*".

In Note 2 **delete** the words "surface-type".

Figure 3 Replace the title by:

Single-pole circuit-breaker or individual pole of multipole circuit-breaker

Figure 7 Replace the title by:

Calibration of the test circuit

Figure 13 Replace the title by:

Examples of mounting of a flush type circuit-breaker for mechanical impact test

Replace item 4 of the Key by:

4 Mounting means, as appropriate (e.g. rail)

Annex A **Replace** the first paragraph by:

There is no generally applicable method by which the short-circuit power factor can be determined with precision. Two examples of acceptable methods are given in this annex A.

Annex C **Replace** the title by:

Test sequences and number of samples necessary to prove compliance with the standard

C.1 **Add** the following test sequence in table C.1:

E_3	9.12.11.4.4 and 9.12.12	Performance at rated making and breaking capacity (I_{cn1}) on an individual pole of multipole circuit-breakers

C.2 **Add** the following test sequence in table C.2:

E_3	3	2 [a]	3

C.3.2 **Add** the following test sequence in table C.3:

E_3	[k]	3 [j] maximum rated current	3 [j] maximum rated current	3 [j] maximum rated current

Add the following notes:

[j] If each pole of the multipole is identical to the individual pole tested in E_2, this test is omitted. If not this test is carried out on an individual protected pole, taken at random, of the circuit-breaker with the highest number of poles.

[k] Covered by test sequence E_2.

Annex D In figure D.1 **replace** the symbol I_{cu} by I_{cn}.

Annex E Add an asterisk "(*)" to the title and add, immediately below:

(*) For auxiliary contact units assembled or to be assembled separately to circuit-breaker see EN 62019.

Annex G **Replace** by:

Annex G (void)

Add annexes ZA and ZB.