

Specification for

# 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**

This European Standard EN 60439-3:1991, with the incorporation of amendment A1:1994 and A2:2001, has the status of a British Standard

## Cooperating organizations

The European Committee for Electrotechnical Standardization (CENELEC), under whose supervision this European Standard was prepared, comprises the National Committees of the following countries.

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### Amendments issued since publication

Amd. No.	Date	Comments
8302	August 1994	See National foreword
13466	1 May 2002	See National foreword

The following BSI references relate to the work on this standard:  
Committee reference PEL/12  
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## National foreword

This British Standard has been prepared under the direction of the Power Electrical Engineering Standards Policy Committee and is the English language version of 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 for their use — Distribution boards” including amendments A1 and A2, and corrigendum April 1994, published by the European Committee for Electrotechnical Standardization (CENELEC). EN 60335-2-6 was derived by CENELEC from IEC 60439-3:1990, which has the same title as the European Standard.

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags **[C]** **[C]**. Where a common modification has been introduced by amendment, the tags carry the number of the amendment. For example, the common modifications introduced by CENELEC amendment A11 are indicated by **[C11]** **[C11]**.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **[A]** **[A]**. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by **[A1]** **[A1]**.

The foreword and preface of IEC 439-3:1990 which do not form part of the text of EN 60439-3 have been quoted in National appendix NA. The deleted parts of the original IEC text are quoted on page 2 of this European Standard.

The foreword of the EN makes reference to “date of withdrawal (dow) of conflicting national standards” as “1994-12-01”. In this case the relevant national standard is BS EN 60439-3 but the date of withdrawal relates only to those parts of the British Standard subject to Amendment A1. Certificates and marks will not be awarded after this date with respect to the British Standard not incorporating Amendment A1. They will be awarded only to the amended British Standard. However, such certificates and marks already awarded with respect to the British Standard not incorporating Amendment A1 may continue to apply for production until 1999-12-01.

The corrigendum, dated April 1994, adds a new Annex ZA which gives an A-deviation for the UK and supersedes BS 5486-13:1989 which is withdrawn.

Annexes designated “normative” are part of the body of the standard. Annexes designated “informative” are given for information only. National appendices are designated “informative”.

### Cross-references

Details of international standards quoted in this British Standard for which there is an identical or technically equivalent British Standard are given in National appendix NC.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.**

### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 23 and a back cover.

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English version

# 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 for their use — Distribution boards

(includes amendments A1:1994 and A2:2001)  
(IEC 60439-3:1990, modified)

Ensembles d'appareillage à basse tension —  
Troisième partie: Règles particulières pour  
ensembles d'appareillage BT destinés à être installés  
en des lieux accessibles à des personnes non  
qualifiées pendant leur utilisation —  
Tableaux de répartition  
(inclut les amendements A1:1994 et A2:2001)  
(CEI 60439-3:1990, modifiée)

Niederspannung-Schaltgeräte-kombinationen —  
Teil 3: Besondere Anforderungen an  
Niederspannung-Schaltgeräte-kombinationen, zu  
deren Bedienung Laien Zutritt haben  
Installationsverteiler  
(enthält Änderungen A1:1994 und A2:2001)  
(IEC 60439-3:1990, modifiziert)

This European Standard was approved by CENELEC on 10 December 1990; its amendment A1 was approved by CENELEC on 1993-12-08 and amendment A2 was approved by CENELEC on 2001-05-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

## CENELEC

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

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## Foreword

Following the decision taken by CENELEC Technical Committee TC 17D at their Brussels meeting in October 1989, the International Standard IEC 60439-3:1990, together with the common modifications prepared by CLC/TC 17D, was submitted to the CENELEC Unique Acceptance Procedure (UAP) in April 1990 for acceptance as a European Standard.

The text of the draft was approved by CENELEC as EN 60439-3 on 10 December 1990.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1991-12-01
- latest date of withdrawal of conflicting national standards (dow) 1991-12-01

For products which have complied with the relevant national standard before 1991-12-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1996-12-01.

## Endorsement notice

The text of the International Standard IEC 439-3: 1990 was approved by CENELEC as a European Standard with agreed common modifications as given below.

## Common modifications

- 7.6.1** Replace the text by:  
Fuses for outgoing circuits shall comply with the general requirements of IEC 60269-3 or with a relevant national standard where it is an established practice for such use.

## Foreword to A1:1994

The text of document 17D(CO)53, as prepared by Sub-Committee 17D: Low voltage switchgear and controlgear assemblies, of IEC Technical Committee 17: Switchgear and controlgear, was submitted to the IEC-CENELEC parallel vote in September 1992.

The reference document was approved by CENELEC as amendment A1 to EN 60439-3 on 8 December 1993.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1994-12-01
- latest date of withdrawal of conflicting national standards (dow) 1994-12-01

For products which have complied with EN 60439-3:1991 before 1994-12-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1999-12-01.

## Foreword to A2:2001

The text of document 17D/239/FDIS, future amendment 2 to IEC 60439-3:1990, prepared by SC 17D, Low-voltage switchgear and controlgear assemblies, of IEC TC 17, Switchgear and controlgear, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 60439-3:1991 on 2001-05-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2002-02-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2004-05-01

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## 1 General

### 1.1 Scope

Replace the second note by:

This standard gives supplementary requirements for such enclosed distribution boards (DBU), which are stationary, type tested assemblies (TTA) for indoor use, containing protective devices and intended for use either in domestic (household) applications or in other places where unskilled persons have access for their use. Control and/or signalling devices may also be included. They are for use on a.c., with a nominal voltage to earth not exceeding 300 V. The outgoing circuits contain short-circuit protective devices, each having a rated current not exceeding 125 A with a total incoming load current not exceeding 250 A.

NOTE The nominal voltage to earth in an IT system is taken as the nominal voltage of the system.

Unskilled persons normally have access to these assemblies, e.g. for switching operations and for replacing fuse-links. **A1** **A1**

## 2 Definitions

### 2.1 General definitions

#### 2.1.1.2

**partially type tested assembly (PTTA)**

not applicable

#### 2.1.9

**test situation**

not applicable

#### **A2** 2.1.12 **A2**

**distribution board**

an assembly containing switching or protective devices (e.g. fuses or miniature circuit-breakers) associated with one or more outgoing circuits fed from one or more incoming circuits, together with terminals for the neutral and protective circuit conductors. It may also include signalling and other control devices. Means of isolation may be included in the board or may be provided separately

### 2.2 Definitions concerning constructional units of assemblies

#### 2.2.8

**withdrawable part**

not applicable

#### 2.2.9

**connected position**

the position of a removable part when it is fully connected for its normally intended function

#### 2.2.10

**test position**

not applicable

#### 2.2.11

**disconnected position**

not applicable

### 2.3 Definitions concerning the external design of assemblies

#### 2.3.1

**open-type assembly**

not applicable

#### 2.3.2

**dead front assembly**

not applicable



**2.3.3.3****desk-type assembly**

not applicable

**2.3.4****busbar trunking system (busway)**

not applicable

**2.4 Definitions concerning the structural parts of assemblies****A<sub>2</sub> 2.4.18 A<sub>2</sub>****parts for aesthetic purposes**

parts which are provided only to improve the appearance of an assembly and are not intended to give any electrical or mechanical protection

**2.5 Definitions concerning the conditions of installation of assemblies****2.5.4****movable assembly**

not applicable

**2.7****gangways within assemblies**

not applicable

**3 Classification of assemblies***Delete:*

— the conditions of installation with respect to mobility (see 2.5.3 and 2.5.4);

A<sub>2</sub> — the form of internal separation (see 7.7);

— the types of electrical connections of functional units (see 7.11). A<sub>2</sub>

**4 Electrical characteristics of assemblies****4.2 Rated current (of a circuit of an assembly)**

*Renumber existing 4.2 to read 4.2.1.*

*Add a new sub-clause:*

**4.2.2 Rated current of a distribution board**

The rated current of a distribution board is that stated by the manufacturer as the rated current of the incoming circuit or circuits. If there is more than one incoming circuit the rated current of a distribution board is the arithmetic sum of the rated currents of all incoming circuits that are intended to be used simultaneously. This current or currents shall be carried without the temperature rise of the several parts exceeding the limits specified in 7.3 when tested according to 8.2.1.

**A<sub>2</sub> 4.7 A<sub>2</sub> Rated diversity factor**

*Replace the note and Table 1 by the following:*

For the purpose of this standard the number of main circuits is the number of outgoing circuits connected to each supply phase. In the absence of information concerning the actual currents, the conventional values given in Table 1 may be used.

**Table 1**

Number of main circuits	Diversity factor
2 and 3	0.8
4 and 5	0.7
6 to 9 inclusive	0.6
10 (and above)	0.5

A<sub>2</sub> A<sub>2</sub>

## 5 Information to be given regarding the assembly

### 5.1 Nameplates

*Add as second sentence:*

The nameplates may be mounted behind a door or removable cover.

**A2** **A2**

*In c) replace 60439-1 by 60439-3.*

*Replace the text of l) by:*

l) degree of protection (see 7.4.2.2.1), if greater than IP2XC according to IEC 60529;

**A2** *Add after item l)*

r) Not applicable.

s) Not applicable.

u) rated current of distribution board. The rated current of the distribution board shall be marked on the ASSEMBLY or the nameplate. **A2**

*Add:*

**A2** *Replace “Information specified under items a), b), c), d), e), l) and r)” by “Information specified under items a), b), c), d), e) and l)”* **A2**

**A1** *Replace “Information specified under items c) to q)... ” by “Information specified from the remaining items.”* **A1**

**A2** **A2**

## 6 Service conditions

### **A2** 6.1.2.3 Pollution degree

*Replace the last paragraph by:*

“Standard pollution degree for an ASSEMBLY to IEC 60439-3:

ASSEMBLIES to this standard are generally for use in a pollution degree 2 environment. Other pollution degrees may apply, depending upon particular applications or the micro-environment.

NOTE The pollution degree of the micro-environment may be influenced by installation in an enclosure.” **A2**

### 6.2.9 Delete the examples.

*Add:*

For flush-type assemblies recessing into a wall is not considered to be a special condition.

## 7 Design and construction

### 7.1.1 General

*Add the following at the beginning of the first paragraph:*

Assemblies intended for use by unskilled persons shall be designed as type-tested LV switchgear and controlgear assemblies (TTA).

*Add at the end of the first paragraph:*

For parts of distribution boards which are made of insulating materials the resistance to heat shall be verified according to **A2** 8.2.12 **A2**. The resistance of insulating materials to abnormal heat and to fire due to internal electric effects shall be verified according to **A2** 8.2.13 **A2**.

*Add a second sentence to the second paragraph:*

Ferrous structural parts of distribution boards, including enclosures, shall have adequate resistance to rusting when tested in accordance with **A2** 8.2.11 **A2**.

*Add a second sentence and note to the third paragraph:*

Enclosures of distribution boards shall, in addition, withstand an impact strength test in accordance with **A2** 8.2.10 **A2**.

NOTE Parts for aesthetic purposes and individual components need not be subjected to the impact tests.

*Add to the end of the clause:*

Any cover which has to be removed during installation or maintenance shall not be used to support components to which conductors are connected if such conductors are subject to any stress when the cover is removed. In this case, a hinged door shall be used instead.

Doors and the like provided with hinges shall allow free access and ease of operation of built-in components.

#### **7.1.2.2** *Isolating distances*

Not applicable.

#### **7.1.3.5** *Replace by:*

Provision shall be made for the terminals for outgoing neutral conductors to correspond in number to the number of outgoing neutral conductors. These terminals shall be located or identified in the same sequence as their respective phase conductor terminals.

Terminals shall also be provided for the protective conductors of the incoming and outgoing circuits, which shall be similarly located or identified, and for any bonding conductors that may be required (e.g. as appropriate to the system).

#### **7.2.1.1** *Delete reference to IP00.*

**A2** **7.2.1.2** *Replace IP2X by IP2XC.*

#### **7.2.1.3** *Not applicable.*

#### **7.2.1.6** *Not applicable.* **A2**

#### **7.4.2** *Add after the title:*

NOTE Open type assemblies are not covered by this Part 3.

*Delete the second paragraph.*

#### **7.4.2.2.1** *Replace first sentence by:*

All **A1** accessible **A1** surfaces shall provide a degree of protection of at least IP2XC according to IEC 60529.

*Add:*

For built-in equipment the degree of protection given in the relevant product standard shall apply.

The degree of protection is verified with all equipment in place and connected as in normal use according to the instructions of the manufacturer.

#### **7.4.2.3** *Protection by obstacles*

Not applicable.

#### **A2** **7.4.2.2.3** a)

a) Removal or opening shall necessitate the use of a key or a tool.

Where any parts inside the ASSEMBLY need occasional handling (such as replacement of a lamp or a fuse-link), an obstacle shall be provided so as to prevent persons from coming unintentionally into contact with live parts not protected by another protective measure. However, this obstacle need not prevent persons from coming intentionally into contact by bypassing this obstacle with the hand. It shall not be possible to remove the obstacle, except through the use of a key or tool.

Live parts, the voltage of which fulfills the condition for SELV (safety extra-low voltage), need not be covered.

*Add:*

7.4.2.2.3 c) and 7.4.2.2.3 d) are not applicable.

**7.4.3.2.2 Protection by total insulation**

*Replace the existing text of 7.4.3.2.2 d) by the following new text:*

**7.4.3.2.2 d)** Delete in the first paragraph the words “The enclosure shall give at least the degree of protection of IP3XD\*.” and the corresponding footnote. **Ⓔ**

**7.4.5 Operating and maintenance gangways within assemblies**

Not applicable.

**7.5.2.3** *Not applicable.*

**7.6.1 Selection of components**

*Add at the end of the first paragraph:*

**Ⓒ** Fuses for outgoing circuits shall comply with the general requirements of IEC 60269-3 or with the relevant national standards where it is an established practice for such use. **Ⓒ**

**7.6.4** *Replace title by: Removable parts.*

*Add at the beginning:*

Withdrawable parts are not permitted in assemblies intended to be installed in places where unskilled persons have access for their use.

**7.7 Internal separation of assemblies by barriers or partitions**

*Add:*

The barriers may be omitted if circuits at lower voltages are wired in cables insulated according to the phase-to-earth voltage of the main circuits.

Safety extra-low voltage circuit conductors shall be in separate compartments, or separated from conductors of circuits at different voltages by a metal screen or sheath connected to the protective conductor, unless they are insulated for the highest voltage present, either individually, or collectively in multicore cables or other grouping of conductors.

**7.8.3.6** *Not applicable.*

## 8 Test specifications

8.1 Replace Table 7 by the following:

**A<sub>2</sub>**

**Table 7 — List of type tests to be performed**

	Characteristics to be checked	Sub-clause	Type test according to 8.1.1	Test order in sequence		
				A	B	C
a)	Temperature rise limits	<b>8.2.1</b>	Verification of temperature rise limits	3 <sup>a</sup>		
b)	Dielectric properties	<b>8.2.2</b>	Verification of dielectric properties	4		2
c)	Short-circuit withstand strength	<b>8.2.3</b>	Verification of short-circuit withstand strength			1 <sup>a</sup>
d)	Effectiveness of the protective circuit	<b>8.2.4</b>				3 <sup>a</sup>
	Effective connection between the exposed conductive parts of the ASSEMBLY and the protective circuit	<b>8.2.4.1</b>	Verification of the effective connection between the exposed conductive parts of the ASSEMBLY and the protective circuit by inspection or by resistance measurement			
	Short-circuit withstand strength of the protective circuit	<b>8.2.4.2</b>	Verification of short-circuit withstand strength of the protective circuit			
e)	Clearances and creepage distances	<b>8.2.5</b>	Verification of clearances and creepage distances		2 <sup>a</sup>	
f)	Mechanical operation	<b>8.2.6</b>	Verification of mechanical operation		1	
g)	Degree of protection	<b>8.2.7</b>	Verification of degree of protection	6 <sup>a</sup>		
h)	Construction and marking	<b>8.2.9</b>	Verification of construction and marking	1 <sup>a</sup>		
i)	Impact strength	<b>8.2.10</b>	Verification of impact strength	5		
j)	Resistance to rusting and to humidity	<b>8.2.11</b> <b>8.2.14</b>	Verification of resistance to rusting and to humidity			4
k)	Resistance of insulating materials to heat	<b>8.2.12</b>	Verification of resistance of insulating materials to heat		3	
l)	Resistance of insulating materials to abnormal heat and to fire	<b>8.2.13</b>	Verification of resistance of insulating materials to abnormal heat and fire due to internal electrical effects			5
m)	Mechanical strength of fastening means of enclosures	<b>8.2.15</b>	Verification of mechanical strength of fastening means of enclosures	2		

<sup>a</sup> No failures by any samples.

**A<sub>2</sub>**

**A1) 8.1.1 Type tests (see 8.2)**

Type tests are intended to verify compliance with the requirements laid down in this standard for a given type of ASSEMBLY.

Type tests shall be carried out on a sample of such an ASSEMBLY or on parts of ASSEMBLIES manufactured to the same or similar design. They shall be carried out on the initiative of the manufacturers.

Type tests include:

- a) Verification of temperature-rise limits **8.2.1**
- b) Verification of the dielectric properties **8.2.2**
- c) Verification of the short-circuit strength **8.2.3**
- d) Verification of the continuity of the protective circuit **8.2.4**
- e) Verification of clearances and creepage distances **8.2.5**
- f) Verification of mechanical operation **8.2.6**
- g) Verification of the degree of protection **8.2.7**
- h) Verification of construction and marking **A2) 8.2.9 A2)**
- i) Verification of impact strength **A2) 8.2.10 A2)**
- j) Verification of resistance to rusting and to humidity **A2) 8.2.11, 8.2.14 A2)**
- k) Verification of resistance of insulating materials to heat **A2) 8.2.12 A2)**
- l) Verification of resistance to abnormal heat and to fire **A2) 8.2.13 A2)**
- m) Verification of mechanical strength of fastening means of enclosures **A2) 8.2.15 A2)**

The type tests are arranged in three separate sequences as detailed in Table 7a. A sample selected for testing to a given sequence shall complete all the tests in that sequence in the order stated.

**Table 7a — Sequence of type tests**

Sequence reference	Type tests
A	h), m), a), b), i), g),
B	<b>A2)</b> f), e), k)
C	c), b), d), j), l) <b>A2)</b>

**Table 7b — List of routine tests to be performed**

	Characteristics to be checked	Subclauses	Routine test according to 8.1.2
a)	Wiring, electrical operation	<b>8.3.1</b>	Inspection of the assembly including inspection of wiring and, if necessary, electrical operation test
b)	Insulation	<b>8.3.2</b>	Dielectric test
c)	Protective measures	<b>8.3.3</b>	Checking of protective measures and of the electrical continuity of the protective circuits

**A2)** **A2)** There shall be no failures by any samples during any of the tests a), c), d), e), g) or h). If the first sample submitted to a test sequence completes the sequence satisfactorily no further testing to that sequence is required. If, however, a sample submitted to a test according to b), f), i), j), k), l) or m) fails, **A2)** then the relevant test sequence shall be repeated on three additional **A2)** samples and there shall be no failure. **A1)**

**A2)** If modifications are made to components of the ASSEMBLY, new type tests have to be carried out only in so far as such modifications are likely to adversely affect the results of these tests. **A2)**

**8.1.2 Routine tests (see 8.3)**

Replace b) by:

b) dielectric test (see 8.3.2);

A dielectric test is not required on distribution boards containing busbars and/or prefabricated main circuit wiring only, nor on simple constructions where an inspection under a) is sufficient.

**8.2.1.3 Temperature-rise test**

Replace second paragraph by:

For this test the distribution board is loaded with its rated current (see 4.2). This current shall be distributed amongst the smallest possible number of outgoing circuits so that each of these circuits is loaded with its rated current multiplied by the rated diversity factor, as stated in **A2** 4.7 **A2**. If the exact total load cannot be obtained by a number of devices loaded to this current, one circuit only may be loaded to a lower value to give the correct total. Fuses or miniature circuit-breakers shall be fitted as specified by the manufacturer and the power losses of fuse-links shall be stated in the report. (Tests may be carried out using dummy fuse-links having the maximum power loss as specified in the relevant specification).

NOTE The appropriate diversity factor should be stated by the manufacturer in the type-test report.

**8.2.1.3.2 Not applicable.**

**8.2.1.3.3 Not applicable.**

**8.2.1.3.4 Not applicable.**

**8.2.2.2 Add:**

This test is made without the components intended to be mounted in the openings of the enclosure of the assembly.

**A2 8.2.9 A2 Verification of construction and marking**

Compliance with Clause 5, 7.1.3, 7.4, 7.6, 7.7 and 7.8 shall be checked by inspection.

**A1 A2 8.2.10 A2 Verification of impact strength**

Compliance is checked on those exposed parts of the DBU which may be subjected to mechanical impact when mounted as in normal use.

**A2 8.2.10.1 A2** The test shall be carried out by means of a spring hammer test apparatus as described in IEC 60068-2-63:1991, Test Eg: Impact, spring hammer. The test is made after the sample has been for 2 h at a temperature of  $-5\text{ °C} \pm 1\text{ K}$  and each blow shall have an impact of 0,7 J.

**A2 8.2.10.2 A2** The sample with cover, or the enclosure, if any, shall be fixed as in normal use or placed against a rigid support.

Three blows shall be applied on separate places of each of the five accessible faces and door (if provided). They shall not be applied to knock-outs, built-in components complying with other standards, or other fastening means which are recessed below the surface so as not to be subject to impact.

Cable entries which are not provided with knock-outs shall be left open. If they are provided with knock-outs, two of them shall be opened.

Before applying the blows, fixing screws of bases, covers and the like shall be tightened with a torque equal to that specified in Table 13.

Table 13 — Tightening torques for the verification of mechanical strength

Diameter of thread mm		Tightening torque Nm		
Metric standard values mm	Range of diameters "d" mm	I	II	III
2,5	$d \leq 2,8$	0,13	0,26	0,26
3,0	$2,8 < d \leq 3,0$	0,16	0,33	0,33
—	$3 < d \leq 3,2$	0,20	0,40	0,40
3,5	$3,2 < d \leq 3,6$	0,26	0,53	0,53
4	$3,6 < d \leq 4,1$	0,47	0,80	0,80
4,5	$4,1 < d \leq 4,7$	0,53	1,20	1,20
5	$4,7 < d \leq 5,3$	0,53	1,33	1,33
6	$5,3 < d \leq 6$	0,80	1,66	2,00
8	$6 < d \leq 8$	1,66	2,33	4,00
10	$8 < d \leq 10$	—	2,66	6,66
12	$10 < d \leq 12$	—	—	9,33
14	$12 < d \leq 15$	—	—	12,6
16	$15 < d \leq 20$	—	—	16,6
20	$20 < d \leq 24$	—	—	24
24	$24 < d$	—	—	33

Column I applies to screws without heads which, when tightened, do not protrude from the hole, and to other screws which cannot be tightened by means of a screwdriver with a blade wider than the root diameter of the screw.

Column II applies to nuts and screws which are tightened by means of a screwdriver.

Column III applies to nuts and screws which can be tightened by means other than a screwdriver.

**8.2.10.3** After the test the samples shall show no damage within the meaning of this standard. In particular, the following items shall not show such damage:

- covers which, when broken, make live parts accessible or impair the further use of the equipment;
- operating means;
- linings and barriers of insulation material and the like.

In case of doubt, it shall be verified that removal and replacement of external parts, such as enclosures and covers, is possible without these parts or their lining being damaged.

Cracks not visible with normal or corrected vision without additional magnification and surface cracks in fibre reinforced mouldings and the like shall be ignored. Small dents which do not reduce the creepage distances or clearances below the values specified and small chips which do not adversely affect the protection against electric shock shall be neglected.

### 8.2.11 Verification of resistance to rusting

The following test applies to assemblies without built-in components, to separate parts or to pieces of large parts, provided the protection against rust is the same as in the final construction.

It may alternatively be applied to a test sample prepared with the same protection against rust.

All grease is removed from the parts or representative samples of the steel enclosures of the distribution board to be tested, by immersion in a cold chemical degreaser such as methylchloroform or refined petrol for 10 min. The parts are then immersed for 10 min in a 10 % solution of ammonium chloride in water at a temperature of  $(20 \pm 5) ^\circ\text{C}$ .

Without drying but after shaking off any drops, the parts are placed for 10 min in a box containing air saturated with moisture at a temperature of  $(20 \pm 5) ^\circ\text{C}$ .

After the parts have dried for 10 min in a heating cabinet at a temperature of  $(100 \pm 5) ^\circ\text{C}$  and have been left at room temperature for 24 h, their surfaces shall show no signs of rust.

Traces of rust on sharp edges and any yellowish film removable by rubbing are ignored.

For small helical springs and the like, and for inaccessible parts exposed to abrasion, a layer of grease may provide sufficient protection against rusting. Such parts are subjected to the test only if there is doubt about the effectiveness of the grease film, and the test is then made without previous removal of the grease.



**A<sub>2</sub>** 8.2.12 **A<sub>2</sub>** *Verification of resistance of insulating materials to heat*

Compliance is checked by the tests of **A<sub>2</sub>** 8.2.12.1, 8.2.12.2 and 8.2.12.3 **A<sub>2</sub>**. These tests are applied to distribution boards having their built-in components (switching devices, indicator lights, etc.) removed.

**A<sub>2</sub>** 8.2.12.1 The sample **A<sub>2</sub>** shall be kept for 168 h in a heating cabinet at a temperature of  $(70 \pm 2) ^\circ\text{C}$ .

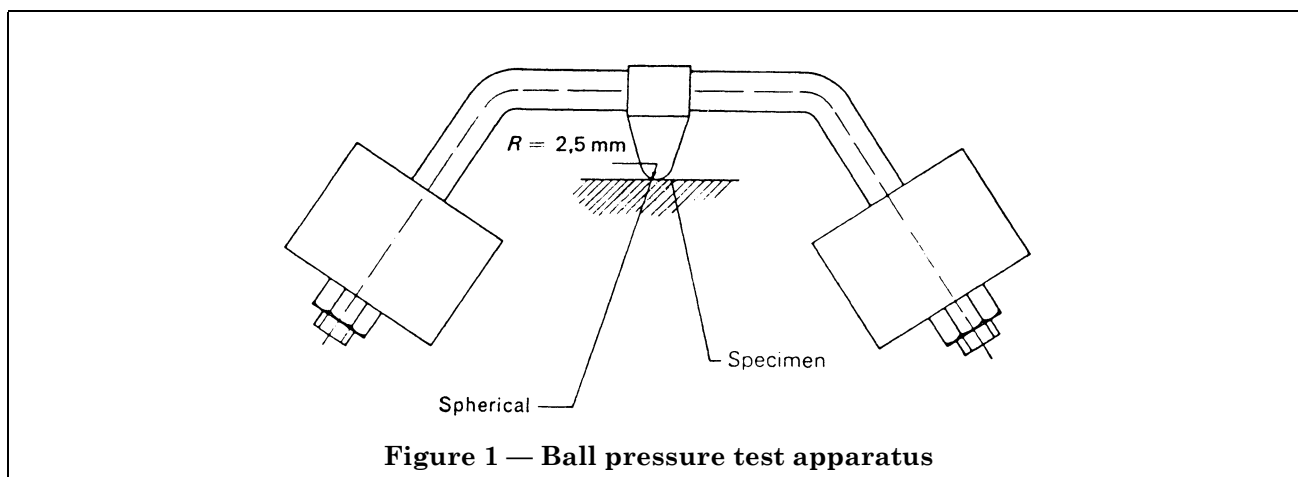
The structural parts of the ASSEMBLY (including enclosures, covers, etc.) shall not undergo any change **A<sub>2</sub>** which impairs the protective function **A<sub>2</sub>** of the distribution board.

Marking shall still be easily legible.

It is permissible to test individual parts (panels, boxes, enclosures, etc.) of the distribution board, provided proper precautions are taken to make the test representative.

Where installed components are likely to affect the result of the test, these components shall be incorporated for the test.

**A<sub>2</sub>** 8.2.12.2 **A<sub>2</sub>** Parts of insulating material necessary to retain current-carrying parts in position are subjected to a ball pressure test by means of the apparatus shown in Figure 1 of this part.



**Figure 1 — Ball pressure test apparatus**

NOTE For the purpose of this test a protective conductor, PE, is not considered as a current-carrying part.

The surface of the part to be tested is placed in the horizontal position and a steel ball of 5 mm diameter is pressed against this surface by a force of 20 N.

The test is made in a heating cabinet at a temperature of  $(125 \pm 2) ^\circ\text{C}$ . After 1 h, the ball is removed. The sample is then cooled down, within 10 s, to approximately room temperature by immersion in cold water. The diameter of the impression caused by the ball is measured and shall not exceed 2 mm.

**A<sub>2</sub>** 8.2.12.3 **A<sub>2</sub>** Other parts of insulating material not necessary to retain current-carrying parts in position, even if they are in contact with them, are subjected to a ball pressure test as per 8.2.12.2, but the test is made at a temperature of  $(70 \pm 2) ^\circ\text{C}$  or at a temperature of  $(30 \pm 2) \text{K}$  in excess of the temperature rise of the relevant part determined during temperature-rise tests (in accordance with 8.2.1.3), whichever is the higher.

**A<sub>2</sub>** 8.2.13 **A<sub>2</sub>** *Verification of resistance of insulating materials to abnormal heat and to fire due to internal electric effects*

Tests shall be carried out in accordance with the principles of IEC 60695-2-1.

**A<sub>2</sub>** 8.2.13.1 **A<sub>2</sub>** *General description of the test*

See Clause 3 of IEC 60695-2-1.

**A<sub>2</sub>** 8.2.13.2 **A<sub>2</sub>** *Description of test apparatus*

The apparatus to be used shall be as described in Clause 4 of IEC 60695-2-1.

A piece of white pinewood board, approximately 10 mm thick and covered with a single layer of tissue paper, is positioned at a distance of 200 mm below the bottom surface of the distribution board.

Tissue paper is specified in **6.86** of ISO 4046 (1978) (Paper vocabulary — second series of terms), as thin, soft, relatively tough paper generally intended for packing delicate articles, its substance being between 12 g/m<sup>2</sup> and 30 g/m<sup>2</sup>.

**A<sub>2</sub>** **8.2.13.3** **A<sub>2</sub>** *Preconditioning*

The specimen is stored for 24 h in an atmosphere having a temperature between 15 °C and 35 °C and a relative humidity between 35 % and 75 % before starting the test.

**A<sub>2</sub>** **8.2.13.4** **A<sub>2</sub>** *Test procedure*

The apparatus is placed in a substantially draught-free dark room, so that the flames occurring during the test are visible.

Before starting the test, the thermocouple is calibrated in accordance with Clause **6** of IEC 60695-2-1.

For the test, the procedure given in **9.1**, **9.2** and **9.3** of IEC 60695-2-1 shall be followed.

After each test, it is necessary to clean the tip of the glow wire of any residue of insulating material, for example by means of a brush.

**A<sub>2</sub>** **8.2.13.5** **A<sub>2</sub>** *Severities*

The temperature of the tip of the glow wire shall be in accordance with Table 12. The duration of application shall be (30 ± 1) s.

**Table 12**

Parts necessary to retain current-carrying parts in position	(960 ± 10) °C
Parts intended to be installed in hollow walls	(850 ± 10) °C
All other parts including parts not necessary to retain current-carrying parts in position and parts intended to be embedded in walls which are combustible with difficulty	(650 ± 10) °C

**A<sub>1</sub>** **A<sub>2</sub>** For the purpose of this test a protective conductor (PE) is not considered to be a current-carrying part. **A<sub>1</sub>**

**A<sub>2</sub>** **8.2.13.6** **A<sub>2</sub>** *Observations and measurements*

During application of the glow-wire and during a further period of 30 s, the specimen, the parts surrounding the specimen and the layer of tissue paper placed below it shall be observed.

The time at which the specimen ignites and the time when flames extinguish during or after the period of application are noted.

The specimen is considered to have withstood the glow-wire test:

- if there is no visible flame and no sustained glowing, or
- if flames or glowing of the specimen extinguish within 30 s after removal of the glow-wire.

There shall be no burning of the tissue paper or scorching of the pinewood board.

**A<sub>1</sub>** **A<sub>2</sub>** **8.2.14** **A<sub>2</sub>** *Verification of resistance to humidity*

The resistance to humidity of the DBU shall be verified according to IEC 60068-2-3:1969, Basic environmental testing procedures — Part 2: Tests — Test Ca: Damp heat, steady state, under the following test conditions:

The test shall be applied to the DBU with the enclosure together with the busbars and terminals, but without other components which are covered by their own product standards in place.

Inlet openings, if any, shall be left open. If knock-outs are provided, one of them shall be opened.

Parts which can be removed without the aid of a tool shall be removed and subjected to the humidity treatment with the main parts. Spring lids shall be open during this treatment.

Before being placed in the testing chamber, the samples shall be stored at room temperature for at least 4 h before the test.

Test duration shall be 4 days.

After this period the removed parts are reinstalled and the lid closed.

The equipment is then submitted to a power frequency test voltage, for 1 min, the value shall be  $2 U_e$  with a minimum of 1 000 V between the different parts as specified in the future Annex K of IEC 60947-1:1988, Low-voltage switchgear and controlgear — Part 1: General rules. This verification shall be made within one hour of the end of the 4-day period.

**A2) 8.2.15 A2) Verification of mechanical strength of fastening means of enclosures**

This test is applied only to items which are not an integral part of other components covered by their own product standards.

The screws or nuts shall be tightened and loosened:

- 10 times when in engagement with a thread of insulating material;
- 5 times in all other cases.

Screws or nuts in engagement with a thread of insulating material shall be completely removed and reinserted each time.

The test shall be made by means of a suitable screwdriver or spanner applying a torque as given in Table 13.

The screws or nuts shall be tightened without jerks.

Where a screw has a hexagonal head with a slot for tightening with a screwdriver and the values in columns II and III of Table 13, are different, the test shall be made twice:

- first applying to the hexagonal head the torque specified in column III by means of the spanner;
- then, on a new sample, applying the torque specified in column II by means of the screwdriver.

If the values in columns II and III are the same, only the test with the screwdriver shall be made.

During the test, the screwed connections shall not work loose and there shall be no damage, such as breakage of screws or damage to the head slots, threads, washers or stirrups, or damage to enclosures and covers, that will impair the further use of the equipment. A1

## Annex ZA (informative)

### A-deviations

**A-deviation:** National deviation due to regulations, the alteration of which is for the time being outside the competence of the CEN/CENELEC member.

This European Standard falls under Directive 73/23/EEC.

NOTE (from CEN/CENELEC IR Part 2, 3.1.9): Where standards fall under EC Directives, it is the view of the Commission of the European Communities (OJ No C 59:1982-03-09) that the effect of the decision of the Court of Justice in case 815/79 Cremonini/Vrankovich (European Court Reports 1980, p. 3583) is that compliance with A-deviations is no longer mandatory and that the free movement of products complying with such a standard should not be restricted except under the safeguard procedure provided for in the relevant Directive.

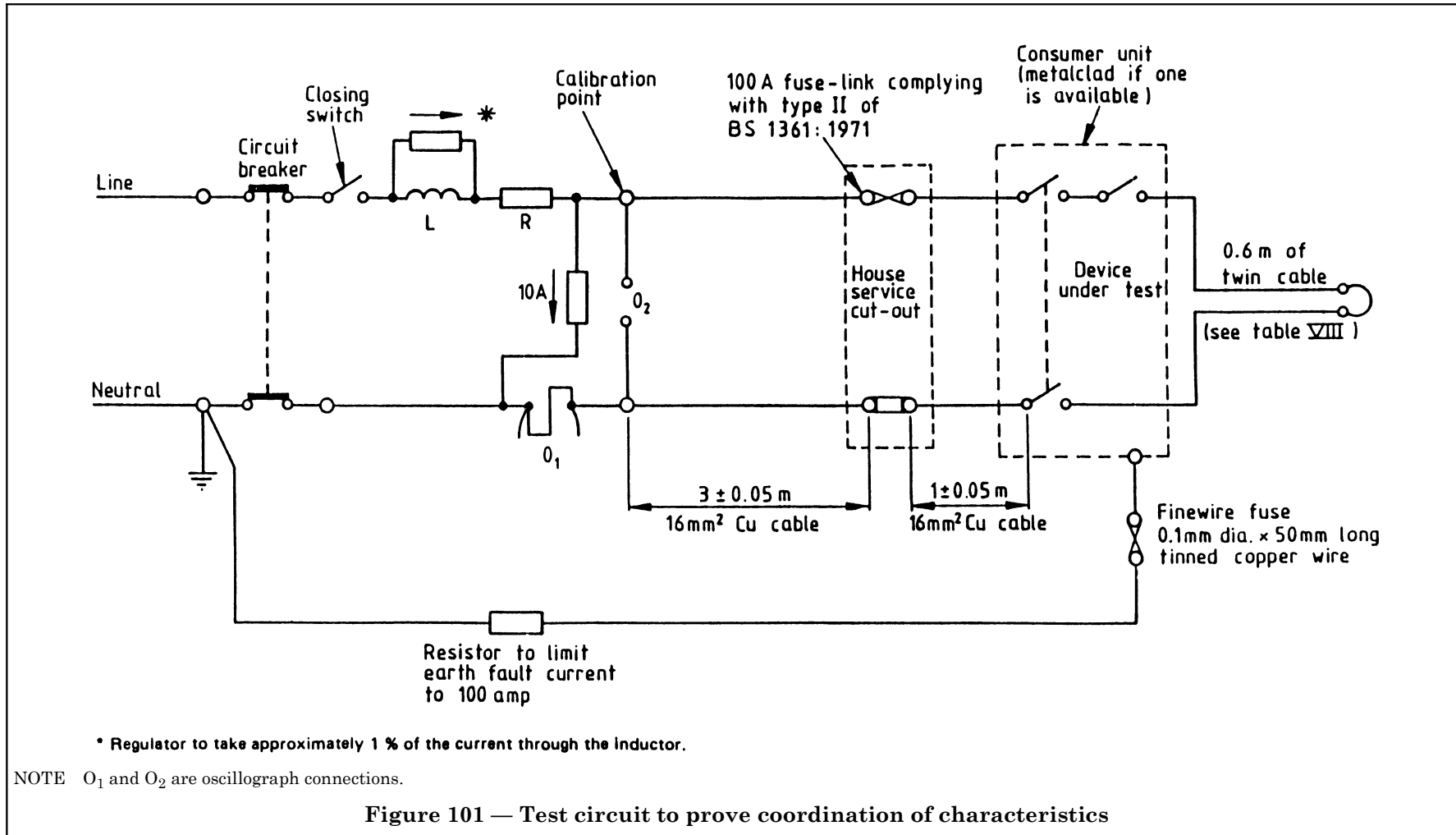
A-deviations in an EFTA-country are valid instead of the relevant provisions of the European Standard in that country until they have been removed.

Clause No	A-Deviation
	<b>United Kingdom</b>
	The Electricity Supply Regulations 1988 (S.I 1988 No. 1057) require electricity suppliers to state the maximum prospective short circuit current at the supply terminals. This information is given in Electricity Association publication P25. To meet this condition the following requirements are to be incorporated:
<b>2.1.11</b>	<b>Additional Definition:</b> Customer Distribution Board: An integrated assembly, for the control and distribution of electrical energy, principally in a household or similar premise, incorporating manual means of double-pole isolation on the incoming circuit(s), with polarity observed throughout. They are designed for use exclusively with specific protective devices on the outgoing circuits, and type-tested for use when energized through the specified 100 amp fuse. Note Generally known in the UK as a Consumer unit.
<b>8.2</b>	<b>Additional Test</b>
	<b>8.2.3</b> Verification of the Assembly Capability to withstand a 16 kA fault. The following test is applied to customer distribution boards as covered by the definition in Clause <b>2.1.11</b> .
	<b>8.2.3.1</b> Test arrangements. The Customer Distribution Board shall be set up as in normal use. It will be sufficient to test a single functional use if the remaining functional units are constructed in the same way and cannot affect the test result.
	<b>8.2.3.2</b> Short-circuit test procedure. The following test procedure is intended to verify the performance of the incoming device and its connections, and any other item in the Consumer Distribution Board not separately rated in excess of 16 kA, when the complete Customer Distribution Board is protected by a fuse-link complying with BS 1361:1971. This type test shall be deemed to cover the use of any other short-circuit protective device having a Joule integral ( $I^2 t$ ) and cut-off current not exceeding the values given in item b) below, at the rated voltage, prospective current and power factor.

Clause No	A-Deviation																																																	
	<p>a) It shall be verified that the representative samples of the final circuit protective devices used for the test comply with Table 101 and Table 102 where applicable</p> <p>b) The reference fuse shall be a 100 A fuse-link complying with type II of BS 1361:1971. Details of the fuse-links used for the test, i.e. manufacturer's name, reference, rated current, rated voltage and pre-arcing (<math>I^2 t</math>), shall be given in the test report.</p> <p>c) The final circuit protective device shall be mounted as in service in the manufacturer's smallest recommended enclosure complying with Part 13 of BS 5486 (metal if offered in the catalogue). The connection on the load side of the protective device under test shall be in accordance with Table 103 and <math>0.6 \pm 0.05</math> m in length.</p> <p>d) The test circuit shall be connected as shown in Figure 101. The relative positions of the closing switch, inductive reactor and resistor are not obligatory, but the resistor shall be in series with the master circuit-breaker.</p> <p>e) The impedance used for limiting the prospective short-circuit fault current to the required value shall be inserted on the supply side of the circuit.</p> <p>Resistors shall be connected between line and neutral, after the impedances for adjusting the prospective current, so as to draw current of 10 A per phase at rated voltage from the supply. If an air-cored inductor is used, a resistor taking approximately 1 % of the current through the inductor shall be connected in parallel with it.</p> <p>A lower value of shunt current may be used with the consent of the manufacturer</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p align="center"><b>Table 101 — Requirements for final circuit protective devices: Miniature Circuit Breakers complying with BS 3871-1</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 35%;">Circuit Breaker Type</th> <th style="width: 10%;">Time h</th> <th style="width: 30%;">Test current Rated current</th> <th style="width: 25%;">Result</th> </tr> </thead> <tbody> <tr> <td rowspan="3">1, 2, 3, 4,</td> <td>2</td> <td>1.0</td> <td>No Trip</td> </tr> <tr> <td>1</td> <td>1.5 (rating &lt;10A)</td> <td>Trip</td> </tr> <tr> <td></td> <td>1.35 (rating &gt;10A)</td> <td>Trip</td> </tr> <tr> <td rowspan="2">B.C.D</td> <td>1</td> <td>1.13</td> <td>No Trip</td> </tr> <tr> <td>1<sup>a</sup></td> <td>1.45</td> <td>Trip</td> </tr> </tbody> </table> <p>NOTE Test to be conducted at specified reference ambient temperature.  <sup>a</sup> This test shall commence within 5 seconds of the end of the test at 1.13 In.</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p align="center"><b>Table 102 — Requirements for final circuit protective devices: Semi-enclosed fuses complying with BS 3036 and cartridge fuses complying with BS 1361, type 1</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Fuse rating A</th> <th style="width: 10%;">Time h</th> <th style="width: 30%;">Test current Rated current</th> <th style="width: 45%;">Result</th> </tr> </thead> <tbody> <tr> <td>5(6)</td> <td>0.75</td> <td rowspan="5" style="text-align: center; vertical-align: middle;">} 1.0</td> <td rowspan="5" style="text-align: center; vertical-align: middle;">} Fuse intact</td> </tr> <tr> <td>15(16)</td> <td>1.0</td> </tr> <tr> <td>20</td> <td>1.0</td> </tr> <tr> <td>30(32)</td> <td>1.25</td> </tr> <tr> <td>45</td> <td>1.5</td> </tr> <tr> <td>5(6)</td> <td>0.75</td> <td rowspan="5" style="text-align: center; vertical-align: middle;">} 2.0</td> <td rowspan="5" style="text-align: center; vertical-align: middle;">} Fuse melted</td> </tr> <tr> <td>15(16)</td> <td>1.0</td> </tr> <tr> <td>20</td> <td>1.0</td> </tr> <tr> <td>30(32)</td> <td>1.25</td> </tr> <tr> <td>45</td> <td>1.5</td> </tr> </tbody> </table> </div>	Circuit Breaker Type	Time h	Test current Rated current	Result	1, 2, 3, 4,	2	1.0	No Trip	1	1.5 (rating <10A)	Trip		1.35 (rating >10A)	Trip	B.C.D	1	1.13	No Trip	1 <sup>a</sup>	1.45	Trip	Fuse rating A	Time h	Test current Rated current	Result	5(6)	0.75	} 1.0	} Fuse intact	15(16)	1.0	20	1.0	30(32)	1.25	45	1.5	5(6)	0.75	} 2.0	} Fuse melted	15(16)	1.0	20	1.0	30(32)	1.25	45	1.5
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	<p data-bbox="293 356 1182 412" style="text-align: center;"><b>Table 103 — Cross sections of copper conductors on load side of protective device under test</b></p> <table border="1" data-bbox="274 421 1198 640" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th data-bbox="274 421 895 488" style="text-align: center;">Device rating A</th> <th data-bbox="900 421 1198 488" style="text-align: center;">conductor mm<sup>2</sup></th> </tr> </thead> <tbody> <tr> <td data-bbox="274 488 895 517" style="text-align: center;">&lt;6</td> <td data-bbox="900 488 1198 517" style="text-align: center;">1.0</td> </tr> <tr> <td data-bbox="274 517 895 546" style="text-align: center;">&gt;6</td> <td data-bbox="900 517 1198 546" style="text-align: center;">1.5</td> </tr> <tr> <td data-bbox="274 546 895 575" style="text-align: center;">&gt;10</td> <td data-bbox="900 546 1198 575" style="text-align: center;">2.5</td> </tr> <tr> <td data-bbox="274 575 895 604" style="text-align: center;">&gt;20</td> <td data-bbox="900 575 1198 604" style="text-align: center;">6.0</td> </tr> <tr> <td data-bbox="274 604 895 640" style="text-align: center;">&gt;32</td> <td data-bbox="900 604 1198 640" style="text-align: center;">10.0</td> </tr> </tbody> </table> <p data-bbox="240 678 1342 909"><b>8.2.3.3</b> Circuit conditions. The applied voltage shall be not less than 100 % and not more than 110 % of the rated single phase voltage of the final circuit protective device. The recovery voltage measured two cycles after operation shall be not less than 95 % nor more than 105 % of the rated single phase voltage of the final circuit protective device, and shall be maintained for at least 30 s after the interruption of the short-circuit current. The higher limit of 105 % may be exceeded with the consent of the manufacturer.</p> <p data-bbox="440 920 1342 1126">The value of the prospective short-circuit current shall be 16 kA – 0 % at a power factor of <math>0.6 \pm 0.05</math> determined from a calibration oscillogram taken with a link of negligible impedance positioned as shown in Figure 101. All parts of the equipment normally earthed in service, including its enclosure, shall be insulated from earth, but shall be connected to the neutral of the supply or to a substantially inductive artificial neutral, permitting a prospective fault current of at least 100 A.</p> <p data-bbox="440 1137 1342 1249">This connection shall include a reliable device, such as a fuse consisting of a copper wire of 0.1 mm diameter and not less than 50 mm in length for the detection of the fault current and, if necessary, a resistor to limit the value of the prospective fault current to approximately 100A.</p> <p data-bbox="240 1261 1342 1350"><b>8.2.3.4</b> Test sequence. The Customer Distribution Board shall be subject to the following two tests A and B with the outgoing way fitted with a final circuit protective device of the maximum thermal current rating</p> <p data-bbox="440 1361 1342 1503">If the final circuit protective devices have a short-circuit rating less than 16 kA, two further tests A and B shall be carried out with a device of the minimum thermal rating fitted. In addition, if the Customer Distribution Board is designed to accept different types or ranges of outgoing devices, each type shall be further tested separately.</p> <p data-bbox="440 1514 791 1536">The two tests are as follows:</p> <p data-bbox="467 1547 1342 1659">a) Test A. With the circuit connected as described above, with all fuses in place and all circuit-breakers closed, the test voltage is applied with the point-on-wave controlled to provide initiation of the fault at between 0° and 20° (electrical) on the rising voltage.</p> <p data-bbox="467 1671 1342 1839">b) Test B. A further short-circuit operation shall be applied after suitable preparation as indicated in table dependent on which of the alternative results of test A is achieved. If circuit-breakers are included in the Customer Distribution Board, the test shall be applied by reclosing a circuit-breaker with the test circuit energized. If fuses are used, the test shall be as in Test A.</p> <p data-bbox="440 1850 1342 1939">During the tests cheesecloth shall be placed on the outside of the enclosure at all openings, e.g. arc vents and handles. There shall be no ignition of the cheesecloth.</p>	Device rating A	conductor mm <sup>2</sup>	<6	1.0	>6	1.5	>10	2.5	>20	6.0	>32	10.0
Device rating A	conductor mm <sup>2</sup>												
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>32	10.0												

Clause No	A-Deviation																														
	<p>The cheesecloth shall be clean and dry bleached plain cotton of approximately 30 g to 40 g per square metre. When placed into position the cheesecloth shall be folded loosely in such a manner that cut and torn edges will not be exposed directly to the arc or flash. Ignition of the cheesecloth is considered to have occurred when a flame is visible. Smouldering is not considered to be evidence of ignition. The cheesecloth may be changed following each test B. Details of the I<sup>2</sup> t let through by the combination of devices during the test shall be given in the test report. A new Customer Distribution Board of the same design may be used for each of the two test sequences.</p> <p style="text-align: center;"><b>Table 104 —Preparation for test B</b></p> <table border="1" data-bbox="411 730 1489 1099"> <thead> <tr> <th colspan="2" data-bbox="411 730 874 763"></th> <th colspan="3" data-bbox="874 730 1489 763">Result of test A</th> </tr> <tr> <td colspan="2" data-bbox="411 763 874 797">Reference fuse complying with BS 1361</td> <td data-bbox="874 763 1027 797">Intact</td> <td colspan="2" data-bbox="1027 763 1489 797">Blown</td> </tr> <tr> <td colspan="2" data-bbox="411 797 874 831">Protective device</td> <td colspan="2" data-bbox="874 797 1182 831">Operated</td> <td data-bbox="1182 797 1489 831">Not operated</td> </tr> <tr> <td data-bbox="411 831 568 920">Final circuit preparation for test B</td> <td data-bbox="568 831 874 920">MCB complying with BS 3871 or RCCB complying with BS 4293</td> <td data-bbox="874 831 1027 920">Nil</td> <td data-bbox="1027 831 1182 920">Replace reference fuse</td> <td data-bbox="1182 831 1489 920">Replace reference fuse, open circuit breaker</td> </tr> <tr> <td data-bbox="411 920 568 1032"></td> <td data-bbox="568 920 874 1032">Fuse complying with BS 3036</td> <td data-bbox="874 920 1027 1032">Rewire test fuse</td> <td data-bbox="1027 920 1182 1032">Replace reference fuse. Rewire test fuse</td> <td data-bbox="1182 920 1489 1032">Replace reference fuse</td> </tr> <tr> <td data-bbox="411 1032 568 1099"></td> <td data-bbox="568 1032 874 1099">Fuse complying with BS 1361</td> <td data-bbox="874 1032 1027 1099">Replace test fuse</td> <td data-bbox="1027 1032 1182 1099">—</td> <td data-bbox="1182 1032 1489 1099">—</td> </tr> </thead> </table> <p><b>8.2.3.5</b> Conditions after test. Where the incoming switch is a protective device, e.g. miniature circuit-breaker (rccb), the test report shall state which of the protective devices operated during the test, i.e. the incoming and/or outgoing devices.</p> <p>The earth fault indicating device shall be intact and the degree of protection of the enclosure shall not be impaired. The insulation resistance a) shall be measured within 3 min of the conclusion of the series of tests. The insulation resistance for b) and c) shall be measured as soon as practical after measurement of a), the times of measurement of b) and c) being recorded in the test report. The values shall be measured at 500 V d.c. and shall not be less than the following:</p> <ol style="list-style-type: none"> <li>0.10 MΩ between the final circuit protective device incoming terminal and the corresponding outgoing terminal, with the isolating device open and with the blown fuse in position or the mcb opened, whichever is applicable.</li> <li>0.25 MΩ between the final circuit protective device terminals and earth, with the final circuit fuse rewired, the final circuit cartridge fuse replaced, or the mcb reclosed, whichever is applicable, and with the incoming isolating device open.</li> <li>0.25 MΩ between the final circuit protective device incoming terminals and any other metal parts which are unearthed and exposed in service.</li> </ol> <p>The condition of the incoming isolating device shall comply with its product specification with regard to isolating properties. The conductors shall not be deformed such that the clearance and creepage distances specified in 7.1.2 are impaired. There shall be no loosening of parts used for the connection of the conductors.</p> <p>Where an rccb is included in the Customer Distribution Board its operation shall be checked. With the rccb fully closed and connected to a supply at 0.85 times rated voltage ±5 % the test device shall be operated. The rccb shall open.</p>			Result of test A			Reference fuse complying with BS 1361		Intact	Blown		Protective device		Operated		Not operated	Final circuit preparation for test B	MCB complying with BS 3871 or RCCB complying with BS 4293	Nil	Replace reference fuse	Replace reference fuse, open circuit breaker		Fuse complying with BS 3036	Rewire test fuse	Replace reference fuse. Rewire test fuse	Replace reference fuse		Fuse complying with BS 1361	Replace test fuse	—	—
		Result of test A																													
Reference fuse complying with BS 1361		Intact	Blown																												
Protective device		Operated		Not operated																											
Final circuit preparation for test B	MCB complying with BS 3871 or RCCB complying with BS 4293	Nil	Replace reference fuse	Replace reference fuse, open circuit breaker																											
	Fuse complying with BS 3036	Rewire test fuse	Replace reference fuse. Rewire test fuse	Replace reference fuse																											
	Fuse complying with BS 1361	Replace test fuse	—	—																											





## National appendix NA (informative)

### Deletions from and IEC text amended by common modifications to IEC Publication 60439-3:1990

#### Foreword of IEC 60439-3:1990

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.
- 4) The IEC has not laid down any procedure concerning marking as an indication of approval and has no responsibility when an item of equipment is declared to comply with one of its recommendations.

#### Preface of IEC 60439-3:1990

This standard has been prepared by Sub-Committee 17D: Low-voltage switchgear and controlgear assemblies, of IEC Technical Committee No. 17: Switchgear and controlgear.

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

Six Months' Rule	Report on Voting
17D(CO)36	17D(CO)40

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

Distribution boards shall comply with all requirements of IEC 60439-1 (1985): Low-voltage switchgear and controlgear assemblies, Part 1: Requirements for type-tested and partially type-tested assemblies, if not otherwise indicated hereinafter and shall also comply with the particular requirements contained in this publication.

The clauses of this standard supplement, modify or replace clauses in IEC 60439-1 (1985).

Where there is no corresponding clause or sub-clause in this standard, the clause or sub-clause of the main document applies without modification.

In view of the fact that this publication should be read in conjunction with IEC 60439-1, the numbering of its clauses and sub-clauses correspond to the latter.

*The following IEC publications are quoted in this standard:*

Publications Nos. 60269-3 (1987): Low-voltage fuses, Part 3: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications).

60529 (1989): Degrees of protection provided by enclosures (IP Code).

60695-2-1 (1980): Fire hazard testing, Part 2: Test methods — Glow-wire test and guidance.

*Other publication quoted:*

ISO 4046 (1978): Paper, board, pulp and related terms — Vocabulary.

#### 7.6.1 Selection of components

The text of this clause has been replaced. It read as follows.

Fuses for outgoing circuits shall comply with the general requirements of IEC 60269-3.

## Foreword

This amendment has been prepared by sub-committee 17D: Low-voltage switchgear and controlgear assemblies, of IEC technical committee 17: Switchgear and controlgear.

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

Six Months' Rule	Report on voting
17D(CO)53	17D(CO)58

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

## Introduction

The clauses of the document supplement, modify or replace the corresponding clauses in IEC 60439-3 — First edition (1990), *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 for their use — Distribution boards*.

Where there is no corresponding clause or subclause in this amendment, the clause or subclause of IEC 60439-3:1990 applies without modifications.

## National appendix NB (informative)

The United Kingdom participation in the preparation of this European Standard was entrusted by the Power Electrical Engineering Standards Policy Committee (PEL/-) to Technical Committee PEL/12, upon which the following bodies were represented:

Association of British Mining Equipment Companies  
ASTA Certification Services  
British Gas plc  
Department of Trade and Industry (Consumer Safety Unit CA Division)  
Electrical Installation Equipment Manufacturers' Association  
Electricity Supply Industry in England and Wales  
Engineering Equipment and Materials Users' Association  
ERA Technology Ltd.  
GAMBICA (BEAMA Ltd.)  
Health and Safety Executive  
Institution of Incorporated Executive Engineers  
National Inspection Council (Quality Assurance Ltd.)  
National Inspection Council for Electrical Installation Contracting  
Transmission and Distribution Association (BEAMA Ltd.)

## National appendix NC (informative)

The British Standards corresponding to the international standards referred to in EN 60439-3 are as follows:

<b>International standard</b>	<b>British Standard</b>
IEC 60439-1	BS 5486, <i>Low-voltage switchgear and controlgear assemblies — Part 1:1990 Requirements for type-tested and partially type-tested assemblies.</i> (Technically equivalent)
IEC 60529:1976	BS 5490:1977, <i>Specification for classification of degrees of protection provided by enclosures.</i> (Identical)
IEC 60695-2-1:1980	BS 6458, <i>Fire hazard testing for electrotechnical products — Section 2.1:1984 Glow-wire test.</i> (Identical)
ISO 4046:1978	BS 3203:1979, <i>Glossary of paper, board, pulp and related terms</i> (Identical)

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