BRITISH STANDARD

BS 5486-11: 1989

Low-voltage switchgear and controlgear assemblies —

Part 11: Specification for particular requirements of fuseboards

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Committees responsible for this British Standard

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

ASTA Certification Services
Association of British Mining Equipment Companies
Association of Supervisory and Executive Engineers
British Gas plc
Building Employers' Confederation
Department of Trade and Industry (Consumer Safety Unit, C A Division)
ERA Technology Ltd.
Electrical Contractors' Association
Electrical Installation Equipment Manufacturers' Association (BEAMA Ltd.)
Electricity Supply Industry in England and Wales
Engineering Equipment and Materials Users' Association
GAMBICA (BEAMA Ltd.)
Health and Safety Executive
National Inspection Council for Electrical Installation Contracting
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Contents

Foreword

This Part of BS 5486 has been prepared under the direction of the Power Electrical Engineering Standards Policy Committee. It supersedes BS 5486-11:1979 which is withdrawn.

This Part has been revised to align it with BS 5486-1:1986. The opportunity has been taken to make two changes, the first being the omission of the reference to the use of semi-enclosed fuses and the second being the omission of the table giving the limiting dimensions of fuseboards (indoor type).

The clause and subclause numbering from clause **2** onwards of this Part of BS 5486 follows that of BS 5486-1:1986. Many subclauses refer to the equivalent subclause in BS 5486-1 as either applicable or not applicable; where no reference is made to Part 1, the subclause replaces the equivalent subclause in that Part.

Reference should be made to the note contained in the foreword to BS 5486-1, regarding requirements described as "under consideration".

Particular requirements for consumer units, such as are installed in a consumer's premises for the control and distribution of electrical energy from a single phase earthed neutral system having a declared voltage not exceeding 250 V a.c. at a nominal frequency of 50 Hz and for a maximum total load of 100 A, are specified in BS 5486-13.

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 to iv, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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1 Scope and general requirements

1.1 Scope

This Part of BS 5486 specifies particular requirements for fuseboards for use in systems having a rated current not exceeding 200 A for individual outgoing circuits.

This Part does not apply to fuseboards used as consumer units as specified in Part 13 of this standard nor to partially type-tested ASSEMBLIES (PTTA) as defined in **2.1.1.2** of Part 1 of this standard.

NOTE 1 All references to Part 1 relate to BS 5486-1:1986; see foreword.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

1.2 General requirements

Type-tested ASSEMBLIES known as fuseboards shall comply with all the requirements of Part 1 unless otherwise indicated hereinafter and shall also comply with the supplementary requirements contained in this Part.

Individual components such as fuses and switches shall comply with the relevant British Standards and in this respect are not covered by this standard.

2 Definitions

2.1 General definitions

The definitions given in this subclause in Part 1 apply, together with the following.

2.1.101
fuseboard

an enclosure containing busbars, with fuses, for the purposes of protecting, controlling or connecting more than one outgoing circuit fed from one or more incoming circuits

NOTE Fuseboards are also known as distribution fuseboards.

2.1.102
fuseway

within an outgoing unit, it is each pole, in which the protective device is a fuse, that is provided for the connection of a pole of an outgoing circuit

2.1.103
pole of a fuseboard

a busbar and associated fuseway connected to a pole of a system of distribution fed into the fuseboard

2.1.104
number of fuseways per pole

the number of fuseways provided per pole of a fuseboard and also the number of outgoing circuits that may be connected

2.2
definitions concerning constructional units of ASSEMBLIES

the definitions given in this subclause in Part 1 apply

2.3
definitions concerning the external design of ASSEMBLIES

the definitions given in this subclause in Part 1 apply

2.4
definitions concerning the structural parts of ASSEMBLIES

the definitions given in this subclause in Part 1 apply

2.5
definitions concerning the conditions of installation of ASSEMBLIES

the definitions given in this subclause in Part 1 apply

2.6 Definitions concerning protective measures with regard to electric shock

The definitions given in this subclause in Part 1 apply, together with the following.

2.6.101
shrouded fuseboard

a fuseboard in which all fuseways are shrouded so that existing unused fuseways may be wired and connected in safety while the other fuseways remain alive and on load

2.7
gangways within ASSEMBLIES

the definitions given in this subclause in Part 1 do not apply to fuseboards

2.8
definitions relating to electronic functions

the definitions given in this subclause in Part 1 do not apply to fuseboards

3 Classification of ASSEMBLIES

ASSEMBLIES are classified according to:

a) the external design (see **2.3** of Part 1);

b) the place of installation (see **2.5.1** and **2.5.2,** both of Part 1);

c) the conditions of installation with respect to mobility (see **2.5.3** and **2.5.4,** both of Part 1);

d) the degree of protection (see **7.2.1** of Part 1);

e) the type of enclosure;

f) the method of mounting, e.g. fixed or removable equipment (see **7.6.3** and **7.6.4,** both of Part 1);

g) the measures for the protection of persons (see **7.4**);

h) the type of fuseboard (see **7.1.4**).

4 Electrical characteristics of ASSEMBLIES

4.1 Rated voltages

The provisions of this subclause in Part 1 shall apply.

4.2 Rated current (of a circuit of an ASSEMBLY)

The rated current of a fuseboard is the sum of the rated currents of the fuseways per pole, multiplied by the appropriate diversity factor (see **4.8**).

The preferred rated currents of fuseways (in A) are as follows:

200 100 63 32 20

4.3 Rated short-time withstand current (of a circuit of an ASSEMBLY)

The provisions of this subclause in Part 1 shall apply.

4.4 Rated peak withstand current (of a circuit of an ASSEMBLY)

The provisions of this subclause in Part 1 shall apply.

4.5 Rated prospective short-circuit withstand current (of a circuit of an ASSEMBLY)

The provisions of this subclause in Part 1 shall apply.

4.6 Rated conditional short-circuit current (of a circuit of an ASSEMBLY)

The provisions of this subclause in Part 1 shall apply.

4.7 Rated fused short-circuit current (of a circuit of an ASSEMBLY)

The provisions of this subclause in Part 1 shall apply.

4.8 Rated diversity factor

The rated diversity factor of an ASSEMBLY or a part of an ASSEMBLY having several main circuits (e.g. a section or subsection) is the ratio of the maximum sum, at any one time, of the assumed currents of all the main circuits involved, to the sum of the rated currents of all the main circuits of the ASSEMBLY or the selected part of the ASSEMBLY.

When the manufacturer states a rated diversity factor, this factor shall be used for the temperature-rise test in accordance with **8.2.1**.

NOTE In the absence of information concerning the actual currents, the conventional values given in Table I of this Part, which replaces Table I of Part 1, may be used.

Table I — Diversity factor

Number of outgoing circuits per pole	Maximum rated current of the outgoing circuit				
	200 A	100 A	63 A	32 A	≤ 20 A
2	1.0	1.0	1.0	1.0	1.0
4	0.8	0.9	0.9	0.9	0.9
6	0.66	0.8	0.8	0.8	0.8
8	—	0.66	0.8	0.8	0.8
10	—	—	0.66	0.66	0.66
12	—	—	—	0.66	0.66

4.9 Rated frequency

The provisions of this subclause in Part 1 shall apply.

5 Information to be given regarding the ASSEMBLY

The following information shall be given by the manufacturer, either on the nameplate or in some other way.

5.1 Nameplates

Each ASSEMBLY shall be provided with one or more plates, marked in a durable manner and located in a place such that they are visible and legible when the ASSEMBLY is installed.

Information specified under a), b) and c) shall be given on the nameplate of the fuseboard.

Information from d) to r) may, where applicable, be given on the nameplates, in the relevant documents, the circuit diagrams or in the manufacturer's list or catalogues.

a) the manufacturer's name or trademark;

b) type designation or identification number making it possible to get relevant information from the manufacturer;

c) the number and date of this Part of BS 5486, i.e. BS 5486-11:1989[1)];

d) type of current (and frequency in the case of a.c.);

e) rated operational voltage (see **4.1.1** of Part 1);

f) rated insulation voltage (see **4.1.2** of Part 1);

[1)] Marking BS 5486-11:1989 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity which may also be desirable.

g) rated voltages of auxiliary circuits (if applicable);

h) limits of operation (see clause **4**);

i) rated current of each circuit (if applicable; see **4.2**);

k) short-circuit strength (see **7.5.2**);

l) degree of protection (see **7.2.1** of Part 1);

m) measures for the protection of persons (see **7.4**);

n) service conditions for indoor use, outdoor use or special use, if different from the usual service conditions as given in **6.1** of Part 1;

o) types of system earthing for which the ASSEMBLY is designed;

p) dimensions given preferably in the order of height, width (or length), depth;

q) mass;

r) rated current of the fuseboard (see **4.2**).

5.2 Markings

The provisions of this subclause in Part 1 shall apply.

5.3 Instructions for installation, operation and maintenance

The manufacturer shall specify in his documents or catalogues the conditions, if any, for the installation, operation and maintenance of the ASSEMBLY and the equipment contained therein.

If necessary, the instructions for the transport, installation and operation of the ASSEMBLY shall indicate the measures that are of particular importance for the proper and correct installation, commissioning and operation of the ASSEMBLY.

Where necessary, the above-mentioned documents shall indicate the recommended extent and frequency of maintenance.

If the circuitry is not obvious from the physical arrangement of the apparatus installed, suitable information shall be supplied, e.g. wiring diagrams or tables.

Provision shall be made by means of a label or card (which is preferably renewable and may be protected by transparent material) for recording the title, cable size and actual current rating of each outgoing circuit, the rated current of the fuseboard (see **4.2**) and, in addition, the current rating of the cartridge fuse-link.

The position of the poles shall be indicated by suitable means; such indication may be incorporated in the outgoing circuit labels.

The label or card shall be fitted inside the door of the enclosure or on the insulating barrier if any, and may be of printed paper. Where reversible door action is obtained by inverting the fuseboard, provision shall be made for inverting the label.

6 Service conditions

The provisions of this clause in Part 1 shall apply.

7 Design and construction

7.1 Mechanical design

7.1.1 *General.* The ASSEMBLIES shall be constructed only of materials capable of withstanding the mechanical, electrical and thermal stresses as well as the effects of humidity which are likely to be encountered in normal service.

Protection against corrosion shall be ensured by the use of suitable materials or by the application of equivalent protective coatings to the exposed surface, taking account of the intended conditions of use and maintenance.

All enclosures or partitions shall be of a mechanical strength sufficient to withstand the stresses to which they may be subjected in normal service.

The apparatus and circuits in the ASSEMBLY shall be so arranged as to facilitate their operation and maintenance and at the same time ensure the necessary degree of safety.

NOTE Where fuseboards are intended for use with cables with aluminium conductors, the manufacturer's advice should be sought.

7.1.2 *Clearances, creepage and isolating distances*

7.1.2.1 *Clearances and creepage distances.* The provisions of this subclause in Part 1 shall apply.

7.1.2.2 *Isolating distances.* Not applicable.

7.1.3 *Terminals for external conductors*

7.1.3.1 The provisions of this subclause in Part 1 shall apply.

7.1.3.2 The provisions of this subclause in Part 1 shall apply.

7.1.3.3 The provisions of this subclause in Part 1 shall apply.

7.1.3.4 Unless otherwise agreed between manufacturer and user, on three-phase and neutral circuits, terminals for the neutral conductor shall allow the connection of copper conductors having a current carrying capacity as follows:

either

a) equal to half the current carrying capacity of the phase conductor, with a minimum of 16 mm^2, if the size of the phase conductor exceeds 16 mm^2; or

b) equal to the full current carrying capacity of the phase conductor if the size of the latter does not exceed 16 mm^2.

Neutral busbars of SP and N fuseboards (see **7.1.4.1**) and 20 A and 32 A TP and N fuseboards shall have one outgoing terminal for each fuse. For all other TP and N fuseboards the neutral busbar shall have one outgoing terminal for each three-phase circuit.

NOTE 1 For certain applications in which the current in the neutral conductor may reach high values, e.g. large fluorescent lighting installations, a neutral conductor having the same current carrying capacity as the phase conductors may be necessary, subject to special agreement between manufacturer and user.

NOTE 2 Additional neutral terminals may be provided subject to agreement between the manufacturer and the user.

7.1.3.5 A multi-terminal protective conductor shall be provided as follows:

a) SP and N (all ratings of fuseway), one terminal for each fuseway;

b) TP and N (20 A and 32 A fuseways), one terminal for each fuseway;

c) TP and N (63 A and 100 A fuseways), one terminal for each three-phase circuit.

7.1.3.6 Openings in cable entries, cover plates, etc., shall be so designed that when the cables are properly installed, the stated protective measures against contact and degree of protection shall be obtained. This implies the selection of means of entry suitable for the application as stated by the manufacturer.

For metal cased fuseboards it shall be possible to ensure that the cables of the phase(s) and neutral, if any, of each outgoing a.c. circuit may be contained in the same conduit, should conduit be used.

7.1.3.7 Identification of terminals shall comply with BS 5559.

Identification of neutral and protective conductor terminals shall either be clear from their disposition relative to the fuse phase or by other means of identification.

7.1.4 *Type of fuseboard*

7.1.4.1 *Designation.* The following types of fuseboards are preferred:

a) single pole and neutral (SP and N);

b) double pole (DP);

c) triple pole (TP);

d) triple pole and neutral (TP and N).

7.1.4.2 *Number of fuseways per pole.* The preferred numbers and ratings of outgoing circuits per pole for each type of fuseboard are as given in Table 101 and Table 102.

Table 101 — Preferred numbers of outgoing circuits for single pole and neutral and double pole fuseboards

Maximum current rating of fuseways per pole	Number of outgoing circuits				
A					
20	4	6	8	10	12
32	4	6	8	10	12
63	4	6	8	10	—
100	4	6	8	—	—

Table 102 — Preferred numbers of outgoing circuits for triple pole and triple pole and neutral fuseboards

Maximum current rating of fuseways per pole	Number of outgoing circuits					
A						
20	—	4	6	8	10	12
32	—	4	6	8	10	12
63	—	4	6	8	10	—
100	—	4	6	8	—	—
200	2	4	6	—	—	—

7.1.5 *Current rating of the neutral busbar.* The current rating of the neutral busbar shall be not less than that of the phase busbar(s).

7.2 Enclosure and degree of protection

The provisions of this subclause in Part 1 shall apply, except for **7.2.1.5** which is not applicable.

7.3 Temperature rise

The provisions of this subclause in Part 1 including Table III shall apply.

7.4 Protection against electric shock

The following requirements are intended to ensure that the required protection measures are obtained when an ASSEMBLY is installed in a system conforming to the relevant specification.

7.4.1 *Protection against both direct and indirect contact.* Not applicable.

7.4.2 *Protection against direct contact* (*see **2.6.8** of Part 1*). The provisions of this subclause in Part 1 shall apply, except for **7.4.2.3** which is not applicable.

7.4.3 *Protection against indirect contact* (*see **2.6.9** of Part 1*). The provisions of this subclause in Part 1 shall apply, except for the requirements for PTTA in the final paragraph of **7.4.3.1.1** and for the requirements in **7.4.3.2.1,** which are not applicable.

7.4.4 *Discharging of electrical charges.* Not applicable.

7.4.5 *Operating and maintenance gangways within ASSEMBLIES.* Not applicable.

7.4.6 *Requirements related to accessibility in service by authorised personnel.* The following requirements are complementary to the protective measures specified in subclause **7.4**.

When the doors of the fuseboard enclosure are open, means shall be provided to prevent accidental contact with live parts whilst any fuse carriers etc. are fitted into their fuse bases and whilst any insulation barriers, etc. are correctly fitted. Neutral bars need not be shrouded.

The provision of locking facilities shall be subject to agreement between manufacturer and user.

Shrouded fuseboards shall comply with the following requirements.

a) All live parts except neutral bars shall be fully shrouded so that existing unused fuseways can be connected in safety.

b) All fuse base fixed contacts shall be so screened that the requirements of the first characteristic numeral of BS 5420:1977 are met (IP2X) even when the fuse carrier is removed from the base.

7.4.6.1 *Requirements related to accessibility for inspection and similar operations.* Not applicable.

7.4.6.2 *Requirements related to accessibility for maintenance.* Not applicable.

7.4.6.3 *Requirement related to accessibility for extension under voltage.* Not applicable.

7.5 Short-circuit protection and short-circuit withstand strength

NOTE For the time being, this subclause applies primarily to a.c. equipment. Requirements concerning d.c. equipment are under consideration.

7.5.1 *General.* The provisions of this subclause in Part 1 shall apply, except for the requirements for PTTA in the final paragraph which are not applicable.

7.5.2 *Information concerning the short-circuit withstand strength*

7.5.2.1 The provisions of this subclause in Part 1 shall apply.

7.5.2.2 The provisions of this subclause in Part 1 shall apply.

7.5.2.3 Not applicable.

7.5.3 *Relationship between peak and r.m.s. values of short-circuit current.* The provisions of this subclause in Part 1 including Table V shall apply.

7.5.4 *Co-ordination of short-circuit protective devices.* The provisions of this subclause in Part 1 shall apply.

7.5.5 *Circuits within an ASSEMBLY*

7.5.5.1 *Main circuits.* The provisions of this subclause in Part 1 shall apply.

7.5.5.2 *Auxiliary circuits.* Not applicable.

7.6 Components installed in ASSEMBLIES

7.6.1 *Selection of components.* The provisions of this subclause in Part 1 shall apply. Components incorporated in the ASSEMBLIES shall comply with the relevant British Standard.

7.6.2 *Installation of components.* The provisions of this subclause in Part 1 shall apply.

7.6.3 *Fixed parts.* The provisions of this subclause in Part 1 shall apply.

7.6.4 *Removable parts and withdrawable parts.* The provisions of this subclause in Part 1 shall apply, except for **7.6.4.4** which is not applicable.

7.6.5 *Identification.* The provisions of this subclause in Part 1 shall apply.

7.7 Internal separation of ASSEMBLIES by barriers or partitions

The provisions of this subclause in Part 1 shall apply.

7.8 Electrical connections inside an ASSEMBLY: Bars and insulated conductors

The provisions of this subclause in Part 1 shall apply.

7.9 Requirements for electronic equipment supply circuits

Not applicable.

8 Test specifications

8.1 Classification of tests

The tests to verify the characteristics of an ASSEMBLY include the following:

a) type tests (see **8.1.1** and **8.2**);

b) routine tests (see **8.1.2** and **8.3**).

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 an ASSEMBLY or on parts of ASSEMBLIES manufactured to the same or a similar design.

They shall be carried out on the initiative of the manufacturer.

Type tests are as follows:

a) verification of temperature-rise limits (**8.2.1**);

b) verification of the dielectric properties (**8.2.2** of Part 1);

c) verification of the short-circuit strength (**8.2.3**);

d) verification of the effectiveness of the protective circuit (**8.2.4.1** of Part 1);

e) verification of clearances and creepage distances (**8.2.5** of Part 1);

f) verification of the degree of protection (**8.2.7** of Part 1).

These tests may be carried out in any order and/or on different samples of the same type.

If modifications are made to the 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.

8.1.2 *Routine tests (see 8.3).* Routine tests are intended to detect faults in materials and workmanship. They are carried out on every new ASSEMBLY after its assembly or on each transport unit. Another routine test at the place of installation is not required.

ASSEMBLIES which are assembled from standardized components outside the works of the manufacturer of these components, by the exclusive use of parts and accessories specified or supplied by the manufacturer for this purpose, shall be routine tested by the firm which has assembled the ASSEMBLY.

Routine tests are as follows:

a) inspection of the ASSEMBLY including inspection of wiring and, if necessary, electrical operation test (see **8.3.1** of Part 1);

b) dielectric test (applies only for ASSEMBLIES containing internal wiring as distinct from busbars) (see **8.3.2**);

c) checking of protective measures and of the electrical continuity of the protective circuit (see **8.3.3** of Part 1).

These tests may be carried out in any order.

8.1.3 *Testing of devices and self-contained components incorporated in the ASSEMBLY.* The provisions of this subclause in Part 1 shall apply.

8.2 Type tests

8.2.1 ***Verification of temperature-rise limits***

8.2.1.1 *General.* The temperature-rise test is designed to verify that the temperature-rise limits specified in **7.3** of Part 1 for the different parts of the ASSEMBLY are not exceeded.

The test shall normally be carried out at the values of rated current in accordance with **8.2.1.3** with the apparatus of the ASSEMBLY installed.

The temperature-rise test shall be made with the type of current for which the fuseboard is intended, and at the design frequency where applicable.

8.2.1.2 *Arrangement of the ASSEMBLY.* The ASSEMBLY shall be arranged as in normal use, with all covers, etc., in place.

8.2.1.3 *Temperature-rise test using current on all apparatus.* The temperature-rise test shall be performed on that size of fuseboard in each current rating where, under the conditions of diversified loading described in **4.8**, the maximum value of power loss per unit area of the total heat dissipating surface of the enclosure is achieved.

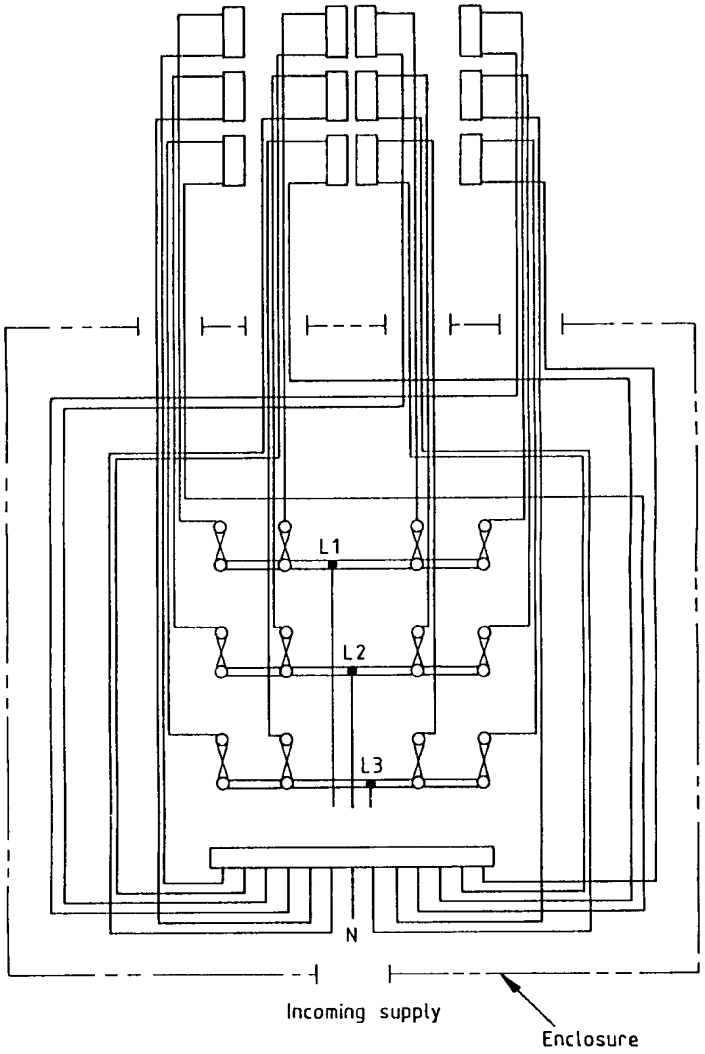
For the purpose of this test, the power loss is the sum of the rated power loss, as declared by the fuse manufacturer of all the fuse-links in the fuseboard, multiplied by the appropriate diversity factor from Table I. The power loss of the fuse-links used for the test shall be stated in the test report.

The test shall be regarded as proving the performance of all fuseboards of the same rating and basic design having different numbers of fuseways per pole.

Every fuseway in the fuseboard shall be fitted with a fuse-link or element of maximum current rating for which it is designed.

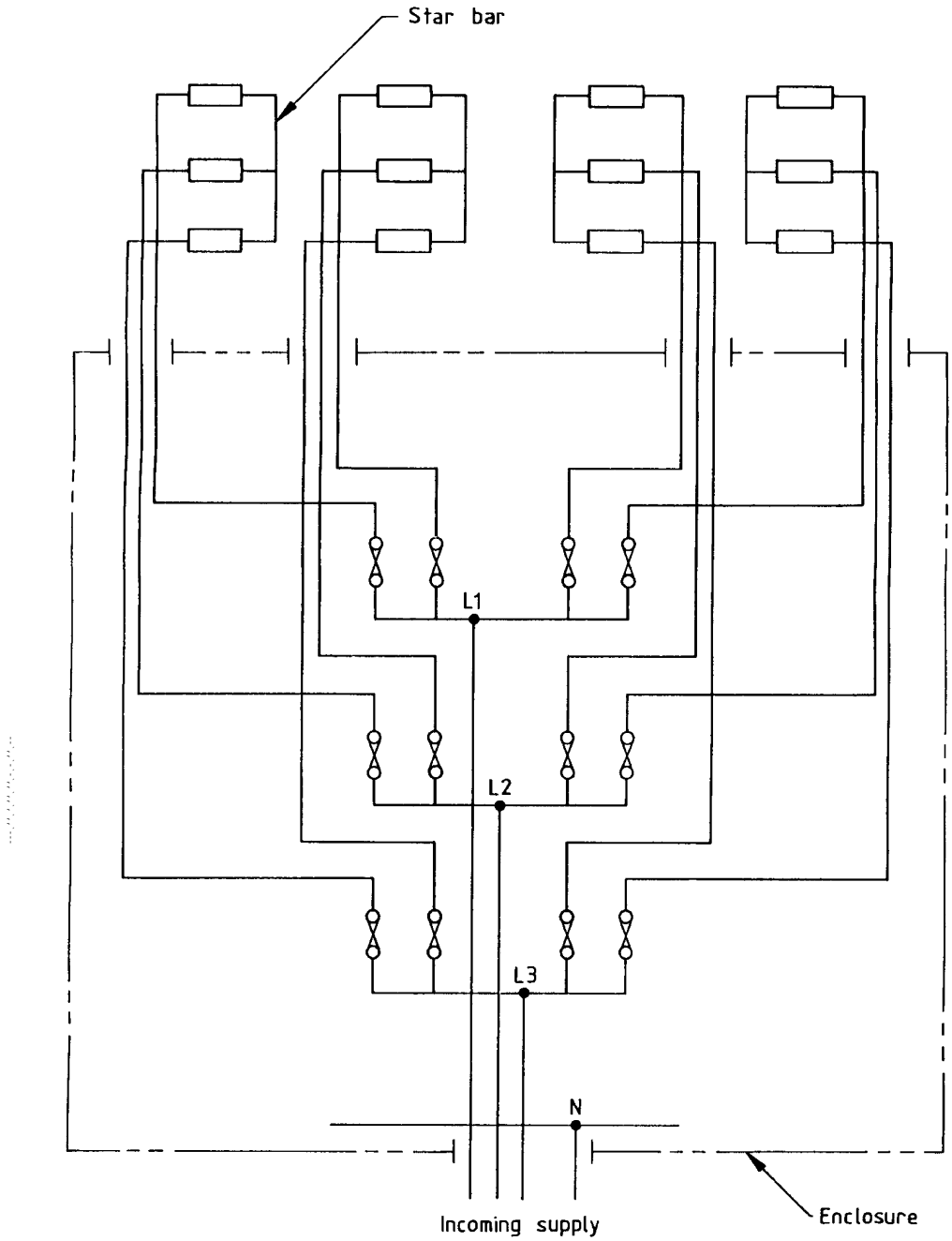
The incoming cables shall comply with **8.2.1.3.1** of Part 1 for a current rating given by the sum of all the outgoing fuseway current ratings per pole multiplied by the diversity factor from Table I. The outgoing cables shall be in accordance with **8.2.1.3.1** of Part 1 with a current rating equal to the fuseway current.

The total current fed into the fuseboard shall be equal to the sum of the ratings of all the outgoing fuseways per pole multiplied by the appropriate diversity factor shown in Table I. This total current shall be distributed equally between all outgoing fuseways and shall be not less than the calculated value. Individual fuseway currents shall be not less than 95 % of the calculated value. No current shall exceed 105 % of the calculated value without agreement of the manufacturer. Care shall be taken to ensure that the current in the fuseway which is likely to be hottest is not less than the average current.



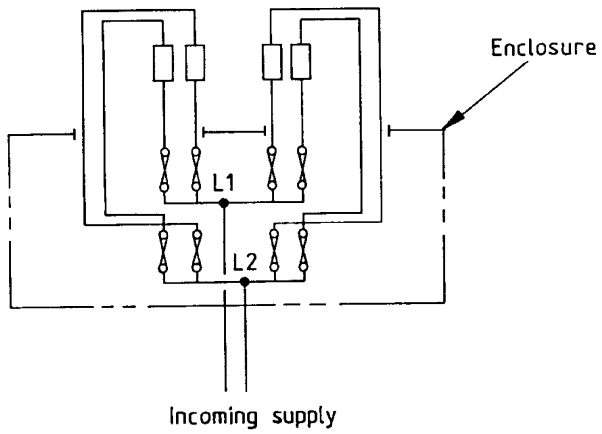
NOTE Where appropriate, single phase testing supply is acceptable.

Figure 101 — Diagram of connections for TP and N fuseboard having outgoing ways rated up to and including 32 A



NOTE Where appropriate, single phase testing supply is acceptable.

Figure 102 — Diagram of connections for TP and TP and N fuseboard having outgoing ways rated in excess of 32 A



NOTE Where appropriate, single phase testing supply is acceptable.

Figure 103 — Diagram of connections for DP fuseboard

For tests on fuseboards containing neutrals and rated up to and including 32 A, the equipment shall be set up for test generally as shown in Figure 101. For tests on fuseboards containing neutrals and rated above 32 A the equipment shall be set up for test generally as shown in Figure 102. For tests on fuseboards without neutrals the equipment shall be set up for test as shown in Figure 103.

The test shall be made for a time sufficient for the temperature rise to reach a constant value (but not exceeding 8 h). In practice this condition is reached when the variation does not exceed 1 K/h. The cross section of the external conductors shall comply with **8.2.1.3.1** and **8.2.1.3.2** of Part 1.

8.2.1.3.1 The provisions of this subclause in Part 1 including Table VIII shall apply.

8.2.1.3.2 The provisions of this subclause in Part 1 including Table IX shall apply.

8.2.1.3.3 For values of test current higher than 800 A but not exceeding 3 150 A: not applicable.

8.2.1.3.4 For values of test current higher than 3 150 A: not applicable.

8.2.1.4 *Temperature-rise test using heating resistors with an equivalent power loss.* Not applicable.

8.2.1.5 *Measurement of temperatures.* The provision of this subclause in Part 1 shall apply.

8.2.1.6 *Ambient air temperature.* The provisions of this subclause in Part 1 shall apply.

8.2.1.7 *Results to be obtained.* The provisions of this subclause in Part 1 shall apply.

8.2.2 *Verification of dielectric properties.* The provisions of this subclause in Part 1 including Table X shall apply.

8.2.3 ***Verification of the short-circuit withstand strength***

8.2.3.1 *Circuits of ASSEMBLIES which are exempted from the verification of the short-circuit withstand strength.* The provisions of this subclause in Part 1 shall apply.

8.2.3.2 *Circuits of ASSEMBLIES the short-circuit withstand strength of which shall be verified by tests*

8.2.3.2.1 *Test arrangements.* The provisions of this subclause in Part 1 shall apply.

8.2.3.2.2 *Performance of the test: General.* The provisions of this subclause in Part 1 shall apply.

8.2.3.2.3 *Testing of the main circuits.* For testing an outgoing circuit, the associated outgoing terminals shall be provided with a bolted short-circuit connection.

Where an outgoing circuit includes a component which has not been tested previously, the following test shall apply.

The switching device shall be closed and held closed in the manner normally used in service.

The test voltage shall then be applied once and for a time sufficiently long to enable the short-circuit protective device in the outgoing unit to operate to clear the fault and, in any case, for not less than 20 cycles (test voltage duration).

8.2.3.2.4 *Value and duration of the short-circuit current.* For ASSEMBLIES with a short-circuit protective device incorporated in the incoming unit (see **7.5.2.1.1** of Part 1) the current corresponding to the stated prospective short-circuit current shall flow until it is broken by the protective device.

8.2.3.2.5 *Results to be obtained.* The provisions of this subclause in Part 1 shall apply.

8.2.3.2.6 For PTTA: not applicable.

8.2.4 ***Verification of the effectiveness of the protective circuit***

8.2.4.1 *Verification of effective connection between the exposed conductive parts of the ASSEMBLY and the protective circuit.* The provisions of this subclause in Part 1 shall apply.

8.2.4.2 *Verification of the short-circuit strength of the protective circuit by test.* Not applicable.

8.2.4.3 *Results to be obtained.* Not applicable.

8.2.5 *Verification of clearances and creepage distances.* The provisions of this subclause in Part 1 shall apply.

8.2.6 *Verification of mechanical operation.* Not applicable.

8.2.7 *Verification of degree of protection.* The provisions of this subclause in Part 1 shall apply.

8.3 Routine tests

8.3.1 *Inspection of the ASSEMBLY including inspection of wiring and, if necessary, electrical operation test.* The provisions of this subclause in Part 1 shall apply.

8.3.2 ***Dielectric test***

8.3.2.1 *General.* The test voltage according to **8.2.2.4** of Part 1 shall be applied for 1 s. The a.c. source shall have sufficient power so as to maintain the test voltage irrespective of all leakage currents. The test voltage shall have a practically sinusoidal wave form and a frequency between 45 Hz and 62 Hz.

All electrical equipment of the ASSEMBLY shall be connected for the test, except for apparatus which, according to the relevant specifications, is designed for a lower test voltage, and current-consuming apparatus (e.g. windings, measuring instruments) in which the application of the test voltage would cause the flow of a current, shall be disconnected at its terminals.

Anti-interference capacitors installed between live and exposed conductive parts shall not be disconnected and shall be capable of withstanding the test voltage.

For the test, either:

a) all switching devices shall be closed; or

b) the test voltage shall be applied successively to all parts of the circuit.

The test voltage shall be applied between the live parts and the frame of the ASSEMBLY.

The test shall only be carried out on ASSEMBLIES containing internal wiring, as distinct from busbars.

8.3.2.2 *Value of test voltage.* The provisions of this subclause in Part 1 shall apply.

8.3.2.3 *Results to be obtained.* The provisions of this subclause in Part 1 shall apply.

8.3.3 *Checking of protective measures and of the electrical continuity of the protective circuits.* The provisions of this subclause in Part 1 shall apply.

8.3.4 *Verification of insulation resistance.* Not applicable.

Appendix A Minimum and maximum cross-sections of copper conductors suitable for connection

The provisions of this appendix in Part 1 shall apply.

Appendix B Method of calculating the cross-sectional area of protective conductors with regard to thermal stresses due to currents of short duration

The provisions of this appendix in Part 1 shall apply.

Appendix C Typical examples

This appendix in Part 1 is not applicable.

Appendix D Typical arrangements of forms of separation by barriers or partitions

The provisions of this appendix in Part 1 shall apply.

Appendix E Items subject to agreement between manufacturer and user

6.1.1.2[a] (Note) Use of ASSEMBLIES in arctic climate.

6.1.3[a] (Note) Use of electronic equipment at altitudes above 1 000 m.

6.2[a] Special service conditions.

6.2.10[a] Electrical and radiated interferences.

6.3.1[a] Conditions during transport, storage and erection.

7.1.3.2[a] Cross-sectional area of cables to be connected.

7.1.3.2[a] Means of connection for aluminium conductors.

7.1.3.4[b] Current-carrying capacities of terminals for neutral conductors. Additional neutral terminals.

7.2.1.1[a] Degree of protection required for the intended installation. For floor-mounted ASSEMBLIES also the degree of protection of the bottom to be indicated.

7.4.2[a] Choice of protective measure against direct contact.

7.4.3[a] Choice of protective measure against indirect contact.

7.4.6[b] Provision of locking facilities.

7.5.4[a] Co-ordination of short-circuit protective devices.

7.6.4.3[a] Degree of protection after removal of a removable or withdrawable part.

7.7[a] Form of separation.

8.2.1.6[a] Ambient air temperatures for temperature-rise test.

8.3.1[a] Repetition of electrical operation test on site.

[a] Subclause of BS 5486-1:1986.
[b] Subclause of this Part of BS 5486.

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Publications referred to

BS 5420, *Specification for degrees of protection of enclosures of switchgear and controlgear for voltages up to and including 1 000 V a.c. and 1 200 V d.c.*

BS 5486, *Low-voltage switchgear and controlgear assemblies.*

BS 5486-1, *Specification for type-tested and partially type-tested assemblies (general requirements).*

BS 5486-13, *Specification for particular requirements of consumer units.*

BS 5559, *Specification for identification of apparatus terminals and general rules for a uniform system of terminal marking, using an alphanumeric notation.*

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