

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Plugs, socket-outlets and couplers for industrial purposes –
Part 4: Switched socket-outlets and connectors with or without interlock**

**Prises de courant pour usages industriels –
Partie 4: Prises de courant et prises mobiles avec interrupteur, avec ou sans
dispositif de verrouillage**



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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.120.30

ISBN 978-2-88912-052-9

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PLUGS, SOCKET-OUTLETS AND COUPLERS
FOR INDUSTRIAL PURPOSES –****Part 4: Switched socket-outlets and connectors
with or without interlock**

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This consolidated version of IEC 60309-4 consists of the first edition (2006) [documents 23H/189/FDIS and 23H/192/RVD] and its amendment 1 (2012) [documents 23H/276/FDIS and 23H/281/RVD]. It bears the edition number 1.1.

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience. A vertical line in the margin shows where the base publication has been modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through.

International Standard IEC 60309-4 has been prepared by subcommittee 23H: Plugs and socket-outlets for industrial purposes, of IEC technical committee 23: Electrical accessories.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This standard is to be read in conjunction with IEC 60309-1 (1999) and IEC 60309-2 (1999).

Part 1 comprises clauses of a general character and the subsequent parts of the series deal with particular types.

The clauses of the subsequent parts 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.

Clauses, subclauses, figures, tables and notes which are additional to those in Part 1 are numbered starting from 101.

The IEC 60309 series, under the general title *Plugs, socket-outlets and couplers for industrial purposes* comprises the following parts:

- Part 1: General requirements
- Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories
- Part 4: Switched socket-outlets and connectors with or without interlock

The committee has decided that the contents of the base publication and its amendments 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
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PLUGS, SOCKET-OUTLETS AND COUPLERS FOR INDUSTRIAL PURPOSES –

Part 4: Switched socket-outlets and connectors with or without interlock

1 Scope

This clause of Part 1 or Part 2 is applicable except as follows:

Replacement of the first paragraph by the following text:

This part of IEC 60309 applies to self-contained products that combine within a single enclosure, a socket-outlet or connector according to IEC 60309-1 or IEC 60309-2 and a switching device, with a rated operating voltage not exceeding ~~690~~ 1 000 V d.c. or a.c. and 500 Hz, and a rated current not exceeding ~~250~~ 800 A, primarily intended for industrial use, either indoors or outdoors.

These accessories are intended to be installed by instructed persons (Amendment 1:2001 of IEC 60050-195:1998, 195-04-02) or skilled persons (Amendment 1:2001 of IEC 60050-195:1998, 195-04-01) only.

These products may incorporate an interlock and/or protective devices.

2 Definitions

[IEC 60309-4:2006+AMD1:2012 CSV](https://standards.iteh.ai/catalog/standards/sist/dc816330-c1d0-4fad-91d7-78ac491115a0/iec-60309-4-2006-amd1-2012-csv)

[https://standards.iteh.ai/catalog/standards/sist/dc816330-c1d0-4fad-91d7-](https://standards.iteh.ai/catalog/standards/sist/dc816330-c1d0-4fad-91d7-78ac491115a0/iec-60309-4-2006-amd1-2012-csv)

This clause of Part 1 or Part 2 is applicable, except as follows.

Deletion of definitions 2.6 to 2.9.

Addition:

2.101

switched socket-outlet or connector

accessory containing in a single enclosure a switching device and a socket-outlet or connector, intended to be used in combination. It can be either interlocked or non-interlocked

2.102

interlocked socket-outlet or connector

socket-outlet or connector associated with an interlock

2.103

switching device

device designated to make or break the current in one or more electric circuits

[IEV 441-14-01]

2.103.1

mechanical switching device

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

[IEV 441-14-02]

2.103.1.1**switch (mechanical)**

mechanical switching device capable of making, carrying and breaking currents under normal circuit conditions, which may include specified operating overload conditions and also carrying, for a specified time, currents under specified abnormal circuit conditions such as those of short-circuit

[IEV 441-14-10]

NOTE A switch may be capable of making, but not breaking short-circuit currents.

2.103.1.1.1**switch-disconnector**

switch, which in the open position complies with the requirements specified for the isolating function

[IEV 441-14-12, modified]

NOTE This definition differs from IEC 441-14-05 by referring to isolating function instead of the requirements specified for a disconnector.

2.103.1.2**contactor**

mechanical switching device having only one position of rest, operated otherwise than by hand, capable of making, carrying and breaking currents under normal circuit conditions, including operating overload conditions

[IEV 441-14-33]

2.103.2**associated switching device**

separate switching device which can be replaced independently

2.103.3**integral switching device**

switching device constructed as a part of a socket-outlet or connector covered by this standard, where neither the switching device nor the socket-outlet or connector can be replaced independently

2.104**isolation (isolating function)**

function intended to cut off the supply from all or a discrete section of the installation, by separating the installation or section from every source of electrical energy for reasons of safety (see IEC 60947-1 and IEC 61140¹)

2.105**utilization category**

⟨switching device⟩ combination of specified requirements related to the conditions in which the switching device fulfils its purpose, selected to represent a characteristic group of practical applications

[IEV 441-17-19, modified]

NOTE The specified requirements may concern e.g. the values of making capacities (if applicable), breaking capacities and other characteristics, the associated circuits under the relevant conditions of use and behaviour.

¹ IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

2.106**interlock or interlocking device**

device, either electrical or electronic or mechanical or a combination of these, which makes the operation of a piece of product dependent upon the condition, position or operation of one or more other pieces of product

2.107**control circuit device**

electrical device intended for the controlling, signaling, interlocking, etc. of switchgear and controlgear (see IEC 60947-1, 2.1.1)

2.108**pilot contact**

auxiliary electric contact for use in a control or monitoring or interlock function

NOTE Pilot contact is not considered to be a pole.

2.109**latching device**

part of the interlock mechanism provided to hold a plug or appliance-inlet in the socket-outlet or connector

3 Normative references

This clause of Part 1 or Part 2 is applicable, except as follows:

Addition:

IEC 60073, *Basic and safety principles for man-machine interface, marking and identification - Coding principles for indicators and actuators*

IEC 60417-DB:2002², *Graphical symbols for use on equipment*

IEC 60617-DB:2001³, *Graphical Symbols for diagrams*

IEC 60947-1:2004, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-4-1, *Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters*

IEC 60947-5-1:2003, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

IEC 61032, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 61058-1, *Switches for appliances – Part 1: General requirements*

4 General

This clause of Part 1 or Part 2 is applicable except as follows:

² “DB” refers to the IEC on-line database.

³ “DB” refers to the IEC on-line database.

Addition:

4.101 Components incorporated or integrated in products (e.g. flexible cable, current cut-outs, thermal cut-outs, safety transformers, switches, fuses, residual current devices, lampholders and connecting devices) shall comply with the relevant standards as far as they reasonably apply.

5 Standard ratings

This clause of Part 2 is applicable except as follows:

5.101 *Replacement:*

5.101 Standard IP ratings are

- IP44
- IP67
- IP66/IP67

For switched socket-outlet with or without interlock according to 6.1.101, the whole unit can have a degree of protection different from IP44 or IP67 or IP66/IP67 but not lower than IP44 (see also 8.1).

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(standards.iteh.ai)

6 Classification

This clause of Part 1 or Part 2 is applicable, except as follows:

[IEC 60309-4:2006+AMD1:2012 CSV](https://standards.iteh.ai/catalog/standards/sist/dc816330-c1d0-4fad-91d7-78ae491115a0/iec-60309-4-2006amd1-2012-csv)

6.1.1 *Replacement:* <https://standards.iteh.ai/catalog/standards/sist/dc816330-c1d0-4fad-91d7-78ae491115a0/iec-60309-4-2006amd1-2012-csv>

6.1.1 According to purpose: socket-outlets, connectors

Deletion of 6.1.5.

Addition:

6.1.101 According to switching devices and interlock facilities:

- products with a switching device and without an interlock;
- products with a switching device and with an interlock.

6.1.102 According to the operation of the interlock/switching device

- manually;
- automatically (electrically and/or electronically);
- combination of the above.

NOTE Inserting the plug is not considered a manual operation of the interlock/switching device.

6.1.103 According to the mechanical switching device

- switch;
- switch-disconnector;
- contactor;
- other devices with suitable switch rating.

6.1.104 According to suitability for isolation of the switching device

- suitable for isolation;
- not suitable for isolation.

6.1.105 According to whether the interlock system has a latching device

- with latching device (mechanical interlock);
- without latching device (electrical interlock).

6.1.106 According to the presence of a protective device

- with protective device;
- without protective device.







7 Marking

This clause of Part 1 or Part 2 is applicable, except as follows:

7.1 Addition:

- indication of the open and closed position of the switching device for products with isolating function according to 6.1.104;
- indication of the type of switching device.

7.2 Addition:

Open position	 https://standards.iteh.ai/catalog/standards/sist/dc816330-c1d0-4fad-91d7-78ac491115a0/iec-60309-4-2006amd1-2012-csv IEC 60417-5008	and/or	OFF
Closed position	 IEC 60417-5007	and/or	ON
Switch	 IEC 60617 – S00227	or	 IEC 60947-3
Switch-disconnector	 IEC 60617 – S00290		
Contactor	 IEC 60617 – S00284		
Other devices	According to IEC 60617		

7.3 Replacement:

7.3 The marking for rated current, the type reference, the nature of supply, if necessary, and either the name or trademark of the manufacturer or the responsible vendor shall be on the outside of the enclosure, or on the lid, if any, if the latter cannot be removed without the aid of a tool.

These markings shall be easily discernible when the accessory is mounted and wired as in normal use, if necessary after it has been removed from the enclosure. The marking, if any, for the insulation voltage shall not be visible when the accessory is mounted and wired as in normal use.

The marking for rated operating voltage, type reference, the degree of protection, and the symbol indicating the position of the earthing contact or the means used for interchangeability, if any, shall be on a place which is visible after installation of the accessory, on the outside of enclosure or on the lid, if any, if the latter cannot be removed without the aid of a tool.

With the exception of the type reference, these markings shall be easily discernible when the accessory is mounted and wired as in normal use.



Compliance is checked by inspection.

7.4 This clause of Part 1 or Part 2 is not applicable.

7.5 Replacement:

7.5 Marking of the terminals for the supply cables

The neutral terminal, if any, shall be marked N.

The earth terminal, if any, shall be marked  or .

The relationship between the terminals for the supply cable and load terminals/load contacts shall be made clear, if necessary by means of a diagram or instruction.

Compliance is checked by inspection.

7.6 Replacement of the first sentence by the following text:

7.6 Marking on the outside of the enclosure shall be indelible and easily legible.

Addition:

7.101 The indication of the positions (open or closed) of the switching device shall be unambiguous and clearly indicated.

The actuator of a mechanical switching device may be used to indicate the position of the contacts.

For mechanical switching devices operated by means of two push-buttons, only the push-button designated for the opening operation shall be red or marked with the symbol "O".

The colours of other push-buttons, illuminated push-buttons and indicator lights shall be in accordance with IEC 60073.

7.102 The marking of the type of switching device shall be on a place which is visible after installation of the products, on the outside of enclosure or on the lid, if any, if the latter cannot be removed without the aid of a tool.

8 Dimensions

This clause of Part 2 is applicable except as follows:

8.1 *Replacement of the first 2 paragraphs starting with “Accessories shall” and finishing with “non-interchangeability” by the following:*

Accessories shall comply with the relevant standard sheets as specified below:

- accessories having rated operating voltages exceeding 50 V:
 - 16/20 A Sheets 2-VIII and 2-VIIIa;
 - 16/20 A and 32/30 A Sheets 2-I, 2-II, 2-IX and 2-IXa;
 - 63/60 A and 125/100 A, without pilot contact Sheets 2-III and 2-IV;
 - 63/60 A and 125/100 A, with pilot contact Sheets 2-IIIa and 2-IVa;
 - mechanical interlock for 16 A to 125 A accessories Sheet 2-V
- accessories having rated operating voltage not exceeding 50 V:
 - 16/20 A and 32/30 A Sheets 2-VIII and 2-IX.

Switched socket-outlets according to 6.1.101 with degree of protection higher than IP44 and different from IP67 shall use socket-outlets that comply with IP66/IP67 construction as stated in standard sheet 2-I (continuation 2) or 2-III (continuation 2) or 2-VIII (continuation 2) (see 6.1.2).

<https://standards.iteh.ai/catalog/standards/sist/dc816330-c1d0-4fad-91d7-78e491115c1f/iec-60309-4-2006-amd1-2012>

<https://standards.iteh.ai/catalog/standards/sist/dc816330-c1d0-4fad-91d7-78e491115c1f/iec-60309-4-2006-amd1-2012>

Deviations from the dimensions specified in the standard sheets may be made, but only if they provide a technical advantage and do not adversely affect the purpose and safety of the accessories complying with the standard sheets, especially with regard to interchangeability and non-interchangeability.

9 Protection against electric shock

Replacement of this clause of Part 1 or Part 2 by the following:

9.1 The enclosure shall be designed so that live parts are not accessible when in normal use and when parts which can be removed without the aid of a tool have been removed.

Compliance is checked by inspection and, if necessary, by the tests from 9.1.1 to 9.1.3.

9.1.1 *The standard test finger shown in Figure 2 of IEC 60309-1 is applied with a force of 10 N ± 1 N in every possible position. An electrical indicator with a voltage not less than 40 V and not more than 50 V is used to show contact with the relevant part.*

9.1.2 *For elastomeric or thermoplastic enclosures, the following test is made at an ambient temperature of 35°C ± 2°C, the products being at this temperature.*

During this test, the parts of elastomeric or thermoplastic material of the products are subjected for 1 min to a force of 75 N, applied through the tip of a straight unjointed test finger of the same dimensions as the standard test finger. This finger, with an electrical indicator as described above, is applied to all places where yielding of the insulating material could impair the safety of the product.

During this test, the product shall not deform to such an extent that live parts become accessible.

9.1.3 The test probe D of IEC 61032 is applied with a force of $1^{+0,1}_0$ N.

This test does not apply to the components fitted to the product.

The protection is satisfactory if the wire cannot enter the enclosure, or if it enters, it does not touch live parts inside the enclosure.

The test wire is provided with an electrical indicator, with a voltage not less than 40 V and not more than 50 V, to show contact with relevant part.

9.2 Parts providing protection against electric shock shall have adequate mechanical strength and shall be reliably secured by means of screws or in a similar reliable manner so that they will not loosen in normal use.

Compliance is checked by inspection and by the tests of Clauses 24 and 25.

9.3 Knobs, operating levers, push-buttons, rockers and the like, for operating switches in switched socket-outlets or connectors shall be of insulating material, unless their accessible metal parts are separated from the metal parts of the mechanism by double insulation or reinforced insulation, or they are reliably connected to earth.

Compliance is checked by inspection and by the tests of Clauses 19 and 22.

10 Provision for earthing [IEC 60309-4:2006+AMD1:2012 CSV](https://standards.iteh.ai/catalog/standards/sist/dc816330-c1d0-4fad-91d7-78ae491115a0/iec-60309-4-2006amd1-2012-csv)
<https://standards.iteh.ai/catalog/standards/sist/dc816330-c1d0-4fad-91d7-78ae491115a0/iec-60309-4-2006amd1-2012-csv>

This clause of Part 1 or Part 2 is applicable except as follows:

10.1 *Replacement of the first paragraph by the following:*

Products with earthing contact shall be provided with an earthing terminal. Metal-clad fixed products with an internal earthing terminal can, in addition, be provided with an external earthing terminal, which, except for flush type products, shall be visible from the outside.

The earthing terminal of the socket-outlet or connector may be used provided it is easily accessible.

11 Terminals

This clause of Part 1 or Part 2 is applicable.

12 Interlocks, switches and their components

Replacement of this clause of Part 1 or Part 2 by the following:

12.1 Switched socket-outlets or connectors with interlocks shall be so constructed that a plug or appliance inlet cannot be completely withdrawn from the socket-outlet or connector while the contacts of that socket-outlet or connector are live, and the contacts of the socket-outlet or connector cannot be made live until a plug or appliance inlet is in proper engagement. The contacts shall not open or close on load.

A female pilot contact in a switched socket-outlet or connector (interlocked or non-interlocked) may be live when not engaged with a male pilot contact if the female contact is part of a SELV circuit or if it is not accessible with the standard test finger according to Figure 2.

NOTE SELV is defined in IEC 60364-4-41⁴.

Socket-outlets and connectors shall be so designed that, after engagement with a complementary accessory, the interlock operates correctly.

The operation of an interlock shall not be impaired by normal wear of the portion of the plug used for interlocking.

Compliance is checked by carrying out the tests of 12.1.1 or 12.1.2 as applicable after the test of Clause 21.

12.1.1 Switched socket-outlets or connectors with interlock but without latching function (electrical interlock) shall be so constructed that

- the time interval between the opening of the contacts of the control switching device and the opening of the contacts of the main poles shall be sufficient to ensure that the mechanical switching device interrupts the current before the contacts of the plug are disconnected from the contacts of the socket-outlet;
- during the closing operation, the contacts of the control switching device shall close after or simultaneously with the contacts of the main poles.

Compliance is checked by the following test:

For products provided with an actuator, an attempt shall be made, without the plug inserted, to close the switching device by applying a force according to 24.101. The switching device contacts shall not close.

This is checked by a continuity test made between the supply terminals and the contact assembly of the socket-outlet.

The time interval is checked by measuring the time interval between the instant of opening of the contacts of the control switching device and the instant of opening of the contact of the mechanical switching device, under no-load conditions.

For 60/63 A and 100/125 A products complying to Part 2 where the control switching device depends on pilot pin and pilot contact-tube, the time interval shall not be greater than 35 ms.

NOTE The time interval of 35 ms is the ratio between the distances given in the standard sheets, in the worst condition, and the separation speed given in Clauses 20 and 21.

12.1.2 Switched socket-outlets and connector with interlock with latching devices locking the plug or appliance inlet into the socket-outlet or connector (mechanical interlock) shall be so constructed that the interlock is linked with the operation of a switching device so that the plug or appliance inlet can neither be inserted nor withdrawn from the socket-outlet or connector while the contacts of the socket-outlet or connector are live and the contacts of the socket-outlet or connector cannot be made live until a plug is almost completely in engagement.

Compliance is checked by inspection, by a manual test and by the following test:

⁴ IEC 60364-4-41, Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock