

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes –
Part 4: Switched socket-outlets with or without interlock**

**Fiches, socles fixes de prise de courant, prises mobiles et socles de connecteur pour usages industriels –
Partie 4: Socles de prise de courant avec interrupteur, avec ou sans dispositif de verrouillage**



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INTERNATIONAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PLUGS, FIXED OR PORTABLE SOCKET-OUTLETS AND
APPLIANCE INLETS FOR INDUSTRIAL PURPOSES –****Part 4: Switched socket-outlets
with or without interlock**

FOREWORD

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

This second edition cancels and replaces the first edition published in 2006 and Amendment 1:2012. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- updated in order to take into account the technical revisions to IEC 60309-1 and to IEC 60309-2.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
23H/482/FDIS	23H/488/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

This document is to be read in conjunction with IEC 60309-1:2021 and with IEC 60309-2:2021.

In this document, the following print types are used:

- requirements proper: in roman type;
- *test specifications: in italic type;*
- notes: in smaller roman type.

IEC 60309-1:2021 deals with general requirements and comprises all clauses of a general character.

Subsequent parts deal with the requirements of particular types of accessories. The clauses of these particular requirements supplement or modify the corresponding clauses of IEC 60309-1:2021 or of IEC 60309-2:2021.

Clauses, subclauses, figures, tables and notes which are additional to those of IEC 60309-1:2021 or of IEC 60309-2:2021 are numbered starting from 401.

A list of all parts in the IEC 60309 series, published under the general title *Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

PLUGS, FIXED OR PORTABLE SOCKET-OUTLETS AND APPLIANCE INLETS FOR INDUSTRIAL PURPOSES –

Part 4: Switched socket-outlets with or without interlock

1 Scope

Clause 1 of IEC 60309-1:2021 or of IEC 60309-2:2021 applies as follows:

Replace the first two paragraphs by the following:

This part of IEC 60309 applies to self-contained products primarily intended for industrial use, either indoors or outdoors that combine the following items within a single enclosure:

- a fixed or portable socket-outlet according to IEC 60309-1 or IEC 60309-2 with a rated operating voltage not exceeding 1 000 V DC or 1 000 V AC with a frequency not exceeding 500 Hz and a rated current not exceeding 800 A;
- a switching device.

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

These accessories are intended to be installed by instructed persons or skilled persons only.

2 Normative references

[IEC 60309-4:2021](https://standards.iteh.ai/catalog/standards/sist/0a64c303-533e-47b0-8480-b83da94ddedf/iec-60309-4-2021)
standards.iteh.ai/catalog/standards/sist/0a64c303-533e-47b0-8480-b83da94ddedf/iec-60309-4-2021

Clause 2 of IEC 60309-1:2021 applies except as follows:

Additional normative references:

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

IEC 60309-1:2021, *Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes – Part 1: General requirements*

IEC 60309-2:2021, *Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes – Part 2: Dimensional compatibility requirements for pin and contact-tube accessories*

IEC 60617, *Graphical symbols for diagrams* (available at <http://std.iec.ch/iec60617>)

IEC 60947-1:2020, *Low-voltage switchgear and controlgear – Part 1: General rules*

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

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

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

3 Terms and definitions

Clause 3 of IEC 60309-1:2021 or of IEC 60309-2:2021 applies except as follows:

Terms and definitions 3.6 to 3.9 do not apply.

Add the following terms and definitions:

3.401

switched socket-outlet

product (interlocked or non-interlocked) containing in a single enclosure a switching device and a socket-outlet, intended to be used in combination

3.402

interlocked socket-outlet

socket-outlet associated with an interlock

3.403

switching device

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

[SOURCE IEC 60050-441:1984, 441-14-01]

3.403.1

mechanical switching device

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

[SOURCE: IEC 60050-441:1984, 441-14-02, modified – The note has been omitted.]

3.403.1.1

(mechanical) switch

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

Note 1 to entry: A switch may be capable of making, but not breaking short-circuit currents.

[SOURCE: IEC 60050-411:1984, 441-14-10]

3.403.1.2

switch-disconnector

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

[SOURCE: IEC 60050-411:1984, 441-14-12, modified – Reference made to the isolating function instead of to the requirements specified for a disconnector.]

**3.403.1.3
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

[SOURCE: IEC 60050-411:1984, 441-14-33, modified – "mechanical" has been omitted from the term and the note has been deleted.]

**3.403.2
associated switching device**

separate switching device which can be replaced independently

**3.403.3
integral switching device**

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

**3.404
isolation**

disconnection of an installation or its discrete section from any source of the electric energy for purposes of electrical safety

[SOURCE: IEC 60947-1:2020, 3.3.19]

**3.405
utilization category (for a switching device)**

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

Note 1 to entry: The specified requirements may concern e.g. the values of making capacities (if applicable), breaking capacities and other characteristics, the associated circuits and the relevant conditions of use and behaviour.

[SOURCE: IEC 60050-411:1984, 441-17-19, modified – Deletion of "or a fuse" from the domain, and "or the fuse" from the definition.]

**3.406
control circuit device**

electrical device intended for the controlling, signalling, interlocking, etc. of switchgear and controlgear

Note 1 to entry: See IEC 60947-1:2020, 3.4.16.

**3.407
latching device**

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

4 General

Clause 4 of IEC 60309-1:2021 or of IEC 60309-2:2021 applies except as follows:

Additional subclause:

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

5 Standard ratings

Clause 5 of IEC 60309-1:2021 applies for products incorporating socket-outlets according to IEC 60309-1.

Clause 5 of IEC 60309-2:2021 applies with the following addition for products incorporating socket-outlets according to IEC 60309-2:2021.

Add the following at the end of 5.201:

For switched socket-outlets with or without interlock according to 6.401, the whole unit can have a different degree of protection but not lower than IP44 (see also 8.1).

6 Classification of accessories

Clause 6 of IEC 60309-1:2021 or of IEC 60309-2:2021 applies except as follows:

6.1 Replacement:

According to purpose:

- fixed socket-outlets,
- portable socket-outlets.

6.5 Not applicable.

Additional subclauses:

IEC 60309-4:2021

<https://standards.iteh.ai/catalog/standards/sist/0a64c303-533e-47b0-8480-18249411c1ff/iec-60309-4:2021>

6.401 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.

6.402 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.

6.403 According to the mechanical switching device:

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

6.404 According to suitability for isolation of the switching device:

- suitable for isolation;
- not suitable for isolation.

6.405 According to whether the interlock system has a latching device:

- with latching device (mechanical interlock);

- without latching device (electrical interlock).

6.406 According to the presence of a protective device:

- with protective device;
- without protective device.







7 Marking

Clause 7 of IEC 60309-1:2021 or of IEC 60309-2:2021 applies except as follows:

7.1 Add the following items to the list:

- indication of the open and closed position of the switching device for products with isolating function according to 6.404;
- indication of the type of switching device.

7.2 Add the following to the existing list of symbols:

Open position		and/or	OFF
IEC 60417-5008 (2002-10) iTeh STANDARD PREVIEW (standards.iteh.ai)			
Closed position		and/or	ON
IEC 60309-4:2021 https://standards.iteh.ai/catalog/standards/sist/0a64c303-533e-47b0-8480-b83da2c2e110/iec-60309-4-2021 IEC 60417-5007 (2002-10)			
Switch a)b)		or	
Switch-disconnector a)b)			
Contactor a)b)			
Other devices ^{a)}	According to their relevant standard		
a) Graphical symbol may appear in a vertical or horizontal orientation. b) In the absence of symbols for marking on equipment, symbols for diagrams according to IEC 60617 are used.			

7.4 Not applicable.

7.5 Replacement:

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

The earth terminal, if any, shall be marked ⏏ (preferred) IEC 60417-5019 (2006-08) or \perp IEC 60417-5017 (2006-08).

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.

Additional marking to indicate neutral terminal and/or earthing terminal may be used as follows:

- letter W and/or white colour for neutral;
- letter G and/or green colour for earthing.

No marking is required for terminals for pilot conductors. In the event that they are marked, it is recommended to use the marking P or PILOT.

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.

Additional subclauses:

7.401 The position (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.

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

8 Dimensions

Clause 8 of IEC 60309-1:2021 applies for products incorporating socket-outlets according to IEC 60309-1.

Clause 8 of IEC 60309-2:2021 applies with the following addition for products incorporating socket-outlets according to IEC 60309-2:

8.1 *Add the following after the first paragraph:*

Switched socket-outlets according to 6.401 with degree of protection higher than IP44 and different from IP67, shall use socket-outlets that comply with construction as stated in standard sheet 2-I (continuation 2) or 2-III (continuation 2) or 2-VIII (continuation 2).

9 Protection against electric shock

Replacement of Clause 9 of IEC 60309-1:2021 or of IEC 60309-2:2021 by the following:

9.1

9.1.1 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 of 9.1.2 to 9.1.4.

9.1.2 *The standard test finger according to IEC 61032, Probe B 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.*

9.1.3 *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.

9.1.4 *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 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 the relevant part.

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

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 Clause 24 and Clause 25.

9.3 Knobs, operating levers, push-buttons, rockers and the like, for operating switches in switched socket-outlets 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 Clause 19 and Clause 22.

10 Provision for earthing

Clause 10 of IEC 60309-1:2021 or of IEC 60309-2:2021 applies except as follows:

10.1 *Replace 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 may be used provided it is easily accessible.

11 Terminals and terminations

Clause 11 of IEC 60309-1:2021 or of IEC 60309-2:2021 applies.

12 Interlocks

Replace Clause 12 of IEC 60309-1:2021 or of IEC 60309-2:2021 by the following:

12 Interlocks, switches and their components

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

A pilot contact in a switched socket-outlet (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 IEC 61032, Probe B.

NOTE SELV is defined in IEC 60364-4-41¹.

Socket-outlets 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 or appliance inlet used for interlocking.

Compliance is checked by carrying out the tests of 12.2 or 12.3 as applicable after the test of Clause 21.

12.2 Switched socket-outlets 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 ensure that the mechanical switching device interrupts the current before the contacts of the plug or appliance inlet are disconnected from the contacts of the socket-outlet;
- during the closing operation, the contacts of the control switching device or the pilot contact shall close after or simultaneously with the power contacts.

¹ IEC 60364-4-41, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

Compliance is checked by the following test:

For products provided with an actuator, an attempt shall be made, without the complementary accessory inserted, to close the mechanical switching device by applying a force according to 24.401. The contacts of the mechanical switching device 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 contact(s) of the control switching device or pilot contacts 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 with IEC 60309-2 where the control switching device depends on the 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 conditions and the separation speed given in Clause 20 and Clause 21.

12.3 Switched socket-outlets with interlock with latching devices locking the plug or appliance inlet into the socket-outlet (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 while the contacts of the socket-outlet are live and the contacts of the socket-outlet cannot be made live until a plug is almost completely in engagement.

(standards.iteh.ai)

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

[IEC 60309-4:2021](https://standards.iteh.ai/catalog/standards/sist/0a64c303-533e-47b0-8480-b83da94ddcd/iec-60309-4-2021)

Products with interlock and latching devices, which hold the plug into the socket-outlet, are subjected to the following test:

Without the complementary accessory inserted, an attempt shall be made to close the mechanical switching device by applying a force according to 24.401. The contacts of the mechanical switching device shall not close.

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

The switched socket-outlet with interlock is fixed to the support of an apparatus as shown in Figure 401 so that the axis of separation is vertical, and the movement of the plug is downwards. With the latching device(s) holding the test plug into the socket-outlet in the engaged position, an axial pull is applied to an appropriate test plug inserted in the switched socket-outlet with interlock. The test plug, according to the relevant standard sheets, shall have finely ground contacts of hardened steel, having a surface roughness not exceeding 0,8 µm over their active length and spaced at the nominal distances, with a tolerance of ±0,05 mm.

The dimension of the test plug contacts or the distance between contact surfaces for other types of plug contacts shall be in accordance with the minimum dimension(s) given in the relevant standard sheets, with a tolerance of $^{+0,01}_0$ mm.

The test plug contacts are wiped free from grease before test.