

Svenska Elektriska Kommissionen, SEK

Fastställt	Utgåva	Sida	Ingår i
2003-05-26	1	1 (1+128)	SEK Område 23E

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

Installationsdvärgbrytare – Dvärgbrytare för överströmsskydd för bostadsinstallationer och liknande – Del 1: Dvärgbrytare för växelström

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

Som svensk standard gäller europastandarden EN 60898-1:2003. Den svenska standarden innehåller den officiella engelska språkversionen av EN 60898-1:2003.

Nationellt förord

Europastandarden EN 60898-1:2003

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 60898-1, First edition, 2002 - Electrical accessories - Circuit breakers for overcurrent protection for household and similar installations - Part 1: Circuit-breakers for a.c. operation**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare utgiven svensk standard SS-EN 60898, utgåva 1, 1992, SS-EN 60898/A11, utgåva 1, 1995, SS-EN 60898/A12, utgåva 1, 1995, SS-EN 60898/A13, utgåva 1, 1995, SS-EN 60898/A14, utgåva 1, 1995, SS-EN 60898/A15, utgåva 1, 1996, SS-EN 60898/A16, utgåva 1, 1996, SS-EN 60898/A17, utgåva 1, 1998, SS-EN 60898/A18, utgåva 1, 1998 och SS-EN 60898/A19, utgåva 1, 2000, gäller ej fr o m 2008-10-01.

ICS 29.120.50

Denna standard är fastställd av Svenska Elektriska Kommissionen, SEK, 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@sekom.se. Internet: www.sekom.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

Svenska Elektriska Kommissionen, SEK, 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

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

EUROPEAN STANDARD

EN 60898-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2003

ICS 29.120.50

Supersedes EN 60898:1991 + A1:1991 + A11:1994 + A12:1995 + A13:1995 + A14:1995 +
A15:1995 + A16:1996 + A17:1998 + A18:1998 + A19:2000

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

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.
-

Annex ZB
(normative)

**International publications quoted in this standard
with the reference of the relevant European publications**

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

IEC publication	Date	Title	EN/HD	Date
IEC 60038	1983	<i>IEC standard voltages</i> ¹⁾	HD 472 S1	1989
IEC 60050(441)	1984	<i>International Electromechanical Vocabulary (IEV) - Chapter 441 Switchgear controlgear and fuses</i>	-	
IEC 60051	Series	<i>Direct acting indicating analogue electrical measuring instruments and their accessories</i>	EN 60051	Series
IEC 60060-1 + Corr. March	1989 1990	<i>High-voltage test techniques – Part 1: General definitions and test requirements</i>	HD 588.1 S1	1991
IEC 60112	– ²⁾	<i>Method for the determination of the proof and the comparative tracking indices of solid insulating materials</i>	EN 60112	2003 ³⁾
IEC 60227 ⁴⁾	Series	<i>Polyvinyl chloride insulated cables of rated voltages up to and including 450/750V</i>	–	–
IEC 60269	Series	<i>Low-voltage fuses</i>	EN 60269	Series
IEC 60364	Series	<i>Electrical installations of buildings</i>	HD 384	Series
IEC 60364-4-41	1992	<i>Electrical installations of buildings – Part 4: Protection for safety – Chapter 41: Protection against electric shock</i>	HD 384.4.41	1996
IEC 60364-4-473 (mod)	1977	<i>Electrical installations of buildings – Part 4: Protection for safety – Chapter 47: Application of protective measures for safety – Section 473: Measures of protection against overcurrent</i>	HD 384.4.473	1980
A1	1998		–	–
IEC 60417	Series	<i>Graphical symbols for use on equipment</i>	EN 60417	Series
IEC 60529	– ²⁾	<i>Degrees of protection provided by enclosures (IP Code)</i>	EN 60529	1991 ³⁾
IEC 60664-1 (mod)	– ²⁾	<i>Insulation co-ordination for equipment within low-voltage systems – Part 1 Principles requirements and tests.</i>	HD 625.1 S1	1996 ³⁾
IEC 60695-2-10	– ²⁾	<i>Fire hazard testing - Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure</i>	EN 60695-2-10	2001 ³⁾
IEC 60947-1 (mod)	1999	<i>Low-voltage switchgear and controlgear – Part 1 General rules</i>	EN 60947-1	1999
IEC 60947-2	1995	<i>Low-voltage switchgear and controlgear – Part 2 Circuit-breakers</i>	EN 60947-2	1996
IEC 62019	1999	<i>Electrical accessories – Circuit-breakers and similar equipment for household use – Auxiliary contact units</i>		
ISO/IEC Guide 2	1991	<i>General terms and their definitions concerning standardization and related activities</i>		

¹⁾ The title of HD 472 S1 is: Nominal voltages for low voltage public electricity supply systems.

²⁾ Undated reference.

³⁾ Valid edition at date of issue.

⁴⁾ The HD 21 series, which is related to, but not directly equivalent with the IEC 60227 series, applies instead.

CONTENTS

1	Scope and object.....	15
2	Normative references	17
3	Definitions	19
3.1	Devices	19
3.2	General terms	21
3.3	Constructional elements	25
3.4	Conditions of operation	29
3.5	Characteristic quantities	31
3.6	Definitions related to insulation co-ordination	39
4	Classification.....	43
4.1	According to the number of poles:	43
4.2	According to the protection against external influences:	43
4.3	According to the method of mounting:	43
4.4	According to the method of connection:	43
4.5	According to the instantaneous tripping current (see 3.5.17):	45
4.6	According to the I^2t characteristics	45
5	Characteristics of circuit-breakers	45
5.1	List of characteristics	45
5.2	Rated quantities	45
5.3	Standard and preferred values	49
6	Marking and other product information.....	53
7	Standard conditions for operation in service	55
7.1	Ambient air temperature range	55
7.2	Altitude.....	57
7.3	Atmospheric conditions	57
7.4	Conditions of installation	57
7.5	Pollution degree	57
8	Requirements for construction and operation.....	57
8.1	Mechanical design.....	57
8.2	Protection against electric shock	73
8.3	Dielectric properties and isolating capability	75
8.4	Temperature-rise.....	75
8.5	Uninterrupted duty.....	77
8.6	Automatic operation	77
8.7	Mechanical and electrical endurance	81
8.8	Performance at short-circuit currents.....	81
8.9	Resistance to mechanical shock and impact.....	81
8.10	Resistance to heat.....	83
8.11	Resistance to abnormal heat and to fire	83
8.12	Resistance to rusting.....	83

9	Tests	83
9.1	Type tests and test sequences	83
9.2	Test conditions	85
9.3	Test of indelibility of marking	87
9.4	Test of reliability of screws, current-carrying parts and connections	87
9.5	Test of reliability of terminals for external conductors	91
9.6	Test of protection against electric shock	93
9.7	Test of dielectric properties and isolating capability	95
9.8	Test of temperature-rise and measurement of power loss	105
9.9	28-day test	107
9.10	Test of tripping characteristic	107
9.11	Test of mechanical and electrical endurance	111
9.12	Short-circuit tests	115
9.13	Mechanical stresses	137
9.14	Test of resistance to heat	145
9.15	Resistance to abnormal heat and to fire (glow-wire test)	147
9.16	Test of resistance to rusting	147
	Annex A (informative) Determination of short-circuit power factor	175
	Annex B (normative) Determination of clearances and creepage distances	177
	Annex C (normative) Number of samples to be submitted and test sequences to be applied for verification of conformity (13.5 of ISO/IEC Guide 2:1991)	183
	Annex D (informative) Co-ordination under short-circuit conditions between a circuit- breaker and another short-circuit protective device (SCPD) associated in the same circuit	195
	Annex E (normative) Special requirements for auxiliary circuits for safety extra-low voltage	211
	Annex F (informative) Examples of terminals	213
	Annex G (informative) Correspondence between ISO and AWG copper conductors	219
	Annex H (normative) Arrangement for short-circuit test	221
	Annex I (normative) Routine tests	227
	Bibliography	229
	Figure 1 – Thread forming tapping screw 3.3.22	149
	Figure 2 – Thread cutting tapping screw 3.3.23	149
	Figure 3 – Single pole circuit-breaker	149
	Figure 4a – Two-pole circuit-breaker with one protected pole	151
	Figure 4b – Two-pole circuit-breaker with two protected poles	151
	Figure 5 – Three-pole circuit-breaker (or three single-pole circuit-breakers)	151
	Figure 6 – Four-pole circuit-breaker	153
	Figure 3 to 6 – Test circuits for short-circuit tests	153
	Figure 7 – Example of short-circuit making or breaking test record in the case of a single- pole device on single phase a.c.	155
	Figure 8 – Mechanical shock test apparatus (9.13.1)	157
	Figure 9 – Standard test finger (9.6)	159
	Figure 10 – Mechanical impact test apparatus (9.13.2)	161

Figure 11 – Striking element for pendulum for mechanical impact test apparatus (9.13.2) ..	163
Figure 12 – Mounting support for mechanical impact test (9.13.2).....	165
Figure 13 – Example of mounting for a rear fixed circuit-breaker for mechanical impact test (9.13.2).....	167
Figure 14 – Example of mounting of a panel board type circuit-breaker for mechanical impact test (9.13.2).....	169
Figure 15 – Application of force for mechanical test on a rail-mounted circuit-breaker (9.13.2.3).....	171
Figure 16 – Ball-pressure test apparatus.....	171
Figure 17 – Example of application of force for mechanical test on two-pole plug-in circuit-breaker, the holding in position of which depends solely on the plug-in connections (9.13.2.4).....	173
Figures B.1 – Illustrations of the application of the recommendations for creepage distances	179
Figures B.2 – Illustrations of the application of the recommendations for creepage distances	181
Figure D.1 – Overcurrent co-ordination between a circuit-breaker and a fuse or back-up protection by a fuse – Operating characteristics	205
Figure D.2 – Total discrimination between two circuit-breakers	207
Figure D.3 – Back-up protection by a circuit-breaker – Operating characteristics	209
Figure F.1 – Examples of pillar terminals	213
Figure F.2 – Examples of screw terminals and stud terminals	215
Figure F.3 – Examples of saddle terminals.....	217
Figure F.4 – Examples of lug terminals	217
Figure H.1 – Test arrangement	223
Figure H.2 – Grid circuit.....	223
Figure H. 3 – Grid circuit.....	225
Table 1 – Preferred values of rated voltage.....	49
Table 2 – Ranges of instantaneous tripping	51
Table 3 – Rated impulse withstand voltage as a function of the nominal voltage of the installation	51
Table 4 – Minimum clearances and creepage distances.....	63
Table 5 – Connectable cross-sections of copper conductors for screw-type terminals	69
Table 6 – Temperature-rise values.....	77
Table 7 – Time-current operating characteristics.....	79
Table 8– List of type tests	83
Table 9 – Cross-sectional areas (S) of test copper conductors corresponding to the rated currents	87
Table 10 – Screw thread diameters and applied torques	89
Table 11 – Pulling forces	91
Table 12 – Conductor dimensions	93
Table 13- Test voltage across the open contacts for verifying the suitability for isolation referred to the rated impulse withstand voltage of the circuit-breaker and to the altitude where the test is carried out	101

Table 14 – Test voltage for verification of impulse withstand voltage for the parts not tested in 9.7.6.1	103
Table 15 – Maximum power loss per pole	107
Table 16 – Applicability of short-circuit tests	115
Table 17 – Power factor ranges of the test circuit	121
Table 18 – Ratio k between service short-circuit capacity (I_{cs}) and rated short-circuit capacity (I_{cn}).....	131
Table 19 – Test procedure for I_{cs} in the case of single- and two-pole circuit-breakers	131
Table 20 – Test procedure for I_{cs} in the case of three- and four-pole circuit-breakers	133
Table 21 – Test procedure for I_{cs} in the case of three-phase tests for single-pole circuit-breakers of rated voltage 230/400 V	133
Table 22 – The test procedure for I_{cn}	135
Table 23 – Test procedure for I_{cn} in the case of three-phase tests for single-pole circuit-breakers of rated voltage 230/400 V	135
Table C.1 – Test sequences	185
Table C.2 – Number of samples for full test procedure.....	187
Table C.3 – Reduction of samples for series of circuit-breakers having different numbers of poles.....	191
Table C.4 – Test sequences for a series of circuit-breakers being of different instantaneous tripping classifications.....	193

ELECTRICAL ACCESSORIES – CIRCUIT-BREAKERS FOR OVERCURRENT PROTECTION FOR HOUSEHOLD AND SIMILAR INSTALLATIONS –

Part 1: Circuit-breakers for a.c. operation

1 Scope and object

This part of IEC 60898 applies to a.c. air-break circuit-breakers for operation at 50 Hz or 60 Hz, having a rated voltage not exceeding 440 V (between phases), a rated current not exceeding 125 A and a rated short-circuit capacity not exceeding 25 000 A.

As far as possible, it is in line with the requirements contained in IEC 60947-2.

These circuit-breakers are intended for the protection against overcurrents of wiring installations of buildings and similar applications; they are designed for use by uninstructed people and for not being maintained.

They are intended for use in an environment with pollution degree 2.

They are suitable for isolation.

Circuit-breakers of this standard, with exception of those rated 120 V or 120/240 V (see table 1), are suitable for use in IT systems provided that the requirements of IEC 60364-4-473:1977 + A1:1998 are complied with.

This standard also applies to circuit-breakers having more than one rated current, provided that the means for changing from one discrete rating to another is not accessible in normal service and that the rating cannot be changed without the use of a tool.

This standard does not apply to

- circuit-breakers intended to protect motors;
- circuit-breakers, the current setting of which is adjustable by means accessible to the user.

For circuit-breakers having a degree of protection higher than IP20 according to IEC 60529, for use in locations where arduous 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.

Requirements for circuit-breakers for a.c. and d.c. operation are given in IEC 60898-2.

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

A guide for co-ordination under short-circuit conditions between a circuit-breaker and another short-circuit protective device (SCPDs) is given in annex D.

NOTE 1 For more severe overvoltage conditions, circuit-breakers complying with other standards (e.g. IEC 60947-2) should be used.

NOTE 2 For an environment with a higher pollution degree, enclosures giving the appropriate degree of protection should be used.

NOTE 3 Circuit-breakers within the scope of this standard may also be used for protection against electric shock in case of fault, depending on their tripping characteristics and on the characteristics of the installation. The criterion of application for such purposes is dealt with by installation rules.

This standard contains all 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 circuit-breakers;
- b) the conditions with which circuit-breakers 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 co-ordination under short-circuit conditions with another short-circuit protective device (SCPD) associated in the same circuit (see annex D);
- g) the routine tests to be carried out on each circuit-breaker to reveal unacceptable variations in material or manufacture, likely to affect safety (see annex I).

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60898. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60898 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60038, *IEC standard voltages*

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

IEC 60060-1:1989, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60112, *Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions*