BS 8488:2009+A1:2010

Incorporating Corrigendum No. 1

BSI Standards Publication

Prefabricated wiring systems intended for permanent connection in fixed installations – Specification

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Date	Text affected
November 2010	A1, see foreword
December 2010	C1, correction to **5.1.1**b)

Contents

Summary of pages
This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 22, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI and came into effect on 28 February 2009. It was prepared by Technical Committee PEL/23, *Electrical accessories*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS 8488-1:2009, which is withdrawn.

Information about this document

The start and finish of text introduced or altered by Amendment No. 1 is indicated in the text by tags [A1] 〈A1〉. Minor editorial changes are not tagged.

Amendment A1 introduces the following principal changes:

- the addition of requirements on how rated current is to be assigned and marked on prefabricated wiring systems;
- additional documentation to be supplied with each prefabricated wiring section;
- the specification of the maximum operating temperature of the wiring system;
- the addition of requirements for connection to the low voltage switchgear and controlgear assembly;
- the addition of requirements for an assembly containing couplers.

The start and finish of text introduced or altered by Corrigendum No. 1 is indicated in the text by tags [C1] 〈C1〉.

Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

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.

1 Scope

This British Standard specifies safety requirements, together with associated tests, for prefabricated wiring systems incorporating installation couplers conforming to [A1] BS EN 61535 [A1] with a rated voltage up to and including 500 V a.c. [A1] and a maximum operating temperature not exceeding 70 °C [A1] for permanent connection in fixed installations. [A1] Prefabricated wiring systems are intended to be installed by instructed or skilled persons, including the connection and disconnection of installation couplers. [A1]

This British Standard includes tests to be conducted as part of the manufacturing process.

[A1] *Text deleted.* [A1]

NOTE 1 Prefabricated wiring systems are typically used in prefabricated houses, installation cavities (such as suspended floors and ceilings), cable tray systems, cable ladder systems, cable ducting systems, cable trunking systems, commercial showrooms, partition walls and in similar applications.

NOTE 2 In locations where special conditions prevail, additional requirements might apply, e.g. accessible areas might require IP4X connectors.

NOTE 3 A guide to use is provided in Annex A.

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.

[A1] BS 5733:2010, *Specification for general requirements for electrical accessories* [A1]

[A1] BS 7671:2008, *Requirements for electrical installations – IEE Wiring Regulations – Seventeenth edition* [A1]

[A1] BS EN 60439-1, *Low-voltage switchgear and controlgear assemblies – Part 1: Type tested and partially type-tested assemblies* [A1]

[A1] BS EN 60439-2, *Low-voltage switchgear and controlgear assemblies – Part 2: Particular requirements for busbar trunking systems (busways)* [A1]

[A1] BS EN 60439-3, *Low-voltage switchgear and controlgear assemblies – Part 3: Particular requirements for low-voltage switchgear and controlgear assemblies intended to be installed in places where unskilled persons have access to their use – Distribution boards* [A1]

[A1] BS EN 60439-4, *Low-voltage switchgear and controlgear assemblies – Part 4: Particular requirements for assemblies for construction sites (ACS)* [A1]

[A1] BS EN 60439-5, *Low-voltage switchgear and controlgear assemblies – Part 5: Particular requirements for assemblies for power distribution in public networks* [A1]

BS EN 60529:1992+A2:2000, *Degrees of protection provided by enclosures (IP code)*

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

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

〉A1〈 BS EN 61439-1, *Low-voltage switchgear and controlgear assemblies – Part 1: General rules* 〉A1〈

〉A1〈 BS EN 61439-2, *Low-voltage switchgear and controlgear assemblies – Part 2: Power switchgear and controlgear assemblies* 〉A1〈

〉A1〈 BS EN 61534-1, *Powertrack systems – Part 1: General requirements* 〉A1〈

〉A1〈 BS EN 61534-21, *Powertrack systems – Part 21: Particular requirements for powertrack systems intended for wall and ceiling mounting* 〉A1〈

〉A1〈 BS EN 61534-22, *Powertrack systems – Part 22: Particular requirements for powertrack systems intended for on floor or under floor installation* 〉A1〈

〉A1〈 BS EN 61535:2009, *Installation couplers intended for permanent connection in fixed installations* 〉A1〈

〉A1〈 BS EN 61984, *Connectors – Safety requirements and tests* 〉A1〈

3 Terms and definitions

For the purpose of this British Standard, the following terms and definitions apply; other definitions related to installation couplers are to be found in 〉A1〈 BS EN 61535 〉A1〈.

3.1 〉A1〈 assembly containing couplers
enclosure containing one or more installation couplers 〉A1〈

3.2 basic insulation
insulation applied to live parts to provide basic protection and which does not necessarily include insulation used exclusively for functional purposes

[BS 7671:2008]

3.3 by hand
not requiring the use of a tool

3.4 installation coupler
connecting device consisting of an installation female connector and an installation male connector 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 installation female connector
supply side portion of an installation coupler which contains the receptacle contacts designed to accommodate the male connector

3.6 installation male connector
load side portion of an installation coupler which contains the pin contacts and is to be inserted into the female connector

3.7 〉A1〈 instructed person
person adequately advised or supervised by skilled persons to enable him/her to avoid dangers which electricity can create 〉A1〈

3.8 mains voltage
voltage exceeding 50 V but not exceeding 1 000 V a.c. between conductors, or 600 V a.c. between conductors and earth

NOTE The actual voltage of an installation may differ from the nominal value by a quantity within normal tolerances.

3.9 metal encased prefabricated wiring system
prefabricated wiring system with metal encasement to provide mechanical protection

3.10 prefabricated wiring system
wiring system consisting of wiring sections incorporating the means of inter-connection designed to allow sections to be connected together forming a given system

3.11 rated current
maximum current assigned to each individual section of the prefabricated wiring system by the manufacturer

*NOTE See **5.1.1**b).*

3.12 rated maximum ambient temperature (t_a)
temperature assigned to a prefabricated wiring system by the manufacturer to indicate the highest sustained temperature in which the system may be operated

NOTE 1 This does not preclude temporary operation at a temperature not exceeding (t_a + 10) °C.

NOTE 2 De-rating factors based on BS 7671 might be appropriate.

3.13 rated voltage
voltage or voltages assigned to the prefabricated wiring system by the manufacturer

3.14 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 their hand, in any direction, without assistance

[BS IEC 60050-195:1998, 06-12, modified]

3.15 routine test
test to which each device is subjected during and/or after manufacture to ascertain whether it conforms to certain criteria

3.16 〈A1〉 skilled person
person with technical knowledge or sufficient experience to enable him/her to avoid dangers which electricity can create 〈A1〉

3.17 terminal
that part of a prefabricated wiring section or metal encasement which is necessary to make electrical connection to a conductor

3.18 type test
test or series of tests made on a type test sample, for the purpose of checking conformity of the design of a given product with the requirements of the relevant standard

3.19 type test sample
sample consisting of one or more similar units submitted by the manufacturer or the responsible vendor for the purpose of a type test

4 Classification

4.1 Classification according to rated voltage

Prefabricated wiring systems shall be classified according to the rated voltage, which shall be not greater than 500 V a.c.

4.2 Classification according to rated current

Prefabricated wiring systems shall be classified according to the rated current of one of the following values:

- 6 A a.c.;
- 10 A a.c.;
- 16 A a.c.;
- 20 A a.c.;
- 25 A a.c.;
- 32 A a.c.;
- 40 A a.c.;
- 63 A a.c.;
- 80 A a.c.;
- 100 A a.c.

4.3 Classification according to the degree of protection against ingress of solid objects, dust and moisture

Prefabricated wiring systems shall be classified according to the degree of protection against ingress of solid objects, dust and moisture, which shall be not less than IP 2X.

5 Marking and documentation

5.1 Marking on wiring sections

5.1.1 When tested in accordance with **C.1**, the following information shall be distinctly and durably marked on each individual section and shall be easily discernible during installation, maintenance or re-configuration of the installation of the wiring system.

a) Mark of origin (this may take the form of a trade mark, the manufacturer's identification mark or name of responsible vendor).

b) Rated current (A) and corresponding reference method from BS 7671:2008, Table 4A2.

The current shall be assigned according to a reference method defined by the manufacturer from BS 7671:2008, Table 4A2. The rated current and cross-sectional area of the wiring section conductors shall be determined on the following basis:

1) the number of loaded cores defined by the manufacturer. A loaded core is where the conductor carries more than 30% of its rating, after applying the rating factor for the total number of current carrying cores;

2) not being grouped with other wiring systems or cables;

3) not being in contact with thermal insulation;

4) the ambient temperature not exceeding 30 °C;

5) the frequency of operating being not greater than 61 Hz.

NOTE 1 The required current-carrying capacity of a system section should be determined by the system designer by applying rating factors for the specific installation conditions. This current carrying capacity may be different from the rated current.

[C1] The rated current and reference method shall be marked in one of the following ways:

- X A BS 7671:2008, Table 4A2, reference method X; or
- X A
  BS 7671:2008, Table 4A2, reference method X

NOTE 2 i.e. The marking can be on one line, or the rated current can be on a separate line above the reference method. For example, if the rated current is 32 A for reference method B, the marking would be as follows:

- *32 A BS 7671:2008, Table 4A2, reference method B; or*
- *32 A*
  BS 7671:2008, Table 4A2, reference method B [C1] [A1]

c) Rated voltage (V).

d) IP code if higher than IP 20.

e) Manufacturer's model number or type reference.

f) Unique manufacturing batch reference that provides traceability.

g) Electrical test status when the test requirements in Annex B have been satisfactorily met.

5.1.2 Markings in accordance with **5.1.2** a) shall be distinctly and durably marked on each individual section or marked on individual system components.

Markings in accordance with **5.1.2** b) and c) shall be distinctly and durably marked on each individual section or alternatively be included in the manufacturer's instructions and/or literature.

a) Marking of earth terminals and terminations with earth symbol.

b) Notice warning that prefabricated wiring systems manufactured to this standard by different manufacturers might not be compatible nor safely inter-connectable.

c) Details of internal connections to be made available for each type reference (including cable identification colours).

5.1.3 The durability of markings made by impression, moulding, pressing or engraving or the like shall be deemed to conform without test.

5.2 [A1] Additional documentation [A1]

[A1] In addition to the markings specified in **5.1**, the following details, if they are necessary to ensure safe use and maintenance, shall be provided with each prefabricated wiring section:

a) instructions for safe use (e.g. readily accessible areas);

b) system design information, validating conformity with BS 7671. The information can be a system design and not provided with each wiring section;

c) information required to facilitate inspection and testing for conformity with BS 7671. The information can be for the complete system and not provided with each wiring section.

The manufacturer shall also provide details of whether any or all of the connections within the prefabricated wiring system are classified according to BS 5733:2010, Clause **4**i), and the following installation information.

1) Connections conforming to BS 8488+A1 and classified according to BS 5733:2010, Clause **4**i), are considered to be maintenance free and do not need to be accessible for inspection, testing and maintenance.

2) Connections conforming only to BS 8488+A1 need to be accessible for inspection, testing and maintenance. ⟨A1⟩

6 Construction

6.1 General

Where not otherwise specified, individual components used within prefabricated wiring systems shall conform to their relevant standards.

6.2 Installation couplers

6.2.1 Installation couplers of prefabricated wiring systems shall not be used in place of socket-outlet systems and are not intended to be used in place of:

- luminaire supporting couplers (BS 6972);
- devices for connecting luminaires (DCLs) (BS EN 61995);
- ceiling roses (BS 67);
- fused connection units (BS 1363-4);
- on load connecting devices to BS 5733.

6.2.2 Prefabricated wiring systems shall incorporate installation couplers that conform to ⟨A1⟩ BS EN 61535 ⟨A1⟩. Where prefabricated wiring systems incorporate installation couplers with more than 5 pins, the installation coupler shall be considered to conform to ⟨A1⟩ BS EN 61535 ⟨A1⟩ for the purpose of this standard and shall be tested in such a way that all of the mains voltage pins are subjected to the same level of testing.

6.2.3 Prefabricated wiring systems shall incorporate installation couplers that have terminal connections suitable for the cable conductor size.

6.2.4 Prefabricated wiring systems shall incorporate installation couplers with a voltage rating and current rating of not less than the rating of the prefabricated wiring system.

6.3 Connectable conductors

Prefabricated wiring systems shall provide a means of connection to the supply or other equipment by either a suitable connector or a lead with free ends.

7 Wiring systems

7.1 Supply connection and other wiring

7.1.1 The cross-sectional area of the cable conductors shall be compatible with the rated current of the wiring system.

7.1.2 Only cable manufactured in accordance with or conforming to a BS or BS EN shall be used for the wiring of a prefabricated wiring system.

7.1.3 Cable with identification colours green-and-yellow shall be used for earth connections (circuit protective conductors) only.

7.1.4 When checked by visual inspection and tested in accordance with the continuity tests in **C.2**, prefabricated wiring systems shall be so constructed that electrical connection shall be permanently and reliably connected from the supply connection to the final connector of the system.

7.2 Maximum operating temperature of the wiring system

The maximum operating temperature of the prefabricated wiring system shall not exceed 70 °C.

7.3 Connection to a low voltage (LV) switchgear and controlgear assembly

A wiring system comprising a number of circuits connected to separate overcurrent protection shall emanate from an LV switchgear and controlgear assembly, which shall conform to the relevant part of BS EN 60439, BS EN 61439 or BS EN 61534.

Where the LV switchgear and controlgear assembly contains the wiring system overcurrent protection, the connector to the LV switchgear and controlgear assembly shall conform to BS EN 61984 and the installation coupler to the LV switchgear and controlgear assembly shall conform to BS EN 61535.

7.4 An assembly containing couplers intended for through connection

Where a wiring system comprising a number of circuits connected to separate overcurrent protection terminates at an assembly containing couplers that are intended for through connection of the separate circuits, the assembly containing couplers shall conform as follows.

a) Where the sum of all the coupler rated currents on the assembly containing the couplers does not exceed 63 A and the circuits are connected to the same supply phase, the assembly of couplers shall conform to BS 5733 or the relevant part of BS EN 60439, BS EN 61439 or BS EN 61534.

b) Where the sum of all the coupler rated currents on the assembly does not exceed 63 A and the circuits are connected to different supply phases, the assembly of couplers shall conform to the relevant part of BS EN 60439, BS EN 61439 or BS EN 61534.

c) Where the sum of all the coupler rated currents on the assembly exceeds 63 A, the assembly of couplers shall conform to the relevant part of BS EN 60439 or BS EN 61439.

7.5 An assembly containing couplers intended for branching of the circuit

Where a wiring system comprising a single circuit terminates at an assembly containing couplers intended for branching of the circuit, the assembly containing the couplers shall conform as follows.

a) Where the assembly containing the couplers is not specifically designated for the connection of luminaires, it shall conform to BS EN 61535 and be classified as a distribution block.

b) Where the assembly containing the couplers is specifically designated for the connection of luminaires, it shall conform to BS 5733 and be classified as a lighting distribution unit as defined in BS 5733.

c) Where the assembly containing the couplers is specifically designated for the connection of a combination not covered by a) or b), it shall conform to BS 5733 or the relevant part of BS EN 60439, BS EN 61439 or BS EN 61534. A1

8 Provision for earthing

*COMMENTARY ON CLAUSE **8***
Metal encased prefabricated wiring systems may have two separate earth paths in a section, one being the circuit protective conductor within the wiring system and the other being a supplementary protective bonding conductor external to the wiring system.

8.1 When checked by visual inspection and tested in accordance with the continuity tests in **C.2**, the circuit protective conductor within the wiring system shall be permanently and reliably connected to an earthing terminal or earthing contact.

8.2 When checked by visual inspection, metal parts of metal encased prefabricated wiring systems which are accessible when installed or which might become live in the event of an insulation fault, shall be permanently and reliably connected to an earthing terminal or earthing contact.

NOTE Metal parts screened from live parts by metal parts which are connected to the earthing terminal or earthing contact, and metal parts separated from live parts by double insulation or by reinforced insulation, are not, for the purpose of this requirement, regarded as likely to become live in the event of an insulation fault.

8.3 When tested in accordance with **C.3**, the earthing connections shall be of low resistance (i.e. resistance not greater than 0.5 Ω).

8.4 When checked by inspection and by attempting to loosen the clamping means by hand, earthing terminals shall be adequately locked against accidental loosening. For screw terminals, it shall not be possible to loosen the clamping means by hand. For screwless terminals, it shall not be possible to loosen the clamping means unintentionally.

8.5 When checked by inspection and if necessary by inspection of material data sheets, earthing terminals of prefabricated wiring systems shall be such that the risk of corrosion resulting from contact

between these parts and the copper of the earthing conductor, or any other metal that is in contact with these parts, is minimized.

The body of the earthing terminals shall be of brass or other metal no less resistant to corrosion, unless it is part of the metal frame or enclosure, in which case the clamping means shall be of brass or other metal no less resistant to corrosion.

8.6 For metal encased prefabricated wiring systems, when checked by visual inspection, the arrangement of the terminations between sections shall be such that the cables become taut or metal encasement reaches the limit of adjustment before any strain is placed on the earth connection or conductor.

9 Protection against electric shock

9.1 When tested in accordance with **C.4**, prefabricated wiring systems shall be so constructed that their live parts are not accessible when fully installed as in normal use. Parts with basic insulation shall not be used on the outer surface of the wiring system without appropriate protection against accidental contact.

NOTE Basic insulation may be accessible when metal encased wiring systems are opened for servicing.

9.2 When tested in accordance with **C.4**, protection against electric shock shall be maintained for all methods and positions of installation in normal use having regard to the limitations indicated in the manufacturer's installation instructions. Protection shall be maintained after removal of all parts which can be removed by a single hand action.

9.3 Covers and other parts providing protection against electric shock shall have mechanical strength and be reliably secured in accordance with their relevant product standards so that they do not work loose with normal handling.

9.4 For covers whose fixing is not dependent on screws and whose removal is obtained by applying a force in an approximately perpendicular direction to the mounting/supporting surface, when tested in accordance with **C.5** the covers shall not work loose.

10 Resistance to solid objects, dust and moisture

10.1 Tests for ingress of solid objects, dust and moisture

10.1.1 When checked in accordance with BS EN 60529, the wiring assembly shall provide the degree of protection against ingress of solid objects, dust and moisture in accordance with the IP code if marked on the wiring assembly. If the assembly is not marked, conformity shall be checked by tests for IP rating IP 20 in accordance with BS EN 60529.

For code IP 5X, tests for category 2 shall be applied. For IP X3 and IP X4, the oscillating tube, BS EN 60529:1992+A2, Figure 4, shall be used.

10.1.2 IP classification shall be measured on a wiring section complete with protective caps when fitted. Where special sealing units or arrangements are required, tests shall be undertaken when the units or arrangements are assembled in accordance with manufacturer's instructions.

10.1.3 After completion of the tests, the wiring section shall withstand the electric strength test specified in Clause **11** and inspection shall meet the acceptance conditions of BS EN 60529 with the following modification:

- no trace of water on current-carrying parts or SELV parts where the voltage under load exceeds 12 V r.m.s. or 30 V ripple-free d.c. or on insulation where it could become a hazard for the user or surroundings, for example where it could reduce the creepage distances below the values specified in Clause **12**.

10.2 Humidity test

When tested in accordance with **C.6**, prefabricated wirings systems shall be adequately protected against humid conditions which might occur in normal use.

11 Insulation resistance and electric strength

11.1 Insulation resistance of prefabricated wiring systems

When tested in accordance with **C.7** immediately after the test in **C.6**, the insulation resistance shall be not less than the values shown in Table C.1.

11.2 Electric strength of prefabricated wiring systems

When tested in accordance with **C.8**, no flashover or breakdown shall occur.

NOTE The high-voltage transformer used for the test should be so designed that, when the output terminals are short-circuited after the output voltage has been adjusted to the appropriate test voltage, the output current is at least 200 mA r.m.s. The over-current relay should not trip when the output current is less than 100 mA r.m.s.

12 Clearances, creepage distances and distances through insulation

The clearances shall be not less than the requirements for impulse withstand category III of BS EN 60664-1. For creepage distances, pollution degree 2 of BS EN 60664-1 shall be applied. When checked by measurement in accordance with **C.9**, minimum values for clearances and creepage distances shall be as specified in Table 1 and Table 2.

13 Resistance to heat, fire and tracking

Where not otherwise specified, for resistance to heat, fire and tracking, all components of the prefabricated system including cables shall conform to their relevant product standard.

Where products are not covered by their own product standards, they shall conform to the test requirements of [A1] BS EN 61535:2009 [A1], Clause **24**.

[A1] *Text deleted.* [A1]

14 Electrical connections

*COMMENTARY ON CLAUSE **14***
These requirements apply to conductor clamping units intended for the connection, by clamping only, of copper conductors of cables and flexible cords.

Every connection between conductors or between a conductor and other equipment shall provide durable electrical continuity and mechanical strength and protection, in accordance with the components' relevant product standards. Connections incorporated within components which conform to their own standards shall be deemed to conform to this requirement.

Where conductor clamping units are not covered by a specific product standard, the test requirements of ⟨A1⟩ BS EN 61535:2009 ⟨A1⟩, **11.1**, shall be followed.

Table 1 **Prefabricated wiring systems intended for use in supply systems with a maximum voltage to earth of 150 V a.c. (rated impulse voltage 2.5 kV)**

Between	**Clearance** mm	**Creepage distance** [A] mm			
		Rated insulation voltage			
		All material groups	**Material group**		
			I	**II**	**III**
		⩽ 125 V	**⩽ 250 V**		
Live parts of different polarity	1.5	1.5	1.5	1.8	2.5
Live parts and					
accessible external surface [B]	3.0	3.0	—		
inaccessible external screws or the like [C]	1.5	1.5	—		
Parts of the earthing circuit and					
live parts	1.5	1.5	—		
accessible screws or the like	1.5	1.5	—		
inaccessible external screws or the like [C]	1.0	1.0	—		
Distance through insulating material between accessible external surfaces and live parts: 1.5 mm					

NOTE The values in this table do not apply to system components for which separate standards exist, but do apply to mounting and accessibility distances to the component when it is incorporated within an assembly.

[A] Values for creepage distances are adapted to clearances because creepage distances cannot be smaller than the corresponding clearances.

[B] The accessible external surface includes a metal foil in contact with the external surfaces of insulating material.

[C] Inaccessible external screws are those which cannot be touched with the standard test finger.

Table 2 **Prefabricated wiring systems intended for use in supply systems with a maximum voltage to earth of 300 V a.c. (rated impulse voltage 4.0 kV)**

Between	**Clearance** mm	**Creepage distances** [A] mm									
		Rated insulation voltage									
		All material groups	**Material group**			**Material group**			**Material group**		
			I	**II**	**III**	**I**	**II**	**III**	**I**	**II**	**III**
		⩽ 250 V	**⩽ 320 V**			**⩽ 400 V**			**⩽ 500 V**		
Live parts of different polarity	3.0	3.0	3.0	3.0	3.2	3.0	3.0	4.0	3.0	3.6	5.0
Live parts and											
accessible external surface [B]	5.5	5.5	5.5	5.5	6.4	—			—		
inaccessible external screws or the like [C]	3.0	3.0	3.0	3.0	3.2	—			—		
Parts of the earthing circuit and											
live parts	3.0	3.0	3.0	3.0	3.2	—			—		
accessible screws or the like	3.0	3.0	3.0	3.0	3.2	—			—		
inaccessible external screws or the like [C]	1.5	1.5		1.5		—			—		
Distance through insulating material between accessible external surfaces and live parts: 1.5 mm											

NOTE The values in this table do not apply to system components for which separate standards exist, but do apply to mounting and accessibility distances to the component when it is incorporated within an assembly.

[A] Values for creepage distances are adapted to clearances because creepage distances cannot be smaller than the corresponding clearances.

[B] The accessible external surface includes a metal foil in contact with the external surfaces of insulating material.

[C] Inaccessible external screws are those which cannot be touched with the standard test finger.

Annex A (informative) Guide to use

A.1 General

Prefabricated wiring systems can be used in applications where the quick and easy connection of different parts of the installation is required. Prefabricated wiring systems are designed to provide rapid connection which guarantees the correct connection. The use of prefabricated wiring systems facilitates installation and disconnecting, and enables changes and repairs to be made easily after installation.

The use of prefabricated wiring systems can help when planning a wiring system. Prefabricated wiring systems may employ rigid or flexible cables.

Prefabricated wiring systems are intended to be connected and disconnected without current flowing.

A.2 Applications

Prefabricated wiring systems can be used in suspended floors and ceilings, which are commonly used in buildings or structures. In this kind of system, the flexibility of the installation is achieved by using the prefabricated wiring system because the fitment and furnishing of rooms are easily changeable. By using prefabricated wiring systems, the installation work becomes quicker than using traditional methods.

In housebuilding, prefabricated wiring systems can have a role due to the fact that houses are sometimes assembled from prefabricated elements.

Installation couplers can be a part or a component of equipment; not just a method of connecting cables. Separate luminaires are a typical group of electrical equipment, which can be easily linked to a comprehensive lighting system by using a prefabricated wiring system. Machinery commonly consists of different units connected to each other by a prefabricated wiring system.

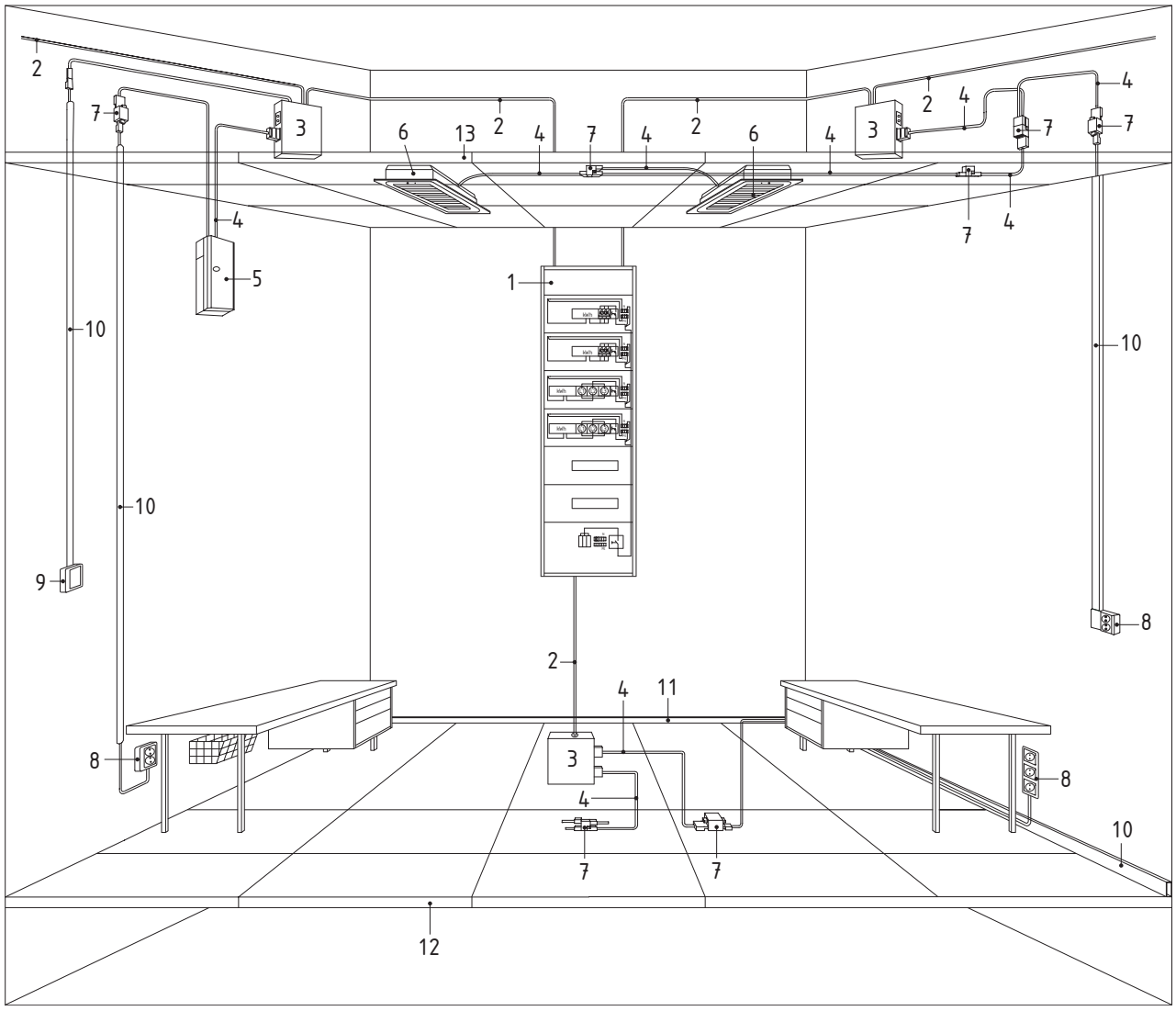
Typical examples are air conditioners and heat recovery units, which have separate motors, control units and pumps.

A.3 Use and verification

The use and the initial verification of a prefabricated wiring system is carried out according to the national wiring rules.

Prefabricated wiring systems might be installed as shown in Figure A.1.

Figure A.1 **Diagrammatic presentation of a typical prefabricated wiring system**



Key

1 Distribution board
2 Mains cables (fixed installation)
3 Junction box
4 Factory wired cable set
5 Small distribution board
6 Lighting fixture
7 Distribution block
8 Socket-outlet for office desk
9 Switch
10 Pillar
11 Trunking/ducting
12 Suspended floor
13 Suspended ceiling

Annex B (normative) Routine testing

B.1 General

The tests specified in this annex shall be carried out by the manufacturer on each section of a prefabricated wiring system after production and are intended to reveal, as far as safety is concerned, unacceptable variations in material and manufacture.

NOTE 1 These tests are intended not to impair the properties and the reliability of wiring sections, and they vary from certain type tests in the standard by the lower voltages utilized.

NOTE 2 More tests might be required to ensure that every wiring section conforms to the sample approved under the type test to this specification. The manufacturer should determine these tests from their experience.

NOTE 3 Within the framework of the quality manual, the manufacturer may vary this test procedure and its values to one better suited to their production arrangements, and may make certain tests at an appropriate stage during manufacture, provided it can be proved that at least the same degree of safety is ensured as specified in this annex.

B.2 Testing

Electrical tests shall be conducted on all units produced as scheduled in Table B.1.

Failed products shall be quarantined for scrap or rebuild.

Visual inspection shall take place to ensure that:

a) all specified marking is securely in place;

b) manufacturer's instructions are with the wiring section, where necessary;

c) the wiring section is complete, and that checks against a checklist for the product have been carried out.

All products passing these tests shall be suitably identified.

Table B.1 **Values for electrical tests**

Test	**Up to and including 100 A**	**Up to and including 100 A metal encased**
EARTH CONTINUITY	N/A	Maximum resistance 0.50 Ω.
Applied between the protective earthing terminal on wiring section and the most accessible parts likely to become live.		Measured by passing a minimum current of 10 A a.c. ⟩A1⟩ or d.c ⟨A1⟨ using a voltage up to 12 V for at least 1 s.
a) ELECTRIC STRENGTH	Maximum breakdown current 5 mA ⟩A1⟩ *Text deleted.* ⟨A1⟨	Maximum breakdown current 5 mA ⟩A1⟩ *Text deleted.* ⟨A1⟨
	Measured by applying a minimum voltage of 1.5 kV a.c. or 2.12 kV d.c. for a minimum of 1 s.	Measured by applying a minimum voltage of 1.5 kV a.c. or 2.12 kV d.c. for a minimum of 1 s.
or	or	or
b) INSULATION RESISTANCE	Minimum resistance 2 M Ω.	Minimum resistance 2 M Ω.
Measured between all of the terminals linked together and all earth terminals and the metal encasement if applicable.	Measured by applying 500 V d.c. for 1 s.	Measured by applying 500 V d.c. for 1 s.
POLARITY/CONTINUITY	Maximum resistance 0.10 Ω [A)]	Maximum resistance 0.10 Ω [A)]
Applied between the incoming terminals and outgoing terminals of each conductor of the wiring section in turn.	Measured by passing a minimum current of 10 A a.c. ⟩A1⟩ or d.c ⟨A1⟨ using a voltage up to 12 V for at least 1 s.	Measured by passing a minimum current of 10 A a.c. ⟩A1⟩ or d.c ⟨A1⟨ using a voltage up to 12 V for at least 1 s.

[A)] Excluding the measured resistance of the cable.

Annex C (normative)

Test methods

C.1 Conformity to the requirements of **5.1** is checked by inspection and by the following test.

Rub the marking lightly for 15 s with a piece of cloth soaked with water and, after drying, for a further 15 s with a piece of cloth soaked with petroleum spirit.

Observe whether marking is legible, whether marking labels are easily removable and whether they show signs of curling.

NOTE Petroleum spirit used should consist of a solvent hexane with a content of aromatics of maximum 0.1% by volume, a value of 29% for kauri-butanol, an initial boiling-point of approximately 65 °C, a dry-point of approximately 69 °C and a density of approximately 0.68 g/cm^3.

C.2 Carry out the test at a current of at least 10 A for 60 s, with a maximum resistance of 0.05 Ω excluding the measured resistance of the cable.

Measure the voltage drop from which the resistance is calculated over the two closest points of contact between the terminal and the cable of the prefabricated wiring system.

C.3 Pass a current of at least 10 A a.c., derived from a source with a no-load voltage not exceeding 12 V a.c., between the earthing terminal or earthing contact and each of the accessible metal parts in turn.

Measure the voltage drop between the earthing terminal or earthing contact and the accessible metal part. Calculate the resistance from the current and the voltage drop.

When type testing, apply the current for a period of at least 1 min.

C.4 Apply test probe B, in accordance with BS EN 61032, 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, in a maximum ambient temperature of (t_a + 10) °C, apply test probe 11, in accordance with BS EN 61032, 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.

C.5 Apply a force of 20 N when the opening of the cover will give access to basic insulated parts and 75 N when live parts will be accessible approximately perpendicular to the mounting/supporting surface.

C.6 Leave any cable entries open; open one knock-out if any are provided.

Remove parts which can be removed by hand and subject them to the humidity treatment with the main part.

Place the wiring assembly, in the most unfavourable position of normal use, in a humidity cabinet containing air with a relative humidity maintained between 91% and 95%. Maintain the temperature of the air at all places where samples can be located within 1 °C of any convenient value "*t*" between 20 °C and 30 °C.

Before being placed in the humidity cabinet, bring the sample to a temperature between "*t*" and (*t* + 4) °C.

Leave the sample in the cabinet for 48 h.

Test the sample immediately in accordance with Clause **11**.

NOTE 1 In most cases, the sample can be brought to the specified temperature between "t" and (t + 4) °C by keeping it in a room at this temperature for at least 4 h before the humidity treatment.

NOTE 2 In order to achieve the specified conditions within the cabinet, it is necessary to ensure constant circulation of the air within, and in general to use a cabinet which is thermally insulated.

C.7 Measure the insulation resistance with a d.c. voltage of approximately 500 V, 1 min after the application of the voltage.

For the insulation of SELV parts of the prefabricated wiring system, measure the insulation resistance with a d.c. voltage of 100 V.

Test insulating linings and barriers only if the distance between live parts and accessible metal parts, without the lining or barrier, is less than that prescribed in Clause **12**.

Test the insulation of bushings, cord anchorages, wire carriers or clips in accordance with Table C.1; during the test ensure that the cable or cord is covered by metal foil or replaced by a metal rod of the same diameter.

Table C.1 **Minimum insulation resistance**

Insulation of parts	**Minimum insulation resistance**
SELV:	
Between current-carrying parts of different polarity	×
Between current-carrying parts and the exterior surface [A)]	×
Between current-carrying parts and metal parts of metal clad or sheathed systems	×
Other than SELV:	
Between live parts of different polarity	×
Between live parts and the exterior surface [A)]	×
Between current-carrying parts and metal parts of metal clad or sheathed systems	×
Between live parts which can become of different polarity through action of a switch	×

× Minimum insulation resistance: 100 Mohm/Length (M) of test sample

[A)] The exterior surface of supplementary insulation is covered with metal foil for the purpose of this test.

C.8 Apply a voltage of substantially sine-wave form, having a frequency of 50 Hz or 60 Hz and the value specified in Table C.2, for 1 min across the insulation shown in Table C.2.

Apply initially no more than half the prescribed voltage, then raise the voltage gradually to the full value.

Ensure that the r.m.s. value of the test voltage applied is measured within ± 3%.

Ensure that the metal foil is so placed that no flashover occurs at the edges of the insulation.

For other than metal clad or sheathed systems incorporating both reinforced insulation and double insulation, ensure that the voltage applied to the reinforced insulation does not overstress the basic insulation or the supplementary insulation.

Ignore glow discharges without drop in voltage.

Table C.2 **Electric strength**

Insulation of parts	**Metal clad or metal sheathed**	**Other than metal clad or sheathed**
SELV:		
Between current-carrying parts of different polarity	a	a
Between current-carrying parts and the exterior surface [A)]	a	a
Between current-carrying parts and metal parts of the system	a	a
Between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts	a	a
Other than SELV:		
Between live parts of different polarity	b	b
Between live parts and the exterior surface [A)]	b	b and c, or d
Between live parts and metal parts of the system	b	b and c, or d
Between live parts which can become of different polarity through action of a switch	b	b and c, or d
Between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts	b	c
Between current-carrying parts and live parts of a mixed supply system, SELV and other than SELV	e	e

a	Basic insulation for voltages of SELV	500
b	Basic insulation for voltages other than SELV	2U [B)] + 1 000
c	Supplementary insulation	2U [B)] + 1 000
d	Double or reinforced insulation	4U [B)] + 2 000
e	Mixed supplies	3 750

[A)] The exterior surface of supplementary insulation is covered with metal foil for the purpose of this test.

[B)] U for the purpose of this standard is "rated voltage".

C.9 Limit the contribution to the creepage distance of any groove less than 1 mm wide to the width of the groove.

Measure distances through slots or openings in external parts of insulating material with metal foil in contact with the accessible surface, the foil being pushed into corners and similar places by means of the standard test finger specified in BS EN 60529, but not being pressed into openings.

Test installation female connectors of prefabricated wiring systems when not engaged with the installation plug.

Test installation male couplers of prefabricated wiring systems only when engaged with its mating coupler in its installation socket.

When creepage distances and clearances are determined at bushings, cord anchorages, wire carriers or clips, make the measurement with the cable fitted.

Do not measure internal creepage distances in permanently sealed components.

NOTE Examples of permanently sealed components are components sealed-off or compound filled.

Measure creepage distances at a supply terminal from the live part in the terminal to any accessible metal parts.

Measure the clearance between incoming supply wiring and accessible metal parts, i.e. from a bare conductor of the largest section to the metal parts which can be accessible.

At the internal wiring side of the terminal, measure the clearance between live parts of the terminal and accessible metal parts.

Bibliography

Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 67, *Specification for ceiling roses*

BS 1363-4, *13 A plugs, socket-outlets, adaptors and connection units – Part 4: Specification for 13 A fused connection units switched and unswitched*

〉A1〈 *Text deleted.* 〉A1〈

BS 6972, *Specification for general requirements for luminaire supporting couplers for domestic, light industrial and commercial use*

〉A1〈 *Text deleted.* 〉A1〈

〉A1〈 *Text deleted.* 〉A1〈

BS EN 61995-1, *Devices for the connection of luminaires for household and similar purposes – Part 1: General requirements*

BS IEC 60050-195:1998, *International Electrotechnical Vocabulary – Part 195: Earthing and protection against electric shock*

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