

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

Industriuttagsdon – Stickproppar, vägguttag och apparatanslutningsdon för industribruk – Del 1: Allmänna fordringar

*Plugs, socket-outlets and couplers for industrial purposes –
Part 1: General requirements*

Som svensk standard gäller europastandarden EN 60309-1:1999. Den svenska standarden innehåller den officiella engelska språkversionen av EN 60309-1:1999.

Nationellt förord

Europastandarden EN 60309-1:1999^{*)}

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 60309-1, Fourth edition, 1999 - Plugs, socket-outlets and couplers for industrial purposes - Part 1: General requirements**

utarbetad inom International Electrotechnical Commission, IEC.

^{*)} EN 60309-1:1999 ikraftsattes 1999-08-20 som SS-EN 60309-1, utan återgivning av IEC-standardens.

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

SEK Svensk Elstandard 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 Svensk Elstandard

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

English version

Plugs, socket-outlets and couplers for industrial purposes
Part 1: General requirements
(IEC 60309-1:1999)

Prises de courant pour usages
industriels
Partie 1: Règles générales
(CEI 60309-1:1999)

Stecker, Steckdosen und Kupplungen
für industrielle Anwendung
Teil 1: Allgemeine Festlegungen
(IEC 60309-1:1999)

This European Standard was approved by CENELEC on 1999-04-01. 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, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, 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 23H/88/FDIS, future edition 4 of IEC 60309-1, prepared by SC 23H, Industrial plugs and socket outlets, of IEC TC 23, Electrical accessories, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60309-1 on 1999-04-01.

This European Standard supersedes EN 60309-1:1997.

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) 2000-01-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2002-04-01

Annexes designated "normative" are part of the body of the standard.
In this standard, annexes A and ZA are normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60309-1:1999 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)**Normative references to international publications
with their corresponding European publications**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050(441)	1984	International Electrotechnical Vocabulary (IEV) Chapter 441: Switchgear, controlgear and fuses	-	-
IEC 60083	1997	Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC	-	-
IEC 60112	1979	Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions	HD 214 S2	1980
IEC 60227 (mod)	series	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V	HD 21	series
IEC 60228 + IEC 60228A (mod)	1978 1982	Conductors of insulated cables First supplement: Guide to the dimensional limits of circular conductors	HD 383 S2 + A1 + A2	1986 1989 1993
IEC 60245-4 (mod)	1994	Rubber insulated cables of rated voltages up to and including 450/750 V Part 4: Cords and flexible cables	HD 22.4 S3 + A1	1995 1999
IEC 60269-1	1986	Low-voltage fuses Part 1: General requirements	EN 60269-1 ¹⁾	1989
IEC 60269-2	1986	Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application)	EN 60269-2	1995
IEC 60320 (mod) series		Appliance couplers for household and similar general purposes	EN 60320	series
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May	1991 1993

1) EN 60269-1 is superseded by EN 60269-1:1998, which is based on IEC 60269-1:1998.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60664-1 (mod)	1992	Insulation coordination for equipment within low-voltage systems Part 1: Principles, requirements and tests	HD 625.1 S1 + corr. November	1996 1996
IEC 60695-2-1	1994	Fire hazard testing Part 2: Test methods - Section 1	EN 60695-2-1	1996
IEC 60947-3 + corr. December 1991 (mod)	1990	Low-voltage switchgear and controlgear Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units	EN 60947-3 ²⁾ + corr. June	1992 1997

2) EN 60947-3 is superseded by EN 60947-3:1999, which is based on IEC 60947-3:1999.

CONTENTS

	Page
INTRODUCTION	7
Clause	
1 Scope	9
2 Definitions	9
3 Normative references	17
4 General	19
5 Standard ratings	21
6 Classification	21
7 Marking	23
8 Dimensions	29
9 Protection against electric shock	29
10 Provision for earthing	31
11 Terminals	33
12 Interlocks	43
13 Resistance to ageing of rubber and thermoplastic material	45
14 General construction	47
15 Construction of socket-outlets	47
16 Construction of plugs and connectors	51
17 Construction of appliance inlets	53
18 Degrees of protection	55
19 Insulation resistance and dielectric strength	59
20 Breaking capacity	61
21 Normal operation	65
22 Temperature rise	67
23 Flexible cables and their connection	71
24 Mechanical strength	77
25 Screws, current-carrying parts and connections	83
26 Creepage distances, clearances and distances through sealing compound	89
27 Resistance to heat, fire and tracking	91
28 Corrosion and resistance to rusting	95
29 Conditional short-circuit current withstand test	97
30 Electromagnetic compatibility	101
Figures	103
Annex A – Guidance and description of test apparatus	139

INTRODUCTION

International Standard IEC 60309 is divided into several parts:

Part 1: General requirements, comprising clauses of a general character.

Subsequent parts: Particular requirements dealing with particular types. The clauses of these particular requirements supplement or modify the corresponding clauses in part 1. Where the text of subsequent parts indicates an "addition" to or a "replacement" of the relevant requirement, test specification or explanation of part 1, these changes are made to the relevant text of part 1, which then becomes part of the standard. Where no change is necessary, the words "This clause of part 1 is applicable" are used.

PLUGS, SOCKET-OUTLETS AND COUPLERS FOR INDUSTRIAL PURPOSES –

Part 1: General requirements

1 Scope

This standard applies to plugs and socket-outlets, cable couplers and appliance couplers, with a rated operating voltage not exceeding 690 V d.c. or a.c. and 500 Hz a.c., and a rated current not exceeding 250 A, primarily intended for industrial use, either indoors or outdoors.

The list of preferred ratings is not intended to exclude other ratings, requirements for which are under consideration.

This standard applies to plugs and socket-outlets, cable couplers and appliance couplers, hereinafter referred to as accessories, for use when the ambient temperature is normally within the range of -25 °C to $+40\text{ °C}$. These accessories are intended to be connected to cables of copper or copper alloy only.

The use of these accessories on building sites and for agricultural, commercial and domestic applications is not precluded.

Socket-outlets or appliance inlets incorporated in or fixed to electrical equipment are within the scope of this standard. This standard also applies to accessories intended to be used in extra-low voltage installations.

This standard does not apply to accessories primarily intended for domestic and similar general purposes.

In locations where special conditions prevail, for example on board ship or where explosions are liable to occur, additional requirements may be necessary.

2 Definitions

Where the terms voltage and current are used, they imply the d.c. or the a.c. r.m.s. values.

For the purpose of this part of IEC 60309, the following definitions apply.

The application of accessories is shown in figure 1.

2.1

plug and socket-outlet

a means enabling the connection at will of a flexible cable to fixed wiring. It consists of two parts:

2.1.1**socket-outlet**

the part intended to be installed with the fixed wiring or incorporated in equipment.

A socket-outlet may also be incorporated in the output circuit of an isolating transformer

2.1.2**plug**

the part integral with or intended to be attached directly to one flexible cable connected to the equipment or to a connector

2.2**cable coupler**

a means enabling the connection at will of two flexible cables. It consists of two parts:

2.2.1**connector**

the part integral with or intended to be attached to one flexible cable connected to the supply

NOTE – In general, a connector has the same contact arrangement as a socket-outlet.

2.2.2**plug**

the part integral with or intended to be attached to one flexible cable connected to the equipment or to a connector

NOTE – The plug of a cable coupler is identical to the plug of a "plug and socket-outlet".

2.3**appliance coupler**

a means enabling the connection at will of a flexible cable to the equipment. It consists of two parts:

2.3.1**connector**

the part integral with, or intended to be attached to, one flexible cable connected to the supply

NOTE – In general, the connector of an appliance coupler is identical to the connector of a cable coupler.

2.3.2**appliance inlet**

the part incorporated in, or fixed to, the equipment or intended to be fixed to it

NOTE – In general, an appliance inlet has the same contact arrangement as a plug.

2.4**rewirable plug or connector**

an accessory so constructed that the flexible cable can be replaced

2.5**non-rewirable plug or connector**

an accessory so constructed that the flexible cable cannot be separated from the accessory without making it permanently useless

2.6**mechanical switching device**

a switching device designed to close and open one or more electric circuits by means of separable contacts

2.7**switched socket-outlet**

a socket-outlet with an associated switching device to disconnect the supply from the socket-outlet contacts

2.8**integral switching device**

a mechanical switching device constructed as a part of an accessory covered by this standard

2.9**interlock**

a device, either electrical or mechanical, which prevents the contacts of a plug from becoming live before it is in proper engagement with a socket-outlet or connector, and which either prevents the plug from being withdrawn while its contacts are live or makes the contacts dead before separation

2.10**retaining device**

a mechanical arrangement which holds a plug or connector in position when it is in proper engagement, and prevents its unintentional withdrawal

2.11**rated current**

the current assigned to the accessory by the manufacturer

2.12**insulation voltage**

the voltage assigned to the accessory by the manufacturer and to which dielectric tests, clearances and creepage distances are referred

2.13**rated operating voltage**

the nominal voltage of the supply for which the accessory is intended to be used

2.14**basic insulation**

the insulation necessary for the proper functioning of the accessory and for basic protection against electric shock

2.15**supplementary insulation (protective insulation)**

an independent insulation provided in addition to the basic insulation, in order to ensure protection against electric shock in the event of a failure of the basic insulation

2.16**double insulation**

insulation comprising both basic insulation and supplementary insulation

2.17**reinforced insulation**

an improved basic insulation with such mechanical and electrical qualities that it provides the same degree of protection against electric shock as double insulation

2.18**terminal**

a conductive part provided for the connection of a conductor to an accessory

2.18.1**pillar terminal**

a terminal in which the conductor is inserted into a hole or cavity, where it is clamped under the shank of the screw or screws. The clamping pressure may be applied directly by the shank of the screw or through an intermediate clamping member to which pressure is applied by the shank of the screw (see figure 14a)

2.18.2**screw terminal**

a terminal in which the conductor is clamped under the head of the screw. The clamping pressure may be applied directly by the head of the screw or through an intermediate part, such as a washer, clamping plate or anti-spread device (see figures 14b and 14c)

2.18.3**stud terminal**

a terminal in which the conductor is clamped under a nut. The clamping pressure may be applied directly by a suitably shaped nut or through an intermediate part, such as a washer, clamping plate or anti-spread device (see figure 14d)

2.18.4**saddle terminal**

a terminal in which the conductor is clamped under a saddle by means of two or more screws or nuts (see figure 14e)

2.18.5**lug terminal**

a screw terminal or a stud terminal, designed for clamping a cable lug or bar by means of a screw or nut (see figure 14f)

2.18.6**mantle terminal**

a terminal in which the conductor is clamped against the base of a slot in a threaded stud by means of a nut. The conductor is clamped against the base of the slot by a suitably shaped washer under the nut, by a central peg if the nut is a cap nut, or by equally effective means for transmitting the pressure from the nut to the conductor within the slot (see figure 14g)

2.19**clamping unit**

the part of a terminal necessary for the clamping and the electrical connection of the conductor

2.20**conditional short-circuit current**

the prospective current that an accessory, protected by a specified short-circuit protective device, can satisfactorily withstand for the total operating time of that device under specified conditions of use and behaviour

NOTE – This definition differs from IEC 441-17-20 by broadening the concept of current-limiting device into a short-circuit protective device, the function of which is not only to limit the current.

2.21**cap**

a part separated or attached, which may be used to provide the degree of protection of a plug or appliance inlet when it is not engaged with a socket-outlet or connector

2.22**lid**

a means to ensure the degree of protection on a socket-outlet or a connector

3 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60309. 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 60309 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 60050-441:1984, *International Electrotechnical Vocabulary (IEV) – Chapter 441: Switchgear, controlgear and fuses*

IEC 60083:1997, *Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC*

IEC 60112:1979, *Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions*

IEC 60227, (all parts) *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

IEC 60228:1978, *Conductors of insulated cables*

IEC 60245-4:1994, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables*

IEC 60269-1:1986, *Low-voltage fuses – Part 1: General requirements*

IEC 60269-2:1986, *Low-voltage fuses – Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) – Sections I to III*

IEC 60320, (all parts) *Appliance couplers for household and similar general purposes*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*

IEC 60664-1:1992, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60695-2-1:1994, *Fire hazard testing – Part 2: Test methods*

IEC 60947-3:1990, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*