

Installation couplers intended for permanent connection in fixed installations

ICS 29.120.30

National foreword

This British Standard is the English language version of IEC 23/337/FDIS. Although the voting failed on this FDIS and the equivalent CENELEC document, CENELEC BT Decision D118/040 allowed UK to publish an identical national standard which will be aligned with any future EN/HD.

The UK committee voted in favour of 23/337/FDIS and is of the opinion that the level of protection in the UK, under normal use, is more than adequate. However, the UK committee believe the references to “installation plugs” (3.5.1) and “installation sockets” (3.5.2) should refer to “installation female connectors” and “installation male connectors”. This is because connectors for permanent connection are manifestly not intended for frequent connection and disconnection, or connection and disconnection on load, and are therefore not suitable for use as plugs and socket outlets as defined, for example, in BS 1363.

Installation couplers are not intended to be used in place of luminaire supporting couplers (BS 6972), ceiling roses (BS 67), fused connection units (BS 1363-4) or on load connecting devices to BS 5733.

The UK participation in its preparation was entrusted to Technical Committee PEL/23, Electrical accessories.

A list of organizations represented on PEL/23 can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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Title

IEC 61535 Ed.1: Installation couplers intended for permanent connection in fixed installations

Titre

CEI 61535 Ed.1 : Couplers d'installation pour connexions permanentes dans des installations fixes**ATTENTION
VOTE PARALLÈLE
CEI – CENELEC**

L'attention des Comités nationaux de la CEI, membres du CENELEC, est attirée sur le fait que ce projet final de Norme internationale est soumis au vote parallèle. Un bulletin de vote séparé pour le vote CENELEC leur sera envoyé par le Secrétariat Central du CENELEC.

**ATTENTION
IEC – CENELEC
PARALLEL VOTING**

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this final Draft International Standard (DIS) is submitted for parallel voting. A separate form for CENELEC voting will be sent to them by the CENELEC Central Secretariat.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INSTALLATION COUPLERS INTENDED FOR PERMANENT CONNECTION
IN FIXED INSTALLATIONS**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61535 has been prepared by IEC technical committee 23: Electrical accessories.

The text of this standard is based on the following documents:

FDIS	Report on voting
23/XX/FDIS	23/XX/RVD

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

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

In this standard the following print types are used:

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

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

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

INSTALLATION COUPLERS INTENDED FOR PERMANENT CONNECTION IN FIXED INSTALLATIONS

1 Scope

This International Standard applies to two- up to five-wire installation couplers with or without earthing contact and with a rated voltage up to and including AC 500 V and a rated connecting capacity up to and including 10 mm² for permanent connection in indoor installation systems according to IEC 60364.

Installation couplers with additional contacts for voltages other than mains voltages are outside the scope of this standard.

NOTE 1 Installation couplers according to this standard are used e.g. in prefabricated houses, installation cavities, such as suspended floors and ceilings, or cable tray systems, cable ladder systems, cable ducting systems and cable trunking systems, or in commercial show rooms, in partition walls and in any similar application.

NOTE 2 This standard may be used as a guide for installation couplers with additional contacts for voltages other than mains voltages.

An installation coupler consists of one installation socket and one installation plug designed by the manufacturer to be connected together forming a given system according to this standard.

Installation couplers are provided with retaining means and they are intended for connection and disconnection without load.

Installation couplers shall not be used to replace socket-outlet systems.

Installation couplers complying with this standard are suitable for use at ambient temperatures from –5 °C to 40 °C (conditions AA4 of IEC 60364-5-51).

In locations where special conditions prevail, as in ships, vehicles and the like and in hazardous locations, for example where explosions are liable to occur, special constructions may be required.

NOTE 3 A guidance for the use of installation couplers is given in Annex C.

NOTE 4 Particular requirements for installation couplers e.g. for higher ambient temperatures, for fair stands, with higher mechanical durability (e.g. metal housings) and similar applications, with higher fire resistance and installation couplers for control circuits (e.g. SELV) should be covered in future parts of this standard.

NOTE 5 National requirements may have requirements concerning the accessibility of installation couplers.

NOTE 6 National rules specify who is allowed to carry out the connection and disconnection of installation couplers.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-32:1975, *Environmental testing – Part 2: Tests. Test Ed: Free fall*
Amendment 2 (1990)

IEC 60112:2003, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60309 (all parts), *Plugs, socket-outlets and couplers for industrial purposes*

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

IEC 60364 (all parts), *Electrical installations of buildings*

IEC 60364-5-51:2001, *Electrical installations of buildings – Part 5-51: Selection and erection of electrical equipment – Common rules*

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

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

IEC 60695-2-11:2000, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test methods for end-products*

IEC 60906 (all parts), *IEC system of plugs and socket-outlets for household and similar purposes*

IEC 60998-2-3:2002, *Connecting devices for low voltage circuits for household and similar purposes – Part 2-3: Particular requirements for connecting devices as separate entities with insulation piercing clamping units*

IEC 60999-1:1999, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for conductors from 0,2 mm² up to 35 mm² (included)*

IEC 61032:1997, *Protection of persons and equipment by enclosures – Probes for verification*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

NOTE Where the terms "voltage" and "current" are used in this standard, they are r.m.s. values, unless otherwise specified.

3.1

rated voltage

voltage assigned to the installation coupler by the manufacturer

3.2

rated current

maximum current assigned to the installation coupler by the manufacturer

NOTE Rated current refers to the installation coupler itself and not to an electric circuit.

3.3

rated connecting capacity

cross-sectional area of the largest conductor(s) to be connected as stated by the manufacturer of the installation coupler

3.4

permanent connection

connecting method in an installation which is only opened for maintenance or in system reconfiguration

NOTE The expression "permanent connection" is understood as a connection which is maintained as long as an installation exists.

3.5

installation coupler

connecting device consisting of an installation socket and an installation plug for permanent connection not intended to be engaged or disengaged under load nor to be engaged or disengaged other than during first installation, during maintenance or during re-configuration of the installation

3.5.1

installation plug

load side portion of an installation coupler which contains the pin contacts

3.5.2

installation socket

supply side portion of an installation coupler which contains the socket contacts

3.6

rewirable installation coupler

installation coupler so constructed that the cable can be replaced

3.7

non-rewirable installation coupler

installation coupler so constructed that it forms a complete unit with the cable after connection and assembly by the manufacturer

NOTE See also 12.15.

3.7.1

non-rewirable moulded-on installation coupler

installation coupler so constructed that the contacts, terminals or connections and the attached cable end are surrounded by insulating material manufactured by a moulding process

3.7.2

non-rewirable non-moulded-on installation coupler

installation coupler so constructed that the contacts, terminals or connections and the attached cable end are surrounded by separate parts of insulating material

3.8

distribution block

device, which is intended for branching of circuit

3.9

retaining means

arrangement by which an installation socket and an installation plug are held in position when they are properly engaged, and which prevents unintentional disengagement

NOTE The disengagement may be made by hand or by tool.

3.10**cap**

removable barrier to prevent ready accessibility to unused installation sockets

3.11**routine test**

test to which each device is subjected during and/or after manufacture to ascertain whether it complies with certain criteria

[IEV 151-16-17, modified]

3.12**type test**

test of one or more devices made to a certain design to show that the design meets certain requirements

[IEV 151-16-16, modified]

3.13**readily accessible**

zone of accessibility to touch extending from any point on a surface where persons usually stand or move about to the limits which a person can reach with the hand, in any direction without assistance

[IEV 195-06-12, modified]

4 General requirements

Installation couplers shall be so designed and constructed that, in normal use, their performance is reliable and without danger to the user or damage to the surroundings.

Compliance is checked by carrying out all the relevant tests specified.

5 General notes on tests

5.1 Tests shall be carried out to check compliance with the relevant requirements of this standard.

Tests are as follows:

- type tests shall be made on representative specimens of each type of installation coupler;
- routine tests shall be made on each installation coupler as required in this standard.

Tests of 5.2 to 5.6 are applicable to type tests and 5.7 to routine tests.

5.2 Unless otherwise specified, the tests shall be carried out on specimens as delivered and under conditions of normal use at an ambient temperature between 15 °C and 35 °C.

Where the value of the temperature is of importance, the test shall be carried out at 23 °C ± 5 °C.

5.3 For testing purposes non-rewirable installation couplers shall be provided with cables of at least one meter length if not otherwise specified in this standard.

5.4 If not otherwise specified in this standard, the tests shall be carried out in the order of the clauses. Installation plugs, caps, installation sockets and distribution blocks shall be tested in connection with their matching counterparts complying with this standard.

5.5 Three specimens shall be subjected to all tests with the exception of the tests of 12.3, clause 18, 21.3, 21.4, 21.4.1 and 21.4.2.

For the tests of 12.3 and 21.3 three additional specimens are needed.

For installation couplers with housings of elastomeric material, two additional specimens are necessary, and these shall be subjected to the tests of 18 and 21.4.1.

For installation couplers with housings of thermoplastic material, two additional specimens shall be subjected to the test of clause 18 and 21.4.2.

5.6 Specimens are deemed not to comply with this standard, if there is more than one specimen failure in any one of the tests.

If one specimen fails in a test, that test, and those preceding, which may have influenced the result of that test, are repeated on another set of specimens of the number specified in 5.5, all of which shall then comply with the repeated tests.

NOTE The applicant may submit, together with the number of specimens specified in 5.5, the additional set of specimens which may be required should one specimen fail. The testing station will then, without further request, test additional specimens and will reject only if a further failure occurs. If the additional set of specimens is not submitted at the same time, the failure of one specimen will entail rejection.

5.7 Routine tests for non-rewirable installation couplers are specified in Annex A.

6 Ratings

6.1 Installation couplers shall preferably have a rated voltage chosen from Table 1.

Installation couplers of the same system shall have the same phase to neutral rating.

Table 1 – Voltage rating for installation couplers

Nominal voltage of power supply system V	Rated voltage V	Rated impulse voltage kV
100	125	2,5
100/200	125/250	2,5
230	250	4
230/400	250/400	4
277/480	320/500	4

6.2 Installation couplers shall have a rated current chosen among the following values:

- 10 A
- 16 A
- 20 A
- 25 A
- 32 A

6.3 The preferred values for rated connecting capacities are 1,5 mm², 2,5 mm², 4 mm², 6 mm², 10 mm².

Compliance of 6.1, 6.2 and 6.3 is checked by inspection of markings according to Clause 8.

7 Classification

Installation couplers are classified:

7.1 According to the rated impulse voltage:

7.1.1 to a rated impulse voltage of 2,5 kV;

7.1.2 to a rated impulse voltage of 4 kV.

7.2 According to the method of connecting the cable:

7.2.1 rewirable installation couplers;

7.2.2 non-rewirable installation couplers.

7.3 According to the degree of protection against ingress of foreign solid objects and ingress of water according IEC 60529 (IP code).

7.4 According to where installation couplers will be installed:

7.4.1 readily accessible installation couplers;

7.4.2 non-readily accessible installation couplers.

NOTE 1 Installation couplers for readily accessible areas can also be used in non-readily accessible areas.

7.5 According to existence of an earthing contact:

7.5.1 installation couplers with earthing contact;

7.5.2 installation couplers without earthing contact.

7.6 According to the type of conductor to be connected:

7.6.1 rigid (solid or stranded) conductor only;

7.6.2 flexible conductor only;

7.6.3 both rigid (solid and stranded) and flexible conductors.

7.7 According to the type of terminals:

7.7.1 installation couplers with screw-type terminals;

7.7.2 installation couplers with screwless terminals.

8 Marking and documentation

8.1 Installation couplers shall be marked with

a) rated current as follows:

- max. 10 A,
- max. 16 A,
- max. 20 A,
- max. 25 A, or
- max. 32 A;

b) rated voltage in volts;

c) the rated connecting capacity for rewirable installation coupler in mm²;

d) the connected conductor size in mm² for non-rewirable installation coupler;

e) manufacturer's or responsible vendor's name, trade mark or identification mark;

f) IP code if higher than IP21;

g) type reference.

8.2 When symbols are used, they shall be as follows:

Volts	V
Alternating current	~
Neutral	N
Earth	
Rated connecting capacity in square millimetres	mm ² or □

8.3 Markings of the installation coupler according to items 8.1 a) to e) shall be readily visible after engagement of the installation coupler.

8.4 Terminal markings shall be L1, L2, L3 or 1, 2, 3, 4 or equivalent. Earthing terminals shall be marked with the symbol . Neutral terminals shall be marked with N. These markings shall not be placed on screws, removable washers or any other easily removable parts.

If terminals are designed to accept only one type of conductor, e.g. flexible, or rigid (stranded or solid), this shall either be clearly marked on the installation coupler by the letter "f" for flexible or "r" for rigid or "s" for solid, respectively or shall be indicated on the smallest packaging unit or in the technical information and catalogue.

8.5 Markings shall be durable and easily legible.

Compliance is checked by inspection and by the following test:

The marking is rubbed by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit.

NOTE Petroleum spirit is defined as an aliphatic solvent hexane with a content of aromatics of maximum 0,1 volume percentage, a kauri-butanol value of 29, an initial boiling point of approximately 65 °C, a dry-point of approximately 69 °C and a density of approximately 0,68 g/cm³.

Markings made by impression, moulding, pressing or engraving or the alike are not subjected to this test.

8.6 The manufacturer shall declare in his installation instructions

- a) the types of cables which are intended to be fitted in the installation couplers;
- b) if the installation coupler is not suitable for installation in readily accessible areas;
- c) if additional parts or precautions are necessary for use in readily accessible areas;
- d) the length of slack of a PE-conductor for rewirable installation couplers;
- e) that there is no dangerous interchangeability with systems specified in standard sheets of IEC 60309, IEC 60320 and IEC 60906 and with the declared national domestic plug and socket-outlet systems.

The manufacturer's catalogue and installation instructions shall contain

- f) a warning advising the installer that the dangerous compatibility between different manufacturer installation coupler system is not automatically prevented by compliance with IEC 61535;
- g) a statement that installation coupler systems are not replacements for the national domestic plug and socket outlet-system.

If looping-in is intended, wiring instructions shall be specified in the manufacturer's technical documentation.

The installation instructions shall be available in the manufacturer's catalogue, in the technical documentation or in or on the smallest packaging unit.

9 Dangerous compatibility

9.1 Installation couplers within the given system shall be designed and constructed so that unintended or improper connection is prevented.

NOTE Unintended or improper connections include single-pole connection, except earth-to-earth connection.

Compliance is checked by inspection and the following test.

It shall not be possible to insert the installation plug into the installation socket resulting in a dangerous situation.

Engagement of the installation plug and installation socket is attempted in any unintended configuration using a force of 80 N for installation couplers marked as "max 10 A", "max 16 A" and "max 20 A" or 120 N for installation couplers marked as max 25 A and max 32 A. The force shall be applied for 1 min during which time the installation plug and installation socket contacts shall not engage.

Where the use of elastomeric or thermoplastic material is likely to influence the results of the test, it shall be carried out at an ambient temperature of $35\text{ °C} \pm 2\text{ °C}$, all parts of the installation coupler being at this temperature.

During the test no contact shall occur.

9.2 It shall not be possible, within a given system, to engage an installation plug with:

- an installation socket with a different number of live poles; exceptions may be admitted for installation sockets which are specially constructed for the purpose of allowing engagement with installation plugs of a lower number of poles, provided that no dangerous situation can arise;

- an installation socket without earthing contact, if the installation plug is an installation plug with earthing contact;
- an installation socket with different phase to neutral voltage ratings.

Compliance is checked by the test according to 9.1.

9.3 Installation couplers of different systems from the same manufacturer shall not be dangerously compatible.

Compliance is checked by the test according to 9.1.

9.4 Installation couplers according to this standard shall not be compatible with systems specified in standard sheets of IEC 60309, IEC 60320 and IEC 60906 and with the national domestic plug and socket-outlet systems of the country where the product is placed on the market.

NOTE Some national plug and socket-outlet systems are shown in IEC 60083.

Compliance is checked by manual test and in case of doubt by examination of drawings.

10 Protection against electric shock

10.1 An engaged installation coupler shall comply with the requirements for IP2XC. The installation coupler shall be so designed that live parts are not accessible if the installation plug and installation socket are partially, or completely, engaged. The installation socket shall be so designed that live parts are not accessible when disengaged and shall comply with the requirements for IP2X. The earthing contact and any metal parts connected to the earthing contact shall not be accessible when the installation coupler is completely engaged.

Installation couplers for use in readily accessible areas shall comply with IP4X both engaged and unengaged.

If the engagement face of the installation socket for readily accessible areas does not comply with IP4X the manufacturer shall make caps available. These caps shall only be removable with the aid of a tool.

Compliance is checked after the removal of parts which can be removed without the use of a tool by using the test probe B according to Figure 2 of IEC 61032, the test probe C according to Figure 3 of IEC 61032, the test probe D according to Figure 4 of IEC 61032 and the test probe 11 according to Figure 7 of IEC 61032 respectively.

Test probe B is applied in every possible position, an electrical indicator being used to show contact with the relevant parts. For installation couplers with enclosures or bodies of elastomeric or thermoplastic material, test probe 11 is applied for 1 min with a force of 75 N at all points where yielding of the insulating material could impair the safety of the connector; this test is made at an ambient temperature of 35 °C ± 2 °C.

Test probe C is pushed against any opening of the enclosure with the force of 3 N when the installation coupler is completely engaged. If it partly or fully penetrates, it is placed in every possible position, but the stop face shall not fully pass through the opening.